APPENDIX H

Operations and Maintenance Manual

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GROUNDWATER REMEDIAL ACTION OPERATION AND MAINTENANCE MANUAL

OPERABLE UNIT 1

COOPER DRUM COMPANY SUPERFUND SITE

DRAFT

Prepared for:

Contract N0. 68-W-98-225/WA NO. 247-RDRD-091N
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ACRONYMS AND ABBREVIATIONS

AC	alternating current
AOS	advanced oxidation system
bgs	below ground surface
Cal-OSHA	California Occupational Safety and Health Administration
cfm	cubic feet per minute
COC	contaminant of concern
DCA	dichloroethane
DCE	cis-1,2-dichloroethene
DCP	1,2-dichloropropane
DPA	drum processing area
DPE	dual-phase extraction
EPA	United States Environmental Protection Agency
EXW	extraction well
GAC	granular activated carbon
gpm	gallons per minute
GW HASP	groundwater health and safety plan
H_2O_2	hydrogen peroxide
HDPE	high-density polyethylene
HOA	hand-off-automatic
HWA	hard wash area
ISCO	in situ chemical oxidation
kW	kilowatt
LACSD	Los Angeles County Sanitation District
LARWQCB	Los Angeles Regional Water Quality Control Board
LGAC	liquid-phase granular activated carbon
MCL	maximum contaminant level
MCP	Main Control Panel
mL	milliliter
MSDS	material safety data sheet
NEC	National Electric Code
NFPA	National Fire Protection Association
NPL	National Priority List

ACRONYMS AND ABBREVIATIONS (Continued)

O_3	ozone
OCS	operation and control system
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OU	operable unit
PCE	tetrachloroethene
PHG	public health goal
PLC	programmable logic controller
PPE	personal protective equipment
ppm	parts per million
PQL	practical quantification limit
psi	pounds per square inch
psig	pounds per square inch, gauge
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RA	remedial action
RAO	remedial action objective
RAWP	remedial action work plan
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
RPO	remedial process optimization
ROD	record of decision
SCADA	supervisory control and data acquisition
SCE	Southern California Edison
SVOC	semivolatile organic compound
TBD	to be determined
TCA	trichloroethane
TCE	trichloroethene
TCP	trichloropropane
TEFC	totally enclosed, fan-cooled
URS	URS Group, Inc.
VC	vinyl chloride
VOC	volatile organic compound
ºF	degrees Fahrenheit

1.0 INTRODUCTION

This Operation and Maintenance (O&M) Manual was prepared to provide instructions for the remedial action (RA) for the Operable Unit 1 (OU1) (Groundwater) at the Cooper Drum Company Site (Site), located at 9316 South Atlantic Avenue, in South Gate, Los Angeles County, California. The Site has been categorized into two operable units (OUs) for the remedial phase: OU1 consists of the impacted groundwater and OU2 consists of the impacted soil and a perched aquifer in the source area. The basis of design for the groundwater (OU1) RA is presented in the report titled *Cooper Drum Company Remedial Design Report* (URS, 2007a).

This document was prepared for OU1 Source Area RA (Source Area System) and the OU1 Downgradient Containment and Treatment System RA (Downgradient Containment/Treatment System). The OU1 RA includes remedial systems for the source area and hydraulic control (containment) and treatment for the leading edge of the groundwater plume.

The Source Area System consists of in situ chemical oxidation utilizing the injection of ozone and hydrogen peroxide into the source area groundwater using sparge wells that form a permeable barrier to groundwater flow. Additional Source Area System components include extraction of groundwater downgradient of the in situ chemical oxidation (ISCO) barrier, aboveground treatment, and injection of this treated groundwater upgradient of the ISCO barrier.

The Downgradient Containment/Treatment System includes a bioremediation barrier (biobarrier) in the mid-plume area with extraction of groundwater near the leading edge of the plume downgradient of the bioremediation barrier that is conveyed to the Source Area System for further treatment.

The main body of this O&M Manual, along with the documents listed hereafter, provide complete O&M information for the Site:

- The Health and Safety Plan for Groundwater-Related Activities (to be provided by O&M contractor);
- Material safety data sheets (MSDSs) for all appropriate materials;
- The site-specific spill plan (to be provided by O&M contractor); and
- The Quality Assurance Project Plan (QAPP) (to be provided by O&M contractor).

All of these documents are kept available on-site.

1.1 BACKGROUND

The Site is located at 9316 South Atlantic Avenue in South Gate, Los Angeles County, California. It is identified as United States Environmental Protection Agency (EPA) ID CAD 055753370 (Latitude 33 56’ 49” N, Longitude 118 11’42”W). The Site consists of 3.3 acres of mixed residential, commercial, and industrial land use, and is 10 miles south of Los Angeles and approximately 1,600 feet west of the Los Angeles River (Figure 1-1). Site facilities include drum processing and storage areas, an office, a

DRAWING: C:\DOCUME~1\dlarson\LOCALS~1\Temp\notesE1EF34\Figure 1-1 OU1 Source Area Treatment System PFD (simplified).dwg

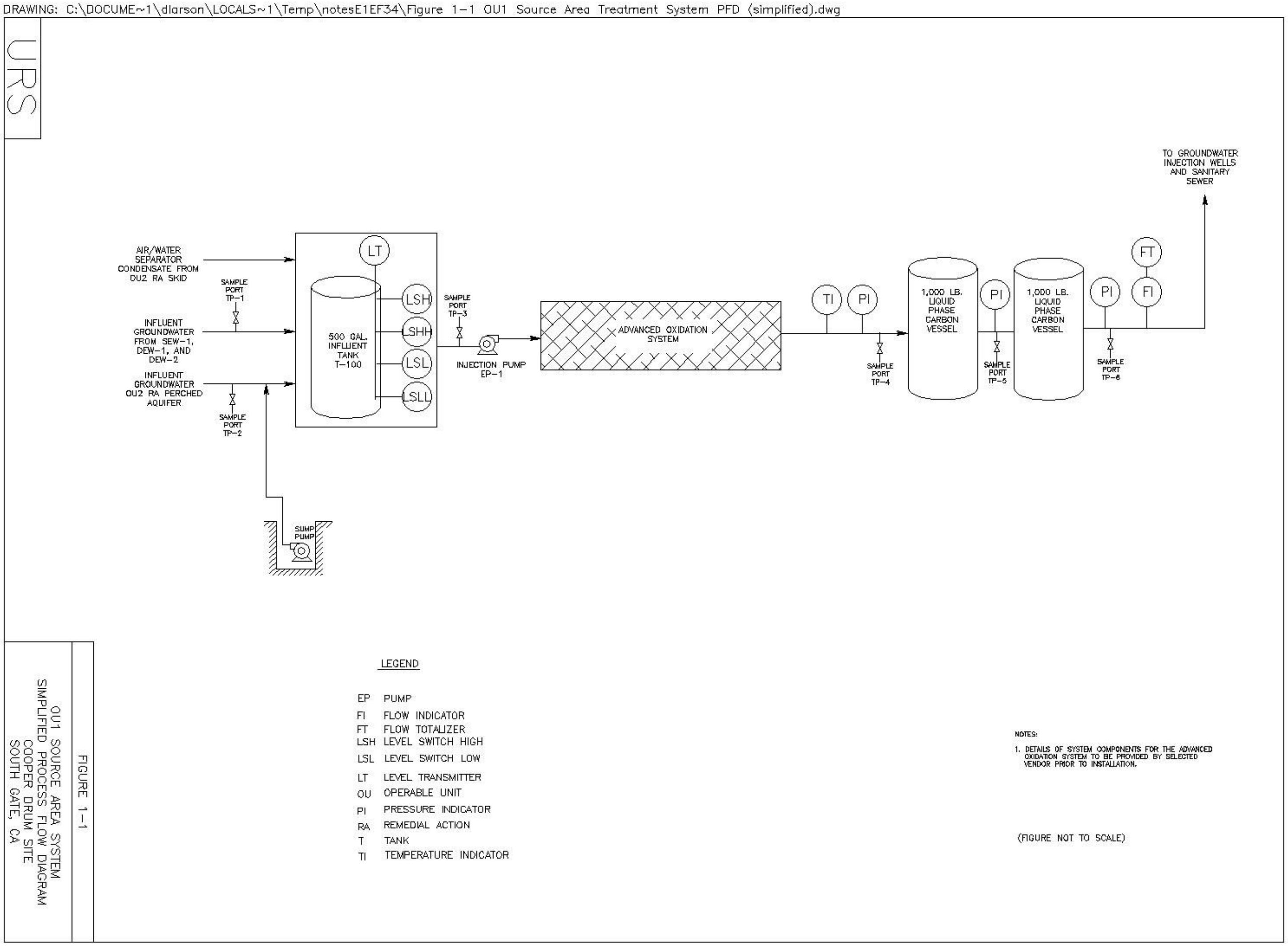

FIGURE 1-1
OU1 SOURCE AREA SYSTEM
SIMPLIFIED PROCESS FLOW DIAGRAM
COOPER DRUM SITE
SOUTH GATE, CA

warehouse, and maintenance buildings. The hard wash area (HWA) is in the northeastern area of the Site, which also includes a covered shed area. The present-day HWA is on the eastern end of the drum processing building, which is referred to as the drum processing area (DPA) in this manual. All Site buildings have concrete floors and the entire facility has been asphalt-paved since 1986. The Tweedy School on the adjacent property has been closed since 1988 because of a concern that children attending the school could be exposed to contamination migrating off Site.

Since 1941, the Site was used by several companies to recondition and recycle used steel drums that once contained various industrial chemicals. The Cooper Drum Company operated from 1972 to 1992, reconditioning drums using a process that consisted of flushing and stripping the drums for painting and resale.

Drum process waste was collected in open concrete sumps and trenches, resulting in releases to soil and groundwater beneath the site. Beginning in 1987, closed-top steel tanks were installed over the sumps, and the trenches were replaced with hard piping. The former HWA was closed and replaced with a new hard-wash area in the DPA, which also provided hard piping and secondary containment.

In 1992, the drum reconditioning business was sold to Waymire Drum Company, which operated the facility until 1996. From 1996 until their departure in 2003, Consolidated Drum Company was the drum-reconditioning operator at the Site. During their tenure, the facility was fitted to process plastic totes (large square containers). An aboveground, enclosed system was used for containing liquids and wastes.

Currently, the site is fully operational; however, drum processing is no longer performed at the site. There were four new tenants, including a pallet company, a trucking and towing company, and two automotive repair/ salvage companies. As of June 2006, the automotive repair/salvage companies moved operations off Site and the pallet company expanded their operations to the vacant property, formerly occupied by the auto repair / salvage companies.

