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ERC CONTROLLED MANUAL TRANSMITTAL

Date Prepared: 09/06/95

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H4-79

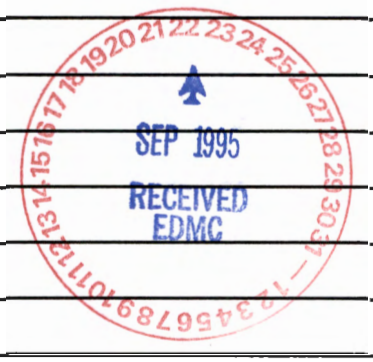
Transmittal Number: BHI-OP-00010-TR90

Document Number: BHI-OP-00010

Title: 200-UP-1 PILOT-SCALE GROUNDWATER TREATMENT SYSTEM OPERATING PROCEDURES

Instructions: (1) Remove and/or insert indicated procedure/section into manual as shown.
(2) Sign this form and return it to Procedures Coordination **within 10 working days of receipt.**

Procedure/Section Numbers and Titles	Remove		Insert	
	Rev.	Date	Rev.	Date
REVISION ORDER TO BHI-OP-00010 **NOTE: INSERT DIRECTLY IN FRONT OF REVISION ORDER A TO BHI-OP-00010**	--	---	B	09/06/95



If you have any questions about this release, please contact Kathy Carter at 372-9555.

Receipt Acknowledgment

I have complied with the above instructions for this manual.

Debbi Isom
Signature

9/28/95
Date

New address or MSIN if different than listed above: _____

FOLD DOWN TO THE DOTTED LINE--PLEASE DO NOT STAPLE OR TAPE.

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REVISION ORDER

DOCUMENT TO BE CHANGED:	BHI-OP-00010	01	2/95	B
	Document Type/No.	Rev. No.	Date	Rev. Order ID (Assigned by DCC)

Change Type: [ ] General [X] Site Spec., Site No. 200-UP-1 [ ] Exception [ ] Revision

Approval of this revision shall alter the document identified above for:

[ ] Sites [X] the project as detailed below in Section 2.

Initiated by: CD Wittreich ____ Revision Required by: 9/6/95

Name Date Date

Reason for change: Revise 200-UP-1 Pump and treat operating procedures to address pump and treat system upgrades.

DESCRIPTION OF CHANGE:

Section	Description
1,2,5,8	See attached redline. All references to extraction well B have been deleted because the well is no longer in use.

SPA 9/6/95 +4

REVIEWED: Project Quality Assurance 9/5/95 Date

CONCUR: Functional/Area/Project Manager 9/6/95 Date

KC

BHI-PC 9/6/95

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the procedures for operating the 200-UP-1 Groundwater Treatment System for the removal of uranium, technetium and carbon tetrachloride from groundwater in the 200 West Area. Procedures for performing routine activities, including ion exchange (IX) resin changeout, filter changeout, and system dewatering, have been included as part of this operating procedure (OP).

1.2 SCOPE

The treatment system is located within the boundary of the 200-UP-1 Operable Unit southeast of the U-Plant near the U-17 Crib in 200 West Area. The treatment system is being operated in accordance with the requirement of the 200-UP-1 IRM Proposed Plan treatment system includes:

- Extraction well(s) from which the contaminated groundwater is obtained
- Return wells for reinjecting treated groundwater to the aquifer
- Two 20,000-gal storage tanks, one for storage of influent (contaminated groundwater) and one for storage of treated effluent
- A 10,000-gal process water tank that provides water for chemical makeup (if required) and other ancillary uses
- An influent pump station with prefilters and control panel for pumping water through the treatment system into the effluent storage tank
- A process treatment station with main process control panel
- An effluent pumping station with filters and control panel for pumping treated effluent to the return well.

The overall system will be connected with a series of 2-in.-high pressure hoses fitted with quick disconnect fittings and power and signal cables. The treatment system utilizes 480-VAC, 3-phase power to power system pumps and be transformed to 240/120-VAC single phase for powering ancillary equipment.

The treatment system is capable of being operated 24 hours/day, 7 days/week with limited operator control. A programmable logic controller is used to monitor critical operating parameters and shut the system down in case of abnormal conditions.

1.3 PRE-STARTUP CHECK

If the system has been modified, ensure that the appropriate acceptance test has been performed on new components. Acceptance test results are to be documented in the Field Log Book.

Refer to Process Flow Diagram, drawing number 0200W-DD-J0003, Rev. 1, for system operations.

1.3.1 Safety and Readiness Walkthrough

Perform a safety and readiness walkthrough (a physical inspection) of the system, including the storage tanks, extraction and return wells, hoses, process system, and annunciator panel, to verify that the system is functional, properly connected, and ready for safe operation. If discrepant conditions are found, note them in the logbook and on discrepancy log sheet and correct before startup. In checking the hoses, perform a walkdown of the hoses connecting the system following the flow from the Well Pump to the Disposal Well to verify integrity:

- Extraction well pump discharges to the Influent Storage Tank inlet manifold
- Influent Storage Tank outlet manifold to the Influent Pump skid suction
- Influent Pump skid discharge to the Process System skid inlet manifold
- From the Inlet manifold to the lead IX column inlet (at top for down flow), then from the bottom of the lead IX column to the inlet (top) of the polish IX column
- From the polish IX column to the inlet of the granular activated carbon (GAC) skid #1
- From the outlet (bottom) of GAC skid #1 to the inlet of GAC skid #2
- GAC skid #2 outlet to the Effluent Storage Tank inlet
- Effluent Storage Tank outlet to the Effluent Pump skid suction
- Effluent Pump skid discharge to the disposal well.

