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MAY 26 2017

Mr. Brian Begley
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Division of Waste Management
Kentucky Department for Environmental Protection
300 Sower Boulevard, 2nd Floor
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PPPO-02-4229276-17

Ms. Julie Corkran
Federal Facility Agreement Manager
U.S. Environmental Protection Agency, Region 4
61 Forsyth Street
Atlanta, Georgia 30303

Dear Mr. Begley and Ms. Corkran:

PADUCAH FEDERAL FACILITY AGREEMENT—SIGNED MEMORANDUM OF AGREEMENT FOR RESOLUTION OF DISPUTE FOR THE FEASIBILITY STUDY FOR SOLID WASTE MANAGEMENT UNITS 2, 3, 7 AND 30 OF THE BURIAL GROUNDS OPERABLE UNIT AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY (DOE/LX/07-1274&D2)

Please find enclosed the signed *Memorandum of Agreement for Resolution of Dispute for the Feasibility Study for Solid Waste Management Units 2, 3, 7 and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-1274&D2*. The Dispute Resolution Committee has resolved the dispute, which includes an agreement of the Federal Facility Agreement parties to defer establishment of radiological effluent limits from the Solid Waste Management Units 2, 3, 7 and 30 project until the Proposed Plan and Record of Decision stages of remedy selection.

The U.S. Department of Energy (DOE) has agreed not to identify any Applicable or Relevant and Appropriate Requirements/To-be-Considered guidance or criteria for radiological effluent in the revised Feasibility Study based on the agreement to defer establishment of radiological effluent limits. DOE maintains its position that effluent limits that are based on Nuclear Regulatory Commission regulations and DOE Orders are protective.

DOE appreciates the U.S. Environmental Protection Agency's and the Kentucky Department for Environmental Protection's efforts in resolving this matter.

If you have any questions or require additional information, please contact April Ladd at (270) 441-6843.

Sincerely,



Tracey Duncan
Federal Facility Agreement Manager
Portsmouth/Paducah Project Office

Enclosure:

Signed Memorandum of Agreement

e-copy w/enclosure:

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MEMORANDUM OF AGREEMENT FOR RESOLUTION OF DISPUTE

for the

*Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30
of the Burial Grounds Operable Unit
at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/LX/07-1274&D2)*

BACKGROUND

On June 12, 2014, the U.S. Department of Energy (DOE) submitted the *Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/LX/07-1274&D2) (Feasibility Study) to the Kentucky Department for Environmental Protection (KDEP) and the U.S. Environmental Protection Agency (EPA) for review and approval. On November 12, 2014, and December 19, 2014, pursuant to Section XX, Review/Comment on Draft/Final Documents, of the Paducah Gaseous Diffusion Plant (PGDP) Federal Facility Agreement (FFA), KDEP and EPA, respectively, issued conditions for approval of the Feasibility Study. In subsequent correspondence dated January 22, 2015, February 2, 2015, and March 20, 2015, KDEP issued additional conditions to DOE. In total, 55 conditions were issued by EPA and KDEP. DOE accepted 37 of the 55 conditions.

On March 27, 2015, pursuant to Section XXV.A, Informal Dispute, of the PGDP FFA, DOE invoked informal dispute resolution for the 18 remaining conditions. The FFA parties, in good faith, conducted a period of informal dispute resolution in accordance with Section XXV.A, Informal Dispute, of the FFA and reached a mutually acceptable resolution on 12 conditions of the 18 disputed conditions.

On December 22, 2015, pursuant to Section XXV.B, Formal Dispute, of the FFA, DOE elevated the 6 unresolved conditions to the Dispute Resolution Committee (DRC) for resolution. The DRC reached a mutually acceptable resolution of the remaining 6 conditions during the formal dispute period.

RESOLUTIONS

The undersigned agree that the dispute invoked by DOE is hereby resolved. The terms of the dispute resolution memorandum of agreement for resolution of this dispute (MOA) are set forth below.

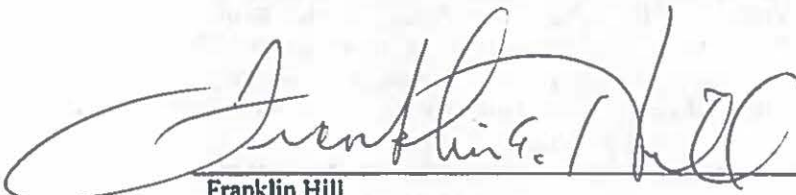
- DOE shall incorporate resolution of the 18 disputed conditions into the revised *Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/LX/07-1274&D2/R1). The attached table, titled “Memorandum of Agreement Table Summarizing Resolutions to EPA and KDWM Disputed Conditions for the *Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/LX/07-1274&D2),” describes how the 18 disputed conditions in EPA and KDEP conditional concurrence letters were resolved and identifies the revisions to the Feasibility Study that the FFA Parties agreed shall be made by DOE in order to resolve the 18 disputed conditions.
- The revised *Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/LX/07-

1274&D2/R1) incorporating the terms and conditions of this dispute resolution agreement will be submitted to EPA and KDEP within 75 days of the date of the last FFA party signature on this agreement.

OTHER TERMS AND CONDITIONS

Pursuant to Section XXV.B.10 of the FFA, resolution of this dispute constitutes a final resolution of the dispute, which resolution is incorporated into, and becomes a term and condition of the FFA. Nothing in this MOA modifies other FFA Terms and Conditions or other CERCLA projects at the PGDP except as specifically stated above.

To the extent authorized under the FFA, nothing in this MOA shall prevent any of the Parties from disputing any other matters related to any of the other response action projects.



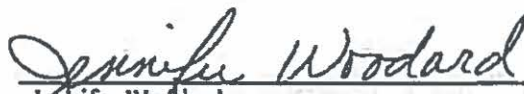
Franklin Hill
Director, Superfund Division
U.S. Environmental Protection Agency, Region 4

5/16/2017
Date



Jon Maybriar
Director, Division of Waste Management
Kentucky Department of Environmental Protection

5-12-17
Date



Jennifer Woodard
Paducah Site Lead
U.S. Department of Energy, Portsmouth/Paducah Project Office

5/12/2017
Date

Memorandum of Agreement Table
Summarizing Resolutions to EPA and KDWM Disputed Conditions for the
*Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 for the Burial Grounds Operable Unit at the
Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-1274&D2)*

Condition(s)	Topic	Resolution and/or Revisions
KDWM GC 3 KDWM SC 13, 14, 15, 19, 20, and 22 EPA 5	Intruder Barrier/ Timing of riprap Placement	The FFA parties agree that the timing of riprap placement will be negotiated as part of the Proposed Plan development if a containment alternative is selected. Statements regarding the timing of riprap placement will be removed from the Feasibility Study.
KRHB GC 2 EPA 6	Principal Threat Waste (PTW) Treatment/Removal	<p>EPA and KY do not fully agree with DOE’s response to EPA Condition 6 and KRHB GC 2. Nevertheless they agree to allow this condition to be resolved as described below with limited changes to tables.</p> <p>The FFA parties agree to modify a cell in Table 5.15 to add, “No treatment or removal of PTW.” (i.e., the cell located in the “Alternative 3” column in the “Reduction of toxicity, mobility, or volume through treatment” row).</p> <p>The FFA parties agree to modify a cell in Table 6.8 to add, “No treatment or removal of PTW.” (i.e., the cell located in the “Alternative 3” column in the “Reduction of toxicity, mobility, or volume through treatment” row).</p>
EPA 1	Waste Descriptions	The FFA parties agree to modify the FS text as shown in Attachment 1 to this MOA table (i.e., text additions to FS Sections 1.3.3.2, 5.1.1, 6.1.1, 7.1.1, and 8.1.1).
EPA 7	SWMU 3, Alternative 3	<p>The FFA parties agree to modify the FS text as shown in Attachment 2 to this MOA table (i.e., text additions to FS Sections 1.5.7, 1.6.3.1, 1.6.3.2, 6.1.1, 6.1.3, 6.2, 6.3.2, 6.3.3, 6.3.3.5, 6.3.4, 6.4.1, 6.4.1.3, 6.4.1.3.1, 6.4.2, 6.4.2.1, 6.4.2.3, 6.4.3).</p> <p>Note that the SWMU 3, Alternative 3 cost estimates require revision to address the revisions (i.e., RDSI activities, Engineering Study, and options) associated with this condition as well as other revisions necessary based on other undisputed conditions. The appropriate cost estimates will be updated in text, tables, and Appendix E where appropriate, throughout the revised FS.</p>

Memorandum of Agreement Table
Summarizing Resolutions to EPA and KDWM Disputed Conditions for the
*Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 for the Burial Grounds Operable Unit at the
Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-1274&D2)*

