WORKING COPY

VERIF. DATE: _____

INTIALS: _____

CP4-ER-0011 FRev. 2B	**TITLE**: Solids Dewatering in the C-612 Northwest Plume Groundwater System	Page 1 of 15

DOCUMENT CATEGORY: ☐ Administrative ☒ Technical

LEVEL OF USE: ☐ Information Level ☒ Reference Level ☐ Continuous Use

FUNCTIONAL AREA: Environmental Remediation **SUBJECT MATTER AREA:** Northwest and Northeast Plume Pump and Treat Operations	**SUBJECT MATTER EXPERT**: Shay Mitchell –Project Manager of Pump and Treat Operations
NUCLEAR SAFETY REVIEW DOCUMENTATION: FRNP-22-0854-X	**APPROVED BY/DATE** (Signature on file): Bruce Ford – Environmental Remediation Manager 12/6/2022
REQUIRED REVIEW DATE (or expiration date for temporary change): 3/21/2027	**EFFECTIVE DATE**: 12/7/2022

REVISION/CHANGE LOG

Revision/Change Letter	Description of Changes	Pages Affected	Date of Revision/Change
FR0	Initial Bluesheeting	All	10/20/2017
FR1	Non-Intent Revision to Incorporate Bluesheeting Changes and Update to Current Form	All	11/27/2017
FR2	General Revision.	All	3/17/2021
FR2A	Added additional methods of solids dewatering.	All	12/6/2022
FR2B	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

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE

1.1 Purpose

The objective of this procedure is to define the required equipment and action steps necessary to remove and disposition water and sludge accumulated in the settling tank (F-008) at the Northwest Plume Groundwater System, Building C-612.

1.2 Scope

This procedure applies to all solids dewatering activities at C-612, including those associated with the operation of the settling tank (F-008), operation of the filter press (G-003), and associated waste handling. | Chg A

2.0 REFERENCES

2.1 Use References

- CP2-ER-0012, *Waste Management Plan for the Paducah Plume Operations at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*
- CP2-ER-0067*, Health and Safety Plan for the Paducah Plumes Operations and C-613 Sediment Basin Paducah, Kentucky*
- CP3-HS-2008*, Accident Prevention/Equipment Control Tags*
- CP3-HS-2010, *Instructions for Lockout/Tagout*
- CP3-OP-0207, *Use of Procedures*
- CP3-SM-0020, *Administrative Controls for Powered Industrial Trucks*
- CP3-SM-1101*, Work Package Development*
- CP3-WM-3015, *Waste Packaging* | Chg A
- CP4-ER-0017, *Northwest/Northeast Plume Daily Operational Data Collection and Maintenance*

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*

3.0 COMMITMENTS

None

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Precautions

4.1.1 Lockout/Tagout (LOTO) shall be performed in accordance with CP3-HS-2010, *Instructions for Lockout/Tagout*.

4.1.2 Personnel performing work will wear appropriate Personal Protective Equipment (PPE):

- PPE as specified by Radiological Work Permit
- Safety glasses w/ side shields
- Steel-toe safety boots
- Tychem 5000 apron and sleeves or Silver Shield apron and sleeves are required if more than incidental body contact with TCE contaminated liquid or materials is expected.
- Leather or cut-resistant gloves (sharp or abrasive edges)
- TCE compatible gloves (Supreno EC Microflex Nitrile, Showa 730, or IH approved equivalent) if handling TCE contaminated pump, piping, bag filters, or liquid.

Chg A

4.1.3 **If** operating a forklift inside the C-612 building, **then** the following shall be observed:

- **When** operating inside facilities, **then** battery powered equipment is recommended to eliminate potential employee exposure to combustion gases.
- Drive forklifts into facilities only when necessary and/or to perform assigned work tasks (transporting equipment & material in and out facilities).
- The overhead door will be opened and ventilation fans used during operation.
- If the forklift is in constant operation or idling for an extended period of time (i.e. 10 minutes) inside the building, carbon monoxide (CO) monitoring will be performed to ensure exposure levels are not above action limit of 10 ppm in the work area. If measurements are in excess of the action level of 10 ppm in the work area, work shall be paused, the hazard assessed, and controls put in place prior to resuming activities.

Chg A

4.1.4 Forklift(s) shall be inspected according to CP3-SM-0020, *Administrative Controls for Powered Industrial Trucks*.

4.1.5 Any forklift in need of repair, defective, or unsafe in any way, shall be reported to the supervisor immediately and equipment tagged per CP3-HS-2008, *Accident Prevention/Equipment Control Tags*.