1.3.2 Valves

Verify that all valves are closed (assuming that neither the extraction well(s) nor the effluent pumping system is operating; if so see Section 1.3.5), including sample valves, and verify that electrical switches are in off (or open) positions.

1.3.3 Filter Housing Lids

Verify that filter housing lids are closed and that filters are ready to accept flow.

1.3.4 Pressure Instruments

Verify that the pressure gauges and differential pressure instruments for monitoring differential pressures of the influent and effluent filters, the activated carbon skids and the IX columns are operable. In addition, verify that the influent and effluent storage tank sight gauges or level transmitters/indicators are operable.

1.3.5 Valving

If the extraction well and/or effluent pumping systems are operating, verify that all treatment system valving are closed.

2.0 STARTUP AND OPERATION

To start operations, the process treatment system will be configured by manually aligning ball valves using level sight gauges and/or tank level indicators on the Influent and Effluent Storage Tanks and using pressure gauges, flowmeters, and differential pressure for controlling the treatment process.

If starting the extraction well, systems valves are to be aligned for flow from the Extraction Well Pump(s) to the Influent Storage Tank. When a sufficient volume of extracted groundwater is in the Influent Storage Tank, the treatment system is brought on-line using an Influent Pump to move water through a minimum of two filter columns, through two IX Columns in series flow, through one or two GAC treatment stations (in series flow when operating both systems), and out to the Effluent Storage Tank. When a sufficient volume of treated effluent is in the Effluent Storage Tank, the water return system is started by pumping water from the effluent storage tank through a minimum of two canister filters and into the return well.

The system utilizes level controls and flow controls with interlocks to prevent overflowing the tanks, protect pumps from loss of flow, warn of breaching of the hoses, and monitor well levels. Differential pressure instrumentation is used on the filters and IX columns to alarm on high differential pressures, indicating the need for changing filters or backwashing or changing media in the columns.

If the extraction well pumps are operating, skip Section 2.2. If the effluent pumping system is operating, skip Section 2.4.

2.1 ELECTRICAL POWER

Energize power to the control panel by actuating the main control disconnect switch and the control power switch(es).

2.2 START EXTRACTION WELL PUMP(S)

Open the following valves for operation of extraction well (all other valves in extraction well system are to be closed):

BV-1, BV-2, BV-5, BV-6, BV-7, BV-8 BV-17 (or BV-18 and BV-19 if rotameter loop is to be used) and BV-22.

Valve BV-8 is used to control the flow rate from extraction well. When starting well, open BV-8 approximately 50%.

2.2.1 Valve MBV-1

Open Motor Operated Ball Valve MBV-1 by pressing the MBV-1 reset button and setting the MBV-1 switch to the Manual position.

2.2.2 Control Panel

Verify that the following lights on the influent pumping station control panel or the main control center panel are not illuminated:

- Influent Storage Tank level, "High"
- Influent Storage Tank level, "High, High."

Refer to Section 7.0 if these indicator lights are illuminated.

2.2.3 Start Extraction Well Pump

Start Extraction Well Pump by holding in the appropriate "Start" pushbutton until flow is established. Watch for flow on FIT-1A and makeup of flow switch FS-1A. Release the pushbutton once flow is established. If flow cannot be established, refer to step 2.2.7.

2.2.4 MBV-1 Selector Switch

Switch MBV-1 selector switch to the Auto position.

2.2.5 Set Flow Rate

Use throttle valve BV-8 to set flow rate from extraction well to desired level.

2.2.6 Control Panel

Verify that the following lights on the influent pumping station control panel or the main control center panel are not illuminated:

- Influent Storage Tank Level, "High"
- Extraction Well Level Low, LSL-1A
- FS-1A
- Influent Storage Tank Level, "High High."

Refer to Section 7.0 if these indicator lights are illuminated.

2.3 START TREATMENT SYSTEM

2.3.1 Ball Valve Configuration

The ion-exchange treatment system may be operated under three possible configurations, depending upon which column is designated lead, polish, and reserve. The ball valves to be open for operating under each configuration are described below. The operator shall verify the system configuration before positioning of valves for operation. The configuration being used will be documented in the Field Log Book.

Regardless of which configuration is used, the following ball valves shall be opened.

- BV-23, BV-29, BV-43, BV-44, BV-45, BV-50, BV-95, BV100, BV-147, BV-148, BV-149, BV-150, BV-154, BV-155, BV-160, BV-161, BV-167, BV-168, BV-170, BV-171, BV-172, and BV-173 . In addition, a minimum of two filter columns must be valved open. Open BV-35 and BV-39 for column F-1A, BV-36 and BV-40 for column F-1B, BV-37 and BV-41 for column F-2A and BV-38 and BV-42 for column F-2B.

- If running Influent Pump P-2A, fully open BV-31 and open BV-32 approximately 30%. BV-32 is used to control the flow rate (and operating pressures) of the treatment system when operating P-2A.

- If running Influent Pump P-2B, fully open BV-33 and open BV-34 approximately 30%. BV-34 is used to control the flow rate (and operating pressures) of the treatment system when operating P-2B.

Configuration 1: Tank 2 is lead, tank 3 is polish, and tank 4 is reserve. (Refer to Figure 1.) For operations using this configuration, open BV-51, BV-54, BV-55, BV-58, BV-61, BV-64, BV-65, and BV-68.