Condition(s)	Topic	Resolution and/or Revisions
EPA 11	SWMU 3, RCRA Subpart F ARARs	The FFA parties agree to modify the FS text as shown in Attachment 3 to this MOA table (i.e., revisions to FS Appendix G ARARs).
EPA 12	CAMU ARARs	The FFA parties agree to modify the FS text as shown in Attachment 4 to this MOA table (i.e., revisions to FS Appendix G ARARs).
EPA 2 Two additional KDWM conditions (rec'd 1/22/2015 and 2/2/2015)	KY UECA	<p>Consistent with the recent resolution of the BGOU SWMUs 5 and 6 Proposed Plan dispute regarding this topic:</p> <ul style="list-style-type: none"> • <i>KRS 224.80-100 et seq.</i> will not be cited as an applicable or relevant and appropriate requirement (ARAR). • 401 <i>KAR 100:030 §8(3) (b) 1-3</i> will not be cited as an ARAR. • <i>KRS 224.80-100 et seq.</i> will be identified as a Land Use Control for remedial alternatives that do not achieve UU/UE. • The FFA parties agree to modify the Feasibility Study text as shown in Attachment 5 to this MOA table (i.e., revisions to Table ES.8, Table 2.1, Section 2.4.1.1, Table 2.2, Table 2.3, Section 5.3.2.3, Table 5.3, Section 5.3.3.4, Table 5.6, Table 5.7, Section 5.3.4.5, Section 5.3.4.7, Table 5.10, Section 5.3.5.7, Table 5.12, Section 6.3.3.3, Table 6.3, Section 6.3.4.4, Table 6.5, Section 7.3.2.4, Table 7.4, Table 7.5, Section 7.3.3.4, Table 7.8, Section 8.3.2.3, Table 8.3, Section 8.3.3.3, and Table 8.5).
EPA 3	Discharge of wastewater and effluent limits for radionuclides	<p>It is the intent of the three parties to defer establishment of any radiological effluent limits for the SWMUs 2, 3, 7, and 30 project within the revised Feasibility Study. As a result, the D2 FS will be revised as indicated below.</p> <ul style="list-style-type: none"> • The FFA parties agree that the following sentences will be incorporated into Sections 2.4.1.9.2 and F.4.5 of the revised FS: <u>“The FFA parties have agreed to defer the establishment of radionuclide effluent limits for discharges of wastewater from this CERCLA project until the Proposed Plan and Record of Decision stage of remedy selection. Effluent limits for radionuclides will be established in accordance with CERCLA, the NCP and EPA guidance.”</u>

Memorandum of Agreement Table
 Summarizing Resolutions to EPA and KDWM Disputed Conditions for the
*Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 for the Burial Grounds Operable Unit at the
 Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-1274&D2)*

Condition(s)	Topic	Resolution and/or Revisions
		<ul style="list-style-type: none"> • References related to specific radiological effluent limits will be removed from Table F.2 of the revised FS. • The FFA parties agree that the ARARs table and text in the revised D2 FS will not identify or cite 1) the NRC regulation [10 CFR part 20 Appendix B, Table 2 Effluent Concentrations; 901 KAR 100:019 Section 44(7)(a)] and will not identify or cite: 2) any effluent limit requirements in the DOE Order 458.1. • The FFA parties agree, that after all of the agreed upon changes related to EPA and KDEP's conditional approval of the D2 FS are incorporated, the revised FS will be approved and placed in the Administrative Record, recognizing that the FFA provides the necessary mechanisms for modifying the approved FS at a later date. <p>Additionally, it is the intent of the three parties to defer all other elements of this condition for the SWMUs 2, 3, 7, and 30 revised Feasibility Study until later in the remedy selection or design process.</p>

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ATTACHMENT 1

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EPA Condition #1

Revisions to excerpts from *Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-1274&D2*

1. INTRODUCTION

1.1 SCOPE OF THE BGOU

The BGOU at PGDP is one of five media-specific, sitewide operable units (OUs) ...

The BGOU consists of contamination associated with PGDP's landfills and burial grounds as listed in Table 1.1. The CERCLA remedial process is employed at the BGOU. In general, the contents of the burial grounds upon excavation and characterization for disposal may include Resource Conservation and Recovery Act (RCRA) hazardous waste, polychlorinated biphenyl (PCB) waste, and low-level waste (LLW). This waste may include low-level threat waste (LLTW) and principal threat waste (PTW) and affected media (see Section 1.3.3). PTW is defined by EPA as "source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur" (EPA 1991a). The National Contingency Plan (NCP) [as promulgated at 40 CFR § 300.30(a)(iii)(A)] states that EPA expects to use treatment to address principal threats posed by PTW, where practicable.

1.3 BACKGROUND INFORMATION

1.3.3 Nature and Extent of Contamination

The SWMUs comprising the BGOU consist primarily of landfills and below ground burial cells in which various PGDP wastes have been placed. The BGOU CSM indicates infiltration of water (i.e., precipitation) descending through the buried waste has mobilized or could mobilize contaminants within the waste. Once mobilized, the most likely pathway of the contaminants would be downward through the UCRS soils, ultimately reaching the RGA. Some lateral movement of contaminants would occur in the UCRS, but these pathways are known to be limited.

1.3.3.1 Source characteristics

The nature and dimensions of the source term is based on the information available on the wastes. The chemicals associated with the wastes are highlighted in Table 1.3 and may contain PTW. PTW is defined by EPA as "source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur" (EPA 1991a). EPA also recognizes that "although no threshold level of risk has been established to identify principal threat waste, a general rule of thumb is to consider as a principal threat those source materials with toxicity and mobility characteristics that combine to pose a potential risk several orders of magnitude greater than the risk level that is acceptable for the current or reasonably anticipated future land use, given realistic exposure scenarios" (EPA 1997).

The following PTW is identified at SWMU 2:

- Approximately 270 tons of uranium (e.g., shavings and sawdust packed in oil) disposed in burial pits in SWMU 2;
- Buried drums of uranium-contaminated TCE and any high soil concentrations of TCE present under and adjacent to the drums;
- Buried drums (thirty-five 30-gal drums documented) of uranyl fluoride solution and high soil concentrations of uranyl fluoride solution present under and adjacent to the drums; and
- High concentrations of TCE and *cis*-1,2-dichloroethene (DCE) (a toxic degradation product of TCE) in soil on the eastern side of SWMU 2.

Additionally, there is the potential that the 59,000 gal of oil with which the uranium disposed of at SWMU 2 was packaged in drums contains PCBs at concentrations greater than 500 ppm. Under EPA guidance, PCBs greater than 500 ppm generally are considered PTW. Absent additional characterization (sampling and analysis) of the buried waste, it is uncertain whether PCBs are widely present at SWMU 2 at levels greater than 500 ppm. Notwithstanding the uncertainty, the 59,000 gal of oil could contain PCBs in excess of 500 ppm; thus it would be considered PTW.

Approximately 3,200 tons of uranium-contaminated waste at SWMU 3 has been identified as PTW. (It is inconclusive whether some of the uranium may be pyrophoric.)

TCE (including degradation products) present in the UCRS at SWMU 7 as dense nonaqueous-phase liquid (DNAPL) and/or high concentration TCE residual soil contamination constitutes PTW.

No PTW has been identified at SWMU 30.

1.3.3.2 Nature and extent of soil impacts

The current understanding of the nature and extent of contamination in surface and subsurface soils was derived from historical investigations as shown on Table 1.2. In the BGOU RI, additional soil samples were collected from angled borings beneath the wastes to establish if releases had occurred from the waste and, if so, their magnitude in the secondary media. Each of the SWMUs has a surface cover. The amount of surface soil data collected for each SWMU varied, since the focus of the BGOU was to identify releases and these would primarily be identified from samples beneath the waste. In some cases, the BGOU data set includes soil and sediment samples collected from locations outside the SWMU boundary that are not affected by releases from the wastes and will be addressed by other CERCLA actions such as the Soils OU or Surface Water OU.

SWMU-specific sections provide details on the distribution of selected COCs. The sampling locations and distribution of the target COCs in surface and subsurface soils evaluated in this FS are shown on figures in Appendix A for each of the SWMUs. The following are key general observations across all SWMUs:

- Radionuclides were detected at each of the SWMUs. Radionuclides of greatest impact when evaluating releases include Tc-99, at SWMUs 7 and 30, and uranium-238 (U-238), at SWMUs 2, 7, and 30. Tc-99 is generally considered one of the more mobile radionuclides and has been detected in RGA groundwater. Tc-99 was detected above background at the highest frequency in surface samples. A similar pattern was observed for U-238.

- Selected chlorinated volatile organic compounds (VOCs) were identified in soil samples at SWMUs 2 and 7. There was one hot spot sample in SWMU 2 at a depth of 12 ft bgs with concentrations of TCE and *cis*-DCE (its anaerobic biodegradation product) each above 100 mg/kg. These concentrations are below the soil saturation concentration, a concentration above which you may expect to have a solvent phase. Other detected concentrations of TCE range from detection limits to 0.428 mg/kg.
- Total PCBs were detected in soil samples from SWMUs 2, 7, and 30. These were typically at higher concentrations and greater frequencies in surface soil, with no detections of total PCBs in the soil samples collected at depths greater than 20 ft bgs. The maximum concentration was 14.8 mg/kg, the only concentration above 10 mg/kg.
- Polycyclic aromatic hydrocarbons (PAHs) were detected most frequently in surface samples at SWMUs 7 and 30. These were not detected in any samples below 20 ft.
- Naturally occurring metals infrequently exceeded both the no action level (NAL) and background concentrations. No clear patterns or gradients of concentrations were identified. For surface soils, these metals include antimony, arsenic, chromium, iron, nickel uranium and vanadium. Uranium exceeded most frequently. For other metals that contribute to the noncancer hazards, only one or occasionally two were detected in a single sample, suggesting these detections were typically not collocated.

In general, the contents of the burial grounds upon excavation and characterization for disposal may include RCRA hazardous waste, PCB waste, and LLW. Depending on the originating source, the TCE could be a listed hazardous waste with one or more waste codes (F001, F002, or U228) and/or be a characteristic hazardous waste (D040), if generated by the response action. Any soils or wastes with PCB concentrations at or greater than 50 ppm would be regulated for disposal as TSCA PCB waste if generated by the response action. Excavated soil and/or debris from the burial grounds could be RCRA characteristic hazardous waste (e.g., toxicity for metals).

5. SWMU 2

5.1.1 Nature and Extent of Contamination

This summary of nature and extent reflects the BGOU RI (DOE 2010b). Additional information can be found in Sections 1.5 and 1.6 of this report.

