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REVISION/CHANGE LOG			
Revision/Change Letter	Description of Changes	Pages Affected	Date of Revision/Change
FR0	Initial Bluesheeting	All	10/20/17
FR1	Non-Intent Revision to Incorporate Bluesheeting Changes and Update to Current Form	All	11/15/17
FR2	General Revision.	All	4/15/2021
FR2A	Periodic Review has been completed with no changes identified in procedure technical content. Nonintent changes have been incorporated per CP3-NS-2001. Date for review cycle has been reset.	All	3/21/2024

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1.0 PURPOSE AND SCOPE

1.1 Purpose

To define the required equipment and steps necessary to manually backwash the ion exchange system in the Northwest Plume Groundwater System (NWPGS), at the C-612 Facility.

1.2 Scope

All activities associated with backwashing the four ion exchange vessels (Vessel A, Vessel B, Vessel C, and Vessel D).

2.0 REFERENCES

2.1 Use References

- CP2-ER-0067, *Health and Safety Plan for the Paducah Plumes Operations and C-613 Sediment Basin Paducah, Kentucky*
- CP3-OP-0207, *Use of Procedures*
- CP4-ER-0008, *Startup and Normal Operations of the C-612 Northwest Plume Groundwater System Following Long-Term Shutdown*
- CP4-ER-0011, *Solids Dewatering in the C-612 Northwest Plume Groundwater System*
- CP4-ER-0017, *Northwest/Northeast Plume Daily Operational Data Collection and Maintenance*
- CP4-ES-2700, *Logbooks and Data Forms*

2.2 Source References

- DOE/OR/07 1253, *Operations and Maintenance Plan for the Northwest Plume Groundwater System Interim Remedial Action Plan at PGDP Paducah, Kentucky*
- JHA-10844, *Maintenance, Operations, and Testing for the Northwest and Northeast Plume and Water Treatment Operations*
- Operation and Maintenance Manual for the Ion Exchange System Trailer, *Job 3171, ProAct, June 2015*

3.0 COMMITMENTS

None

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Precautions

Cut resistant or leather gloves shall be worn for handling items with sharp edges or corners.

4.2 Limitations

None

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5.0 PREREQUISITES

- 5.1 Engineering shall be provide oversite of activities performed under this procedure.
- 5.2 Notify the Pump and Treat Project Manager of the time of system shutdown.
- 5.3 Prior to performing the action steps identified in this procedure for the first time, the user shall have reviewed this document based upon its Level of Use according to CP3-OP-0207, *Use of Procedures*.
- 5.4 Prior to performing the action steps identified in this procedure, the performer shall have completed the required applicable training.

Technician

6.0 INSTRUCTIONS

6.1 Preparation Activities

- 6.1.1 Record the differential pressure readings between the following sets of gauges on CP4-ER-0017-F02, *Daily NWNPE Operational Data Collection and Maintenance Form*.
- 6.1.2 Only backwash the ion exchange column(s) that has a differential pressure reading exceeding 10 pounds per square inch gauge (psig), or as directed by the Pump and Treat Project Manager (or designee).
- 6.1.3 Visually verify that the sand filters (G-001 and G-002) are **NOT** currently being backwashed on the sand filter skid local control panels.
- 6.1.4 **If** the sand filters are in a backwash cycle, **then** delay the ion exchange backwashing until the cycle is complete and solids dewatering has been conducted.
- 6.1.5 Verify that the backwash/slucice tank (F-002) level is at least 80% as indicated by the level indicator on the main NWPGS control panel, K-100.
- 6.1.6 **If** the backward/slucice tank level is below 80%, **then** wait 15 minutes and recheck.
- 6.1.7 **If** the tank level is still below 80%, **then** notify the Pump and Treat Project Manager (or designee).
- 6.1.8 Verify that the settling tank (F-008) is less than 50% full on the K-100 panel.
- 6.1.9 **If** the settling tank is greater than 50% full, **then** perform solids dewatering according to CP4-ER-0011, *Solids Dewatering in the C-612 Northwest Plume Groundwater System* until the tank drains to below 50% full.
- 6.1.10 Verify that the UV-107 valve is in the CLOSED position at the K-100 panel **and** check the oil level in the backwash pump site glass.

