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CONSOLIDATED WATER TREATMENT FACILITY

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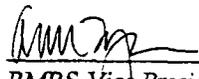
TREATED EFFLUENT RECIRCULATION
CONSOLIDATED WATER TREATMENT FACILITY

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Rocky Flats Environmental Technology Site
4-I51-ENV-OPS-FO.33
REVISION 1
TREATED EFFLUENT RECIRCULATION
CONSOLIDATED WATER TREATMENT FACILITY
BUILDING 891

APPROVED BY:



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131 July 1996
Date

DOE RFFO/ER Concurrence on file: Yes No NA

Environmental Protection Agency Approval Received: Yes No NA

Responsible Organization: Environmental Restoration Program Division Effective Date: 7/31/96

CONCURRENCE BY THE FOLLOWING DISCIPLINES IS DOCUMENTED IN THE PROCEDURE HISTORY FILE:

Environmental Operations Management
Quality Assurance
Subject Matter Expert

USE CATEGORY 3

ORC review not required

The following have been incorporated in this revision:
N/A

Periodic review frequency: 1 year from the effective date

DOCUMENT CLASSIFICATION REVIEW
PER R.B. HOFFMAN, CLASSIFICATION OFFICER
JUNE 11, 1991

LIST OF EFFECTIVE PAGES

<u>Pages</u>	<u>Effective Date</u>	<u>Change Number</u>
1-18	<u>07/31/96</u>	

TOTAL NUMBER OF PAGES: 18

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1. PURPOSE

This procedure provides instructions for recirculating treated effluent from the Effluent Storage Tanks of the Consolidated Water Treatment Facility (CWTF).

This procedure ensures that the treated effluent is recirculated properly for re-treatment through Ion Exchange only, UV/H₂O₂ only (with or without GAC) and, UV/H₂O₂ and Ion Exchange together and to obtain a representative effluent tank sample. Effluent tank samples will be taken to determine chemical addition for neutralization and for analysis to meet the Applicable or Relevant and Appropriate Requirements (ARAR's) prior to discharge to the South Interceptor Ditch.

2. SCOPE

This procedure applies to the CWTF Responsible Manager, Lead Operator/Operator, and all Environmental Operations Management employees and subcontractors.

This procedure addresses the following topics:

- Recirculation from a treated effluent storage tank for Ion Exchange re-treatment only,
- Recirculation from a treated effluent storage tank for UV/H₂O₂ re-treatment only (with or without GAC),
- Recirculation from a treated effluent storage tank for Ultraviolet/hydrogen peroxide (UV/H₂O₂) and Ion Exchange re-treatment,
- Treated effluent storage tank recirculation without treatment for sampling, and
- Treated effluent storage tank recirculation without treatment for neutralization.

3. OVERVIEW

The CWTF consists of the following systems:

- A groundwater recovery and storage system
- A chemical precipitation/microfiltration system
- A UV/H₂O₂ oxidation system
- A granular activated carbon (GAC) vessel
- An ion exchange system with units for acid and caustic regeneration of resin
- A spent regenerant neutralization system
- A treated effluent storage and discharge system

This procedure describes the steps utilized to recirculate treated effluent in the following three systems:

- The UV/H₂O₂ oxidation system
- The ion exchange system
- The treated effluent storage and discharge system

3. **OVERVIEW (continued)**

A process flow diagram is shown in Appendix 2, Influent Collection, Transfer and Storage, CWTF, 4-I49-ENV-OPS-FO.31.

If the analytical results from sampling of the treated effluent storage Tanks T-205, T-206, and T-207 indicate that the treated effluent exceeds an ARAR for one or more constituents, then the tanks are recirculated through the UV/H₂O₂ oxidation system (with or without GAC) and/or the Ion Exchange system for further treatment in accordance with this procedure.

The treated effluent storage tanks may be recirculated through the system without additional UV/H₂O₂ or Ion Exchange treatment to ensure adequate mixing before sampling the tanks. This procedure also details the requirements necessary to neutralize a recirculating effluent tank prior to sampling for discharge parameters.