The BGOU RI reviewed both data collected during the RI along with historical data (DOE 2010b). The RI Report states that the most prevalent metals detected above background level in subsurface soil samples at SWMU 2 are arsenic, thallium, and uranium. Arsenic was detected above the screening levels throughout the depth of the angled borings (60 ft) installed during the RI. The areas that exceed the background level for metals are in the shallow soils on the eastern side of the SWMU and an isolated area at 45 ft bgs on the western side (i.e., the 60 ft sample at this location was less than background). Because this is a relatively small SWMU, these two zones may be connected spatially. The highest concentrations of uranium were found at shallow depths on the western side of the burial ground. TCE and its

degradation products, *cis*-1,2-DCE and vinyl chloride, were detected at high levels (140 mg/kg, 130 mg/kg, and 1.4 mg/kg, respectively) at a depth of 12 ft bgs on the eastern side of the burial unit. Although PCBs were suspected to be associated with the waste buried in SWMU 2, PCBs were detected above 1 ppm in only one subsurface soil sample below a depth of 6 ft (the approximate depth of the top of buried waste). The highest activities of the uranium isotopes were found at shallow depths on the western side of the burial ground. The distribution of the uranium isotopes is very similar to that of naturally-occurring uranium.

Groundwater sample collections were attempted at the two angled borings installed at SWMU 2 as part of the BGOU RI; however, none were collected (even where the UCRS is saturated, the low hydraulic conductivity of the unit restricts groundwater yield). A review of historical data indicates uranium and the uranium isotopes exceeded screening criteria in the horizon of the burial cells. Additionally, beryllium, manganese, and vanadium, TCE and its degradation products, and uranium isotopes occurred at levels that exceeded historical RI screening criteria throughout the UCRS interval below the waste pits.

The RGA groundwater samples contained several metals that exceeded RI screening criteria, including beryllium, iron, manganese, uranium, vanadium (also identified as UCRS contaminants), arsenic, and cadmium. TCE was the most widely detected organic contaminant in RGA groundwater at SWMU 2. Another VOC, 1,1-DCE, showed high levels in one RGA historical boring. RGA groundwater samples from one historical location contained U-234 above screening criteria; samples from two historical locations contained U-238 above screening criteria. Note: These chemicals are summarized from the BGOU RI Report (DOE 2010b).

PTW. Review of the SWMU 2 waste disposal history suggests the presence of a number of source materials of concern, including some identified as PTW.

- Approximately 270 tons of uranium (e.g., shavings and sawdust packed in oil) disposed of in burial pits at SWMU 2;
- Buried drums of uranium-contaminated TCE and any high soil concentrations of TCE present under and adjacent to the drums;
- Buried drums (thirty-five 30-gal drums documented) of uranyl fluoride solution and high soil concentrations of uranyl fluoride solution present under and adjacent to the drums;
- High concentrations of TCE and *cis*-1,2-DCE (a toxic degradation product of TCE) in soil on the eastern side of SWMU 2; and
- There is the potential that the 59,000 gal of oil with which the uranium was packaged in drums contains PCBs concentrations greater than 500 ppm considering sample results of 7,900 ppm PCB from a drum excavated from SWMU 2 (Ashburn 1984). Under EPA guidance, PCBs greater than 500 ppm generally are considered PTW. Absent additional characterization (sampling and analysis) of the buried waste, it is uncertain whether PCBs are widely present at SWMU 2 at levels greater than 500 ppm. The 59,000 gal of oil could contain PCBs in excess of 500 ppm and thus be considered PTW.

Radionuclides. Consistent with the presence of source materials, uranium isotopes frequently were detected above background and risk-based concentrations in soils (see Appendix A, Figures A.1 and A.2). The sediment sample, SWMU 2-15, is from an area addressed in the SWOU, thus, sediments in this location have been addressed as part of the SWOU on-site actions.

Because small pieces of uranium metal may be pyrophoric (spontaneously burn in air), operating practices of that time required placing the material in drums and submerging the material in petroleum-based oil and synthetic oil to avoid contact with air. It is possible that the oils used may have included some PCB-contaminated oils. Such oils are resistant to chemical and biological degradation and from leaching by percolating waters. In addition, oils, as they slowly degrade, consume oxygen, which lowers the ORP. Under such conditions, uranium dissolution is negligible (ORNL 1998).

PCBs. The sludge in drums recovered in the 1984 excavation of cell 9 contained PCBs (1,500 to 7,900 mg/kg); however, other portions of the source material (not associated with cell 9) at SWMU 2 may contain PCBs. PCBs were detected in several soil samples, occasionally exceeding the NAL (see Figures A.1 and A.2); however, detections at these locations do not correlate with a buried PCB in oil source. The maximum concentration in soil was below 10 mg/kg. Any soils or wastes with PCB concentrations at or greater than 50 ppm would be regulated for disposal as TSCA PCB waste if generated by the response action.

Solvents. The waste unit disposal summary indicates drums containing TCE were disposed of in the SWMU at cells 8 and 9. TCE and its degradation products, *cis*-1,2-DCE and vinyl chloride, were detected at high levels (140 mg/kg, 130 mg/kg, and 1.4 mg/kg, respectively) at a depth of 12 ft bgs on the eastern side of the burial unit and within Burial Cell 6 (See Figure A.3); however, this area is not the area where the TCE drums were dispositioned. The concentration of 140 mg/kg is below the soil saturation concentration (C_{sat}) of 690 mg/kg that is used to estimate the presence of a solvent phase. TCE was detected in soil at 9 additional locations with concentrations from 0.0021 mg/kg to 0.0428 mg/kg. TCE was the most widely detected organic contaminant in RGA groundwater at SWMU 2; however, there is an upgradient contribution to the RGA TCE concentrations. The hydrogeological assessment of the SWMUs 2 and 3 areas (PRS 2007a) determined that an upgradient source is responsible for some if not all of the TCE levels in the area. It is difficult to separate any potential impacts to the RGA from SWMU 2 due to the migration of contamination from upgradient areas. Based upon the disposal information and the sampling data, the PTW-level TCE sources are limited to cells 6, 8, and 9; however, the lateral and vertical extent of PTW beyond these cells has not been delineated.

Disposal records for SWMU 2 indicate drums containing TCE were historically disposed of in this unit. Depending on the originating source, the TCE could be a listed hazardous waste with one or more waste codes (F001, F002, or U228) and/or be a characteristic hazardous waste (D040), if generated by the response action. Given the historical uses of TCE at PGDP, TCE, TCE-contaminated soils, and TCE-contaminated debris (e.g., drums, PPE) likely would be considered characteristic and/or listed RCRA hazardous wastes until such time as a “contained-in” determination has been made, and/or a “contaminated with” determination has been made. In addition, drums and/or containers that have been emptied in accordance with 40 *CFR* 261.7 also are not hazardous waste.

Technetium-99. No documentation of Tc-99 disposal at SWMU 2 exists; however, during the years of feed plant operation from 1953 to 1964 and from 1968 intermittently through 1977, recycled uranium feed material from nuclear reactors was reprocessed through the feed plant, resulting in the introduction of reactor-produced radioactive impurities, such as Tc-99, into the enrichment process. It is possible that a portion of the uranium-contaminated wastes disposed of in burial grounds at PGDP contains Tc-99 from reprocessing activities (DOE 1994b); however, Tc-99 is not a target compound at SWMU 2 based on soil data. It was identified as having the potential to impact groundwater, but the modeled concentrations did not exceed the MCL. More importantly, it was detected above background in only 3 surface samples (maximum concentration of 14.6 pCi/g), and was not found above background in 57 subsurface soil samples, suggesting no evidence of a release from SWMU 2.

Arsenic. Arsenic above background concentrations poses a potential direct contact risk as well as a potential concern for migration to groundwater. The distribution of arsenic at SWMU 2 is shown on Figures A.1 to A.3. Depending upon the levels of arsenic, the soil and/or debris in the burial grounds could be RCRA characteristic hazardous waste.

6. SWMU 3

6.1.1 Nature and Extent of Contamination

This summary of nature and extent reflects the BGOU RI (DOE 2010b). Additional information can be found in Sections 1.5 and 1.6 of this report.

SWMU 3 extends to the area under the cap within the former surface impoundment area that received the wastes plus the pipeline which carried effluent to a ditch adjacent to the waste unit.

The source area of SWMU 3 contains approximately 6,615,000 lb of uranium-contaminated waste that has been identified as PTW. No other wastes have been identified as PTW at SWMU 3. The historical record is inconclusive about whether pyrophoric uranium is present in SWMU 3. The total volume is approximately 260,000 ft³. Some uranium-contaminated waste also may be contaminated with TCE, radionuclides, and metals. In 1986, the disposal of waste at C-404 Landfill was halted, and a portion of the disposed of waste was found to be RCRA-hazardous [i.e., the gold dissolver precipitate that was disposed in the C-404 Landfill was determined to be a “characteristic” hazardous waste based on EP toxicity for cadmium (D006), lead (D008), and selenium (D010)]. The landfill was covered with a RCRA multilayered cap and certified closed in 1987. It currently is regulated under RCRA as a land disposal unit and compliance is monitored under a RCRA postclosure permit issued in 1992. The closure plan requires continued groundwater monitoring (DOE 1989). A permit modification was submitted in May 2008, revising the MW network for the unit to add a new upgradient well, MW420 (DOE 2008). MW420 is screened in the upper RGA. The permit conditions are summarized in Appendix G.

No surface soil samples were collected from the surface of the Subtitle C cap. Presumably clean materials were used to construct the cap; however, subsequent to the construction of the cap, radiological surveys of adjacent roadways revealed contamination. In response to these survey results, additional gravel has been added to the roadways to prevent vehicles from spreading contamination. Though it has not been surveyed, radiological technicians have posted the cap as a radiological area as a result of elevated readings on the gravel roads and pads adjacent to the cap. In 2011, a water sample originating from a cap drain pipe was collected and analyzed for approximately 190 constituents (VOAs, SVOAs, metals, radionuclides, and PCBs). Eleven constituents were detected by the analyses; all but one (U-238) fell below the NFA threshold of a preliminary human health risk screening. Though the sample was not collected as part of an approved work plan and the manner in which it was collected made it susceptible to cross contamination, the presence of elevated levels of U-238 creates an element of uncertainty as to the nature and extent of contamination in the cap.