Configuration 2: Tank 3 is lead, tank 4 is polish, and tank 2 is reserve. (Refer to Figure 2.) For operations using this configuration, open BV-61, BV-64, BV-65, BV-68, BV-71, BV-74, BV-75 and BV-78.

Configuration 3: Tank 4 is lead, tank 2 is polish, and tank 3 is reserve. (Refer to Figure 3.) For operations using this configuration, open BV-71, BV-74, BV-75, BV-78, BV-51, BV-54, BV-55 and BV-58.

2.3.2 Motor-Operated Ball Valves

Open motor-operated ball valve MBV-2 by pressing the MBV-2 reset button and setting the MBV-2 switch to the manual position.

Open motor-operated ball valve MBV-3 by pressing the MBV-3 reset button and setting the MBV-3 switch to the manual position.

2.3.3 Start Influent Pump

Start either Influent Pump P-2A or P-2B by holding in the appropriate "Start" pushbutton until flow is established. Watch for flow on FIT-2 and makeup of FS-2, FS-3, and FS-4. Release the pushbutton once flow is established. If flow cannot be established, refer to Step 2.3.6.

2.3.4 MBV Selector Switch

Switch MBV-2 selector switch to the Auto position.

Switch MBV-3 selector switch to the Auto position. (Note: this can be done before or after step 2.3.5)

2.3.5 Set Flow Rate

Use throttle valve (BV-32 for pump P-2A, or BV-34 for pump P-2B) to set flow rate. **Flow rate shall not exceed 70 gal/min (required for a minimum contact time of 4 min). The pressure in the IX column shall not exceed 65 psig (these vessels are rated at 70 psig maximum).** These pressures are determined using PI-7 for tank 2, PI-10 on tank 3, and PI-13 on tank 4. PSH1 will shut the influent feed pumps down if 65 psig is exceeded upstream of the IX columns, PSH2 and PSH3 will shut the system down if the inlet pressure to the GAC columns exceeds 25 psig.

2.3.6 Annunciator Panel

Verify that the following lights on the annunciator panel are not illuminated.

- Flow switch FS-2
- Flow switch FS-3
- Flow switch FS-4
- Flow Switch High FSH-7
- Influent Storage Tank Level, "Low"
- Effluent Storage Tank Level, "High"
- Effluent Storage Tank Level, "High High."

Refer to Section 7.0 if these indicator lights are illuminated.

2.4 START EFFLUENT PUMP

When the Effluent Storage Tank has a sufficient volume of treated effluent, an Effluent Pump is started as follows to discharge the treated effluent into the selected disposal well.

2.4.1 Ball Valves

The following ball valves (BV) are to be positioned before startup of the Effluent Pump(s).

- If running Effluent Pump P-5A, open BV-101, BV-105, BV-108, BV-116, BV-117, BV-130, BV-135 and GV-134. Open BV-110 approximately 50% (This valve is used to control the flow rate when operating pump P-5A).

- If running effluent pump P-5B, open BV-101, BV-105, BV-109, BV-116, BV-117, BV-139, BV-135 and GV-134. Open BV-111 approximately 50%. (This valve is used to control the flow rate when operating pump P-5B.)

  In addition, a minimum of two filter columns must be valved open. Open BV-112 and BV-114 for columns F3A and F3B, BV-113 and BV-115 for columns F4A and F4B.

2.4.2 Annunciator Panel

Verify that the following annunciator lights on the annunciator panel are not illuminated:

- Disposal Well level, "High"
- Effluent Storage Tank level, "Low."

2.4.3 Pumps P-5A/P-5B

Start either effluent Pump P-5A or P-5B by holding in the appropriate "Start" pushbutton until flow is established. Watch for flow on FIT-3 and makeup of FS-5 and FS-6. Release the pushbutton once flow is established. If flow cannot be established, refer to Step 2.4.4.

2.4.4 Annunciator Lights

Verify that the following annunciator lights on the annunciator panel are not illuminated:

- Disposal Well Level, "High"
- Effluent Storage Tank Level, "Low"
- FS-5
- FS-6

Refer to Section 7.0 if these indicator lights are illuminated.

2.5 BACKWASH PROCEDURE

When new IX resin or GAC is loaded into the process columns and before it is placed into service, it must be backwashed to remove fines and color bodies. The process engineer may also schedule a column backwash to reduce the pressure drop across the column. When a backwash is to be done, the Treatment

System (Note: the extraction/injection systems by remain operating if tank levels allow) will be shut down. Two pumps are available for use for backwashing, the backwash pump (located on the Process Skid) and the gas motor operated pump. If sufficient treated or clean water exists in the Effluent Storage Tank, it may be used for the backwash water source.

Backwashing is performed manually. To set up for backwash, perform the following. (Note: The backwash will require nominally 1000-3000 gal per column depending on size and amount of media. Sufficient backwash water must be available.)

NOTE: The GAC column should be filled 50-70% with GAC. After filling with GAC, it is advisable to fill the tank with water and allow the tank to soak overnight before backwashing operations begin.

2.5.1 Effluent Storage Tank Connection

Connect a hose from the Effluent Storage Tank or Process Water Tank to the quick disconnect on the suction side of Pump P-3 (or to the suction of the gas motor operated pump).