4.1.6 **If** the forklift malfunctions during use, **then** a work pause shall be initiated until necessary repairs can be made. The forklift should be tagged per CP3-HS-2008.

4.1.7 Loads shall be lowered and power shut off when forklifts are left unattended.

4.1.8 Only stable, safely arranged loads, which do **NOT** exceed the forklift capacity, shall be handled.

4.1.9 Personnel are **NOT** to try to adjust load or catch any part of load if it falls during transport.

4.1.10 Personnel shall **NOT** pass under elevated forks under any circumstances.

4.1.11 Personnel working as spotters shall keep a safe distance from the load.

4.1.12 The load center of gravity shall be taken into consideration to ensure the load to be stable.

4.1.13 Only trained and qualified personnel shall operate forklifts and aerial lifts.

4.2 Limitations

None

5.0 PREREQUISITES

5.1 Notify the Pump and Treat Project Manager of the time of system shutdown.

5.2 Notify RADCON and IH prior to performing work under this procedure. Chg A

5.3 Ensure appropriate waste containers are staged and ready for use.

5.4 **If** using bag filters and/or bag filter skid for solids dewatering **then** ensure bag filter skid and/or extra bag filters are pre-staged.

5.5 **If** using mobile pump **then** ensure pump is fueled prior to use.

5.6 Prior to the user performing the action steps identified in in this procedure, review this document based upon its Level of Use according to CP3-OP-0207, *Use of Procedures.*

5.7 Prior to performing the action steps identified in this procedure the performer will complete the required applicable training.

5.8 Prior to using this procedure as a work control document, follow the requirements as defined in CP3-SM-1101, *Work Package Development* for the activities being performed.

Technician

6.0 INSTRUCTIONS

6.1 Preparation Activities

6.1.1 Consult with the Pump and Treat Project Manager (or designee) to determine which extraction well pump(s), if any, to shut down or throttle back.

6.2 Solids Dewatering Using Gravity Feed and Bag Filter Chg A

6.2.1 Ensure the C-612 sump pump (J-016) is in the auto position on the J-016 disconnect.

6.2.2 Ensure the settling tank supernatant discharge valve (UV-107) is CLOSED by pressing the "CLOSE" button on the K-100 control panel.

6.2.3 Place the sump pump discharge valve (to the equalization tank) HV-172 opened OR closed, as directed by the Pump and Treat Project Manager (or designee).

6.2.4 Place the sump pump discharge valve (to the settling tank) HV-158 opened OR closed, as directed by the Pump and Treat Project Manager (or designee).

6.2.5 Connect a 2 inch I.D. hose from the clean-out located on the settling tank discharge line to the C-612 sump.

Chg A

6.2.6 Place a bag filter over the discharge end of the hose.

NOTE:

Solids shall **NOT** bypass the bag filter during discharge. Solids that enter the sump must be pumped back into the settling tank or manually removed

6.2.7 If necessary, secure the discharge end of the hose over the C-612 sump.

6.2.8 Slowly open sludge valve HV-174 until the settling tank F-008 is adequately discharging through the bag filter.

6.2.9 Replace the bag filter as needed:

- Close sludge valve HV-174.
- Allow water remaining in the discharge line to drain through the bag filter into the sump.
- Replace spent bag filter with a new one.
- Repeat Step 6.2.8
- Allow spent bag filter to drain over sump.

6.2.10 Solids dewatering is complete when the settling tank is empty.

6.2.11 Once solids dewatering is complete, close sludge valve HV-174.

6.2.12 Remove bag filter and allow to drain over sump.

6.2.13 Disconnect 2 inch I.D. line from clean-out located on the settling tank discharge line.

6.2.14 Package spent bag filter in the appropriate waste container.

6.3 Solids Dewatering Using Bag Filter Skid

NOTEs:

If necessary, the mobile transfer pump can be primed with sanitary water prior to connecting the hosing.

Bag filters should be 50 micron or smaller.

6.3.1 Shut down the appropriate extraction well pump, as designated by the Pump and Treat Project Manager (or designee).

6.3.2 Ensure the C-612 sump pump (J-016) is in the auto position on the J-016 disconnect.

6.3.3 Ensure the settling tank supernatant discharge valve (UV-107) is CLOSED by pressing the "CLOSE" button on the K-100 control panel.

6.3.4 Place the sump pump discharge valve (to the equalization tank) HV-172 open **OR** close, as directed by the Pump and Treat Project Manager (or designee).

6.3.5 Place the sump pump discharge valve (to the settling tank) HV-158 open **OR** close, as directed by the Pump and Treat Project Manager (or designee). Chg A

6.3.6 Place the bag filters/cartridges into the bag filter skid ensuring the filters/cartridges are seated in the enclosures.