Subsurface soil samples collected from angled borings beneath the unit indicate the presence of U-238 and U-234 above background in a few locations. Uranium and uranium isotopes were not detected above background in any samples below 20 ft.

For UCRS groundwater, RI and historical data identified levels of metals (arsenic, iron, lead, manganese, molybdenum, or uranium), TCE, Tc-99, and U-238 that exceed screening criteria at all sampling locations (DOE 2010b). Any releases to subsurface soils and groundwater may be related to past uses of the unit as a surface impoundment or as the current RCRA-regulated landfill.

The BGOU RI found RGA groundwater contaminants exceeding screening levels for SWMU 3 are metals (arsenic, iron, manganese, and uranium); organics (1,1-DCE, chloroform, and TCE); and radionuclides (U-234 and U-238).

URGA well MW420 (background) is the only URGA well with Tc-99 levels above the minimum detectable activity. The absence of Tc-99 in downgradient RGA wells demonstrates that the C-404 Landfill is not a source of statistically quantifiable levels of Tc-99. Note: UCRS wells MW85, MW88, MW91, and MW94 have detectable levels of Tc-99; only MW91 has a Tc-99 level greater than 900 pCi/L.

Dissolved-phase contamination with TCE is present in UCRS groundwater at SWMU 3 above MCLs. There is no evidence of TCE disposal at SWMU 3, and leachate collection records do not indicate the continued presence of TCE DNAPL or high concentration TCE in soils at SWMU 3.

The hydrogeological assessment of SWMUs 2 and 3 that was completed as part of the BGOU RI (PRS 2007a) documents that an upgradient source accounts for the high TCE concentrations in RGA groundwater. Because the 1,1-DCE detects occurred only in upgradient wells, it also appears to be related to an upgradient source.

Groundwater monitoring under the RCRA permit for the unit, however, has shown statistically significant increases of TCE above background in one of three downgradient compliance wells in the upper RGA (MW84). C-404 Landfill Source Demonstration, Paducah Gaseous Diffusion Plant, Paducah, Kentucky (PRS 2007b), related the increase in TCE levels to trends in the Southwest Plume and does not indicate that SWMU 3 is the contributor.

The 1987 Closure Plan (KY/B-257) and 1989 Post-Closure Permit Application (KY/H-35) for the C-404 Low-Level Radioactive Waste Burial Ground both contain a detailed inventory of the waste types placed in the unit based on documented disposal records available at the time. According to these documents, the gold dissolver precipitate that was disposed in the C-404 Landfill was determined to be a “characteristic” hazardous waste based on EP toxicity for cadmium (D006), lead (D008), and selenium (D010). The Post-Closure Permit Application further states that no evidence of disposal of trichloroethylene (TCE) or other similar organic chemicals was identified based on interviews and reviewed records. However, low concentrations of TCE have historically been detected in the leachate collected from the C-404 leachate collection sump. A later study, the 2005 Regulatory Analysis on Application of the Headworks Exemption to Uranium Precipitate Waste (BJC/PAD-732), involved worker interviews conducted at that time, one of which indicated that one option historically used for disposing of the C-400 degreaser sludge included placing it in steel drums and taking it to the C-409 Facility where the TCE was evaporated and the remaining drummed sludge was reportedly disposed at the C-404 Landfill. TCE degreaser sludge would be considered a F001 listed hazardous waste. Given the historical uses of TCE at PGDP, TCE, TCE-contaminated soils, and TCE-contaminated debris (e.g., drums, PPE) likely would be considered characteristic and/or listed RCRA hazardous wastes until such time as a “contained-in” and/or a “contaminated with” determination has been made. In addition, drums and/or containers that have been emptied in accordance with 40 CFR 261.7 also are not hazardous waste.

7. SWMU 7

7.1.1 Nature and Extent of Contamination

This summary of nature and extent reflects the BGOU RI (DOE 2010b) and the Soils OU RI (DOE 2013b). Additional information can be found in Sections 1.5 and 1.6 of this report.

Sources of contamination at SWMU 7 are known to include uranium and various metals. TCE (including degradation products) present in UCRS as DNAPL and/or high concentration TCE residual soil contamination is identified as PTW. Excavation of test pits and analysis of drummed wastes at the TP-3 and TP-5 areas during the 1992 SI (CH2M HILL 1992) identified no PTW. Note: The test pit investigation was designed to evaluate whether the geophysical anomalies that indicated buried metal have buried wastes rather than the empty drums reported to have been disposed of.

Buried drums of waste were removed from a shallow test pit excavated in SWMU 7 during the Phase II Site Investigation in 1992 (CH2M HILL 1992). Analyses of samples of the drummed waste and surrounding soils collected from Test Pit 5 (TP-5) at depths of less than 5 ft indicated the following: (1) contaminants present in TP-5 samples also were detected in subsurface soil samples collected elsewhere in SWMU 7 and (2) elevated concentrations of U-235 and U-238 were detected in TP-5 samples, at similar concentrations to those detected in other SWMU 7 subsurface soil samples. Section 1.6.4 indicates TCE was not detected in the TP-5 samples. The data are consistent with the reported nature of the waste as empty drums. The nature and extent of the TP-3 and TP-5 contents is apparently similar to the waste and subsurface soil contamination found elsewhere in SWMU 7 and can be addressed using the same alternatives. These areas were not found to contain PTW.

Metals concentrations in subsurface soil samples of SWMU 7 rarely exceed background levels. Prior to the Soils OU RI, uranium metal had been detected above background levels only at three locations that characterize Burial Pits B and C that contained uranium-contaminated noncombustible trash. The Soils OU RI investigated the soils beneath the location of former SWMU 12, the former "Drum Mountain," and found uranium metal up to 4,325.1 mg/kg (DOE 2012). The extent of contamination is limited to shallow soil depths (5 to 10 ft bgs).

Two VOCs (vinyl chloride and 1,1-DCE) were identified as contaminants, though both were detected infrequently. U-238 is the most widely detected radionuclide contaminant above PGDP background levels in subsurface soils at SWMU 7, with most exceedances limited to depths less than 15 ft bgs. Arsenic was found at background concentrations in the BGOU data included in the RI; however, arsenic was detected at somewhat higher concentrations in selected samples collected for the Soils OU. Arsenic was retained as a COC for SWMU 7 based on results of elevated concentrations in samples.

The RI identified 14 metals in UCRS groundwater samples from SWMU 7 above screening levels. Arsenic, iron, and manganese were the most frequently detected metals. Organic contaminants in UCRS groundwater at SWMU 7 consisted of five VOCs. TCE and its reductive dechlorination products, *cis*-12-DCE and vinyl chloride, were the most frequently detected organic contaminants. (Ethene was not analyzed for at SWMU 7. It is uncertain if TCE is biodegrading to this final degradation product.) The radionuclide contaminants present in the SWMU 7 UCRS groundwater samples were Rn-222 and the uranium isotopes U-234 and U-238.

The analyses of groundwater samples from MW66 (an upper RGA well located between Burial Pits A and B of SWMUs 30 and 7, respectively) reveal abrupt rises or spikes of dissolved TCE that correlate to periods of higher hydraulic head (TCE spikes often exceed 10,000 µg/L). This spiking behavior suggests

a UCRS DNAPL source that releases contaminant mass in response to seasonal variations (more mass being released during times of higher hydraulic head). If this potential DNAPL source extended deeper into the RGA, the TCE trend would not fluctuate as much as observed. The SWMUs 7 and 30 RI report also postulated a DNAPL source near Burial Pit B (DOE 1998a).

Historical and RI data reveal the occurrence of 12 metal contaminants in the RGA groundwater samples from SWMU 7. As in the UCRS samples, arsenic, iron, and manganese were the most frequently detected groundwater contaminants. All of the SWMU 7 RGA organic groundwater contaminants were VOCs. TCE was the dominant organic contaminant. The RGA groundwater radionuclide contaminants of SWMU 7 consist of Tc-99, U-234, and U-238. Although a potential TCE DNAPL source is believed to exist near Pit B, as discussed, the primary occurrence of VOCs and Tc-99 in the RGA largely is due to the Northwest Plume, which passes beneath SWMU 7 (Figure 7.2).

The review of the McNairy groundwater analyses identified TCE and chloroform as the only SWMU 7 McNairy groundwater contaminants. This VOC contamination in the McNairy formation in the vicinity of SWMU 7 is likely from an upgradient source.

Depending on the originating source, the TCE could be a listed hazardous waste with one or more waste codes (F001, F002, or U228) and/or be a characteristic hazardous waste (D040), if generated by the response action. Excavated soil and/or debris from the burial grounds could be RCRA characteristic hazardous waste (e.g., toxicity for metals).

8. SWMU 30

8.1.1 Nature and Extent of Contamination

This summary of nature and extent reflects the BGOU RI (DOE 2010b). Additional information can be found in Sections 1.5 and 1.6 of this report.

The information on the activities at SWMU 30 suggests potential sources of uranium and residuals from combustion of a variety of materials. No wastes have been identified as PTW at SWMU 30. SWMU 30 contains LLTWs.

The presence of waste-related impacts in surface and subsurface soils was characterized in the BGOU RI. Appendix A contains figures that show concentrations of chemicals of interest that exceed screening values. For direct contact pathways, surface soil impacts are shown in Figure A.10 and surface and subsurface (0–16 ft) in Figure A.11. Figure A.12 highlights locations where soils have levels of contaminants that potentially may migrate and impact RGA groundwater.