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6.2 Ion Exchange Vessel A Backwashing

- 6.2.1 Don personal protective clothing according to CP2-ER-0067, *Health and Safety Plan for the Paducah Plumes Operations and C-613 Sediment Basin Paducah, Kentucky*.

NOTES:

System shall be taken offline to backwash ion exchange system.

Individual components may need to be placed in bypass mode or manual in order to manually operate.

Due to valve configuration requirements, Vessel B must be taken off-line while Vessel A is being backwashed. The backwash wastewater is routed to the settling tank.

- 6.2.2 Align (or verify alignment of) Ion Exchange Vessel A for backwash according to Appendix B, *Valve Alignment for Ion Exchange Trailer Vessel Backwash*.
- 6.2.3 Open (or verify opened) Backwash/Sluice Pump Suction Valve Hand Valve (HV)-057.
- 6.2.4 Open (or verify opened) Backwash/Sluice Pump Discharge Pressure Gauge Valve HV-058.
- 6.2.5 Open (or verify opened) Backwash/Sluice Pump Recycle Valve HV-059 (Approximately 50% Open).
- 6.2.6 Open (or verify opened) Backwash/Sluice Pump Discharge Valve HV-060.

NOTE:

The following step will energize the backwash pump (J-008) as indicated by the illumination of the green light on the master disconnect switch.

- 6.2.7 Press the "START" button for the backwash/sluice pump on the main NWPGS control panel, K-100.

NOTE:

Step 6.2.8 through Step 6.2.11 will be performed as needed during the backwash cycle.

- 6.2.8 Check resin level and **if** resin is floating more than one-half of the way up the upper sight glass; **then** go to Step 6.2.12 **and** notify the Pump and Treat Project Manager (or designee).
- 6.2.9 Slowly open the ion exchange trailer backwash effluent valve PV-4.
- 6.2.10 Check the pressure indicator PI-J008 and **if** the pressure exceeds 50 psig, **then** stop the backwash cycle according to Step 6.2.13 **and** consult the Pump and Treat Project Manager (or designee).
- 6.2.11 Monitor settling tank level and **if** the level exceeds 90%, **then** stop the backwash cycle according to Step 6.2.13 **and** consult the Pump and Treat Project Manager (or designee).
- 6.2.12 Backwash the ion exchange column for approximately 50 minutes or until backwash effluent water clarity is achieved as indicated by monitoring sight glass upstream of PV-24.

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NOTE:

The following step will de-energize the backwash pump (J-008) as indicated by the illumination of the red light on the master disconnect switch.

- 6.2.13** Stop backwash of the column by pressing the “STOP” button for the backwash/slucie pump on the main NWPGS Control Panel, K-100.
- 6.2.14** Close Backwash/Slucie Pump Suction Valve HV-057.
- 6.2.15** Close Backwash/Slucie Pump Discharge Valve HV-060.
- 6.2.16** Close the Vessel A/B Backwash Influent Block Valve PV-25.
- 6.2.17** Close Auto Valve (AV) 1 Air Supply Block Valve PV-28.
- 6.2.18** Close the ion exchange ion exchange trailer backwash effluent valve PV-24.
- 6.2.19** Allow the ion exchange column resin bed to settle for 5 minutes.

NOTE:

Alignment will be performed according to Appendix B of CP4-ER-0008, *Startup and Normal Operations of the C-612 Northwest Plume Groundwater System Following Long-Term Shutdown*.

- 6.2.20** Align the ion exchange columns in the same configuration they were prior to the execution of this procedure.