2.5.2 Backwash Pump Connection

Connect a hose from the discharge of the backwash pump (or to the suction of the gas motor operated pump) to the Process Manifold inlet, just upstream of FS-3. This will provide flow control for the backwash.

2.5.3 Quick Disconnect

Connect a hose from the quick disconnect at the outlet of the manifold (just downstream of BV-50) to the bottom of the column to be backwashed (near BV-58, BV-68, BV-78 BV-171 or BV-173).

2.5.4 Backwash Solution

The backwash solution will be sent back through the Influent Filters to remove solids and then into the Influent Storage Tank. Connect a hose from a quick disconnect at the top of the IX Column (or GAC skid) being backwashed to BV-29 at the inlet of the Influent Filters (flow will be through pumps P-2A or P-2B) and a hose from BV-45 (filter outlet) to the outlet manifold of the Influent Storage Tank near MBV-2. (Note: MBV-2 must be opened in the manual mode.)

2.5.5 New Media

Backwash new media in each column until the colored backwash solution turns clear (carbon fines, fractured resin beads, or color bodies contribute to the color). As stated above, this may require approximately 1000 to 3000 gal per column and may take approximately 1 to 2 hours. The backwash rate should be sufficient to expand the bed 30% to 50% and should require approximately 20 gal/min for both the IX resin and the GAC. **Be sure not to exceed the 65 psig pressure rating on the IX columns or the 25 psig pressure rating on the GAC columns.**

2.5.6 Normal Processing Water Flow

When backwash is complete, secure hoses and valves and make correct hose connections to allow establishing normal processing water flow as described in Section 1.3.

2.5.7 Documentation

Table 1 is provided to document these steps, and a copy of this checklist is to be maintained in the field files.

Table 1. Backwash of IX Columns.

OPERATOR: _____ **DATE:** _____

	Backwash Checklist	Verified/Date
1.	Verify that sufficient backwash water is available for backwashing.	
2.	Connect a hose from the Effluent Storage Tank or Process Water Tank to the suction of the backwash pump (or the gas motor operated pump) as described in Section 2.6.1.	
3.	Connect a hose from the backwash pump (or gas pump) discharge to the inlet of the Process Manifold as in Section 2.6.2.	
4.	Connect a hose from the quick disconnect at the outlet of the process manifold to the bottom of the column being backwashed as in Section 2.6.3.	
5.	Connect a hose from a quick disconnect at the top of the column being backwashed to BV-29 at the inlet of the Influent Filters, and a hose from BV-45 (filter outlet) to the outlet manifold of the Influent Storage Tank near MBV-2.	
6.	Backwash new media at 20 gal/min in each column until the colored backwash solution turns clear (carbon fines, fractured resin beads, or color bodies contribute to the color). As stated above this may require approximately 1000-3000 gal per column, and may take approximately 1 to 2 hours. Do not exceed 65 psig on IX columns or 25 psig on the GAC columns (monitor frequently).	
7.	When backwash is complete, secure hoses and valves and make correct hose connections to allow establishing normal processing water flow as described in Section 1.3.	

2.6 SYSTEM DEWATERING PROCEDURE

Routine maintenance activities and freezing weather conditions may require that system components be periodically dewatered. Removal of water from the system is accomplished using compressed air to push the water from the system into either the influent or effluent storage tanks. The separate stages of the system (extraction, process, and effluent pumping system) can be isolated from one another and therefore dewatered separately. Dewatering of the process system in freezing weather is all that is required if the extraction and effluent systems are to remain operating overnight.

CAUTION: Do not exceed 50 psig air pressure when dewatering the system. Relieve the air pressure from the lines after dewatering the system(s) to ensure that freezing weather conditions/ice blockage do not create localized high-pressure areas that may injure maintenance or operating personnel. Do not use compressed air to blow out ice from a line.

2.6.1 Extraction Well Dewatering

- Extraction Well:
  - -- Connect air hose from compressor to air fitting located near BV-4. Turn on air compressor and pressurize air hose to 30-40 psig.
  - -- Ensure BV-3, BV-7, BV-8, BV-17 (or BV-18 and BV-19), BV-22 and MBV-1 are open. All other valves in extraction well system are to be closed (including BV-4).
  - -- Slowly open BV-4, pressurizing extraction well manifold forcing the stagnant water into the influent storage tank. Once air is heard entering the tank, elevate the high-pressure flexible hosing beginning at the well head and working towards the influent manifold on the influent storage tank. Close BV-22 to prevent water from re-entering the lines.
  - -- Relieve air pressure from system through the air vacuum valve by opening BV-2 and BV-6. Air pressure can also be relieved by releasing pressure at the air compressor through the line pressure regulator.
  - -- Close BV-4 and disconnect air hose.

2.6.2 Process Treatment System

- Connect air hose from compressor to air fitting located near BV-30. Turn on air compressor and pressurize air hose to 30-40 psig.

- Ensure all ball valves on the process system that were open during processing are open, including MBV-2 and MBV-3. BV-30, BV-31, and BV-33 are to be closed.

- Slowly open BV-30, pressurizing the water line leading from the influent storage tank to the influent pumping station, forcing the stagnant water into the influent storage tank. Once air is heard entering the tank, elevate the high-pressure flexible hosing beginning at the influent pump skid, working towards the effluent manifold on the influent storage tank. Close BV-23 to prevent water from re-entering the line. Close MBV-2.