The soil sampling results indicate that one or more uranium isotopes were detected above background in each of the surface soil samples, approximately 60% of the samples in the interval from 1–20 ft, and not detected above background in any of the samples at depths greater than 20 ft. The uranium isotopes U-234, U-235/236, and U-238 are the only radionuclide contaminants at depths of 10 ft or less.

Concentrations are highest in surface soils, the maximum and average concentrations of U-238 decrease more than a factor of 10 in the interval from 1–20 ft. Np-237 and Pu-239 also were detected above background in surface soils; however, Pu-239 did not exceed the industrial worker NAL at any of these

locations, while Np-237 exceeded in three locations. Similar to the distribution of radionuclides, some metals show a higher frequency of exceeding background concentrations in surface soils, occasionally present above screening values.

The history of the waste unit does not suggest significant contributions of VOCs would be present. The soil data showed one detection of TCE (0.0374 mg/kg at a depth of 30 ft) and one detection of 1,1-DCE (0.005 mg/kg at a depth of 60 ft).

In the four water samples collected from open boreholes in the UCRS within the SWMU boundary, TCE was not detected and is not present at concentrations above the MCL; however, the organics, TCE, benzene, and vinyl chloride, were detected above screening levels.

Of the organic analytes, only TCE was detected frequently above screening levels, in all four RGA groundwater MWs. The highest concentration of TCE within the RGA is at MW66, a well located along the eastern edge of SWMU 30; thus, it is not downgradient from the waste unit. Tetrachloroethene was detected at only one location, MW66, at 0.32 mg/L, which is above the screening level.

Total PAHs may be present associated with the combustion done at the site. Total PAHs were detected in 7 of 11 surface soil locations in concentrations from 0.002 to 12.5 mg/kg. Two of the 3 highest concentrations were in ditch samples at the southern boundary of the site. PAHs were detected in only 2 subsurface locations at concentrations below screening values. This pattern is similar to that of other chemicals of interest in that the greater residual concentrations at SWMU 30 remain near the surface.

Total PCBs were detected at the site, with the highest frequency of detection and concentrations in surface samples. Total PCBs were detected in 9 of 9 surface soil locations ranging from 26 to 15,000 µg/kg. They were not detected at depths greater than 20 ft.

Tc-99 is not known to be associated with activities at this SWMU, but was detected above background. Tc-99 was not detected above background in any samples collected at depths greater than 20 ft, and above background in only 1 of 10 samples collected at depths from 1–20 ft. There were four surface locations with Tc-99 above background; two of these that also had the highest concentrations were in the drainage ditch to the south of the site.

Tc-99 was not detected in any of the water samples collected from borings or MWs in the UCRS. The uranium isotopes U-234 and U-238 frequently exceeded screening levels in the SWMU 30 UCRS groundwater samples. RI screening of the sample analyses revealed nine metal contaminants in UCRS groundwater samples: arsenic, cadmium, iron, lead, manganese, molybdenum, nickel, uranium, and vanadium. All but cadmium were detected at levels exceeding screening criteria in 50% or more of the samples.

The RGA groundwater samples from SWMU 30 contained five metal contaminants: arsenic, iron, lead, manganese, and uranium. Radon-222 and Tc-99 were the most frequently detected radionuclide contaminants. The Tc-99 MCL was exceeded only in RGA well MW66, a well not located downgradient from the waste unit.

No McNairy groundwater data were available.

Depending on the originating source, the TCE could be a listed hazardous waste with one or more waste codes (F001, F002, or U228) and/or be a characteristic hazardous waste (D040), if generated by the response action. Any soils or wastes with PCB concentrations at or greater than 50 ppm would be

regulated for disposal as TSCA PCB waste if generated by the response action. Excavated soil and/or debris from the burial grounds could be RCRA characteristic hazardous waste (e.g., toxicity for metals).

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ATTACHMENT 2

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EPA Condition #7

Revisions to excerpts from *Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-1274&D2*

1.5.7 SWMU 3 Leachate Pit Evaluation

The C-404 Low-Level Radioactive Waste Burial Ground (SWMU 3) originally was constructed as an aboveground surface impoundment (circa 1952). The floor of the surface impoundment was constructed of well-tamped clay and surrounded by earth dikes to a height of 6 ft. The impoundment was designed with an overflow weir in the dike near its southwest corner. Immediately downstream of the weir, discharges passed through a flow-through sump. The walls and floor of the sump were constructed with 10" reinforced concrete. In 1957, the C-404 surface impoundment was converted to a disposal facility for solid uranium-contaminated wastes; as part of the conversion, the flow-through sump immediately downstream of the existing weir, was placed into service as a leachate collection pit.

Subsequent to the approval of the BGOU RI Report, C-404 Semiannual reports were reviewed to understand any trends in the amount of leachate removed and frequency of removal. Also the analytical results of the leachate were reviewed to understand better contaminant levels in the leachate and any trends in contaminant concentrations through time.

The timing of historic leachate influx and removal suggests a seasonal relationship (i.e., most influx and removal has occurred in winter months when UCRS groundwater elevations are high). During the period from 2001 to 2009, approximately 2,000 gallons of leachate were generated annually and removed from the leachate pit. The base of the leachate pit is 369 ft amsl or 2 ft below the highest UCRS groundwater elevation (371 amsl). This information indicates that it is possible that groundwater could infiltrate into the leachate pit when UCRS groundwater elevations are high. This infiltration could occur through imperfections not detected during routine visual inspections or sump tests. High levels of U-238 (ranging from 2,290 pCi/L to 39,700 pCi/L) suggest that water collected from the pit contains a leachate component (i.e., water that has been in contact with the waste in the disposal cell). There is no apparent relationship/correlation between the rate at which water flows into the pit/sump and the uranium concentration in that water. The amount of leachate (versus groundwater) that contributes to the total water withdrawn from the sump is an uncertainty. Possible origins of the leachate in the pit include: 1) waste dewatering over time, 2) groundwater intrusion into wastes through former impoundment bottom liner, and 3) rain water infiltration through RCRA cap. If, or how much, any of these mechanism are contributing to the leachate is an uncertainty.

A leachate sump integrity test is conducted annually at C-404 as specified in Attachment I of the Kentucky Division of Waste Management Hazardous Waste Facility Permit, KY8-890-008-982. The test is a measure of water elevations monitored over a one-month period during the year, and reported in the appropriate semiannual report. According to the *C-404 Hazardous Waste Landfill November 2015 Semiannual Groundwater Report (April 2015–September 2015), Paducah Gaseous Diffusion Plant, Paducah, Kentucky, PAD-ENM-0095/V2*, the leachate level was monitored most recently from September 9 through October 10, 2015, using an automated system that collects data at 15 minute intervals. The test shows the leachate level was constant (within 0.06 ft) over the monitoring period; the measurement shows no evidence of the C-404 unit leaking. A printout of the data is provided in an appendix of the Semiannual Groundwater Report.

Available data indicates the intrusion of groundwater into wastes through the former impoundment bottom liner is unlikely. Based upon piezometric data, there is a 2-ft separation between the base of waste and the highest UCRS groundwater elevation (373 ft and 371ft amsl, respectively). This information shows, therefore, that the waste does not sit in groundwater even when UCRS groundwater elevations are high. The base of the leachate pit, however, is 369 ft amsl or 2 ft below the highest UCRS groundwater elevation (371 amsl).

1.6.3 SWMU 3 Summary

SWMU 3 was a burial ground that contains uranium precipitated from aqueous solutions, UF₄, uranium metal, uranium oxides, degreasing sludge, and radioactively-contaminated trash. Contaminants from the buried waste and contaminated soils in SWMU 3 are expected to be found concentrated in the soils and groundwater of the UCRS immediately within and under the burial cells.

1.6.3.1 Surface soil COCs

COCs in surface soil at SWMU 3 taken from the “Future industrial worker at current concentrations (soil)” scenario on Table 1.6 are the following: arsenic, U-235, and U-238. U-234 was added to the COC list because this isotope is expected to be present where U-235 and U-238 are found. No surface soil data are available for comparison. Metals and uranium isotopes (U-234, U-235, and U-238) are the target COCs.

Uncertainties. Uncertainties associated with the surface soil at SWMU 3 are presented in Table 1.13 (including whether the existing Subtitle C cap presents a radiological surface risk to industrial workers or presents hotspot risks).

1.6.3.2 Waste and subsurface soil

COCs. As stated in Table 1.13, the risk assessment for SWMUs 2 and 3 did not evaluate an outdoor or excavation worker scenario for soil, but did evaluate hypothetical exposure to an adult or child resident to off-site groundwater. The COCs for SWMU 3 include COCs identified through the assessments of both the on-site industrial worker for soil and off-site groundwater user to include the most comprehensive list of COCs. The full list of COCs at SWMU 3 (see Table 1.6) are the following: arsenic, manganese, uranium, Tc-99, U-235, and U-238. U-234 was added to the COC list because this isotope is expected to be present where U-235 and U-238 are found.

These COCs were compared to background and NALs (see Table 1.18). Manganese was determined to be less than background and thus no longer is considered. Uranium, uranium isotopes (U-234, U-235, and U-238), and Tc-99 were not screened based on background and NALs. Naphthalene was determined to not pose a threat to groundwater and is not retained as a COC (see Appendix B).

The COCs retained for SWMU 3 subsurface soil are cis-1,2-DCE; TCE; Total PCBs; arsenic; uranium; Tc-99; U-234, U-235, and U-238. All of these COCs should be considered target COCs.

PTW. The estimated 3,200 tons of bulk uranium disposed of in the former surface impoundment at SWMU 3 is PTW. It is inconclusive whether pyrophoric uranium is present in SWMU 3.

Uncertainties. Uncertainties associated with the waste and subsurface soil at SWMU 3 are presented in Table 1.13.