EPA conducted remedial investigation (RI) activities for Cooper Drum from 1996 to 2001. In June 2001, EPA added the Site to the National Priority List (NPL) of hazardous waste sites requiring remedial action. Site investigations conducted as part of the RI identified the former HWA as the primary source of contamination. The DPA also was identified as a source of contamination as a result of chemical spills that were documented during the 1980s. Following the remedial investigation/feasibility (RI/FS) process, the Record of Decision (ROD) for the Site was signed on September 28, 2002.

Twelve hazardous substances are considered contaminants of concern (COCs) in Site groundwater: 1,2,3-trichloropropane (TCP); trichloroethene (TCE); 1,2-dichloroethane (DCA); vinyl chloride (VC); 1,2-dichloropropane (DCP); 1,1-DCA; cis-1,2-dichloroethene (DCE); tetrachloroethene (PCE); trans-1, 2-DCE; benzene; 1,1-DCE; and 1,4-dioxane.

Except for 1,4-dioxane, which is a semivolatile organic compound (SVOC), all the other COCs are volatile organic compounds (VOCs). As stated in the ROD, the remedial action objective (RAO) for groundwater is restoration of the groundwater (through treatment) for beneficial use. Therefore, the cleanup goal for the majority of the Site VOCs is to achieve maximum contaminant levels (MCLs). However, the cleanup goal for 1,2,3-TCP and 1,4-dioxane (for which an MCL has not been defined) is to achieve the practical quantification limit (PQL) and the public health goal (PHG), respectively.

The main hydrogeologic features penetrated by borings and wells completed during the RI field investigation include the Bellflower Aquiclude, the perched aquifer, the Gaspur Aquifer, and the Exposition Aquifer. These units constitute a shallow aquifer and a deeper aquifer. The shallow aquifer consists of the saturated portion of the Bellflower Aquiclude, which incorporates the perched aquifer (approximately 35 to 40 feet below ground surface [bgs]), and the Gaspur Aquifer. The Bellflower Aquiclude extends to a depth of approximately 70 feet bgs, where the Gaspur Aquifer, which extends to a depth of approximately 110 to 120 feet bgs, underlies it. The upper portion of the deeper aquifer system is represented by the Exposition Aquifer, which underlies the shallow aquifer.

Data from investigations at the Site and adjacent sites indicates that groundwater flows in a predominantly southerly direction. Additionally, the groundwater contamination from adjacent sites may have commingled with and impacted the Site plume.

1.2 GENERAL PROCESS DESCRIPTION

The OU1 Source Area System is configured to treat contaminated groundwater by ISCO through 15 injection wells dispersing ozone (O_3) and hydrogen peroxide (H_2O_2) and thereafter, extracting the downgradient groundwater oxidized by the ISCO injection wells, treating it in the aboveground advanced oxidation system (AOS) and liquid-phase granular activated carbon (LGAC) and injecting the treated groundwater back into the aquifer upgradient of the ISCO permeable barrier.

The main OU1 Source Area System components include pumps, motors, blowers, an equalization tank, an H_2O_2 storage tank, an air compressor, an AOS, and two 1,000-pound LGAC vessels.

Groundwater is injected with ozone and hydrogen peroxide (i.e., ISCO) from 15 oxidant injection wells (henceforth referred to as peroxone wells) installed in the Source Area. These peroxone injection wells will create an ISCO barrier for groundwater. Downgradient of the peroxone injection wells groundwater will be extracted by one extraction well, using a submersible groundwater pump. The extracted groundwater is conveyed to the aboveground AOS through conveyance piping. The treated groundwater is then conveyed through the LGAC vessels, to further polish the treated groundwater. This aboveground AOS will also be used to treat approximately 5 gallons per minute (gpm) of groundwater extracted from the OU2 perched aquifer (as described in the OU2 Design Report, July 2007). The treated groundwater will then be injected in the shallow Gaspur Aquifer via 2 injection wells placed upgradient of the permeable ISCO barrier at a maximum of 20 gpm per well.

The OU1 Downgradient Containment/Treatment System is configured to treat contaminated groundwater by extracting groundwater, which is downgradient of a 350-foot long bioremediation barrier, at the leading edge of the impacted groundwater plume via two extraction wells and discharge the extracted groundwater, after treatment at the source area, to the sanitary sewer under a Los Angeles County Sanitation District (LACSD) permit.

The main OU1 Downgradient Containment/Treatment System components include two extraction well pumps and motors.

1.3 PURPOSE AND SCOPE OF THIS OPERATION AND MAINTENANCE MANUAL

The primary objective of this O&M Manual is to provide the information required to perform the O&M services for the OU1 Source Area System and OU1 Downgradient Contamination/Treatment System. Following are the scheduled O&M activities:

- Collecting samples from the treatment system(s);
- Checking pumps, blowers, and motors for proper operation;
- Lubricating motors, blowers, and pump bearings;
- Checking for excessive vibration and noise;
- Measuring bearing temperature;
- Inspecting motor starters and recording amp draw readings;
- Inspecting motor ventilation openings and cleaning motors;
- Inspecting shafts, couplings, and seals;
- Checking all fluid levels;
- Calibrating all instrumentation (level controllers, flow meters, and pH meters); and
- Inspecting and tuning automatic level controllers.

Additional O&M responsibilities include analyzing treatment streams, reporting remediation status, ensuring quality control (QC), recording operational and laboratory data, and implementing, remedial process optimization (RPO) into OU1 RA operations. A simplified process flow diagram of the OU1 Source Area Treatment System is presented on Figure 1-1.

1.4 ENVIRONMENTAL POINTS OF CONTACT AT THE SITE

Following are the Cooper Drum Company Site Office primary points of contact for the O&M of the OU1 Source Area System and OU1 Downgradient Contamination/Treatment System:

United States Environmental Protection Agency (EPA) Region 9
Southern California Field Office
(213) 244-1800

Los Angeles County Sanitation District (LACSD)
(562) 699-7411
(562) 908-4288

Los Angeles Regional Water Quality Control Board (LARWQCB)
Groundwater Division
(213) 576-6607

2.0 SYSTEM COMPONENTS

The OU1 Source Area System and OU1 Downgradient Containment/Treatment System both have one normal mode of operation. These systems operate solely as groundwater treatment systems, though the OU1 Source Area System includes a soil vapor treatment system used for the OU2 RA for the soil and perched aquifer treatment system, which is housed on the same treatment pad.

Table 2-1 identifies the major components of the OU1 Source Area System and OU1 Downgradient Containment/Treatment System and provides a functional description of the components. Major system components are discussed in the following subsections. Detailed data for some of the components can be found in the specific equipment manufacturers' O&M manuals, which are provided in Appendix C of this manual.

TABLE 2-1

System Main Components

Component	Description
Extraction Well Pumps	The extraction well pumps are submersible well pumps that transfer ground-water to the OU1 Source Area System.
Extraction Well Control Panels	Each extraction well or group of wells has a local control panel for controlling the well pump. The control panel typically contains a local hand-off-automatic (HOA) switch, a level controller, and a programmable logic controller (PLC).
Extraction Well Flow Meters	Each extraction well has a flow meter for local flow indication/totalization. A signal is transmitted to their respective treatment systems, allowing operators to remotely monitor and record flow information.
Extraction Well Vault Pumps	Each flush-mounted extraction well has a concrete vault that houses the instrumentation for that particular well. A sump pump with level control keeps the vault free of standing water by discharging it to ground surface. A high-level switch will shut down the extraction well if the vault pump fails.
Peroxone Injection System Hydrogen Peroxide Storage Tank	The hydrogen peroxide non-metallic, double-walled storage tank holds approximately 150 gallons of up to 35% strength hydrogen peroxide.
Advanced Oxidation System Hydrogen Peroxide Storage Tank	The hydrogen peroxide non-metallic storage tank is a storage tank holds approximately 25 gallons of up to 35% strength hydrogen peroxide.
Influent Tank	Influent tank T-100 is a 500-gallon aboveground, round, holding tank. The tank provides equalization against surges and flow variations and additional water from the sump. Treated water can be recirculated to the influent tank if necessary. Influent tank T-100 has continuous level indication and independent high- and low-level switches. This tank receives groundwater extracted from SEW-1 and the downgradient extraction wells before the groundwater is transferred to the AOS
ISCO System Chemical Feed Pump	ISCO system chemical feed pump P-150 delivers hydrogen peroxide from the hydrogen peroxide storage tank to the peroxone wells. The tank has continuous level indication and independent high- and low- level switches.

TABLE 2-1

(Continued)

Component	Description
Injection Pump, EP-1	Injection pump EP-1 transfers water from the Influent Tank T-100 to the AOS. The pump is controlled by high- and low-level switches within Influent Tank T-100.
Advanced Oxidation System R-1	The AOS combines ozone and hydrogen peroxide to destroy groundwater contaminants in a continuous flow reactor. The system utilizes multiple reagent injection points and mixers to maximize contaminant destruction in a waste-free process. It is 4.5 feet wide, 8 feet long, and approximately 7.5 feet high. The maximum flow rate is 160 gpm and ozone capacity is 20 pounds/ day. Detailed information on a sample AOS can be found in Appendix C.
Advanced Oxidation System Control Panel	The AOS control panel is the local panel for controlling most system functions. The panel houses the AOS VFD, the PLC, the level indicators for the ozone and hydrogen peroxide tanks, HOA switches, selector switches, and local indicating lights.
Sump Pump P-250	The sump pump is located within the sump of the bermed area of the OU1 Source Area Treatment System pad. The sump has high- and low-level float switches that control pump operation. The sump pump discharges to the Influent Tank T-100.
LGAC Vessels	The LGAC vessels are located on the OU1 Source Area aboveground treatment pad. AOS effluent is conveyed through the LGAC vessels. The LGAC unit consists of two 1,000-pound LGAC vessels.
Main Control Panel (MCP)	The MCP, in the treatment compound on Rayo Avenue, houses the MCP PLC that processes all of the control and instrumentation signals from the AOS control panel and the influent tank. In addition, the MCP PLC processes and integrates the interlocks between the master alarm shutdown switch, the autodialer, and the operation and control system (OCS).
Operation and Control System (OCS)	The OCS consists of a computer software program, which is commonly referred to as the SCADA system, which allows operators to monitor and control specific OU1 Source Area System and OU1 Downgradient Containment/Treatment System functions from the computer terminal at the warehouse on Rayo Avenue. The OCS monitors and records flow from all extraction wells, the various OU1 Source Area System and OU1 Downgradient Containment/ Treatment System flow meters, and other instrumentation as necessary. It allows for the start and stop of the OU1 RA systems and all of the extraction well pumps.
System Flow Meters	The OU1 Source Area System and the OU1 Downgradient Containment/ Treatment System contain system flow meters with transmitters to monitor and record the flow rates throughout the system. All flow information is transmitted back to the OU1 Source Area System, the MCP and the OCS.
pH Meter	The pH meter is located on the sanitary sewer discharge in the OU1 Source Area System. The pH meter is equipped with interlocks to shut down the system if the pH deviates from the normal operational range.