All equipment controls and valves for controlling the CWTF systems are located in Building 891, treatment trailers T-900A & B and in the adjacent areas. A complete list of valve designators, nomenclature, and types is provided in Appendix 4, Influent Collection, Transfer and Storage, CWTF, 4-I49-ENV-OPS-FO.31.

Each subsection of the major Instructions Sections is a stand alone section that may be performed independently of other subsections.

4. **LIMITATIONS AND PRECAUTIONS**

- The level of Tank T-203 shall be observed before recirculation through the UV/H₂O₂ oxidation system to ensure adequate capacity for the volume of liquids to be processed through the UV/H₂O₂ oxidation system.
- An empty effluent storage tank must be available to receive re-treated water from the CWTF treatment systems.
- The following recirculation isolation valves shall remain LOCKED CLOSED with an operational lock at all times when recirculation is not occurring:
 - HVC-205, T-205 Recirculation
 - HVC-206, T-206 Recirculation
 - HVC-207, T-207 Recirculation

5. PREREQUISITES

5.1 Planning and Coordination

CWTF Responsible Manager

- [1] Verifies that the samples of the operationally full effluent tank are collected and analyzed in accordance with the Sampling and Analysis Plan for Operation and Maintenance of the Interim Measures/Interim Remedial Action for the 881 Hillside Operable Unit No. 1 and 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples.
- [2] Directs the Lead Operator/Operator to recirculate the contents of the treated effluent storage tank through the Ion Exchange and/or the UV/H₂O₂ oxidation system for further treatment, in accordance with Section 6 Instructions, as necessary.
- [3] Directs the Lead Operator/Operator to recirculate the contents of the treated effluent storage tank, without treatment, for neutralization or sampling.
- [4] Supervises the operational lock requirements for the appropriate valves.

Lead Operator/Operator

- [1] Verifies that capacity exists in an effluent tank to accept re-treated water.
- [2] Verifies that T-203 is at an acceptable level to receive re-treated water from UV/H₂O₂ oxidation and, if necessary GAC.
- [3] Ensures that the recirculation valves for the tanks that will not be recirculated are LOCKED CLOSED with an operational lock. This applies to the following valves:
 - HVC-205, T-205 Recirculation
 - HVC-206, T-206 Recirculation
 - HVC-207, T-207 Recirculation
- [4] Record all activities in the CWTF Logbook.

Health and Safety Specialist

- [1] Conduct a pre-shift safety briefing covering plant operations prior to the initiation of this procedure.

6. INSTRUCTIONS

6.1 ION EXCHANGE RECIRCULATION FROM TREATED EFFLUENT STORAGE TANK

Lead Operator/Operator

- [1] CLOSE HVB-203, IX feed from T-203.
- [2] CLOSE the following valves:
 - HV-500, Recirculation from Effluent Storage Tanks
 - HV-501, Recirculation to UV
 - HV-503, Recirculation
 - V-108, Recirculation Isolation
- [3] OPEN the following valves:
 - HV-502, Recirculation to IX
 - V-95, Plant Effluent
- [4] OPEN the appropriate valves for the tank to be recirculated:
 - [A] For Tank T-205, OPEN HVA-205, Plant Effluent/T-205 Influent and HVC-205, T-205 Recirculation.
 - [B] For Tank T-206, OPEN HVA-206, Plant Effluent/T-206 Influent and HVC-206, T-206 Recirculation.
 - [C] For Tank T-207, OPEN the following valves:
 - HVA-207, Plant Effluent/T-207 Influent
 - HVC-207, T-207 Recirculation
 - HVD-207, T-207 Isolation
- [5] Place the Ion Exchange system in operation in accordance with 4-I52-ENV-OPS-FO.34.

6.1 ION EXCHANGE RECIRCULATION FROM TREATED EFFLUENT STORAGE TANK
(continued)

Lead Operator/Operator

- [6] **IF** an alarm occurs on the IX Control Panel,
THEN check system status and notify the CWTF Responsible Manager.