In addition, the following uncertainties have been identified: (1) the integrity of the existing Subtitle C cap, (2) the integrity of the clay bottom liner (i.e., the well-tamped clay floor that served as the floor of the former surface impoundment), and (3) the integrity of the concrete leachate collection sump/pit. Elevated U-238 contaminant levels in the leachate indicate (a) waste may be dewatering over time; (b) groundwater may be intruding through the clay bottom liner and contacting the waste; and/or (c) rain water may be infiltrating through the existing Subtitle C cap and contacting the waste. Also, the groundwater level with respect to the leachate collection sump/pit suggest that the sump/pit may be leaking.

1.6.3.3 Groundwater protection

COCs. COCs for the protection of groundwater are taken from the future adult rural resident at modeled concentrations for RGA groundwater drawn at the SWMU 3 boundary for total ELCR and the future child rural resident at modeled concentrations for RGA groundwater drawn at the SWMU 3 boundary for total HI scenarios on Table 1.6. These COCs include arsenic, manganese, uranium (metal), Tc-99, U-235, and U-238.

The COCs listed above were compared to background (see Table 1.18). Manganese was determined to be less than background or within the range of background and thus no longer is considered in this FS. U-234 was added to the COC list because this isotope is expected to be present where U-235 and U-238 are found. TCE was added to the COC list based on historical leachate data from SWMU 3; thus the target COCs are TCE, arsenic, uranium (metal), Tc-99, and the uranium isotopes (U-234, U-235, and U-238).

PTW. No COCs associated with PTW currently are identified for groundwater protection at SWMU 3.

Uncertainties. Uncertainties associated with the protection of groundwater at SWMU 3 are presented in Table 1.13. Section 1.5.4.3 identifies that the presence of PCBs, metals, and radionuclides detected in SWMU 3 leachate provides an uncertainty that the list of SWMU 3 COCs is comprehensive.

6.1.1 Nature and Extent of Contamination

This summary of nature and extent reflects the BGOU RI (DOE 2010b). Additional information can be found in Sections 1.5 and 1.6 of this report.

SWMU 3 extends to the area under the cap within the former surface impoundment area that received the wastes plus the pipeline which carried effluent to a ditch adjacent to the waste unit.

The source area of SWMU 3 contains approximately 6,615,000 lb of uranium-contaminated waste that has been identified as PTW. No other wastes have been identified as PTW at SWMU 3. The historical record is inconclusive about whether pyrophoric uranium is present in SWMU 3. The total volume is approximately 260,000 ft³. Some uranium-contaminated waste also may be contaminated with TCE, radionuclides, and metals. In 1986, the disposal of waste at C-404 Landfill was halted, and a portion of the disposed of waste was found to be RCRA-hazardous. The landfill was covered with a RCRA multilayered cap and certified closed in 1987. It currently is regulated under RCRA as a land disposal unit and compliance is monitored under a RCRA postclosure permit issued in 1992. The closure plan requires continued groundwater monitoring (DOE 1989). A permit modification was submitted in May 2008, revising the MW network for the unit to add a new upgradient well, MW420 (DOE 2008). MW420 is screened in the upper RGA. The permit conditions are summarized in Appendix G.

No surface soil samples were collected from the surface of the Subtitle C cap. Presumably clean materials were used to construct the cap; however, subsequent to the construction of the cap, radiological surveys of adjacent roadways revealed contamination. In response to these survey results, additional gravel has been added to the roadways to prevent vehicles from spreading contamination. Though it has not been surveyed, radiological technicians have posted the cap as a radiological area as a result of elevated readings on the gravel roads and pads adjacent to the cap. In 2011, a water sample originating from a cap drain pipe was collected and analyzed for approximately 190 constituents (VOAs, SVOAs, metals, radionuclides, and PCBs). Eleven constituents were detected by the analyses; all but one (U-238) fell below the NFA threshold of a preliminary human health risk screening. Though the sample was not collected as part of an approved work plan and the manner in which it was collected made it susceptible to cross contamination, the presence of elevated levels of U-238 creates an element of uncertainty as to the nature and extent of contamination in the cap.

Subsurface soil samples collected from angled borings beneath the unit indicate the presence of U-238 and U-234 above background in a few locations. Uranium and uranium isotopes were not detected above background in any samples below 20 ft.

For UCRS groundwater, RI and historical data identified levels of metals (arsenic, iron, lead, manganese, molybdenum, or uranium), TCE, Tc-99, and U-238 that exceed screening criteria at all sampling locations (DOE 2010b). Any releases to subsurface soils and groundwater may be related to past uses of the unit as a surface impoundment or as the current RCRA-regulated landfill.

The BGOU RI found RGA groundwater contaminants exceeding screening levels for SWMU 3 are metals (arsenic, iron, manganese, and uranium); organics (1,1-DCE, chloroform, and TCE); and radionuclides (U-234 and U-238).

URGA well MW420 (background) is the only URGA well with Tc-99 levels above the minimum detectable activity. The absence of Tc-99 in downgradient RGA wells demonstrates that the C-404 Landfill is not a source of statistically quantifiable levels of Tc-99. Note: UCRS wells MW85, MW88, MW91, and MW94 have detectable levels of Tc-99; only MW91 has a Tc-99 level greater than 900 pCi/L.

Dissolved-phase contamination with TCE is present in UCRS groundwater at SWMU 3 above MCLs. There is ~~are~~ no evidence disposal records of TCE disposal at SWMU 3, and leachate collection records do not indicate the continued presence of TCE DNAPL or high concentration TCE in soils at SWMU 3. Note that there are uncertainties associated with the leachate's origin (see Section 1.5.7).

The hydrogeological assessment of SWMUs 2 and 3 that was completed as part of the BGOU RI (PRS 2007a) documents that an upgradient source accounts for the high TCE concentrations in RGA groundwater. Because the 1,1-DCE detects occurred only in upgradient wells, it also appears to be related to an upgradient source.

Groundwater monitoring under the RCRA permit for the unit, however, has shown statistically significant increases of TCE above background in one of three downgradient compliance wells in the upper RGA (MW84). C-404 Landfill Source Demonstration, Paducah Gaseous Diffusion Plant, Paducah, Kentucky (PRS 2007b), related the increase in TCE levels to trends in the Southwest Plume and does not indicate that SWMU 3 is the contributor.

6.1.2 Risk Summary

This risk summary reflects the summary presented in the BGOU RI (DOE 2010b). Additional information can be found in Sections 1.5 and 1.6 of this report.

Sections 1.5 and 1.6.3 outline the potential risks posed by contaminants detected in soil that must be addressed in this FS, as developed through a review of the BGOU RI BHHRA and COCs, refining these as appropriate, and addressing uncertainties with a review of data collected subsequent to completion of the BHHRA. The BGOU RI BHHRA for SWMU 3 summarized the WAG 22 BHHRA, which evaluated risks using combined data from SWMUs 2 and 3. In addition, the WAG 22 BHHRA identified the COCs based on samples collected to depths of 8 ft, so these would be considered COCs for both surface and subsurface soils.

The primary threat from the SWMU is associated with the potential for risk to persons who may be exposed to waste. Although unacceptable direct contact risks were identified for industrial workers exposed to affected soils in the combined SWMU 2 and SWMU 3 BHHRA, a review of the current data shows the concentrations of these radionuclides in soils at SWMU 3 are much lower than at SWMU 2 and the unacceptable direct contact risks accrue to SWMU 2. Target COCs for direct contact include metals and uranium isotopes.

The BGOU RI BHHRA also identified COCs that may migrate to the RGA at levels that would limit future residential use. These were reviewed and the list refined (see Sections 1.5.4 and 1.6.3).

6.1.3 Hydrogeological Interpretation

The study area geology and hydrogeology are summarized below, as documented in the BGOU RI (DOE 2010b). Because SWMUs 2 and 3 are adjacent to each other, their hydrogeological interpretation is discussed as one.

Stratigraphy. The burial cells of SWMU 3 are constructed immediately above the HU1 loess member (silt with some clay) of the UCD. This is different from conditions at SWMU 2 where the burial cells were excavated into HU1. Although SWMU 3 is constructed above HU1, some waste cells in SWMU 2 likely extend to near the base of the HU1 unit, at a depth of 18.5 ft. The underlying HU2 interval consists of upper and lower sand and gravel horizons, separated by an intervening clayey silt unit, to a depth of 40 ft. A 9-ft thick silty clay interval (HU3) separates the HU2 sand and gravel horizons from the basal HU4 sand and the sands and gravels of the LCD (HU5).

UCRS Groundwater Flow and Hydraulic Potential. The SWMU 2 Data Summary and Interpretation Report (DOE 1997) documents the depth and gradient of the water table in the vicinity of SWMU 3 using measurements from shallow MWs and piezometers. Four rounds of measurements of water level during a one-week period in August 1996 consistently demonstrate that the water table occurred within 10 ft of land surface, sloping toward a ditch on the west side. RCRA compliance monitoring for SWMU 3 indicates differing conditions at SWMU 3—gradients vary but are net northward. The depth to water typically is greater than 10 ft bgs. Because SWMU 3 is an aboveground facility with a Subtitle C cap, the actual saturation level within the waste is unknown; ~~however, the rate of dewatering of the SWMU contents is nearly constant (from a review of leachate data) and, combined with the 10+ ft difference between the bottom of the wastes and the top of the water table, indicates the bulk of the landfill wastes are in saturated conditions.~~¹⁰, and there are uncertainties associated with the leachate collection pit's

¹⁰ ~~The continuing recovery of leachate from the facility indicates that the unit is still dewatering and that some portion of the base of the disposal cell must be saturated.~~

~~origin~~ (1) the integrity of the existing Subtitle C cap, (2) the integrity of the clay bottom liner (i.e., the well-tamped clay floor that served as the floor of the former surface impoundment), and (3) the integrity of the concrete leachate collection sump/pit (see Section 1.5.7 and Section 1.6.3.2).