6.3 Ion Exchange Vessel B Backwashing

- 6.3.1** Don personal protective clothing according to CP2-ER-0067.

NOTE:

The process flow stream will stay on-line and will be rerouted through the ion exchange vessels that are **NOT** going to be backwashed. Due to valve configuration requirements, Vessel A must be taken off-line while Vessel B is being backwashed. Vessels C & D are to remain on-line during this process. The backwash wastewater is routed to the settling tank.

- 6.3.2** Align (or verify alignment of) Ion Exchange Vessel B for backwash according to Appendix B.
- 6.3.3** Open (or verify opened) Backwash/Slucie Pump Suction Valve HV-057.
- 6.3.4** Open (or verify opened) Backwash/Slucie Pump Discharge Pressure Gauge Valve HV-058.
- 6.3.5** Open (or verify opened) Backwash/Slucie Pump Recycle Valve HV-059 (Approximately 50% Open).
- 6.3.6** Open (or verify opened) Backwash/Slucie Pump Discharge Valve HV-060.

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NOTE:

The following step will energize the backwash pump (J-008) as indicated by the illumination of the green light on the master disconnect switch.

- 6.3.7** Press the “START” button for the backwash/slucice pump on the main NWPGS control panel, K-100.

NOTE:

Step **6.3.8** through Step **6.3.11** will be performed as needed during the backwash cycle.

- 6.3.8** Check resin level and **if** resin is floating more than one-half of the way up the upper sight glass, **then** go to Step **6.3.12** **and** notify the Pump and Treat Project Manager (or designee).
- 6.3.9** Slowly open the ion exchange trailer backwash effluent valve PV-5.
- 6.3.10** Check the pressure indicator PI-J008 and **if** the pressure exceeds 50 psig, **then** stop the backwash cycle according to Step **6.3.13** **and** consult the Pump and Treat Project Manager (or designee).
- 6.3.11** Monitor settling tank level **and if** the level exceeds 90%, **then** stop the backwash cycle according to Step **6.3.13** **and** consult the Pump and Treat Project Manager (or designee).
- 6.3.12** Backwash the ion exchange column for approximately 50 minutes **or** until backwash effluent water clarity is achieved as indicated by monitoring sight glass upstream of PV-24.

NOTE:

The following step will de-energize the backwash pump (J-008) as indicated by the illumination of the red light on the master disconnect switch.

- 6.3.13** Stop backwash of the column by pressing the “STOP” button for the backwash/slucice pump on the main NWPGS Control Panel, K-100.
- 6.3.14** Close Backwash/Slucice Pump Suction Valve HV-057.
- 6.3.15** Close Backwash/Slucice Pump Discharge Valve HV-060
- 6.3.16** Close Vessel A/B Backwash Influent Block Valve PV-25.
- 6.3.17** Close AV2 Air Supply Block Valve PV-29.
- 6.3.18** Close the ion exchange ion exchange trailer backwash effluent valve PV-24.

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6.3.19 Allow the ion exchange column resin bed to settle for 5 minutes.

NOTE:

Alignment will be performed according to Appendix B of CP4-ER-0008.

6.3.20 Align the ion exchange columns in the same configuration they were prior to the execution of this procedure.

6.4 Ion Exchange Vessel C Backwashing

6.4.1 Don personal protective clothing according to CP2-ER-0067.

NOTES:

The process flow stream will stay on-line and will be rerouted through the ion exchange vessels that are **NOT** going to be backwashed.

Due to valve configuration requirements Vessel D must be taken offline while Vessel C is being backwashed.

Vessels A & B are to remain online during this process.

The backwash wastewater is routed to the settling tank.