The system automatically shuts down upon the following conditions:

- Overpressure on P-1, P-2, P-3
- Low Flow on P-1, P-2, P-3
- Flow Failure on BLR-1, BLR-2
- Degassifier High Sump Level
- Degassifier Low Sump Level
- Degassifier Air Temperature
- High Differential Pressure on BLF-1, BLF-2
- High Differential Pressure on IX-1, IX-2, IX-3, IX-4
- Motorized Valve Failure

- [7] **WHEN** recirculation is completed,
THEN:

[A] Shut down the Ion Exchange system in accordance with 4-I52-ENV-OPS-FO.34.

[B] **CLOSE** the following valves:

- HV-502
- V-95
- V-108

[C] **CLOSE** the appropriate valves:

[a] For Tank T-205, **CLOSE** HVA-205 and HVC-205.

[b] For Tank T-206, **CLOSE** HVA-206 and HVC-206.

[c] For Tank T-207, **CLOSE** the following valves:

- HVA-207
- HVC-207
- HVD-207

6.1 ION EXCHANGE RECIRCULATION FROM TREATED EFFLUENT STORAGE TANK
(continued)

Lead Operator/Operator

[8] LOCK CLOSED, with an operational lock, one of the following valves, as required:

- HVC-205
- HVC-206
- HVC-207

[10] Record all activities in the CWTF Logbook and on the appropriate process logsheets..

6.2 UV/H₂O₂ RECIRCULATION FROM TREATED EFFLUENT TANK

Lead Operator/Operator

[1] Ensure that the recirculation valves for the effluent tanks which will not be recirculated are LOCKED CLOSED, and that an operational lock has been applied to the appropriate valves:

- HVC-205, T-205 Recirculation
- HVC-206, T-206 Recirculation
- HVC-207, T-207 Recirculation

[2] CLOSE HVB-201, Effluent from T-201 and HVB-202, Effluent from T-202.

[3] OPEN HV-501, Recirculation to UV.

[4] OPEN HVA-203, Influent to T-203 and HVB-203, Effluent from T-203.

[5] CLOSE the following valves:

- V-2, P-1 outlet
- V-95, Plant Effluent
- V-128, Gamma Detection Isolation
- HV-500, Recirculation from Effluent Recirculation Tank(s)
- HV-502, Recirculation to IX

[6] OPEN HV-503, Recirculation

6.2 UV/H₂O₂ RECIRCULATION FROM TREATED EFFLUENT TANK
(continued)

NOTE 1 *If Granular Activated Carbon (GAC) treatment is desired, perform the following valve alignment:*

Lead Operator/Operator

- [7] OPEN valves V-170, inlet to GAC and V-171, outlet from GAC.
- [8] CLOSE valve V-172, GAC bypass.
- [9] Start UV system per instructions in 4-I53-ENV-OPS-FO.35, System Normal Operations, Ultraviolet/Hydrogen Peroxide Oxidation and Granular Activated Carbon Systems, CWTF.
- [10] Turn Ion Exchange control power switch, located on UCP-3 in Main Control Center, to ON panel.
- [11] Place P-1 in HAND and monitor T-203 tank levels.
- [12] Record activities in the CWTF Logbook and on appropriate process logsheets.

6.3 UV/H₂O₂ AND ION EXCHANGE RECIRCULATION FROM TREATED EFFLUENT STORAGE TANK

Lead Operator/Operator

- [1] Ensure that the recirculation valves for the tanks that will not be recirculated are LOCKED CLOSED, and that an operational lock has been applied to the appropriate valves:
 - HVC-205, T-205 Recirculation
 - HVC-206, T-206 Recirculation
 - HVC-207, T-207 Recirculation
- [2] CLOSE HVB-201, Effluent from T-201 and HVB-202, Effluent from T-202.
- [3] OPEN HV-501, Recirculation to UV.
- [4] CLOSE the following valves:
 - HV-500, Recirculation from Effluent Storage Tanks
 - HV-502, Recirculation to IX

6.3 UV/H₂O₂ AND ION EXCHANGE RECIRCULATION FROM TREATED EFFLUENT STORAGE TANK (continued)

Lead Operator/Operator

CLOSE the following valves:

- HV-503, Recirculation
- V-108

[5] OPEN the following valves:

- HVA-203, UV Effluent to T-203
- HVB-203, IX Feed From T-203
- V-95, Plant Effluent

[6] OPEN the appropriate valves for the tank to be recirculated:

[A] For Tank T-205, OPEN HVA-205, Plant Effluent/T205 Influent and HVC-205, T-205 Recirculation.