TABLE 2-1

(Continued)

Component	Description
Autodialer	The autodialer is an automatic paging system for the OU1 Source Area System. The autodialer automatically calls the O&M operator's cell phone to report system shutdowns and alarms.

AOS = advanced oxidation system
cfm = cubic feet per minute
gpm = gallons per minute
HOA = hand-off-automatic
kW = kilowatt
LC = programmable logic controller
LGAC = liquid-phase granular activated carbon
MCP = main control panel
OCS = operation and control system
OU = operable unit
SCADA = supervisory control and data acquisition
VFD = variable frequency drive
VOC = volatile organic compound

2.1 EXTRACTION WELLS

Extraction well locations provide hydraulic control of groundwater contamination and maximize groundwater flow through the permeable barriers. One extraction well is located in the OU1 Source Area, which is treated by the OU1 Source Area System, and two extraction wells are located in the Down-gradient Containment/Treatment Area. Construction details for all extraction wells associated with the two systems are provided in Table 2-2.

TABLE 2-2

Extraction Well Construction Details

Well	Well Type	Total Depth (feet bgs)	Screen Begin Depth (feet bgs)	Screen End Depth (feet bgs)
SEW-1	EXW	105.00	60.00	100.00
DEW-1	EXW	115.00	65.00	112.00
DEW-2	EXW	115.00	65.00	112.00

bgs = below ground surface
DEW = downgradient extraction well
SEW = source area extraction well
EXW = extraction well

All extraction wells (SEW-1, DEW-1, and DEW-2) are connected to the OU1 Source Area treatment system.

Well system components are housed in subsurface vaults. A submersible centrifugal pump is installed in the sump (below the screened interval) of each groundwater well. Each submersible, centrifugal pump has high and low amperage controls on the motor starter to turn the pump on or off if the water level in the well fluctuates or if there is blockage in the discharge or conveyance line piping. A low-level control switch protects the pump from damage by preventing it from pumping the well dry.

In the OU1 Downgradient Containment/Treatment System, groundwater from the two wells is conveyed to the Source Area Treatment compound, where it is combined with all other extracted water and treated before being discharged to the sewer. Sample ports installed in the vault of each well allow for the collection of groundwater samples before the flows are combined. In-line electromagnetic flow meters, located in the well vaults, measure the volume of water extracted from each well.

2.2 OZONE/ HYDROGEN PEROXIDE INJECTION WELLS

Peroxone wells are located in the OU1 Source Area, forming a permeable V-shaped barrier to the groundwater, to facilitate the completed destruction of the target contaminants. Twelve new peroxone wells (denoted P_{ox}-1 through P_{ox}-12) are in located the source area. Apart from the newly installed peroxone wells, the three existing peroxone wells, previously used during the pilot study (M_{ox}-1, M_{ox}-2, and M_{ox}-3), are also utilized. Ozone will be used as the primary oxidant during the ISCO activities. All of the peroxone wells are located in the OU1 Source Area. As groundwater flows downstream, it is then treated by the OU1 Source Area System. Construction details for all extraction wells associated with the two systems are provided in Table 2-3.

TABLE 2-3

Peroxone Well Construction Details

Well	Well Type	Total Depth (feet bgs)	Injection Location Interval 1 (feet bgs)	Injection Location Interval 2 (feet bgs)	Sparge Point Diameter (inches)
M_{ox}-1	PW	100	75	95	1
M_{ox}-2	PW	100	75	95	1
M_{ox}-3	PW	100	75	95	1
P_{ox}-1	PW	100	75	95	1
P_{ox}-2	PW	100	75	95	1
P_{ox}-3	PW	100	75	95	1
P_{ox}-4	PW	100	75	95	1
P_{ox}-5	PW	100	75	95	1
P_{ox}-6	PW	100	75	95	1
P_{ox}-7	PW	100	75	95	1
P_{ox}-8	PW	100	75	95	1
P_{ox}-9	PW	100	75	95	1
P_{ox}-10	PW	100	75	95	1
P_{ox}-11	PW	100	75	95	1
P_{ox}-12	PW	100	75	95	1

bgs = below ground surface
PW = peroxone injection well

2.3 GROUNDWATER INJECTION WELLS

Two groundwater injection wells are located upgradient of the ISCO barrier to shorten the cleanup time. Groundwater in the two injection wells is pre-treated by the OU1 Source Area System before being re-injected into the ground; there are no groundwater injection wells located in the Downgradient Containment/Treatment Area. Construction details for all injection wells associated with the OU1 Source Area System are provided in Table 2-4.

TABLE 2-4

Groundwater Injection Well Construction Details

Well	Well Type	Total Depth (feet bgs)	Injection Depth (feet bgs)	Injection Depth (feet bgs)
IW-1	IW	85.00	55.00	85.00
IW-2	IW	85.00	55.00	85.00

bgs = below ground surface
IW = injection well

Both groundwater injection wells are connected to the OU1 Source Area treatment system.

2.4 PUMPS

2.4.1 Extraction Well Pumps

Table 2-5 summarizes typical extraction well flow rates and submersible pump data. This table lists the pumps for wells associated with the OU1 Source Area and OU1 Downgradient Contamination/Treatment Area. The combined flow rate of the OU1 Downgradient Containment/Treatment Area groundwater extraction wells is approximately 40 gpm, and the extraction well in the OU1 Source Area flows at approximately 25 gpm.

TABLE 2-5

Extraction Well Pump Summary

Well Number	Screen Interval (ft bgs)	Pump Type	Design Flow Rate (gpm)
SEW-1	60–100	22 SQ10-160	25
DEW-1	65–112	22 SQ10-160	20
DEW-2	65–112	22 SQ10-160	20

ft bgs = feet below ground surface
gpm = gallons per minute

Groundwater from SEW-1, DEW-1, and DEW-2 is treated by the OU1 Source Area System and is discharged proportionally to the groundwater injection wells or the sanitary sewer. The submersible pump(s) in each well (or group of wells) has a separate local control panel located at the wellhead. All wells can be shut down remotely from the Operation and Control System (OCS) terminal (see Section 3.0) at the OU1 Source Area System and from the OU1 Downgradient Containment/Treatment System.

The piping manifold at each extraction well contains a flow meter and a "T" connection that will allow the well to also act as an air inlet well within the underground vault box. Most extraction wells have four piping manifold valves. The first valve, the valve farthest downstream from the extraction well, is a gate or ball valve that is used to isolate the pump and piping manifold when the pump or fittings are being repaired or replaced. This valve should be fully open except when the pump or headworks are being serviced. The second valve, a 1/2-inch valve on the wellhead manifold, is used to expel air from the pipeline and to collect samples from the well. This valve should be closed except when a sample is being collected from the well. The third valve, a globe valve, is used to adjust the flow rate. The fourth valve is a check valve. Typically, each well will have a globe valve, a gate or ball valve, and a check valve

2.4.2 Treatment System Pumps

A description of the following treatment system pumps are provided in Table 2-1: EP-1 and P-250.

2.5 TRANSFER PIPELINES

The peroxone wells are piped individually to the treatment trailer system that conveys ozone and hydrogen peroxide to the treatment wells. This design will allow the operators to control flow and take measurements from each peroxone well at the system.

Groundwater from SEW-1 is conveyed to the OU1 Source Area through a network of 4-inch-high density polyethylene (HDPE) pipelines. Groundwater from DEW-1 and DEW-2 is conveyed to the Source Area treatment system via an HDPE pipeline. The pipelines are located aboveground and underground. All conveyance pipelines are single-walled pipes.

2.6 TANKS

A description of the following treatment system tanks are provided in Table 2-1: T-100, T-150, and T-250.

2.7 ADVANCED OXIDATION SYSTEM

The AOS is designed to remove VOCs and 1,4-dioxane from groundwater at a maximum design flow rate of 160 gpm. The AOS has a performance removal efficiency of up to 90.0% for TCE and 1,4-dioxane. The AOS is 8 feet long, 4.5 feet wide, and 7.5 feet tall. Water from the influent tank is transferred to the AOS by feed pump, EP-1. The AOS is a continuous, in-line process that runs at influent water pressure. Ozone and hydrogen peroxide are injected at parts per million (ppm) levels into the contaminated groundwater. The ozone is produced at 40 to 50 pounds per square inch, gauge (psig) from a solid-state ozone generator located on-site. The ozone generator is supplied pure oxygen to produce high concentrations of ozone (6–10% in oxygen). Ozone injection occurs at various sites along the flow path to increase process efficiency and decrease byproduct formation. The continuous reactor section of the AOS is composed of individual reactors. The individual reactors consist of an injection section where ozone and hydrogen peroxide are injected, a mixing section, and a reaction section with a sampling point at the end. This sampling point allows samples to be taken to monitor the extent of contaminant destruction as a function of applied oxidant (ozone and hydrogen peroxide). The residence time in each individual reactor is approximately 3 and 10 seconds.

Each reactor has three ozone injectors and an 8-inch static mixer, and has a residence time of 5 to 30 seconds. Hydrogen peroxide is injected into the contaminated water upstream of the first reactor. The hydrogen peroxide flow is controlled with a metering pump, and the flow is monitored and recorded. Oxygen flow is monitored and recorded by an oxygen mass flow indicator. The concentration of ozone injected is measured using an on-line ozone analyzer. Water is provided from the influent tank, which collects water from all the extraction wells, the sump pump, and 5 gpm of perched aquifer from the OU2 RA system. All process variables are monitored and controlled by a programmable logic controller (PLC).

AOS effluent is conveyed to the LGAC vessels for further polishing of any residual ethanes.

2.8 LGAC UNIT

The LGAC unit, located in the OU1 Source Area System, is composed of two 1,000-pound LGAC vessels, each 5 feet, 10 inches high, and 4 feet in diameter. Maximum vessel operating pressure is 75 psig. The vessels have a maximum flow rate through the LGAC vessels of 80 gpm, and a maximum temperature of 150 degrees Fahrenheit (°F).

The AOS is designed to reduce the influent LGAC VOC concentrations. The LGAC system is used to further polish the groundwater, and the expected loading on the carbon should be minimal. Carbon changeout frequency will be based on the carbon loading. Monthly carbon tracking, listing all contaminants found in the carbon and their respective amounts, will be used to ensure that the carbon is not close to its load limit for any of the contaminants.

2.9 OPERABLE UNIT SUMP

There is one containment area, located in the bermed section of OU1 Source Area System. This area has a sump to remove any accumulated rainfall or spills.

The OU1 Source Area System sump is a 2-foot by 2-foot by 2-foot deep concrete sump with a fiberglass grate, and is equipped with one 30 gpm submersible sump pump. This pump transfers accumulated water from the sump to the pipeline conveying groundwater from the dual-phase extraction (DPE), wells which is then conveyed to Influent Tank T-100.