6.4.2 Align (or verify alignment of) Ion Exchange Vessel C for backwash according to Appendix B.

6.4.3 Open (or verify opened) Backwash/Sluice Pump Suction Valve HV-057.

6.4.4 Open (or verify opened) Backwash/Sluice Pump Discharge Pressure Gauge Valve HV-058.

6.4.5 Open (or verify opened) Backwash/Sluice Pump Recycle Valve HV-059 (Approximately 50% Open).

6.4.6 Open (or verify opened) Backwash/Sluice Pump Discharge Valve HV-060.

NOTE:

The following step will energize the backwash pump (J-008) as indicated by the illumination of the green light on the master disconnect switch.

6.4.7 Press the “START” button for the backwash/sluice pump on the main NWPGS control panel, K-100.

NOTE:

Step **6.4.8** through Step **6.4.11** will be performed, as needed, during the backwash cycle.

6.4.8 Check resin level and **if** resin is floating more than one-half of the way up the upper sight glass, **then** go to Step **6.4.12** and notify the Pump and Treat Project Manager (or designee).

6.4.9 Slowly open the ion exchange trailer backwash effluent valve PV-15.

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- 6.4.10 Check the pressure indicator PI-J008 and **if** the pressure exceeds 50 psig, **then** stop the backwash cycle according to Step 6.4.13 **and** consult the Pump and Treat Project Manager (or designee).
- 6.4.11 Monitor settling tank level and **if** the level exceeds 90%, **then** stop the backwash cycle as per Step 6.4.13 **and** consult the Pump and Treat Project Manager (or designee).
- 6.4.12 Backwash the ion exchange column for approximately 50 minutes or until backwash effluent water clarity is achieved as indicated by monitoring sight glass upstream of PV-24.

NOTE:

The following step will de-energize the backwash pump (J-008) as indicated by the illumination of the red light on the master disconnect switch.

- 6.4.13 Stop backwash of the column by pressing the “STOP” button for the backwash/slucie pump on the main NWPGS Control Panel, K-100.
- 6.4.14 Close Backwash/Slucie Pump Suction Valve HV-057.
- 6.4.15 Close Backwash/Slucie Pump Discharge Valve HV-060
- 6.4.16 Close Vessel C/D Backwash Influent Valve PV-26.
- 6.4.17 Close AV3 Air Supply Block Valve PV-30.
- 6.4.18 Close the ion exchange ion exchange trailer backwash effluent valve PV-24.
- 6.4.19 Allow the ion exchange column resin bed to settle for 5 minutes.

NOTE:

Alignment will be performed according to Appendix B of CP4-ER-0008.

- 6.4.20 Align the ion exchange columns in the same configuration they were prior to the execution of this procedure.

6.5 Ion Exchange Vessel D Backwashing

- 6.5.1 Don personal protective clothing according to CP2-ER-0067.

NOTES:

The process flow stream will stay on-line and will be rerouted through the ion exchange vessels that are **NOT** going to be backwashed.

Due to valve configuration requirements Vessel C must be taken off-line while Vessel D is being backwashed.

Vessels A & B are to remain on-line during this process.

The backwash wastewater is routed to the settling tank.

- 6.5.2 Align (or verify alignment of) Ion Exchange Vessel D for backwash according to Appendix B.

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- 6.5.3 Open (or verify opened) Backwash/Sluice Pump Suction Valve HV-057.
- 6.5.4 Open (or verify opened) Backwash/Sluice Pump Discharge Pressure Gauge Valve HV-058.
- 6.5.5 Open (or verify opened) Backwash/Sluice Pump Recycle Valve HV-059 (Approximately 50% Open).
- 6.5.6 Open (or verify opened) Backwash/Sluice Pump Discharge Valve HV-060.

NOTE:

The following step will energize the backwash pump (J-008) as indicated by the illumination of the green light on the master disconnect switch.

- 6.5.7 Press the “START” button for the backwash/sluice pump on the main NWPGS control panel, K-100.

NOTE:

Step 6.5.8 through Step 6.5.11 will be performed as needed during the backwash cycle.