[B] For Tank T-206, OPEN HVA-206, Plant Effluent/T206 Influent and HVC-206, T-206 Recirculation.

[C] For Tank T-207, OPEN the following valves:

- HVA-207, Plant Effluent/T-207 Influent
- HVC-207, T-207 Recirculation
- HVD-207, T-207 Isolation

[7] Verify that FCV-4, UV Effluent Control is OPEN.

NOTE 1 *If GAC treatment is desired, perform the following valve alignment:*

[8] OPEN valves V-170, inlet to GAC and V-171, outlet from GAC.

[9] CLOSE valve V-172, GAC bypass.

[10] Place the UV/H₂O₂ system in operation in accordance with 4-I53-ENV-OPS-FO.35, System Normal Operations, Ultraviolet/Hydrogen Peroxide Oxidation and Granular Activated Carbon Systems, CWTF.

6.3 UV/H₂O₂ AND ION EXCHANGE RECIRCULATION FROM TREATED EFFLUENT
STORAGE TANK (continued)

Lead Operator/Operator

[11] Place the Ion Exchange System in operation in accordance with 4-I52-ENV-OPS-FO.34, Ion Exchange System, Normal Operations.

[12] **WHEN** recirculation is completed,
THEN:

[A] Shut down the UV/H₂O₂ system in accordance with 4-I53-ENV-OPS-FO.35.

[B] Shut down the Ion Exchange system in accordance with 4-I52-ENV-OPS-FO.34.

[C] CLOSE the following valves:

- HV-501
- V-95

[D] OPEN valve V-108.

[E] CLOSE the appropriate valves:

[a] For Tank T-205, CLOSE HVA-205 and HVC-205.

[b] For Tank T-206, CLOSE HVA-206 and HVC-206.

[c] For Tank T-207, CLOSE the following valves:

- HVA-207
- HVC-207
- HVD-207

[13] LOCK CLOSED, with an operational lock, one of the following valves, as required:

- HVC-205
- HVC-206
- HVC-207

[14] Record all activities in the CWTF Logbook and all appropriate process logsheets.

6.4 TREATED EFFLUENT STORAGE TANK RECIRCULATION (WITHOUT TREATMENT)
FOR SAMPLING

Lead Operator/Operator

- [1] Ensure that the recirculation valves for the tanks that will not be recirculated are LOCKED CLOSED, and that an operational lock(s) have been applied to the appropriate valves:
 - HVC-205, T-205 Recirculation
 - HVC-206, T-206 Recirculation
 - HVC-207, T-207 Recirculation

- [2] OPEN HV-502, Recirculation to IX and HV-503, Recirculation.

- [3] CLOSE HV-501, Recirculation to UV and HV-500, Recirculation from Effluent Storage Tanks.

- [4] CLOSE the following valves:
 - V-2, P-1 Service Outlet
 - V-95, Plant Effluent
 - V-128, Gamma Detection Isolation

- [5] OPEN the appropriate valves for the tank to be recirculated:
 - [A] For Tank T-205, OPEN HVA-205, Plant Effluent/T-205 Influent and HVC-205, T-205 Recirculation.

 - [B] For Tank T-206, OPEN HVA-206, Plant Effluent/T-206 Influent and HVC-206, T-206 Recirculation.

 - [C] For Tank T-207, OPEN the following valves:
 - HVA-207, Plant Effluent/T-206 Influent
 - HVC-207, T-207 Recirculation
 - HVD-207, T-207 Isolation

- [6] Verify that the Ion Exchange Auto switch is OFF.