2.10 ELECTRICAL SYSTEM

The electrical system is designed in accordance with the classification of each of the remediation system areas: OU1 Source Area System and OU1 Downgradient Containment/Treatment System. In accordance with the National Electrical Code (NEC), and considering the mixture of vapors the system handles at the Site, the system requires Class 1, Division 1, electrical components, especially given that the system is monitored and managed by operating personnel intermittently (after the initial startup). Class 1, Division 1-specified components are designed to safely operate in atmospheres with potentially explosive or flammable vapors.

System motors are specified as totally enclosed, fan-cooled (TEFC). The motors also are rated "T," as defined by the NEC, and comply with the National Fire Protection Association (NFPA) 497M (or latest equivalent) to produce lower temperatures on the external housing, to comply with the Class 1, Division 1, criteria. Other electrical components are specified to operate under outdoor weather conditions for this area. The electrical panel includes all overcurrent protection devices and motor starters as shown on the electrical design drawings (Sheets E-1, E-2, and E-3 of the design drawing package, which is included as a separate attachment to this report). There is an emergency shut-off switch inside the compound. The remediation system is lighted at night for security and safety.

2.11 OPERATIONAL CONTROLS

Within the OU1 Source Area System, a PLC panel is integrated in the Advanced Oxidation System. Various elements, switches, and transmitters in the system convey system information to the PLC, which is based on programmed setpoints, cycle pumps, and signal alarms. The PLC is used to record data such as flow rates and pressure readings. The data are used to evaluate system performance. The control system is equipped with an autodialer to notify operators in the event of a system alarm condition or shutdown.

The peroxone well injection process will be controlled through an integrated PLC system that controls valve sequencing and activates all audio/visual alarms. A call-out modem will be included for reporting the system operational status. A call-out modem is included for reporting the system operational status. The peroxone injection system is located in a vendor provided trailer, which resides within the warehouse along Rayo Avenue.

The operation and control of the OU1 Source Area System is shared among three main panels. First is the main control panel. The second panel controls the OU1 Source Area System and is integrated with the AOS. The last OU1 Source Area System control panel is the OCS, located at the treatment compound on Rayo Ave. Descriptions of all three panels are provided in Table 2-1.

The following instrumentation and process components are on the OU1 Source Area System:

- Pressure gauges for each oxidant injection well on the manifold;
- Ozone/peroxide compressor motor thermal overload switch;
- Pressure and temperature monitors on all oxidant injection well lines;
- High- and low-temperature shutoff at the treatment system;

- Flow meters on all liquid conveyance lines;
- Water flow totalizer and system run clocks;
- pH meter with interlocks at the sewer discharge; and
- Localized control panels and central control panel for the submersible groundwater pumps.

No instrumentation or process components are installed in the OU1 Downgradient Containment/ Treatment System.

The remediation system operator(s) will be supplied with other portable monitoring equipment and tools for proper remote system adjustment and operation.

2.11.1 Extraction Well System

The OU1 Source Area System and OU1 Downgradient Containment/Treatment System extraction wells contain submersible centrifugal pumps. The control hardware for each well includes a level switch, a PLC, alarm lights, and system interlocks. If the water level drops below the level switch in the well, a signal is processed by the PLC, which controls the alternating current (AC) power supplied to the pump via an interlock. The AC circuit powering the pump is shut off should the low-water-level switch be activated. Low-level switch activation activates an alarm light mounted in the main control panel.

Well pumps also can be turned on or shut down using a hand switch mounted on the main control panel.

2.11.2 Sump Pump

The control hardware associated with the sump pump includes a high-level switch, PLC, and alarm lights.

Under normal operations, the sump pump is controlled by a self-contained float switch that cycles the pump on and off as dictated by the sump water level.

If, because of control failure, equipment failure or unusually high rainwater influx (greater than a 100-year, 24-hour storm), the sump pump is unable to maintain normal water levels in the sump, the water level will rise and activate a shunt trip via the pad high-level switch. If a high pad water level causes the shunt trip to activate, tripping the breaker, the extraction wells will shut down. This condition causes a high-level alarm light to light at the main control panel, triggering a communication to the main OU1 Source Area System or the OU1 Downgradient Containment/Treatment System, which in turn sends out an autodialer alarm/notification.

2.11.3 Influent Tank

The control hardware associated with the influent tank includes low/low- and high/high-level switches, a level indicating transmitter, a level indicator, PLC, and alarm lights. A level transmitter mounted on the influent tank below the level of the transfer pump inlet continuously transmits and indicates a signal to the level indicator mounted on the main control panel and to the PLC. The PLC, via an interlock, powers a pump according to the measured water level in the tank. The higher the water level, the greater the pumping rate. The design maximum pumping rate is 70 gpm. Under the expected conditions, this will provide a continuous supply of groundwater to the AOS. A hand switch mounted at the main control panel can be used to manually activate or shut down the pump.

In the event of control failure or unusually high influent water flow, a high/high-level switch will close to prevent overfilling the tank. This switch is set so that a maximum of approximately 500 gallons of water can accumulate in the tank at any given time. This volume corresponds to the secondary containment capacity of the treatment pad. If a high water level causes this switch to close, all upstream pumping sources of water will be shut down. In addition, a shunt trip is activated when the water level in the tank exceeds the high/high-level switch, causing the breaker to trip. This action will shut down the extraction wells and AOS skid.

If controls fail to shut down or to adequately reduce the pumping rate of the influent tank transfer pump, a low/low-level switch will be activated to shut down and prevent damage to this pump.

In the event of either a high/high or low/low water level condition, alarm lights mounted at the main control panel will light to inform operators of the condition. The autodialer also will notify operators of an alarm condition.

2.11.4 Advanced Oxidation System Skid

The local AOS interlocks include a high level and low level. Other conditions that will shut down the AOS include a high/high influent tank level, a high pad level, and an OU1 Source Area System shutdown. Additional controls for the AOS are described in the manufacturer's O&M Manual provided as Appendix C.

2.12 AUTODIALER

The autodialer for the OU1 Source Area System and OU1 Downgradient Containment/Treatment System calls the O&M contractor to report system shutdowns and alarms. The following are an example of system alarms that would initiate the autodialer:

- High temperature in control cabinet
- AOS failure
- Pad flood switch
- High-high tank level

If the operator for the 24-hour phone does not answer the alarm call and acknowledge the system alarms, the autodialer will begin calling a programmed list of alternative numbers until the alarm is acknowledged.

3.0 SYSTEM OPERATION

This section presents the specific sequence of steps to be followed to bring the OU1 Source Area System to normal operation. Certain system components are not required for the OU1 Source Area System operation and are only on line when warranted by influent conditions. Operators must read this section and thoroughly understand it before starting the system.

In addition to discussing startup and shutdown procedures (Sections 3.1 and 3.2, respectively), this section describes routine operations and troubleshooting guidelines for the system.

3.1 STARTUP PROCEDURES

Before initiating system startup, inspect each piece of equipment to be used. After completing the pre-startup inspection, verify that there is power at each control panel. The selector switch setting will indicate the status of the feed. Mechanical equipment, instrumentation, and electrical switches should be checked for repair or warning tags.

Verify extraction well operation flow setpoints based on the most recent hydraulic data. Review the operation monitoring forms for the operational control parameters under which the plant was last operated (flow rates, influent tank levels, etc.).

After completing the pre-startup checks, again verify that there is power at each control panel. Follow the steps presented hereafter to continue the OU1 Source Area System startup process.

3.1.1 OU1 Source Area Startup Procedures

1. Close all groundwater sample ports at wells and on treatment pad.
2. Verify the OU1 Source Area Treatment System components are all enabled, and ready to run.
3. Open all necessary valves at the selected wellheads, sump, influent tank, AOS, and the effluent groundwater conveyance line.
4. Turn on the main power panel.
5. Enable the extraction pump.
6. Allow water to fill influent tank to a depth of 2 feet.
7. Enable influent tank transfer pump (EP-1).

3.1.2 LGAC Vessels

Preliminary Steps. Complete the following steps before operating the carbon adsorption equipment.

1. Check all piping connections for proper installation and tightness.
2. Ensure that all gauges and instruments are functional and installed correctly.

3. Ensure the valves throughout the system are in the correct configuration.

3.1.3 Extraction Wells

The following is the startup procedure for the submersible pumps in the extraction wells.

1. Verify that the breaker at the main power panel is in the ON position.
2. Verify that the breaker on the local control panel is in the ON position.
3. Verify that the flow control valve and isolation valves are open.
4. Turn the HOA switch to AUTO. The pump should start. If the pump does not start, an operational condition may be prohibiting the pump from starting in AUTO. Verify proper level switch operation.
5. Turning the HOA switch to OFF turns off the pump.

All extraction well pumps can be started or stopped from the OCS terminal in the warehouse on Rayo Ave. when the local HOA switch is on AUTO.

3.1.4 Conveyance Piping

Operators should ensure that all valves are correctly aligned to transport groundwater to the OU1 Source Area System. Since most extraction well pumps have local level controls, there will be very few instances when valves will need to be closed or opened.

3.1.5 Operable Unit Sump

A sump pump in the main berm area is automatically controlled by a high- and low-level switch that starts and stops the pump.

3.2 SHUTDOWN PROCEDURES

To perform a normal shutdown at the OU1 Source Area System, turn off the extraction wells at the OCS. All other components will shut down automatically.

OU1 Source Area System Shutdown Procedures

1. Turn off all extraction wells.
2. Switch all AOS switches to the OFF position.
3. Verify that influent pump EP-1 is shut down.
4. Close appropriate influent and effluent valves.

3.2.1 LGAC Vessel

Short-Duration Shutdowns. For short-duration shutdowns (less than two weeks), minimal work is required. The valves in the pipelines to and from the carbon vessel should be closed, and the valves in the vent lines on each vessel should be opened.

Extended Shutdowns. For extended shutdown periods (longer than two weeks), the vessel should be drained and refilled with potable water. Water in the vessels is drained and cycled back into the influent tank for processing after the plant is restarted. All of the valves in the pipelines to and from the train should be closed, and the valves in the vessel vent lines should be opened.

Emergency Procedures. In the event a malfunction causes the shutdown of a carbon vessel, flow to the vessel should be stopped. Proper safety procedures as outlined in the groundwater Health and Safety Plan (GW HASP), provided by the O&M contractor, should be observed at all times to prevent injury to personnel and damage to the equipment.

3.2.2 Extraction Wells

The extraction wells can be shut down from the supervisory control and data acquisition (SCADA) terminal may be remotely accessed or locally controlled by placing the local HOA switch in the OFF position.

3.2.3 System Sump Pump

Shutdown of the main berm area sump pump is automatic when the water level is low enough in the bermed area.

3.2.4 Emergency Shutdown Procedures

The OU1 Source Area System and OU1 Downgradient Containment/Treatment System main electrical disconnect is on the main control panel. The OU1 Source Area System and OU1 Downgradient Containment/Treatment Systems are designed to shut down in the event of a power outage or flooding, as described hereafter.