- Close BV-29 and BV-30. Open BV-31 if pump P-2A was used. Open BV-33 if pump P-2B was used. Slowly open BV-30, pressurizing the water line leading from the influent pumping station to the process treatment skid located in the tent. This forces the stagnant water from the line into the lead column and pushes the water displaced from the lead column through the system and into the effluent storage tank. Watch for flow on FIT-2. When no flow is seen, elevate the high-pressure flexible hosing beginning at the influent pump skid working towards the process tent. Once reaching the tent, place the elevated line on the stand located just outside the tent where the process line enters. This prevents any residual water from the hose inside the tent from collecting outside the heated environment. Close BV-30.

- Relieve air pressure from the air hose using the line pressure regulator on the compressor. Disconnect the air hose. Relieve the pressure in the system by opening BV-30. Use a poly hose to direct the pressure into a container. The air pressure can also be relieved from the system by opening the purge line located at the top of the lead column. Close BV-156.

- Connect air hose from compressor to air fitting located near BV-165. Turn on air compressor and pressurize air hose to 30-40 psig.

- Open BV-163, slowly open BV-165, pressurizing the water line leading from the GAC #2 skid to the effluent storage tank. Once air is heard entering the effluent storage tank, elevate the high-pressure flexible hosing beginning at the GAC #2 skid and working towards the effluent storage tanks influent manifold. Close BV-100 to prevent water from re-entering the lines.

- Relieve air pressure from the air hose using the line pressure regulator on the compressor. Disconnect the air hose. Relieve the pressure in the system by opening BV-165. Use a poly hose to direct the pressure into a container.

2.6.3 Effluent Pumping Station

- Connect air hose from compressor to air fitting located near BV-107. Turn on air compressor and pressurize air hose to 30-40 psig.

- Ensure all ball valves on the effluent pumping system that were open during processing are open. BV-107, BV-108, and BV-109 are to be closed.

- Slowly open BV-107, pressurizing the water line leading from the effluent pumping station to the effluent storage tank, forcing the stagnant water into the effluent storage tank. Once air is heard entering the tank, elevate the high-pressure flexible hosing beginning at the effluent pumping skid working towards the effluent manifold on the effluent storage tank. Close BV-101 to prevent water from re-entering the line.

- Close BV-105 and BV-107. Open BV-108 if pump P-5A was used. Open BV-109 if pump P-5B was used. Slowly open BV-107, pressurizing the water line leading from the effluent pumping station to the return well. This forces the stagnant water from the line into the return well. Watch for flow on FIT-3. When no flow is seen, elevate the high-pressure flexible hosing beginning at the effluent pump skid working towards the return well. Close BV-107.

- Relieve air pressure from the air hose using the line pressure regulator on the compressor. Disconnect the air hose. Relieve the pressure in the system by opening BV-107. Use a poly hose to direct the pressure into a container. The air pressure can also be relieved from the system using the air-vacuum valve located on the return well manifold by opening BV-132.

2.7 FILTER CHANGEOUT

The filters periodically require changeout of the filter elements (bags for influent filters or cartridges for effluent filters) when they become clogged with solids. This is evident by increasing differential pressure across the filters as measured by the differential pressure transmitters, which alarm at 30 psig differential. In general, when the filters are to be changed out, the process is shut down, valves are positioned, and residual water is blown out of the filter housings with the air compressor. This minimizes personnel contact with potentially contaminated solutions during the changeout procedure.

2.7.1 Influent Filter Changeout

NOTE: An RCT must be present whenever opening/breaching the system (per Radiation Work Permit [RWP]) upstream of the IX columns.

NOTE: After blowing out the water, be sure that all the air is bled out of the lines and verify that there is no pressure before opening filter housings.

- If the process is operating, follow procedures to shut down the process system.
- Be sure that MBV-2 and BV-23 are closed.
- Dewater filter columns following blowout procedures for influent pumping station outlined in Section 2.6.
- Bleed all air pressure from filter column through port located near BV-30. Bleed air into a container to contain any residual water.
- Open filter column, remove filter, and place into a plastic bag. Radiological Control Technicians (RCT) may survey filter housing. Replace filters and securely close filter housings.

2.7.2 Effluent Filter Changeout

NOTE: After blowing out the water, be sure that all the air is bled out of the lines and verify that there is no pressure before opening filter housings.

- If the process is operating, follow procedures to shut down the process system.
- Be sure that BV-101 and MBV-3 are to be closed.
- Dewater filter columns following blowout procedures for effluent pumping station outlined in Section 2.6.
- Bleed all air pressure from filter column through port located near BV-107. Bleed air into a bucket to contain any residual water.
- Open filter column, remove filter, and place into a plastic bag. Replace filters and securely close filter housings.

2.8 ION EXCHANGE RESIN CHANGEOUT PROCEDURE

Ion exchange resin changeouts will occur as scheduled by the test engineer. Changeouts typically occur once the resin has been loaded to capacity with contaminants. The resin changeouts will be performed in accordance with the RWP prepared for the changeout and with the site safety plan and/or any specific safety permits deemed necessary by the site safety specialist or RCT.

Current permits and plans (latest revision, not expired):

- RWP for resin change
- Health and safety plan
- Waste packaging requirements.