- [7] Energize the Ion Exchange Control Panel by placing the Input/Output switch to ON.

- [8] Start Pump P-1 by placing the selector switch on the Ion Exchange Control Panel to HAND.

6.4 TREATED EFFLUENT STORAGE TANK RECIRCULATION (WITHOUT TREATMENT)
FOR SAMPLING (continued)

NOTE 1 *The pump utilized for recirculation in this Section (P-1), is capable of pumping approximately 50 gpm under these circumstances. Effluent tank volumes are typically above 110,000 gals. upon sampling or during neutralization. At the pumping rate noted above, a total tank turnover for complete mixing would require approximately 36 hours. Although this is unrealistic, the maximum time possible should be utilized for neutralization and for sampling to assure a representative sample is obtained. The minimum amount of time used to recirculate will not be less than four hours.*

Lead Operator/Operator

- [9] To sample a treated effluent tank prior to discharge, perform the following steps:
- [A] Recirculate the tank for the maximum time allowable before sampling.
 - [B] Perform sampling in accordance with 5-21000-OPS-FO.13, Containerization, Preserving, Handling and Shipping of Soil and Water Samples and the CWTF Sampling and Analysis Plan (SAP).
 - [C] Take the samples at V-96, Plant Effluent Sample Port.
- [10] **WHEN** recirculation is complete,
THEN stop Pump P-1 by placing the selector switch to OFF.
- [11] De-energize the Ion Exchange Control Panel by placing the Input/Output switch to OFF.
- [12] CLOSE HV-502 and HV-503.
- [13] CLOSE the appropriate valves for the tank that was recirculated:
- [A] For Tank T-205, CLOSE HVA-205 and HVC-205.
 - [B] For Tank T-206, CLOSE HVA-206 and HVC-206.
 - [C] For Tank T-207, CLOSE the following valves:
 - HVA-207
 - HVC-207
 - HVD-207
- [14] Record all activities in the CWTF Logbook.

**6.5 TREATED EFFLUENT STORAGE TANK RECIRCULATION (WITHOUT TREATMENT)
FOR NEUTRALIZATION**

Lead Operator/Operator

- [1] Ensure that the recirculation valves for the tanks that will not be recirculated are LOCKED CLOSED, and that an operational lock(s) have been applied to the appropriate valves:
 - HVC-205, T-205 Recirculation
 - HVC-206, T-206 Recirculation
 - HVC-207, T-207 Recirculation

- [2] OPEN HV-502, Recirculation to IX and HV-503, Recirculation.

- [3] CLOSE HV-501, Recirculation to UV and HV-500, Recirculation from Effluent Storage Tanks.

- [4] CLOSE the following valves:
 - V-2, P-1 Service Outlet
 - V-95, Plant Effluent
 - V-128, Gamma Detection Isolation

- [5] OPEN the appropriate valves for the tank to be recirculated:
 - [A] For Tank T-205, OPEN HVA-205, Plant Effluent/T-205 Influent and HVC-205, T-205 Recirculation.

 - [B] For Tank T-206, OPEN HVA-206, Plant Effluent/T-206 Influent and HVC-206, T-206 Recirculation.

 - [C] For Tank T-207, OPEN the following valves:
 - HVA-207, Plant Effluent/T-206 Influent
 - HVC-207, T-207 Recirculation
 - HVD-207, T-207 Isolation

- [6] Verify that the Ion Exchange Auto switch is OFF.

- [7] Energize the Ion Exchange Control Panel by placing the Input/Output switch to ON.

- [8] Start Pump P-1 by placing the selector switch on the Ion Exchange Control Panel to HAND.