The following three basic alarm conditions will initiate plant shutdown.

- **Containment Berm High Water.** When the containment berm alarm is initiated, water inside the plant containment berm has risen to a level causing the alarm to sound. The alarm will sound when water inside the berm is approximately 1 foot above the gravel surface. This condition could result from an unusually high amount of rainwater or from a pipe break or vessel failure inside the containment berm. This alarm will shut down the feed pumps and all the extraction well pumps.
- **Loss of Plant Power.** This condition will shut down the entire plant and well fields. When power is re-established, the plant equipment and well field pumps will have to be restarted manually.
- **Influent Tank High Level.** The influent tank high-level alarm will be activated when water inside the influent tank has risen to approximately 1-foot below the top of the tank. This condition could result from an obstruction or partially closed valve downstream from the tank. This will shut down the entire treatment system and all the extraction well pumps.

3.2.5 Flooding

In the event of flooding, the treatment system will undergo a delayed shutdown process. A high-water-level switch triggers the delayed shutdown. Once the switch is triggered, the treatment system will undergo a normal shutdown cycle to avoid stressing the unit. In the event the containment pad floods before the shutdown cycle is complete, the entire system will shut down immediately. Manual restart of the system is required.

3.3 ROUTINE OPERATIONS

Under normal operating conditions, the system will be monitored to ensure that all process components are operating as desired. Visual inspections and recording of process parameters will be performed during site visits. System adjustments should be made to ensure optimal performance of the OU1 Source Area System and OU1 Downgradient Containment/Treatment System.

3.3.1 Extraction Wells

Well Flow Rate. To control the groundwater flow rate of a well, the globe valve at the wellhead may be adjusted. However, the wellhead discharge pressure should be monitored to ensure that the well's submersible pump is operating within an appropriate range.

3.3.2 LGAC Vessels

During normal operations, the LGAC system functions automatically. Routine maintenance activities for the LGAC vessels include backwashing the vessels, determining granular activated carbon (GAC) changeout frequency, and transferring carbon into and out of the vessels. Procedures for each of these activities are presented in this section.

Determination of Carbon Changeout Schedule. Loading on the carbon vessels should be minimal, since the Advanced Oxidation system pre-treats the groundwater before it reaches the LGAC vessels. Therefore, a rigid carbon changeout schedule is not feasible. However, data tracking is required. Many variables affect the changeout schedule. Totalized flow through the carbon vessels is one indicator that can be used to track changeout needs. The totalized flow at the required changeout time will be fairly constant over a short time period (one year). Analytical results for carbon effluent samples are the factor used to determine the carbon changeout schedule. The concentration signaling a need for carbon changeout of the primary vessel operating in series is 1.0 µg/L of any of the following VOCs in the mid-bed sample: vinyl chloride, 1,1-DCA, TCE, PCE, 1,2-DCA, 1,1,1-trichloroethane (TCA), 1,1-DCE, or 1,2-DCE. The target concentration for a carbon changeout of vessels operating in parallel is detection of one of these VOCs at the effluent.

The frequency of effluent sampling and the target levels for carbon changeout will be continuously evaluated to determine the optimal sampling schedule and changeout frequency. If future changes in the frequency of sampling and carbon changeout are necessary, the changes will be included in the remedial action work plan (RAWP), to be prepared by the O&M contractor. Currently, the effluent sampling frequency is monthly, based on the assumed sewer district requirements, but may change based on actual permit requirements.

Spent Carbon Transfer. When COCs are detected above target levels at the carbon vessel effluent, the carbon is considered spent. At this point, the vessel is ready to be removed from service to replace the spent carbon with virgin carbon. Spent carbon will be sent for regeneration at an approved facility.

The procedures for carbon transfer from the carbon vessel to a transport trailer are described here. Spent carbon is transferred from the carbon vessel into an empty carbon trailer. The spent carbon is transferred as a slurry into the trailer by pressurizing the carbon vessel with compressed air. The specific steps to complete the spent carbon transfer are as follows.

1. Isolate the vessel from the rest of the system.
2. Connect the 4-inch-diameter hose from the carbon outlet line on the carbon vessel to the trailer fill line.
3. Connect a 4-inch-diameter hose from the trailer drain line to the plant sump.
4. Open the valve in the trailer vent line.
5. Open the valve in the plant air line to the carbon vessel and pressurize the vessel to 20 to 25 psig.
6. When the vessel pressure reaches 20 psig, open the valves in the carbon discharge line and start the carbon flow from the vessel to the carbon trailer.
7. After 10 minutes, open the valve in the influent line to the vessel to add water. Allow the water to flow for 5 to 10 minutes and then close the valve.
8. Concurrently, open the valves in the front septum line on the trailer to begin draining water from the tank to the OU1 Source Area System sump.
9. The transfer process should take from one to two hours. The transfer is complete when airflow is detected in the carbon transfer line and the vessel pressure starts to drop. At this point close the valve in the carbon discharge line while leaving the valve in the air line to the vessel open.
10. A small amount of carbon is likely to remain in the vessel, and this material must be removed. To remove the remaining carbon, first open the influent line to the adsorber and add water to the vessel for two to three minutes, then close the valve.
11. When the pressure in the vessel reaches 20 psig, open the valve in the carbon line and transfer the remaining amount of carbon into the trailer.
12. When all of the carbon is transferred, the carbon vessel should be flushed with water to remove the last remaining traces of carbon. At times, pockets of carbon can become trapped in the vessel and not be completely transferred out. Complete transfer should be verified by opening the access port on the carbon vessel and conducting a thorough visual inspection. When the flushing operation is complete, the adsorber is ready to be filled with virgin carbon from a carbon transfer trailer.
13. When airflow is detected in the carbon line, close the valve in the air line and allow the carbon vessel to vent through the trailer until the pressure decreases to zero. At this point, close the valve in the carbon discharge line on the bottom of the vessel and flush the line with plant water into the trailer.

14. Open the valves in the rear septum line on the trailer and continue draining the trailer.
15. The trailer can be pressurized with air to expedite the draining process. To accomplish this, first close the valve in the trailer vent line and connect the 1-1/2-inch air line to the trailer air connection.
16. Open the valve in the air line and increase the pressure on the trailer to 20 to 25 psig. With air pressure on the trailer, the blowdown should take about 60 minutes.
17. When airflow is detected in the drain line, close the valve in the front septum. Continue draining water until airflow is again detected in the drain line.
18. When all the water is drained from the trailer, close the valve in the air line, open the valve in the trailer vent line to bleed off the air pressure, bleed off the pressure in the air line, and disconnect the hose.
19. Repeat steps 13 through 15 as needed to remove all of the standing water from the trailer.

The carbon transfer operation is now complete. The vessel should be completely empty and ready to be filled with virgin carbon.

Filling the Vessel with Carbon. When the steps outlined above are completed, the vessel is ready to be filled with the virgin GAC. The carbon is transferred into the vessel from carbon trailers as a slurry. The first step is to add a water heel in the vessel to cushion the initial flow of carbon slurry into the vessel. When this step is completed, the appropriate hose connections are made between the trailer and the vessel. The trailer is then filled with water. The valves in the carbon transfer line and the vent line on the vessel should be opened before starting the transfer. All the other valves in the system should be closed. The detailed procedures for making the transfer were described earlier in this section.

The trailer operator will connect the necessary hoses and operate the trailer valves. A plant operator should be available to re-valve the carbon vessel skid or indicate which valves may be operated by the driver. The driver will monitor the sequence of operations to ensure that correct procedures are being followed.

When all of the carbon has been transferred from the trailer, the driver will disconnect the hoses, close the valves on the trailer, and close the valves in the vent and carbon fill lines on the vessel. The carbon vessel must be filled with potable water, and the virgin carbon must be allowed to soak for 24 hours. The water is discharged to the sanitary sewer. When adsorber operations are complete, the vessel can be put into operation.

3.3.3 Conveyance Piping and Extraction Wells

The pipeline network is equipped with manual valves that can be used to isolate flow from individual wells or flow from each of the well fields. The plant operator is responsible for checking aboveground pipelines for possible leakage during each site visit.

A gate or globe valve located at the discharge of each wellhead is used to adjust flow manually. The globe gate valve and ball valve should not be completely shut while the pump is running. This could create high pressure in the pipeline that could damage the pump. If it is necessary to close the discharge valve, the pump must be turned off. The HOA switch on the local control panel must be turned to the OFF position before the valve is shut.

All of the extraction wells are controlled by pump controllers. These pump controllers monitor the electrical load on the submersible pump motor and turn the motor on or off depending on the load variation measured. The amount of load on a submersible pump motor can be used to measure indirectly the level of water in a well. When a submersible pump is pumping in a well with water, a certain electrical load will be imparted to the motor. Similarly, when a submersible pump is pumping in a dry well (with no water), minimal or no load will be imparted to the pump motor. Consequently, by monitoring the load variation on the submersible pump motor, the pump can be turned on or off depending on the water level in the well. In this case, the pump controller serves the same function as a high- and low-level switch in the well.

3.3.4 Influent Tank T-100

During normal plant operations, contaminated groundwater from the extraction well manifold and water from the sumps will enter influent tank T-100. Level controller will adjust the speed for AOS feed pump VFD. The controller and PLC will maintain the tank level setpoint at 2 feet unless the pumps are running at their preset minimum speed and exceed the influent flow rate. The AOS PLC has a low-level setpoint feature that disables the AOS feed pump from delivering groundwater to the AOS. This feature protects the pumps from cavitation and will not shut down the system. The PLC will then enable the AOS feed pump when the water in the tank recovers to a preprogrammed level of 2 feet. The level sensors control the speed, based on the detected level within the tank, and eventually stabilize at the programmed setpoint of 2 feet. In addition, a high-level switch set at 3 feet will shut off the system and all the extraction wells.

3.3.5 System Sump Pump

The sump pump in the main berm area sump is equipped with a float-level switch (HIGH and LOW). The high-level switch, when activated, will start the pump; the low-level switch, when activated, will shut the pump off. This will prevent the pump from running dry. The actuation level for the pump is adjusted by lowering or raising the floats attached to the pump.

3.4 TROUBLESHOOTING GUIDELINES

This section details system alarm troubleshooting (Table 3-1) and includes contingency plans for various system conditions (Table 3-2). These tables do not address every possible alarm condition and system malfunction. The equipment-specific O&M manuals in Appendix C of this O&M Manual should be referenced for troubleshooting of the AOS system, peroxone system and other system components. System troubleshooting should be performed by an experienced and qualified operator.