6.3.7 Tighten the retaining bolts on the lids of the bag filter/cartridge enclosures.

6.3.8 Connect a 2-inch I.D. hose from the clean out located on the settling tank discharge line to the inlet on the mobile transfer pump.

6.3.9 Connect a 2-inch I.D. hose from the outlet on the mobile transfer pump to the inlet of the bag filter skid.

6.3.10 Connect a 2-inch I.D. hose from the outlet on the bag filter skid to the sump pump discharge valve (to a mobile tank truck) HV-159 inlet.

6.3.11 Open sump pump discharge valve (to a mobile tank truck) HV-159.

NOTE: Pressure indicating gauges on the bag filter skid indicated when bag filters are spent.

Spent bag filters may be placed over the C-612 sump to drain prior to packaging in the appropriate waste container. Caution should be taken to prevent any solids from falling out of the spent bag filters into the sump.

6.3.12 Open sludge valve HV-174.

6.3.13 Start the transfer pump to begin pumping from the settling tank to the bag filter skid.

6.3.14 As necessary, remove and replace the bag filter(s) and/or cartridges as they are spent.

- Close sludge valve HV-174.
- Close sump pump discharge valve (to a mobile tank truck) HV-159.
- Shut off the mobile transfer pump.
- Replace spent bag filter(s)/cartridges.
- Repeat Steps 6.3.11 to 6.3.13.
- Allow spent bag filter(s)/cartridges to drain over sump.

6.3.15 Solids dewatering is complete once the settling tank is empty.

6.3.16 Once solids dewatering is complete, close sludge valve HV-174.

6.3.17 Allow remaining water in the 2-inch I.D. hoses and skid to pump into HV-159 inlet.

6.3.18 Close sump pump discharge valve (to a mobile tank truck) HV-159.

6.3.19 Shut off the mobile transfer pump.

6.3.20 Remove spent bag filters/cartridges and allow to drain over the C-612 sump as needed.

Chg A

6.3.21 Disassemble 2-inch I.D. hosing from mobile pump and skid.

6.3.22 Verify level of settling tank F-008 by looking on the K-100 control panel and open HV-174 to verify settling tank is empty.

6.3.23 Close sludge valve HV-174.

6.3.24 Dispose of all waste in the appropriate waste container.

6.4 Solids Dewatering Using Filter Press (G-003)

NOTE:

The capacity of the filter press (G-003) is approximately 4 ft^3 of compressed sludge. **If** the settling tank (F-008) contains more than 4 ft^3 of compressed sludge when full, **then** multiple batch filter press runs and filter press cleanings will have to be executed to process the contents of the settling tank.

6.4.1 If the sludge feed line becomes blocked, then perform Section 6.5 for directions on clearing the blockage.

6.4.2 Verify that the master disconnect for the backwash/sluice pump is in the "OFF" position.

6.4.3 Ensure the settling tank supernatant discharge valve (UV-107) is CLOSED by pressing the "CLOSE" button on the K-100 control panel.

6.4.4 Place the sump pump discharge valve (to the equalization tank) HV-172 as directed by the Pump and Treat Project Manager (or designee).

6.4.5 Place the sump pump discharge valve (to the settling tank) HV-158 as directed by the Pump and Treat Project Manager (or designee).

6.4.6 Verify the filter press hydraulic cylinder control valve (FPV-009) is in the "PORT A" position to extend the hydraulic cylinder.

6.4.7 Open the air supply pressure valve HV-033.

CAUTION:

Hydraulic pressure should **NOT** exceed 8,000 pounds per square inch gauge (psig).

NOTE:

The air supply pressure valve (HV-033) must remain in the "OPEN" position and the hydraulic pump must be left in the "PORT A" position at all times during operation of the filter press.

6.4.8 Adjust the air pressure by slowly opening the filter press hydraulic cylinder pressure control valve (FPV-001) until the hydraulic pressure gauge, located on the hydraulic pump valve, reaches 7,200 psig.

6.4.9 Ensure the filter press compressed air inlet valve (FPV-002) located at the top left of the filter press and the filter press bypass valve (HV-216) is CLOSED.