6.5 TREATED EFFLUENT STORAGE TANK RECIRCULATION (WITHOUT TREATMENT)
FOR NEUTRALIZATION (continued)

NOTE 1 *The pump utilized for recirculation in this Section (P-1), is capable of pumping approximately 50 gpm under these circumstances. Effluent tank volumes are typically above 110,000 gals. upon sampling or during neutralization. At the pumping rate noted above, a total tank turnover for complete mixing would require approximately 36 hours. Although this is unrealistic, the maximum time possible should be utilized for neutralization and for sampling to assure a representative sample is obtained. The minimum amount of time used to recirculate will not be less than four hours.*

Lead Operator/Operator

- [9] To sample a treated effluent tank for pH, prior to neutralization, perform the following steps:
- [A] Recirculate the tank for the maximum time allowable before sampling.
 - [B] Obtain a representative sample of 1000 mL in a suitable container from the Plant Effluent Sample Port, V-96.
 - [C] With dilute sulfuric acid solution (approximately 10%), titrate the sample to obtain a volume of acid required to neutralize the sample to a pH of 6.5 to 9.0.
 - [D] Calculate the amount of concentrated sulfuric acid required to neutralize the total number of gallons of treated effluent in the storage tank.
- [10] **WHILE** recirculation is continuing,
THEN begin neutralizing the effluent tank using the following steps:
- [A] Gather the following equipment:
 - LMI metering pump
 - Suction and discharge tubing with pipe fitting adapter for V-96
 - Five gallon bucket with distilled water
 - [B] Don the appropriate PPE for chemical handling of concentrated sulfuric acid per the CWTF Health and Safety Plan (HASp).
 - [C] Obtain the proper amount of concentrated sulfuric acid necessary for the neutralization from a drum in the acid storage conex, located west of the Treated Effluent tanks.
 - [D] After assembling the pump and tubing (connecting the pump discharge tubing to V-96), OPEN V-96 and pump domestic water through the pump and tubing as a leak check, and tighten fittings as necessary.

6.5 TREATED EFFLUENT STORAGE TANK RECIRCULATION (WITHOUT TREATMENT)
FOR NEUTRALIZATION (continued)

- [E] Don the required PPE for sulfuric acid handling, and slowly add the acid to the domestic water in the five gallon bucket.
 - [F] Start the pump, and monitor the system.
 - [G] When most of the diluted acid has been pumped from the bucket, add water to aid in flushing the system.
 - [H] Use a bucket with domestic water to perform a final rinse of the pump and tubing and CLOSE V-96.
- [11] De-energize the Ion Exchange Control Panel by placing the Input/Output switch to OFF.
- [12] CLOSE HV-502 and HV-503.
- [13] CLOSE the appropriate valves for the tank that was recirculated:
- [A] For Tank T-205, CLOSE HVA-205 and HVC-205.
 - [B] For Tank T-206, CLOSE HVA-206 and HVC-206.
 - [C] For Tank T-207, CLOSE the following valves:
 - HVA-207
 - HVC-207
 - HVD-207
- [14] Record all activities in the CWTF Logbook.

7. **POST-PERFORMANCE ACTIVITY**

Management of all records is consistent with 1-77000-RM-001, Records Management Guidance for Records Sources.

The daily logs generated as a result of this procedure are considered quality records and are managed in accordance with 2-G18-ER-ADM-17.01, Quality Assurance Records Management.

[1] Ensure that the original and one copy of the Daily Log, are transmitted to the ERPD Project File Center in accordance with 2-G18-ER-ADM-17.01.

Submission of record copies to the ERPD File Center satisfies Administrative Record requirements as defined in 2-S65-ER-ADM-17.02, Administrative Record Document Identification and Transmittal.

There are no nonquality records generated by this procedure.

8. **REFERENCES**

Interim Measures/Interim Remedial Action Plan and Decision Document, 881 Hillside Area, Operable Unit 1

1-77000-RM-001, Records Management Guidance for Records Sources

2-G18-ER-ADM-17.01, Records Capture and Transmittal

2-S65-ER-ADM-17.02, Administrative Record Document Identification and Transmittal

5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples

RF/ER-96-0018, REV. 0, Sampling and Analysis Plan, CWTF

CWTF Health and Safety Plan

4-I53-ENV-OPS-FO.35, System Normal Operations, Ultraviolet/Hydrogen Peroxide Oxidation and Granular Activated Carbon Systems, CWTF.

4-I52-ENV-OPS-FO.34, Ion Exchange System, Normal Operations.

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