Tools and Supplies:

- Glovebag/box that fits manway (if required by health physics)
- Scaffolding with ladders to hold workers and glove bag/box
- Universal separator (modified drum lid)
- 4-in.-diameter PVC tubing 6 ft in length and large funnel or similar device to load resin into column
- Fittings necessary to attach vacuum hose to both vacuum and separator
- Two rolls of duct tape
- Minimum of six 10-mil reinforced polyethylene drum liners for 55-gal drums and six 90-mil drum liners
- Minimum of six 55-gal galvanized steel drums
- Drum labels as appropriate.
- Radiological posting and rope - four surface contamination area (SCA) signs, four radiologically buffered area (RBA) signs, 50 ft of yellow and magenta rope and one Step-off pad
- Laundry bags for used anti-Cs
- HEPA-filtered vacuum cleaner (DOP tested) with vacuum hose (2 @ 15 ft)
- Extension cords (with GFI's) to power vacuum
- Vacuum nozzle tubing
- Minimum of two boxes of absorbent wipes
- Minimum of one yellow polyethylene bags for waste generated during wipedown of glovebag (if glovebag was required)
- Minimum of ten stay ties, at least 12 in. long
- Tools for cutting plastic and stay ties
- Two 12-in.-long, 3/4-in.-diameter threaded bolts
- Four nuts that fit above bolts

2.8.1 Spent Resin Removal Process

A. Dewater IX column by attaching the air compressor hose to the air fitting located at the top of the column to be dewatered (Note: make sure the valve located immediately downstream of this fitting is closed). Pressurize air hose to 30-40 psig. Close the 2-in. ball valve at the top of the tank and open the valves downstream of the column into the effluent storage tank. This configuration will allow the water in the column to be forced downstream into the next column. Open the ball valve downstream of the air fitting, beginning the dewatering process. Continue to provide air at approximately 40 psig for 10 minutes.

B. Bleed any residual pressure from the IX column into purgewater carboy (with drain line) attached to the same port utilized to dewater the column. (Check pressure using gauge located at top of vessel.) Let the column sit overnight. Verify that the column has been adequately dewatered by opening the sample port located at the bottom of each column. (Place a container under sample port.) If a significant volume of water remains, repeat steps A and B.

Note: For best results, dewatering should be completed several days prior to vacuuming resin as the drier the resin is the easier it is to vacuum

C. Remove retaining bolts on IX column manhole cover that are in the 12 o'clock and 6 o'clock positions (use a drip pan to contain any water that may drip out as bolts are loosened). Replace each of the two bolts with a 1-ft-long bolt, adjusting them so that they contact the column behind the manhole flange. Tighten a nut on each 1-ft bolt to hold the cover in place.

D. Remove all remaining bolts and nuts utilizing the 12-in. bolts to hold the manhole cover in place.

E. Install glove box/bag (if required by health physics) forming a seal between the bag and the outer edge of the manway. If the glove bag is not used, a plastic drop cloth will be attached to the column outlet just below the manway to collect any beads that may fall out of the column during the removal process.

F. Place channel iron or similar material in bottom of the glovebag/drop cloth to set the manway cover on. This will allow room during the removal process. for worker's hands when laying the cover on the glovebag floor. (Elevating the cover in this manner will make re-installation easier.)

G. Stock the glovebag/drop cloth with all necessary equipment to perform bead removal (e.g., wrenches, sleeved vacuum hose, wipes, etc).

H. Remove the nuts on the front of the manway cover (on the 12-in. bolts), slide the manhole cover away from the column, and place it on prepared surface in the glove bag/drop cloth.

I. The spent resin will be drawn into galvanized steel drums with 10-mil nylon reinforced polyethylene liners inside. A second 90 mil liner may be placed inside the 10-mil liner to prevent the bag from collapsing when the vacuum is applied.

J. Utilizing a HEPA vacuum (with a collection drum in line upstream of the vacuum) with a vacuum hose sleeved through the glove box/bag, remove as much of the spent resin beads as practicable.

NOTE: Operation of the HEPA vacuum, including changing the waste bag on the bottom, will be in accordance with WHC-CM-7-8 Section 9.1, Rev.0.

K. The modified drum lid should be transferred from the full drums to the empty drums utilizing the empty drum's drum liner to sleeve the lid between drums.

L. Horse tail full drum liner and install permanent lid on drum.

M. On completion of the work, the waste bag will be removed from the vacuum in accordance with the above procedure and then transferred to one of the collection drums.

NOTE: A drum dolly will used to move the full drums. The drums will be stored in an RMA until dispositioned.

N. Materials within the glovebag/drop cloth will be decontaminated and released by health physics or packaged before removal.

2.8.2 New Bead Installation Process

A. Fill column with fresh beads using a clean container/bucket through the manhole . IF any apparatus used to handle the new beads comes in contact with the inside of the column or manhole, the RCT will need to survey such items, as necessary. Fill column with resin to bottom of manhole (approximately 288 gal).

B. Replace the manhole cover on the 12-in. bolts and tighten the two nuts that were removed until seal is formed between the manhole and manhole cover with the rubber gasket in between.

E. Utilize the HEPA vacuum to remove any IX beads that remain in the glovebag/dropcloth regardless of their origin (clean or spent) and dispose of them in the waste drums.

F. Remove glovebag/ drop cloth and package as required for or collapse and dispose of as waste.

G. Replace remaining retaining bolts in manhole cover and tighten down to seat the gasket.

H. Replace the 12-in. bolts with the original nuts and bolts. (Be certain that the manhole cover is sealed properly when backwashing and when the column is brought on-line.)

3.0 SYSTEM SHUTDOWN PROCEDURES

Shutdown of the treatment system involves turning pumps off, closing all ball valves, and dewatering the system if necessary. For normal operations, the system will operate 24 hours/day and will only be shut down when maintenance activities are required. A walkdown of the system is made before closing the site to ensure that all ball valves are closed on non-operational systems.