- 6.5.8 Check resin level and **if** resin is floating more than one-half of the way up the upper sight glass, **then** go to Step 6.5.12 **and** notify the Pump and Treat Project Manager (or designee).
- 6.5.9 Slowly open the ion exchange trailer backwash effluent valve PV-16.
- 6.5.10 Check the pressure indicator PI-J008 and **if** the pressure exceeds 50 psig, **then** stop the backwash cycle as per Step 6.5.13 **and** consult the Pump and Treat Project Manager (or designee).
- 6.5.11 Monitor settling tank level and **if** the level exceeds 90%, **then** stop the backwash cycle as per Step 6.5.13 **and** consult the Pump and Treat Project Manager (or designee).
- 6.5.12 Backwash the ion exchange column for approximately 50 minutes or until backwash effluent water clarity is achieved as indicated by monitoring sight glass upstream of PV-24.

NOTE:

The following step will de-energize the backwash pump (J-008) as indicated by the illumination of the red light on the master disconnect switch.

- 6.5.13 Stop backwash of the column by pressing the “STOP” button for the backwash/sluice pump on the main NWPGS Control Panel, K-100.
- 6.5.14 Close Backwash/Sluice Pump Suction Valve HV-057.
- 6.5.15 Close Backwash/Sluice Pump Discharge Valve HV-060
- 6.5.16 Close Vessel C/D Backwash Influent Block Valve PV-26.
- 6.5.17 Close AV4 Air Supply Block Valve PV-31.
- 6.5.18 Close the ion exchange ion exchange trailer backwash effluent valve PV-24.

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6.5.19 Allow the ion exchange column resin bed to settle for 5 minutes.

NOTE:

Alignment will be performed according to Appendix B of CP4-ER-0008.

6.5.20 Align the ion exchange columns in the same configuration they were prior to the execution of this procedure.

7.0 ACCEPTANCE CRITERIA

None

8.0 POST PERFORMANCE WORK ACTIVITIES

8.1 Notify the Pump and Treat Project Manager of the time of system has been restarted.

8.2 Record all operational activities according to CP4-ER-0017, *Northwest/Northeast Plume Daily Operational Data Collection and Maintenance* and CP4-ES-2700, *Logbooks and Data Forms*.

9.0 RECORDS

9.1 Records Generated

The following records may be generated by this procedure:

None

Forms are to be completed in accordance with CP3-OP-0024, *Forms Control*.

9.2 Records Disposition

The records are to be maintained according to CP3-RD-0010, *Records Management Process*.

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Appendix A – Acronyms/Definitions

ACRONYMS

AV – Auto Valve

HV – Hand Valve

NWPGS – Northwest Plume Groundwater System

psig – pounds per square inch gauge

DEFINITIONS

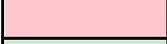
Technician - The person performing the steps in this procedure. The person performing this work could have job functions including but **NOT** limited to the Frontline Supervisor, an Operator, or Maintenance Mechanic.