RGA Groundwater Flow and Hydraulic Potential. The BGOU RI includes a hydrogeological assessment of SWMU 3 (PRS 2007a), which documents the primary groundwater pathways in the RGA. Contaminant trends associated with the Southwest Plume demonstrate convincingly that the dominant groundwater pathway immediately south of SWMU 3 is to the north/northwest, in agreement with the larger Southwest Plume trend, which passes beneath the south end of SWMU 2. Beneath SWMU 3, the groundwater pathway veers northward.

The governing parameters determining the groundwater flow paths are the higher hydraulic conductivity corridors in the RGA marked by the Southwest Plume and the Northwest Plume to the south and north of SWMU 3, respectively, and the RGA potentiometric surface, which declines to the north. Edges of the Southwest Plume and Northwest Plume approximate boundaries of higher hydraulic conductivity in the HU5 sediments, through which the majority of groundwater flow occurs. Pumping tests of the RGA in the area of the main contaminant plumes on-site (Terran 1992; LMES 1996) have determined the representative hydraulic conductivity to be 1,200 to 1,300 ft/day, which contrasts with the hydraulic conductivity of the RGA beneath SWMU 3, measured as 100 ft/day in a previous pumping test (Terran 1990).

The northward groundwater flow beneath SWMU 3 is an intermediate flow path between the hydraulic conductivity “expressways” delineated by the Southwest Plume (to the south of SWMU 3) and the Northwest Plume (to the north of SWMU 3) and is related to seasonal variations in potentiometric head.

Average RGA groundwater flow velocity in the areas of the contaminant plumes is commonly 1 to 3 ft/day. Hydraulic potential gradients to the north and to the west are commonly similar in the SWMU 3 area. The northward groundwater flow rate beneath SWMU 3 is likely 0.1 to 0.3 ft/day, in step with the order-of-magnitude reduction in hydraulic conductivity beneath SWMU 3.

6.2 SWMU-SPECIFIC RAOs

RAOs that are specific to SWMU 3 were developed based on the findings and observations from the BGOU RI Report. The SWMU-specific RAOs are directed toward conditions related to the waste materials and affected soils, the surface soils, and the subsurface soils at the SWMU.

Approximately 6,615,000 lb of uranium-contaminated waste and wastes in buried drums represent a principal threat should exposure occur. ~~Leachate is collected from the base of the unit; thus, uranium~~ Uranium found at SWMU 3 is unlikely to pose a threat to underlying soil and groundwater due to its relative immobility and the collection of leachate. Note that there are uncertainties associated with (1) possible radiological contamination of the surface soil at SWMU 3, (2) the integrity of the existing Subtitle C cap, (3) the integrity of the clay bottom liner (i.e., the well-tamped clay floor that served as the floor of the former surface impoundment), and (4) the integrity of the concrete leachate collection sump/pit (see Section 1.5.7, Table 1.13, Section 1.6.3.1, and Section 1.6.3.2).

SWMU-Specific RAO for Protection of Groundwater. Contribute to the protection of groundwater by eliminating, reducing, or controlling sources of groundwater contamination (see Section 1.6 for target COCs) that could result in an exceedance in RGA groundwater of the MCL (or risk-based concentration for residential use of groundwater in the absence of an MCL).

SWMU-Specific RAO for Protection of Direct Contact with Waste. Prevent exposure to waste that exceeds target cumulative ELCRs and cumulative noncancer HIs for the future industrial and future excavation worker receptors. The acceptable cumulative risk levels for this RAO are defined as follows:

- Waste: Cumulative ELCR < 1E-05 and cumulative HI ≤ 1 for a future excavation worker [considering site-specific exposures based upon SWMU size/area as footnoted in the 2013 Risk Methods Document (DOE 2013a)].

SWMU-Specific RAO for Protection of Direct Contact with Contaminated Soils. Prevent exposure to contaminated soils that exceeds target cumulative ELCRs and cumulative noncancer HIs for the future industrial and future excavation worker receptors.¹¹ The acceptable cumulative risk levels for this RAO are defined as follows:

- Surface Soils: Cumulative ELCR < 1E-05 and cumulative HI ≤ 1 for a future industrial worker [considering default exposure in the 2013 Risk Methods Document (DOE 2013a)].
- Surface and Subsurface Soil: Cumulative ELCR < 1E-05 and cumulative HI ≤ 1 for a future excavation worker [considering site-specific exposures based upon SWMU size/area as footnoted in the 2013 Risk Methods Document (DOE 2013a)].

SWMU-Specific RAO for PTW. Treat or remove PTW wherever practicable, consistent with 40 *CFR* § 300.430 (a)(1)(iii)(A).

PRGs were developed consistent with the approach described in Section 2.

The PRGs identified for target compounds to be addressed in this FS for protection of groundwater and direct contact at SWMU 3 are listed in Table 6.1. No surface soil samples were collected from the top of the cap; therefore, an uncertainty remains as to the risk posed by direct contact with the surface soil.

6.3.2 Alternative 1—No Action

The No Action alternative is defined in accordance with CERCLA and provides a baseline to which other alternatives can be compared. Under this alternative, no action would be taken to implement remedial activities for SWMU 3 or to reduce the potential hazard to human or ecological receptors. Alternative 1 does not address PTW or any of the COCs identified in SWMU 3 soils that pose an unacceptable risk under some future use scenarios because no action is taken.

Alternative 1 recognizes that there is a Subtitle C cap present on SWMU 3 and that leachate currently is collected from a leachate ~~collection sump~~ pit and treated as needed prior to discharge/disposal. Note that there are uncertainties associated with the efficacy of the leachate pit (see Section 1.5.7). This alternative has no provisions to ensure continued leachate collection or cap maintenance; thus, this alternative does not meet the threshold criterion of protection of human health and the environment.

¹¹ No surface soil data were collected at the waste unit. The surface samples in the discharge ditch are evaluated separately in Section 1.5.

6.3.3 Alternative 3—Containment, Surface Controls, LUCs, and Monitoring

Alternative 3 will evaluate means to effectively contain waste and contaminated soil in place and limit direct contact through the use of caps, surface controls, and LUCs.

As applied at SWMU 3, this alternative recognizes the existing RCRA Subtitle C cap and leachate ~~collection system~~ pit that currently prevent direct contact with the waste and significantly reduce infiltration of precipitation into buried wastes. Additionally, surface controls, monitoring, and LUCs will be evaluated.

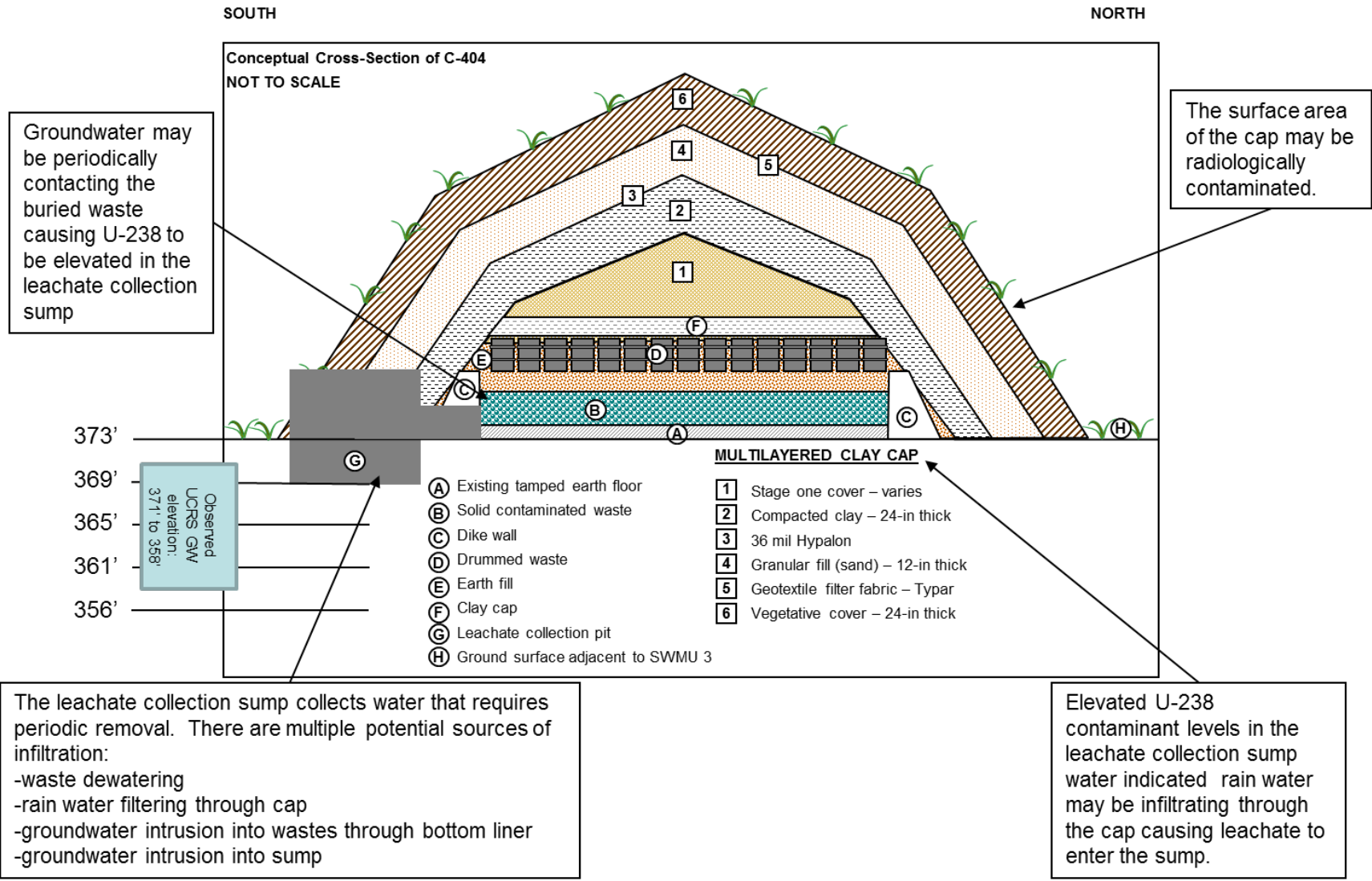
Uncertainties. As previously stated, there are uncertainties associated with (1) possible radiological contamination of the surface soil on/in the existing RCRA Subtitle C cap, (2) the integrity of the existing Subtitle C cap, (3) the integrity of the clay bottom liner (i.e., the well-tamped clay floor that served as the floor of the former surface impoundment), and (4) the integrity of the concrete leachate collection sump/pit (see Section 1.5.7, Table 1.13, Section 1.6.3.1, and Section 1.6.3.2). Figure 6.XX illustrates these uncertainties.