4.0 INSTRUMENT CALIBRATION

Instrumentation utilized on the pilot scale system requires periodic maintenance and calibration to ensure it is operating as required. The instruments are calibrated according to the schedule outlined below following the manufacturers calibration procedures. All instrument calibrations shall be documented in the field log-book. Calibration information shall be recorded in a calibration log book to be maintained on-site. Calibration of instruments identified as indicator only, meaning they are not used to control system operating parameters, is not considered to be critical and is only completed periodically to ensure that is it performing as necessary.

4.1 Digital Process Indicators

The digital process indicators are used within the control room building to provide a remote display of operational conditions in one location. The digital indicators shall be calibrated according to the same schedule as that of the individual instrument they are associate with.

4.2 Flow Controllers

The flow controllers are used to monitor the flow rates from each of the extraction wells, through the process treatment system and into the return well. These parameters are not critical to the operation of the treatment system (indicator only) but do provide information on system productivity. For this reason, the flow controllers are to be calibrated semi-annually.

4.3 Level Transmitters

The level transmitters are used to monitor and control water levels in the influent and effluent storage tanks. The operation of these instruments controls the systems pumps to ensure that the tanks are not overflowed or that pumps are run in a dry state. The level transmitters shall be calibrated semi-annually.

4.4 Temperature Loop

The temperature loops provide a signal to a digital process indicator which displays the water temperature for that particular temperature loop. The temperature of the extracted water and the return water are monitored. The temperature loop instruments are considered to be indicator only and are not required for system operation (indicator only). The temperature loops shall be calibrated annually.

4.5 Differential Pressure Transmitters

The differential pressure transmitters are used to monitor the pressure drop across the ion-exchange and filter columns. High differential pressures across these columns indicate when a filter changeout is required or if an operational problem exists within the ion-exchange columns. These meters are connected to the annunciator panel and are set to alarm when high differential pressure conditions exist. The differential pressure information can also be obtained from the individual pressure gauges installed on the inlet and outlet of each column. The differential pressure transmitters are to be calibrated semi-annually, if calibration of these instruments lapses, the pressure gauges (with valid calibrations) can be used to monitor the appropriate pressure drops until the calibration of the DPT is completed.

4.6 Oil-filled Pressure Gauges

Oil filled pressure gauges are used to provide point pressure information throughout the treatment system. These gauges are used to ensure that the operational pressures are maintained within design specifications. The pressure gauges shall be calibrated semi-annually.

4.7 Pressure Switches/Pressure Relief Valves

Three pressure switches and three pressure relief valves are used to protect the ion-exchange and GAC vessels from being over-pressurized and possible failure. The pressure switches shall be calibrated semi-annually and the pressure relief valves calibrated annually.

5.0 LEVEL INTERLOCK CHECKLIST

This Section describes testing of level interlocks. The interlocks shall be tested, at a minimum, every 120 days if operating.

5.1 INTERLOCK TESTING

Each interlock will be tested by shorting out the appropriate relays and verifying that each will stop the appropriate pump or close the appropriate valve.

5.2 START EXTRACTION WELL PUMP, P-1A, RESTART AFTER EACH TEST

LSL-1 (Low Level, Extraction Well)	Stop P-1A	_____	_____
LSH-1 (High Level, Influent Tank)	Stop P-1A	_____	_____
LSHH-1 (High-High Level,Inf. Tank)	Stop P-1A	_____	_____
FS-1 (Low Flow, Extraction Pump)	Stop P-1A	_____	_____

5.3 START INFLUENT PUMPS P-2A OR P-2B, RESTART AFTER EACH TEST

LSL-2 (Low Level, Influent Tank)	Stop P-2A/B	_____	_____
LSH-2 (High Level, Effluent Tank)	Stop P-2A/B	_____	_____
LSHH-2 (High-High Level, Eff.Tank)	Stop P-2A/B	_____	_____
FS-2 (Low/No Flow, Influent Pumps)	Stop P-2A/B	_____	_____
FS-3 (No Flow,Hose to Proces Skid)	Stop P-2A/B	_____	_____
FS-4 (No Flow, Hose to Eff. Tank)	Stop P-2A/B	_____	_____
FSH-7 (High flow in Process Skid)	Stop P-2A/B	_____	_____
PSH-1 (Pressure Switch, Process)	Stop P-2A/B	_____	_____
PSH-2 (Pressure Switch, GAC #1)	Stop P-2A/B	_____	_____
PSH-3 (Pressure Switch, GAC #2)	Stop P-2A/B	_____	_____

5.4 START EFFLUENT PUMPS P-2A OR P-2B; RESTART AFTER EACH TEST

LSH-3 (High Level, Return Well)	Stop P-5A/B	_____	_____
FS-5 (No Flow, Hose to Eff. Skid)	Stop P-5A/B	_____	_____
FS-6 (No Flow, Hose to Well)	Stop P-5A/B	_____	_____
LSL-3 (Low Level, Effluent Tank)	Stop P-5A/B	_____	_____

6.0 FAILSAFE MOTOR OPERATED VALVE INTERLOCK CHECKLIST

The Failsafe Motor Operated Ball Valves are located on the inlet and outlets of the Influent and Effluent Storage Tanks. The failsafe feature of Motor Operated Ball Valves MBV-1, MBV-2 MBV-3 and MBV-4 is to prevent an uncontrolled discharge of the tank contents in the event of a breach in the system.