3.4.1 LGAC Vessels

Common problems associated with LGAC system operation are indicated by premature breakthrough of VOCs through the carbon bed, which can result from failure of the AOS to adequately treat the water or

TABLE 3-1

System Alarm Troubleshooting and Response

Reason for Alarm	Results/Implications	Potential Problem/Remedy
High water level in the Influent tank (T-100).	All active well pumps, containment sump (P-150) shut down.	• Level switch level transmitter/ PLC/variable-frequency pump drive has failed. Test control hardware. • Large rainfall input to system from sump exceeds transfer pump (P-150) capacity. Consider pumping off excess water into a portable tank.
High water level in the equalization tank (T-100); shunt trip breaker.	Activates shunt trip breaker for all wells and AOS.	Flooded pad, overfilled equalization tank.
Low water level in the Influent tank (T-100).	Influent tank transfer pump (EP-1) shuts down to prevent pump damage.	Break in well field pipeline. Bad level transmitter. Replace transmitter.
High water level in containment area of pad; shunt trip breaker.	Total system shutdown. Well pumps, blowers, transfer pumps, sump pump shut down.	• High rainfall has exceeded sump pump capacity. • Broken liquid line has flooded pad. Repair line. • Bad high-level switch. Replace switch.

AOS = advanced oxidation system
PLC = programmable logic controller

short circuiting of the carbon bed due to low flow. Testing of the AOS effluent may help to resolve the cause of the failure and select the proper corrective action.

The other potential problem is excess LGAC pressure. Do the following if this occurs.

1. Open the downstream valve to relieve pressure.
2. Check the LGAC pump gauges.
3. Check the stripper valve operation.

3.4.2 Extraction Wells

If a flow meter's readings become erratic, the flow meter should be inspected for deposits or debris and then cleaned.

Depending on the pump operating conditions, the submersible pumps should operate from three to seven years. Typically, submersible pump motors require replacement every five years. When a pump needs replacement, the pump and associated down-hole components should be inspected for evidence of

TABLE 3-2

Contingency Plan for System Operations

Potential Situation	Contingency Plan
Untreated Water Leak Detected	• Shut down system immediately. • If untreated water has migrated outside of containment area, do not pump down the standing water within the containment area, as collection of samples may be required. • Notify EPA and URS personnel. • Collect samples if so directed by EPA or URS project management. • Repair leak or other source of water. • Restart system under increased monitoring.
Meter Failure	• Determine if the system can be operated according to the project goals without the information provided by the failed meter. • Shut down the system and repair or replace meter, if necessary.
Electrical System Failure	• Field staff will not make electrical repairs to the system unless they have experience in performing the specific task required. • If field staff are not qualified to perform repairs, a professional electrician will make the necessary repairs.
System Shutdown Due to Alarm Condition	• Field staff will diagnose the problem, make any necessary adjustments/ repairs, and restart the system. • If addressing a non-routine alarm condition, the system should be monitored for a short time after system startup to ensure proper operation.
pH Meter Failure	• Determine if the system can be operated according to the project goals without the information provided by the failed pH meter. • Shut down the system and repair or replace meter, if necessary.

EPA = United States Environmental Protection Agency

corrosion or bacterial buildup. If such evidence exists, redevelopment should be conducted, by swabbing or jetting the well to remove corrosion and bacteria and to pull any fine-grained material trapped in the filter pack into the well. Dispersing agents also should be used to facilitate the removal of clays that may have been drawn into the gravel pack. Variations in flow rates over time should be monitored for all extraction wells. While sudden pump failures may indicate pump malfunction, gradual decreases in flow rates with time may be an indicator that bacterial growth is inhibiting groundwater intake.

3.4.3 Conveyance Piping

Do the following, in the event of a conveyance pipeline leak.

1. Shut down the appropriate wells and close appropriate valves to isolate the affected section of conveyance piping, if possible.
2. Notify the following individuals and provide pertinent information:
   a. Immediate supervisor;
   b. URS project manager;
   c. Field project manager for EPA; and
   d. Spill response team.
3. Alert staff. Make all emergency notifications per the Site-Specific Spill Plan.
4. Use the spill containment equipment to contain and isolate the spill. Divert the spill away from surface waters.

A large leak will be indicated at the OCS screen as an abrupt loss of flow through the plant. A slight leak will be detected through periodic pipeline inspections. All aboveground pipelines should be inspected visually for leaks at least once each week. Some sections of the conveyance pipeline are below ground, are not protected by leak detection systems, and have no provisions for direct inspection. However, the operator should be aware that standing water or saturated soil in the vicinity of underground piping during periods of little or no precipitation may be an indicator of leakage. If such conditions are noted, the operator should notify EPA and treat the condition as a potential pipeline leak. Operators should notify supervisory personnel and take the necessary measures to contain and repair any leak. Additional emergency response procedures are described in greater detail in Section 5.0.

A float-level switch has been installed in each extraction well vault to detect a high-water level in the vault. When the switch is activated, the SCADA registers an alarm at the control panel, indicating a leak has occurred and shuts off the extraction well pump. However, because each vault is equipped with a sump pump to remove rainwater build-up, leaks small enough to be controlled by the sump pump will not be noticed until the weekly inspection of the conveyance line.

3.4.4 Influent Tank T-100

If a low influent tank level is indicated, perform the following procedures.

1. Visually check the influent tank external float indicator to verify a low tank level. This will rule out an instrumentation problem.
2. Check the OCS extraction well flow rate indicators. If extraction well flows have stopped, check the extraction wells. If the circuit breakers are tripped, they may be reset and the wells can be started. The plant supervisor should be contacted for advice and assistance if needed.

Note: If the level in the influent tank begins to drop rapidly, follow the previous instructions. If the AOS feed pump shuts down on a low influent tank level, extraction well water must be added to the influent tank to restart the AOS feed pump.

If a high influent tank level is indicated, perform the following procedures.

1. Visually check the influent tank external float indicator to verify a high tank level. This will rule out an instrumentation problem.
2. Check the alarm control panel.
3. Check the AOS feed pump to verify it is pumping.
4. Shut down the extraction well pump if the level continues to rise.

The accuracy of the influent tank level-control system should be verified if malfunction of the level controls is suspected. The level-control system controls the influent rate to the AOS and consists of a submersible level transmitter wired to a level indication controller.

A malfunction of the influent tank level-control system may cause the tank to have an unusually high or low level. Any high level in the tank will result in a high-level alarm to the main control panel and the automatic shutdown of the extraction well pumps. Any low level in the tank will result in a low-level alarm to the main control panel and an automatic shutdown of the AOS feed pumps. Corrective action will require monitoring of the local level gauge and manual control of the AOS feed pumps.

3.4.5 System Sump Pump

The sump pump level controls could fail or become stuck in the wrong position. This would prevent the automatic operation of the sump pump. These problems are minimized through routine scheduled inspections.

4.0 SYSTEM MAINTENANCE

This section of the O&M manual provides guidance on maintaining the remedial equipment to optimize the system and minimize system downtime from equipment malfunctions. Recommended equipment settings, preventive maintenance tasks and frequencies, and a recommended spare parts inventory are included.

During standard operation, the OU1 Source Area System and OU1 Downgradient Containment/ Treatment System are maintained on a monthly basis. Routine monthly activities include, but are not limited to, the recording of the plant process operating parameters, observatory equipment inspections, and basic maintenance. A maintenance database is employed by treatment plant operators to assign and track maintenance tasks.

4.1 OPERATIONS AND MAINTENANCE DOCUMENTATION

The site personnel responsible for system maintenance will document all activities completed and general and site-specific observations in a field logbook. This logbook will enable system operators to refer to past activities and events and will aid them in system trend analysis, report generation, and trouble-shooting. In addition to the site log, treatment system process logs (see Appendix B to this O&M Manual) will be completed as called for (monthly, quarterly, or yearly). The operator will record critical process parameters for mass balance calculations and system performance and trend analyses. System readings should be compared to the recommended values presented in Table 4-1.

TABLE 4-1

Recommended Treatment System Process Parameters

Operating Parameter	Normal Operating Range
Automated Data Collection by PLC	
Extraction well water level	135 to 140 feet
Well groundwater extraction rate	20 to 25 gpm
Manual Measurement	
Well/piezometer water level	105 to 135 feet bgs (varies seasonally)
Extraction well water discharge pressure	20 to 60 psi
Tank water level	TBD
LGAC vessels flow rate	Up to 80 gpm maximum

bgs = below ground surface
gpm = gallons per minute
PLC = programmable logic controller
psi = pounds per square inch
LGAC = liquid-phase granular activated carbon
TBD = to be determined

4.2 ROUTINE EQUIPMENT MAINTENANCE

Preventive maintenance activities to be performed on system equipment are presented in Table 4-2. A review of all vendor operations manuals will be conducted; as conditions vary, so may the frequency of maintenance activities.

TABLE 4-2

Preventive Maintenance Tasks and Frequencies

Equipment	Maintenance Action Item	Maintenance Frequency
Advanced Oxidation System	Clean and inspect.	TBD
Centrifugal Pump	Disassemble, inspect, and clean impeller housing.	TBD
	Grease motor.	TBD
Liquid Level Transmitter	Conduct in-process checks for the sensor module, amplifier board, and the calibration board.	TBD
Electrical Panel	Check all operating lights and replace as needed. Confirm wire terminations are tight. Clean and inspect panel terminals.	Every six months
Interlocks	Test.	Semiannually

TBD = to be determined

Operators must be experienced and qualified to operate this type of system and must receive specific training in equipment operation. Every aspect of the system O&M cannot be covered in the manual.

4.3 SPARE PARTS INVENTORY

Spare parts should be maintained at the site to minimize system downtime from an unanticipated component failure or delay in the procurement and delivery process. Recommended spare parts and their quantities for the OU1 Source Area System and OU1 Downgradient Containment/Treatment System are described in Table 4-3.

TABLE 4-3

OU1 Source Area Spare Parts Inventory

Component	Model or Catalog Number	Minimum Quantity	Quantity On Hand	Manufacturer	Vendor	Vendor Information	Delivery Time
Advanced Oxidation System:							
Influent Pump	TBD	1	TBD	TBD	TBD	TBD	TBD
LGAC:							
No critical spare parts.							
Carbon Vessels:							
No critical spare parts							
Plant Controls:							
Influent tank liquid level pressure transmitter	TBD	1	TBD	TBD	TBD	TBD	TBD
Liquid level sensor	TBD	1	TBD	TBD	TBD	TBD	TBD
6” flow meter	TBD	1	TBD	TBD	TBD	TBD	TBD
Extraction System:							
Sump Pump	TimeMark #422	2	TBD	TBD	TBD	TBD	TBD
Pump Controller	TimeMark #276C	2	TBD	TBD	TBD	TBD	TBD
Pump Controller	TBD	1	TBD	TBD	TBD	TBD	TBD
Flow Meter	TBD	1	TBD	TBD	TBD	TBD	TBD
Analog input card, 4-20	TBD	1	TBD	TBD	TBD	TBD	TBD

TBD = to be determined

5.0 HEALTH AND SAFETY/CONTINGENCY PLANS

The GW HASP, provided by the O&M contractor, for the groundwater treatment facilities at the Site establishes the policies and procedures that protect workers and the public from potential hazards posed by work at this site. Safety is considered the highest priority, and these policies are to be upheld during all project work. All project activities will be conducted to minimize the probability of injury, accident, or incident occurrence. The plan also addresses applicable federal Occupational Safety and Health Administration (OSHA) and California OSHA (Cal-OSHA) requirements.