6.4.10 Open valves in the following sequence:

A. The filter press lower right filtrate discharge valve (FPV-007)

B. The filter press lower left filtrate discharge valves (FPV-008)

C. The filter press upper left filtrate discharge valve (FPV-004)

D. The filter press upper right filtrate discharge valve (FPV-005)

E. The filter press left/right filtrate discharge isolation valve (FPV-003)

F. The filter press sludge influent valve (FPV-006)

G. The filter press bypass valve (HV-216)

H. The sludge pump discharge valve (HV-124)

I. The sludge pump air supply valve (HV-102)

J. The sludge pump air inlet valve (HV-105)

K. The settling tank drain valve (HV-174)

6.4.11 Slowly adjust the sludge pump air pressure control valve (PRV-127) until 30 psig is indicated on the sludge pump pressure gauge (PI-J015B) while gradually increase pressure to the sludge pump each time the pump slows or stalls **and** do **NOT** exceed a maximum pressure of 100 psig.

6.4.12 Run the sludge pump (J-015) until the maximum feed pressure (100 psig) has been reached, the pump has stalled, **or** until the pump speed rapidly increases indicating that all sludge has been removed from the settling tank (F-008).

6.4.13 **If** the filter press does **NOT** require cleaning, **then** proceed to Step **6.4.36.**

Chg A

6.4.14 Close the following valves in the following sequence:

A. The settling tank drain valve (HV-174)

B. The sludge pump compressed air supply valve (HV-102)

C. The sludge pump discharge valve (HV-124)

D. The filter press sludge influent valve (FPV-006)

E. The filter press filtrate discharge valves (FPV-003, FPV-004, FPV-005, and FPV-008)

6.4.15 Ensure that the filter press lower right filtrate discharge valve (FPV-007) is left OPEN.

6.4.16 Open the filter press compressed air supply valve (HV-108).

6.4.17 Set the pressure to the filter press at 40 psig by adjusting the filter press air pressure control valve (PRV-G003).

6.4.18 Open the filter press compressed air inlet valve (FPV-002).

6.4.19 Allow air to pass through the filter press until no water is discharged to the facility sump (Normally 4-8 hours).

6.4.20 Close the filter press compressed air supply valve (HV-108).

6.4.21 Position a waste drum on a drum cart **and** place the drum and cart under the solids discharge hopper below the filter press (G-003).

6.4.22 Close the filter press hydraulic cylinder air supply valve (HV-033).

6.4.23 LOTO valves HV-033, HV-108, and FPV-006 to isolate the filter press. Chg A

6.4.24 Turn the filter press hydraulic cylinder control valve (FPV-009) to the "PORT B" position to open the hydraulic ram.

NOTE:
RADCON personnel must be present to conduct radiological surveys before proceeding to the next steps.

6.4.25 Remove one filter plate **and** slide the compression plate back (this will allow the hydraulic ram to be manually raised after the cylinder has retracted).

NOTE:

Additional waste disposal drums shall be used as needed in Steps **6.4.26** through **6.4.27** to contain filtered sludge/solids.

CAUTION:

Filter cloths should not be damaged while scraping off the cake.

6.4.26 Spread each plate apart and carefully scrape the filter cake off of each plate **and** allow the cake to enter the 55-gal waste drum through the hopper attached to the bottom of the filter press.

6.4.27 **When** drum is full, **then** remove drum and cart and secure the lid. Chg A

NOTES:

If the solids dewatering process is proceeding slowly, **then** the filter plates may need additional cleaning.

Filter plates may be individually pressure washed over the facility sump before being returned to service.

The following steps instruct an operator on the necessary preparation work before pressure-washing activities begin.

6.4.28 **If** pressure washing the filter plates, **then** perform the following steps:

NOTE:

The barrier/splash guard will contain all water produced during the pressure washing activities.

A. Install the plastic barrier/splash guard around the sump.

B. Stage the pressure washer near the sump.

C. Connect one end of a lawn and garden hose to the pressure washer and the other end to the sanitary water supply.

D. Connect the power cord from the pressure washer to a ground fault circuit interrupter protected receptacle.

NOTE:

Required inspections must be performed prior to operating the fork truck.

E. Drape plastic over a wooden pallet.

F. Raise the plastic covered wooden pallet with the fork truck up to the side of the filter press.

G. Individually remove the filter press plates **and** load them on to the plastic covered wooden pallet.

H. Take the filter press plates to the floor sump.

I. Place the filter press plates on a rack **and** pressure-wash both sides of the plates inside the barrier/splash guard.

J. Place the filter press plates on the floor sump grate out of the way to let the excess water run-off.

K. Load the filter press plates back on the pallet **and** return them to the filter press for reloading.

6.4.29 Reload all but one of the filter plates into the filter press, ensuring that all gaskets are seated in the correct position.