6.1 MBV-1, MANUAL MODE

A. Set MBV-1-Auto" switch to "Manual."

B. Verify that valve is open; then open panelboard circuit breaker for MBV-1.

C. Verify closure of valve on loss of power.

6.2 MBV-1, AUTOMATIC MODE

A. Set MBV-1 "Manual-Auto" switch to "Auto."

B. Open manual ball valves BV-2, BV-4 BV-6, and BV-7. Start Pump P-1A (Well Pump) and watch for MBV-1 to open.

C. Open panelboard circuit breaker for MBV-1 and verify closure of valve on loss of power.

D. Close panelboard circuit breaker to open valve; then shut off Well Pump P-1 and verify that valve closes when P-1 shuts down.

6.3 MBV-2, MANUAL MODE

A. Set MBV-2 "Manual-Auto" switch to "Manual."

B. Verify that valve is open; then open panelboard circuit breaker for MBV-2.

C. Verify closure of valve on loss of power.

6.4 MBV-2, AUTOMATIC MODE

A. Set MBV-2 "Manual-Auto" switch to "Auto."

B. Open the manual ball valves as noted in Section 2.3.1 for the respective pump P-2A or P-2B to ensure flow can be established; then start Influent Pump P-2A, or P-2B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.

C. Open panelboard circuit breaker for MBV-2 and verify closure of valve on loss of power.

D. Close panelboard circuit breaker to open valve; then shut off whichever pump is running, P-2A or P-2B, and verify that valve closes when pump shuts down.

6.5 MBV-3, MANUAL MODE

A. Set MBV-3 "Manual-Auto" switch to "Manual."

B. Verify that valve is open; then open panelboard circuit breaker for MBV-3.

C. Verify closure of valve on loss of power.

6.6 MBV-3, AUTOMATIC MODE

A. Set MBV-3 "Manual-Auto" switch to "Auto."

B. Open the manual ball valves as noted in Section 2.3.1 for the respective pump P-2A or P-2B to ensure flow can be established; then start Influent Pump P-2A, or P-2B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.

C. Open panelboard circuit breaker for MBV-3 and verify closure of valve on loss of power.

D. Close panelboard circuit breaker to open valve; then shut off whichever pump is running, P-2A or P-2B, and verify that valve closes when pump shuts down.

6.7 MBV-4, MANUAL MODE

A. Set MBV-4 "Manual-Auto" switch to "Manual."

B. Verify that valve is open; then open panelboard circuit breaker for MBV-4.

C. Verify closure of valve on loss of power.

6.8 MBV-4, AUTOMATIC MODE

A. Set MBV-4 "Manual-Auto" switch to "Auto."

B. Open the manual ball valves as noted in Section 2.4.1 for the respective pump P-5A or P-5B to ensure flow can be established; then start effluent Pump P-5A, or P-5B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.

C. Open panelboard circuit breaker for MBV-4 and verify closure of valve on loss of power.

D. Close panelboard circuit breaker to open valve; then shut off whichever pump is running, P-5A or P-5B, and verify that valve closes when pump shuts down.

7.0 EMERGENCY SHUTDOWN SWITCHES

The emergency shutdown switch (or switches) will shut the Treatment System down in case of an emergency. Items included on this emergency switch include the Well Pump, Influent Pumps, Effluent Pumps, and Failsafe Motor-Operated Valves (MBV-1, MBV-2, MBV-3 and MBV-4). The emergency shutdown system will be tested quarterly.

7.1 VERIFY SYSTEM IS OPERATING

Verify that Well Pump (P-1), Influent Pump (P-2A or 2B), Effluent Pump (P-5A or 5B) (if applicable) are running. Also verify that Failsafe Motor-Operated Valves are open.

7.2 EMERGENCY SHUTDOWN SWITCHES

Actuate Emergency Shutdown Switch(es) and verify shutdown of pumps and closure of valves.

P-1A	_____
P-2A/2B	_____
P-5A/5B	_____
MBV-1	_____
MBV-2	_____
MBV-3	_____
MBV-4	_____

8.0 TROUBLE SHOOTING

8.1 EXTRACTION WELL PUMPS

Extraction Well Pumps will not operate under conditions specified below.

A. Influent Storage Tank level is "High" or "High-High."

B. Extraction Well level is low.

C. Flowswitch, FS-1A (for well pump P-1A) is not satisfied: There is no flow in the line from the well to the Influent Storage Tank.

8.2 PUMP P-2A OR P-2B

Either Pump P-2A or P-2B will not operate under conditions specified below.

A. Flowswitches FS-2, FS-3 or FS-4 not satisfied: There is no flow in the lines to the Influent Pumps or to the inlet manifold on the Process Skid, or to the Effluent Storage Tank.

B. Influent Storage Tank level is "Low."

C. Effluent Storage Tank level is "High."

D. Flowswitch FSH-7 is not satisfied indicating a potential high flow situation through the treatment system. This alarm should only be triggered when pumps are operating however.

8.3 PUMP P-5A P-5B

Either Pump P-5A or P-5B will not operate under the following conditions.

A. Disposal Well level is "High."

B. Effluent Storage Tank level is "Low."

C. Flowswitches FS-5 and FS-6 not satisfied: There is no flow in the lines from the Effluent Storage Tank to the Effluent Pumps or from the Effluent Pump(s) to the Disposal Well.