The GW HASP is maintained on Site. All O&M employees are required to read and sign the plan prior to beginning work at the Site. All subcontractors and visitors are required to undergo a health and safety briefing and sign the associated record sheet before entering the site.

5.1 OPERATOR TRAINING

Training is necessary to ensure that personnel possess the proper skills and knowledge to safely operate groundwater treatment facilities. All employees involved with system testing, operation, and maintenance receive thorough safety training. Safety training focuses on ordinary and emergency situations. Health and safety procedures and issues are discussed at safety meetings held on each site visit. Task-specific briefings, including task-specific safety issues, are held before beginning new tasks. Training topics include the following:

- Names of personnel responsible for site safety;
- Names of personnel trained in first aid and cardiopulmonary resuscitation;
- Health and safety hazards on site;
- Use and care of personal protective equipment (PPE);
- Location of safety equipment (such as fire extinguishers and first aid kits);
- Site Standard Operating Procedures and safe work practices;
- Work zones and site control measures;
- Hazard communication program (including discussion of Site MSDSs);
- Emergency, spill response, and contingency plans;
- Lockout/tagout procedures;
- Confined space entry procedures (when applicable); and
- Hot-work procedures (when applicable).

All personnel must complete the OSHA-mandated 40-hour Hazardous Waste Operations and Emergency Response training and medical surveillance before working on Site. Training records are maintained and updated as part of the project file.

In addition to general safety training, specialized training is conducted for the testing, operation, and maintenance of system equipment. This training covers equipment startup and shutdown (automatic and manual) procedures, process parameter monitoring, sampling, equipment maintenance and trouble-shooting, and system operation under contingency situations. Training is provided to each new operating staff member.

5.1.1 Mental Preparedness

It is important that an action plan be made for responding to each type of foreseeable emergency. Operators will conduct health and safety briefings on each visit, addressing task-specific hazards. In the case of minor emergencies, the plan may be no more than a mental note made by the operator in charge.

For large-scale emergencies or natural disasters, the plan should contain a formal outline of procedures and responsibilities for all parties participating in the emergency action. See Section 5.6.

The operator should devote some time each visit to mentally walk through steps to be taken to correct various emergency situations. An occasional afternoon spent touring the plant and thinking about what to do if a particular emergency or situation arises serves as a good operator self-training program.

During such exercises, it is inevitable that questions will arise. If the operator immediately seeks answers from co-workers, technical representatives, etc., a logical and effective action plan will develop in the operator's mind.

5.1.2 Material Preparedness – Equipment and Spare Parts

The operator should be aware of the materials that would be critical during emergencies and should have these items on hand or know exactly where to obtain them on short notice. Along with a stock of routine spare parts, the operator should also stock critical parts that are not available locally and that require considerable lead time to order from the factory. Emergency first aid equipment also should be located conveniently.

Other materials to consider in preparing for emergencies include hand tools, special tools, and equipment for lifting or moving heavy objects, etc. The operator also should consider which pieces of heavy mechanized equipment might be required for each emergency.

5.2 TYPES OF EMERGENCIES

It is not necessary for groundwater treatment facilities to continue treatment during emergency situations caused by natural disasters, equipment failures, and other unusual conditions. However, if such emergencies are properly responded to, adverse consequences can be minimized. This section outlines suggested emergency procedures and plans for responding to various types of emergencies. Effective emergency planning requires considerable coordination and forethought by the operations staff. This section is meant to serve as a guide to identifying the major considerations in each type of emergency. The operations staff has worked out the detailed plans contained herein.

The OU1 Source Area System and the OU1 Downgradient Containment/Treatment System can be subject to the following types of emergencies:

- Natural disasters;
- Process and equipment failures;
- Power outages;
- Fire or explosion;
- Leaks and spills; and
- Personnel injury.

The effects of these emergencies on system operations and appropriate responses to the emergencies are discussed in the following sections.

5.2.1 Natural Disasters

Natural disasters, such as flooding, earthquakes, high winds, and electrical storms, could cause any or all of the other types of emergencies. Operators should be aware of any and all natural disasters that could occur at the plant. Section 5.6 contains several references regarding natural disasters. Should a natural disaster occur, the OU1 Source Area System and the OU1 Downgradient Containment/Treatment System should be shut down until safe operations can be assured by the inspection of system components.

5.2.2 Process and Equipment Failures

Most major pieces of equipment within the plant have standby units to permit continued facility operation in the event of component failure. Critical spare parts are kept on Site to minimize downtime in the event of equipment failure. Critical spare pieces of plant equipment are available to ensure that the facility can continue to operate with units out of service.

In the event of a pipeline failure, the line should be isolated, the wells should be shut down, and the pipe section should be repaired or replaced as soon as possible. In addition, the operator should shut down all electrical equipment being sprayed or in danger of being flooded by the leak**. At no time should an operator walk through or stand in liquids when shutting down electrical equipment.** Process upsets will usually be caused by equipment malfunctions.

5.2.3 Power Outages

Power is supplied by the Southern California Edison (SCE) generating facility. In the event of a power outage, SCE should be contacted to determine the nature and extent of the outage. If the outage has not affected the well fields, and the OU1 Source Area System and the OU1 Downgradient Containment/ Treatment System are not operating and flow is still entering the plant, the well pumps should be shut off.

Electrical equipment should be turned off so that it does not come back on when power is restored. When power is restored, all equipment should be restarted as directed under startup procedures in Section 3.1.1.

5.2.4 Fire or Explosion

In the event of a fire, explosion, or related incident, the following procedures should be followed:

1. Evacuate all personnel from the danger area.
2. Call 911 for emergency services.
3. Request medical assistance for injured personnel.
4. Identify the type of fire, and extinguish the fire if it is safe to do so.
5. If the fire is electrical, de-energize the circuit.

In any event, take all appropriate actions to protect lives and property. Render all assistance possible, but do not perform the duties of experts trained for emergency situations or put yourself in danger.

5.2.5 Leaks and Spills

Leaks and spills at the OU1 Source Area System could occur within or outside of bermed areas. The following sections describe actions to be taken in the extent of a spill or leak.

Containment Within the Bermed Areas

The OU1 Source Area System is designed to contain and dispose of any spills of untreated water or chemicals within the bermed areas. Untreated water spilled in the main berm area will be directed to the main sump, where it will be pumped into the influent storage tank.

Containment Outside of the Bermed Areas

Spills outside of the bermed areas may be the result of leaks in the conveyance piping. The pipeline to the plant should be checked for leaks weekly. If a leak in the pipeline is discovered, immediate action must be taken to stop, contain, and repair the leak.

An emergency containment kit is on the site. The kit includes plastic sheeting, a containment pan, and pipe clamps. EPA must be notified in the event of any leak.

To avoid exposure to the contaminated water, appropriate PPE should be worn by anyone who attempts to stop or contain a pipeline leak. The water should be directed away from any storm drains or ditches by whatever means are available (shovels, hoes, backhoes, absorbent berms). Dikes should then contain the water until it can be removed properly by appropriate personnel.

5.2.6 Personnel Injury

If emergency medical assistance is required, call 911 for an ambulance/rescue unit. Stay on the line until the dispatcher has obtained all pertinent information and has instructed you to hang up. Provide first aid according to the dispatcher's instructions until the emergency medical team has arrived.

5.3 SCADA CALL-OUT RESPONSE

The SCADA system has the ability to dial off-duty personnel in the event of a shutdown. In the event of a call-out by the SCADA system, plant operations personnel can respond to any alarm condition in a timely manner.

5.4 EMERGENCY RESOLUTION

An action plan for response to foreseeable emergencies is outlined below.

5.4.1 Determining Whether a Call for Assistance is Required

In the event of an emergency, the operator on duty must assess the nature and severity of the problem. The first determination that must be made is whether assistance is required.

A logical sequence of steps in responding to emergencies should be followed by the operator on duty. This sequence includes identifying the emergency, investigating the extent of the emergency, deciding on a proper initial course of action, taking corrective action to rectify the situation, and following up with a post-emergency investigation.

The operator on duty should contact the plant manager for any of the following situations:

- A natural disaster that affects the treatment facility;
- A process failure that could affect the facility's effluent quality;
- Mechanical/electrical failure of a major pump, motor, or similar equipment;
- Fire or explosion;
- Pipe breakage or serious leak; and/or
- Personal injury.

5.4.2 Identifying the Emergency

The first step will be obvious in most cases. Equipment breakdowns, injuries, and natural disasters will capture the operator's attention immediately. In other cases, the operator may have prior warning of an impending emergency, such as weather reports, alarms, and changes in normal process variables.

5.4.3 Initial Investigation

Once the operator is aware that an emergency situation either exists or is impending, an initial investigation should be made immediately. Assessment of the emergency should include identifying:

- Injured persons, if any;
- Damage to equipment;
- Possible impending damage that would occur if corrective action were not taken immediately; and
- Resources required to correct the situation immediately.

5.4.4 Initial Action

When the extent of an emergency is known, the operator should immediately decide what initial steps should be taken to correct the emergency situation. The first action in the case of large-scale emergencies usually consists of notifying responsible authorities, calling for the necessary assistance in order of priority, and shutting the plant down. A list of emergency contacts and their telephone numbers is a critical asset to the operator during this phase of the emergency. This list is at the operator's desk.

After the necessary calls have been made, the operator should begin action to remedy matters, within certain limitations. The operator should not endanger himself/herself or others by attempting tasks with which he/she is unfamiliar. In all cases, if in doubt, the operator should wait until qualified help arrives before taking action.

5.4.5 Corrective Action

When help arrives, the operator should immediately inform those responding to the emergency of the pertinent details of the situation. If the type of emergency is beyond the operator's own capabilities, the operator also should appoint the proper person immediately to supervise corrective action. While work is underway, the operator should notify persons not called initially but who have interests at stake in the emergency.

Corrective action should be continued until the situation is either under control or completely rectified. If correction will take considerable time, the operator should consult with the required parties to outline a long-term effort to complete the tasks.

5.4.6 Follow-Up

After the situation is corrected, the OU1 Source Area System and the OU1 Downgradient Containment/ Treatment System staff should make every effort to assess why the emergency occurred, review corrective actions taken, and then take preventive actions to minimize the chance of recurrence, such as revising maintenance procedures.

5.4.7 Incident Documentation

After any incident or emergency, documenting the events that transpired is an important step in future prevention and preparedness. By providing a written report of the incident, operations and EPA personnel can be better prepared in the event of a similar incident or possibly prevent the incident from occurring in the future.