6.4.30 Manually lower the hydraulic ram back into place and install the last filter plate.

6.4.31 Remove the LOTO on valves HV-033, HV-108, and FPV-006. Chg A

6.4.32 Open the filter press hydraulic cylinder air supply valve (HV-033).

NOTE:
The filter press hydraulic cylinder air supply valve (FPV-001) should **NOT** need further adjustment.

6.4.33 Turn the filter press hydraulic cylinder control valve (FPV-009) to the "PORT A" position to extend the hydraulic cylinder.

6.4.34 Close the filter press hydraulic cylinder air supply valve (HV-033).

6.4.35 **If** all the sludge has **NOT** been removed from the settling tank, **then** return to Step **6.4.3**.

6.4.36 Close the settling tank drain valve (HV-174).

6.4.37 Close the sludge pump discharge valve (HV-124).

6.4.38 Close the sludge pump air supply valve (HV-102).

6.4.39 Place the sump pump discharge valve (to the settling tank) (HV-158) open **OR** close as directed by the Pump and Treat Project Manager (or designee). Chg A

6.4.40 Place the sump discharge valve (to the equalization tank) (HV-172) open **OR** close as directed by the Pump and Treat Project Manager (or designee).

6.5 Northwest Plume Groundwater System Sludge Feed Line Clean-Out

NOTES:
The method below outlines the steps for cleaning the sludge feed line.

JHA-10844, *Maintenance, Operations, and Testing for the Northwest and Northeast Plume and Water Treatment Operations* should be referenced for Personal Protective Equipment requirements and hazard controls.

Text deleted. Chg A

6.5.1 Ensure the settling tank drain valve (HV-174) is CLOSED.

6.5.2 Ensure the solids dewatering pump is turned off and the discharge valve (HV-124) is CLOSED.

6.5.3 Place appropriate container under the clean-out located between the settling tank discharge line and the solids dewatering pump.

6.5.4 Remove the clean-out cap and slowly open the settling tank discharge valve **and** drain contents into an appropriate container until all solids have been removed from the tank and line.

6.5.5 Close HV-174 and reinstall the clean-out cap.

6.5.6 Ensure the filter press bypass valve (HV-216) is CLOSED.

6.5.7 Remove the clean-out cap located downstream.

6.5.8 Connect a hose to the clean-out fitting running to an appropriate container.

6.5.9 Close the filter press influent valve (FPV-006) and open HV-216.

6.5.10 Begin solids dewatering according to Section **6.4**, which will pump solids out of the sludge feed line into the container.

6.5.11 Once the discharge from HV-216 appears clean, stop the solids dewatering process in according to Section **6.4**.

6.5.12 **If 6.5.10** and **6.5.11** do **NOT** clear the sludge feed line, **then** continue with Steps **6.5.13** through **6.5.23**. Chg A

6.5.13 Ensure valve HV-124 and the air supply valve (HV-102) are CLOSED.

6.5.14 Place a single-source LOTO on HV-102.

6.5.15 Connect a hose from the filter press bypass cleanout fitting to the sanitary water supply (The hose must have a valve on the end connected to the sanitary water supply).

6.5.16 Connect a hose from HV-124 running to an appropriate container.

6.5.17 Open valves HV-124, HV-216, and the valve on the hose connected to the sanitary water supply.

6.5.18 Slowly open the sanitary water supply valve to backflush solids into the appropriate container.

6.5.19 **When** all the visible solids have been removed from the sludge feed line, **then** close the valves in the sequence listed:

A. Sanitary water supply valve

B. Connecting hose valve

C. HV-216

D. HV-124

6.5.20 Remove the connecting hose from the sanitary water supply and re-open the valve connected on the hose to drain contents of the hose in the appropriate container. Chg A

6.5.21 Remove the hose from the filter press bypass fitting **and** reinstall the cap.

6.5.22 Disconnect the drain hose from HV-124 and re-connect the original line from the sludge pump to HV-124.

6.5.23 Remove the single source LOTO on HV-102, **and** return all valves to the normal operating settings.

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

7.0 ACCEPTANCE CRITERIA

None

8.0 POST PERFORMANCE WORK ACTIVITIES

8.1 Record all operational activities according to CP4-ER-0017, *NW/NE Daily Operational Data Collection and Maintenance.*

8.2 Dispose of waste filter cake in accordance with CP2-ER-0012, *Waste Management Plan for the Paducah Plume Operations at the Paducah Gaseous Diffusion Plant Paducah, Kentucky.*

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 in accordance with CP3-RD-0010, *Records Management Process.*

Appendix A – Acronyms/Definitions

ACRONYMS

LOTO – Lockout/Tagout

PPE – Personal Protective Equipment

psig – pounds per square inch gauge

RADCON – Radiological Control

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.