Appendix B – Valve Alignment for Ion Exchange Trailer Vessel Backwash

VALVE ID	DESCRIPTION	VESSEL BEING BACKWASHED			
		A	B	C	D
PV-1	Vessels A/B Process Influent Block Valve	CLOSED	CLOSED		
PV-2	Vessel A Primary Influent Block Valve	OPEN	CLOSED		
PV-3	Vessel B Primary Influent Block Valve	CLOSED	OPEN		
PV-4	Vessel A Primary Effluent Block Valve	CLOSED	CLOSED		
PV-5	Vessel B Primary Effluent Block Valve	CLOSED	CLOSED		
PV-6	Vessel A (Lag) Influent Block Valve	OPEN	CLOSED		
PV-7	Vessel B (Lag) Influent Block Valve	CLOSED	OPEN		
PV-8	Vessel A (Lead) Effluent Block Valve	OPEN	CLOSED		
PV-9	Vessel A (Lag) Effluent Block Valve	CLOSED	CLOSED		
PV-10	Vessel B (Lag) Effluent Block Valve	CLOSED	CLOSED		
PV-11	Vessel B (Lead) Effluent Block Valve	CLOSED	OPEN		
PV-12	Vessels C/D Process Influent Block Valve			CLOSED	CLOSED
PV-13	Vessel C Primary Influent Block Valve			OPEN	CLOSED
PV-14	Vessel D Primary Influent Block Valve			CLOSED	OPEN
PV-15	Vessel C Primary Effluent Block Valve			CLOSED	CLOSED
PV-16	Vessel D Primary Effluent Block Valve			CLOSED	CLOSED
PV-17	Vessel C (Lag) Influent Block Valve			OPEN	CLOSED
PV-18	Vessel D (Lag) Influent Block Valve			CLOSED	OPEN
PV-19	Vessel C (Lead) Effluent Block Valve			OPEN	CLOSED
PV-20	Vessel C (Lag) Effluent Block Valve			CLOSED	CLOSED
PV-21	Vessel D (Lag) Effluent Block Valve			CLOSED	CLOSED
PV-22	Vessel D (Lead) Effluent Block Valve			CLOSED	OPEN
PV-23	Ion Exchange System Effluent Block Valve	OPEN	OPEN	OPEN	OPEN
PV-24	Ion Exchange System Backwash Effluent Block Valve	½ OPEN	½ OPEN	½ OPEN	½ OPEN
PV-25	Vessels A/B Backwash Influent Block Valve	OPEN	OPEN	CLOSED	CLOSED
PV-26	Vessels C/D Backwash Influent Block Valve	CLOSED	CLOSED	OPEN	OPEN
PV-27	Main Air Supply Block Valve	OPEN	OPEN	OPEN	OPEN
PV-28	A V1 Air Supply Block Valve	OPEN	CLOSED	CLOSED	CLOSED
PV-29	A V2 Air Supply Block Valve	CLOSED	OPEN	CLOSED	CLOSED
PV-30	A V3 Air Supply Block Valve	CLOSED	CLOSED	OPEN	CLOSED
PV-31	A V4 Air Supply Block Valve	CLOSED	CLOSED	CLOSED	OPEN
PV-32	Main Air Supply Bleed Valve	CLOSED	CLOSED	CLOSED	CLOSED
PV-33	Main Air Supply Secondary Block Valve	OPEN	OPEN	OPEN	OPEN

Appendix B – Valve Alignment for Ion Exchange Trailer Vessel Backwash (Continued)

VALVE ID	DESCRIPTION	VESSEL BEING BACKWASHED			
		A	B	C	D
HV-056	Backwash/Sluice Tank Drain Valve	CLOSED	CLOSED	CLOSED	CLOSED
HV-057	Backwash/Sluice Pump Suction Valve	OPEN	OPEN	OPEN	OPEN
HV-058	Backwash/Pump Discharge Pressure Gauge Valve	OPEN	OPEN	OPEN	OPEN
HV-059	Backwash/Sluice Pump Recycle Valve	½ OPEN	½ OPEN	½ OPEN	½ OPEN
HV-060	Backwash/Sluice Pump Discharge Valve	OPEN	OPEN	OPEN	OPEN
HV-095	Effluent Backwash Water Header Valve	OPEN	OPEN	OPEN	OPEN
HV-144	Backwash System Tank Influent Control Air Supply Valve	OPEN	OPEN	OPEN	OPEN
HV-168	Backwash Water Sample Supply Valve	CLOSED	CLOSED	CLOSED	CLOSED
HV-169	Backwash Water Sample Valve	CLOSED	CLOSED	CLOSED	CLOSED

-  - Indicates Valve to Remain in Current Position
-  - Indicates Valve to be in the Closed Position
-  - Indicates Valve to be in the Open Position
-  - Indicates Valve to be in the ½ Open Position