5.5 EMERGENCY RESPONSE CENTER

The emergency response center will be the place from which emergency operations will be directed. An emergency response center, to be effective, must contain certain materials and information. One such item is a current telephone call list. This should contain, at a minimum, the following information for each person employed at the facility:

- Position;

- Name;
- Address;
- Telephone number; and
- Emergency contact, in case of injury.

Emergency telephone numbers (i.e., police and fire departments, etc.) should likewise be prominently posted and kept current. Other items required at the emergency response center include the following:

- A complete set of as-built drawings;
- A set of contract specifications with all addenda;
- The O&M Manual;
- The GW HASP; and
- Current facility operating records.

5.6 EMERGENCY PROCEDURE REFERENCES

The following publications dealing with emergency procedures are available at no cost.

- The U.S. Army A.G. Publications Center.
  - *Introduction to Civil Preparedness* (CPG1-1).
  - *Standards for Local Civil Preparedness* (CPG-5).
  - *Disaster Operations – A Handbook for Local Governments* (CPG1-1).
  - *In Time of Emergency – A Citizen's Handbook on Nuclear Attack and Natural Disasters* (H-14).
- The EPA.
  - Emergency Planning for Municipal Wastewater Treatment Facilities (EPA-430/9-74-013).

6.0 RECORD KEEPING

Keeping adequate performance records is an important part of good treatment facility operation. Clear and concise records of operational activities aid in solving future operational problems, modifying procedures if necessary, anticipating repair or maintenance needs, and evaluating treatment performance. This section describes record keeping requirements for OU1 Source Area System and the OU1 Down-gradient Containment/Treatment System operation.

6.1 MONITORING FORMS

Process parameters for the OU1 Source Area System and the OU1 Downgradient Containment/Treatment System are recorded on the following monitoring forms:

- **Process Data Sheets** are used to record system monitoring information, including flow parameters into the influent tank, flow parameters leaving the influent tank, flow rate and pressure readings at the AOS, flow rate and pressure readings at the LGAC vessels, flow rate/totalizer readings at the effluent meter, and pH meter at the sanitary sewer discharge.
- **OU1 Source Area System and the OU1 Downgradient Containment/Treatment System Monthly Extraction Well Inspection Sheets** are used to record flow rate and totalizer flow at the extraction wells.
- **Groundwater Treatment Systems Shutdown Log** is used to records the downtime for the OU1 Source Area System.

Blank forms containing these data are included in Appendix B.

7.0 SAMPLING PROCEDURES

This section outlines the locations, frequencies and procedures for collecting water, and carbon samples related to operation of the OU1 Source Area System and OU1 Downgradient Containment/Treatment System. System samples will be required during the system startup and routine operation to ensure proper operation of the remediation equipment. A detailed summary of a typical sampling schedule is tabulated in Tables 7-1 and 7-2 for the source area and downgradient systems and well network.

TABLE 7-1

OU1 Source Area System Sampling Plan

Program	Sample Location	Sample Frequency	
		Initial Operations[a]	Long-Term Operations
ISCO Waste Discharge Permit[b]	8 monitoring wells[c]	Baseline and Monthly for 6 months	Quarterly for remaining 2.5 years
Treatment System[b,d]	Influent and Effluent	Weekly	Monthly (for 3 years)
Long Term Performance Monitoring	3 monitoring wells[c,e]	N/A	Quarterly/Semiannually/ Annually (up to 23 years or less)

[a] Initial operations typically last one to four weeks. During this time, the treatment system equipment is being fine tuned to operate at maximum efficiency given the Site conditions.

[b] Per WDR permit analyzed quarterly for VOCs, 1-4-dioxane, chloride, nitrate, sulfate, bromide, alkalinity, TSS, TDS, TOC, cations, hexavalent chromium, priority pollutant metals. VOC and 1,4-dioxane only for more frequent than quarterly sampling. Cations include barium, boron, calcium, iron, magnesium, manganese, potassium, and sodium. Priority pollutant metals and hexavalent chromium will be analyzed during the initial sampling round and annually thereafter.

[c] Initially, all groundwater monitoring wells will be sampled quarterly. As concentrations decline, the sampling frequency shall decline as follows:

- Quarterly – groundwater concentrations greater than cleanup goal;
- Semiannual – groundwater concentrations less than cleanup goals during the previous sampling event;
- Annual – groundwater concentrations less than cleanup goal for two consecutive sample events;
- Stop sampling a well, until confirmation sampling, if groundwater concentrations less than cleanup goal for three consecutive sample events; and
- If concentrations increase above cleanup goals at any time, the well shall resume the quarterly sampling frequency and follow the process listed above.

[d] Influent sample will serve as sample for extraction. Effluent sample will serve as sample for injection wells.

[e] During ISCO analyzed for VOCs and 1,4-dioxane only. After completion of ISCO (expected to be 3 year or less) analyzed for MNA parameters including VOCs, 1-4-dioxane, chloride, nitrate, sulfate, sulfide, alkalinity, ethane/ethane, and methane.

ISCO = in situ chemical oxidation
MNA = monitored natural attenuation
N/A = not applicable
TDS = total dissolved solids
TOC = total organic carbon
TSS = total suspended solids
VOCs = volatile organic compounds
WDR = waste discharge requirement

TABLE 7-2

OU1 Downgradient Containment/Treatment Area System Sampling Plan

Program	Sample Location	Sample Frequency	
		Initial Operations[a]	Long-Term Operations
Bioremediation barrier Waste Discharge Permit[b]	6 monitoring wells[c] (downgradient of barrier)	Once (Baseline sampling)	Quarterly for remaining 20 years[b]
LACSD Discharge Permit	LACSD discharge location (sanitary sewer)[d]	Once (during initial operations)	Monthly for 20 years
Long Term Performance Monitoring	7 monitoring wells[c,e]	N/A	Quarterly/Semiannually/ Annually for 23 years
	Advanced Oxidation System (influent, effluent)	Weekly	Monthly

[a] Initial operations typically last one to four weeks. During this time, the treatment system equipment is being fine tuned to operate at maximum efficiency given the Site conditions.

[b] Per WDR permit analyzed quarterly for VOCs, 1-4-dioxane, chloride, nitrate, sulfate, bromide, alkalinity, TSS, TDS, TOC, cations, hexavalent chromium, priority pollutant metals. VOC and 1,4-dioxane only for more frequent than quarterly sampling. Cations include barium, boron, calcium, iron, magnesium, manganese, potassium, and sodium. Priority pollutant metals and hexavalent chromium will be analyzed during the initial sampling round and annually thereafter.

[c] Initially all groundwater monitoring wells will be sampled quarterly. As concentrations decline, the sampling frequency shall decline as follows:

- Quarterly – groundwater concentrations greater than cleanup goal;
- Semi-annual – groundwater concentrations less than cleanup goals during the previous sampling event;
- Annual – groundwater concentrations less than cleanup goal for two consecutive sample events;
- Stop sampling a well, until confirmation sampling, if groundwater concentrations less than cleanup goal for three consecutive sample events; and
- If concentrations increase above cleanup goals at any time, the well shall resume the quarterly sampling frequency and follow the process listed above.

[d] Influent sample will serve as sample for extraction. Effluent sample will serve as sample for injection wells.

[e] During ISCO analyzed for VOCs and 1,4-dioxane only. After completion of ISCO (expected to be 3 year or less) analyzed for MNA parameters including VOCs, 1-4-dioxane, chloride, nitrate, sulfate, sulfide, alkalinity, ethane/ethane, and methane.

ISCO = in situ chemical oxidation
LACSD = Los Angeles County Sanitation District
MNA = monitored natural attenuation
N/A = not applicable
TDS = total dissolved solids
TOC = total organic carbon
TSS = total suspended solids
VOCs = volatile organic compounds
WDR = waste discharge requirement

A detailed monthly sampling matrix will be provided to the field sampler. The sample matrix will list the sampling locations, number and type of containers, preservation requirements, analyses, laboratory, and the analytical hold times. Sample labels will be prepared by the O&M contractors and supplied with the sampling matrix

7.1 WATER SAMPLING PROCEDURES

Samples will be collected in a way that ensures characteristics are preserved from collection through laboratory examination. These general procedures will be followed.

- Don the appropriate PPE, in accordance with project health and safety requirements.
- Check the label on the sampling port and the labels on the sampling bottles to ensure the correct sample bottles are used.
- Open the valve on the sampling port and adjust the valve so that flow of approximately 300 milliliters (mL) per minute is attained using a timer and a graduated cylinder.
- Collect the samples for various analyses (VOCs, SVOCs, metals, etc.). Fill the sample vial leaving a positive meniscus, but do not overfill the vial. Put the cap on and check for air bubbles by turning the vial upside down and tapping. If any air bubbles are present, recollect the sample.
- Immediately after collection, place all samples in a cooler containing ice and a trip blank.

The process points should be sampled from the lowest concentration to the highest concentration.

7.2 CARBON VESSEL SAMPLING PROCEDURES

The carbon contained in the LGAC vessels at the OU1 Source Area System must be profiled before disposal. The company performing the carbon removal is responsible for profiling the spent carbon for disposal. In addition, the company responsible for the profile will provide URS with specific quality assurance (QA) requirements for sample collection.

7.3 QUALITY ASSURANCE/QUALITY CONTROL

The quality of the data produced for the OU1 Source Area System and OU1 Downgradient Containment/ Treatment System is assured through the analysis of both field and laboratory QC samples. QC samples are collected to assess the influence of sampling procedures, equipment, and handling on reported results. QC samples include field QC samples and laboratory QC samples. Field QC samples are used to assess the consistency of the sampling program and to evaluate the precision and accuracy of analytical data. Field QC samples collected at the OU1 Source Area System and OU1 Downgradient Containment/ Treatment System are described below. The following samples will be collected: Field Duplicates, Trip Blanks, Equipment Blanks, and Laboratory QC Samples. Detailed information on these samples will be provided by the Site O&M contractor.

7.4 DATA ASSESSMENT, REPORTING, AND NOTIFICATION

Data Assessment, Management Procedures, and Reporting/Notification procedures will be provided by the Site O&M contractor.

8.0 OPERATIONS & MAINTENANCE BUDGET

For a detailed cost summary, please refer to the tabbed section titled *Cost Estimate*.

9.0 REFERENCES USED IN PREPARING THIS O&M MANUAL

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URS, 2007c. *Cooper Drum Superfund Site OU1 Basis of Design Report*. July.

APPENDIX A

Design Drawings

Design Drawings are included behind the tabbed section titled *Design Drawings*.

APPENDIX B

Monitoring Forms

CONTENTS

APPENDIX C

Manufacturers' O&M Manuals and Cut Sheets

The O&M contractor is required to include copies of all manufacturer-provided O&M Manuals and copies of equipment cut sheets for all pieces of equipment, in this section.