In order to address these uncertainties, Alternative 3 will include a Remedial Design Site Investigation (RDSI) to evaluate each uncertainty. The RDSI activities will include a radiological survey and/or soil sampling to assess the cap contamination, an evaluation of performance data to determine the degree to which the cap may be leaking, additional groundwater elevation studies to determine if groundwater is intruding into the waste through the clay bottom liner, and a detailed evaluation of the sump/pit to determine if it is leaking.

As part of the RDSI, an Engineering Evaluation will be conducted to evaluate impacts of the riprap on the integrity and performance of the existing RCRA Subtitle C cap. The Engineering Evaluation also will consider the RDSI data to determine if additional measures need to be implemented to address any/all of the uncertainties. Additional measures to address the uncertainties may include additional cover over the existing cap to address radiological contamination, additional liners over the existing cap to prevent rain water infiltration, slurry walls to prevent groundwater intrusion through the clay bottom liner, and/or lining or replacement of the sump/pit to prevent leakage.

If it is determined that the SWMU 3 cap is radiologically contaminated and has caused surficial/shallow radiological contamination beyond the SWMU 3 administrative boundary, then this contamination will be addressed by Alternative 3.

Figure 6.XX Identified Uncertainties with SWMU 3, Alternative 3



6.3.3.5 Summary of SWMU-specific alternative

Table 6.3 identifies and summarizes the features that will be included for Alternative 3 at SWMU 3.

Table 6.3. SWMU 3, Alternative 3 Components

General Response Action	Technologies	RPOs *
Containment	Caps	RCRA Subtitle C cap
Surface Controls	Surface Barriers	Riprap (contingent upon property transfer)
Monitoring	Groundwater Monitoring	Conventional groundwater monitoring
LUCs	Physical Controls	Warning signs
	Administrative Controls	E/PP Program Property record notices Deed and/or lease restrictions (contingent upon transfer) CERCLA 120(h)

* Note: Alternative 3 also will include RDSI and Engineering Study to address uncertainties.

Alternative 3 satisfies the first RAO and contains waste in place. Risk to groundwater also is mitigated through containment.

- The RCRA Subtitle C cap and clay bottom liner (i.e., well-tamped clay floor that served as the floor of the former surface impoundment) existing leachate collection system work, using hydraulics are present to isolate the waste, above the water table. Because the amount of leachate or its origin cannot be verified with existing information (e.g., if and how much groundwater is in the leachate), the efficacy of the RCRA Subtitle C cap and clay bottom liner (i.e., well-tamped clay floor that served as the floor of the former surface impoundment) cannot be calculated with certainty. As described in Section 6.3.3, there are there are uncertainties associated with (1) possible radiological contamination of the surface soil on/in the existing RCRA Subtitle C cap, (2) the integrity of the existing Subtitle C cap, (3) the integrity of the clay bottom liner (i.e., the well-tamped clay floor that served as the floor of the former surface impoundment), and (4) the integrity of the concrete leachate collection sump/pit. An RDSI will be conducted to assess the uncertainties, and an Engineering Study will be conducted to ensure the uncertainties are addressed properly.
- RGA groundwater MWs would monitor remedy effectiveness.

Alternative 3 satisfies the second RAO. The potential for direct contact would be mitigated through layered controls.

- The RCRA Subtitle C cap forms a barrier to prevent infiltration, and it also mitigates intrusion. As described in Section 6.3.3, there are there are uncertainties associated with (1) possible radiological contamination of the surface soil on/in the existing RCRA Subtitle C cap, and (2) the integrity of the existing Subtitle C cap. An RDSI will be conducted to assess the uncertainties, and an Engineering Study will be conducted to determine whether interim measures need to be implemented for the cap to support the riprap and to ensure the uncertainties are addressed properly. If it is determined that the SWMU 3 cap is radiologically contaminated and has caused surficial/shallow radiological contamination beyond the SWMU 3 administrative boundary, then this contamination will be addressed by Alternative 3.

- Physical LUCs would provide warning at the site, and administrative LUCs would provide warning and mitigate potential exposure.
- ~~Upon property transfer, riprap~~ Riprap would be placed over the RCRA Subtitle C cap.

Regarding the third RAO, Alternative 3 does not include treatment or removal of PTW.

Additional details used for cost estimating purposes are presented in Table 6.4 and Appendix E.

Table 6.4. SWMU 3, Alternative 3 Key Cost Drivers and Key Assumptions

CAPITAL COSTS ...
ANNUAL COSTS ...

The riprap and bedding layer would extend slightly past the existing toe of slope and would cover surface contamination near the compliance wells.

6.3.4 Alternative 5—Excavation, Disposal, Treatment, LUCs, and Monitoring

General Alternative 5 assembles RPOs primarily from the removal, treatment, and disposal GRAs. Ex situ treatment also is evaluated to treat wastes (as needed) on- site or off-site in accordance with ARARs prior to disposal should they not meet the disposal facility’s WAC. Finally, LUCs and monitoring are evaluated and would be implemented if excavation and in situ treatment do not result in UU/UE conditions.

Uncertainties. If it is determined that the SWMU 3 cap is radiologically contaminated and has caused surficial/shallow radiological contamination beyond the SWMU 3 administrative boundary, then this contamination will be addressed by Alternative 5.

Table 6.7. SWMU 3 Specific Alternative Key Features

Alternative	Name	Key features
1	No Action	No action
3	Containment, Surface Controls, LUCs, and Monitoring	<ul style="list-style-type: none"> • RCRA Subtitle C cap (Existing) • Riprap (contingent upon property transfer) • Monitoring • LUCs • <u>RDSI and Engineering Study to address uncertainties</u>
5	Excavation and Disposal, Treatment, LUCs, and Monitoring	<ul style="list-style-type: none"> • Installation of sheet pile delineating excavation bounds • Excavation of buried waste materials and affected soils • Post remediation sampling and analysis • WAC sampling and analysis • <i>Ex situ</i> waste treatment (as needed) to meet WAC requirements • Waste disposal* • Backfill excavation • LUCs • Monitoring

6.4 DETAILED ANALYSIS OF ALTERNATIVES

In this section, each of the SWMU-specific alternatives are analyzed against the nine evaluation criteria. Of the criteria, Overall Protection of Human Health and Environment and Compliance with ARARs are threshold criteria and the remaining seven criteria are balancing criteria.

6.4.1 Alternative 1—No Action

The No Action alternative is defined in accordance with CERCLA and provides a baseline to which other alternatives can be compared. A Subtitle C cap and clay bottom liner (i.e., well-tamped clay floor that served as the floor of the former surface impoundment) ~~a leachate collection system~~ are in place at SWMU 3, which is a closed unit under the jurisdiction of the KY RCRA program. Note that there are uncertainties associated with the leachate pit (see Section 1.5.7). Under this alternative, SWMU 3 will continue to be monitored and managed in accordance with the requirements of the RCRA permit. A summary of the current postclosure care requirements of the RCRA permit are summarized in Appendix G.

Alternative 1 acknowledges the existence of a Subtitle C cap at SWMU 3 and current permit conditions.

6.4.1.1 Overall protection of human health and the environment

This alternative is not protective of human health and the environment because this alternative has no element that would extend controls or containment as long as waste is in place. Waste (including PTW) is not treated or removed at SWMU 3, but a cover is in place to control access to the waste and soils in close proximity to the waste. No additional controls would be implemented to protect site workers or the public. This alternative includes no elements to extend controls beyond the RCRA-designated period or the DOE-control period.

No ecological impacts at the BGOU are anticipated under this alternative (or any other alternative at SWMU 3). The BGOU is located at an active operational facility already disturbed by construction and operational activities and does not support any unique or significant ecological resources. No known archaeological or historical sites or T&E species would be impacted by this alternative.

6.4.1.2 Compliance with ARARs

There are no actions for Alternative 1; thus, there are no action-specific ARARs.

6.4.1.3 Long-term effectiveness and permanence

Existing site controls are present to prevent exposure to the waste and underlying groundwater. The potential for leaching of contaminants to the RGA currently is reduced or prevented by the existing Subtitle C cap, compacted soil liner, and leachate collection system clay bottom liner (i.e., well-tamped clay floor that served as the floor of the former surface impoundment). Note that there are uncertainties associated with the leachate pit (see Section 1.5.7). This alternative does not provide any long-term controls to manage residual risk at this SWMU; thus, it has low long-term effectiveness and permanence.

6.4.1.3.1 Reduction of toxicity, mobility, or volume through treatment

This alternative does reduce toxicity, mobility, or volume through treatment to a small degree associated with leachate that currently is collected and treated. Note that there are uncertainties associated with the leachate pit (see Section 1.5.7).

6.4.1.3.2 Short-term effectiveness

No actions would be implemented under Alternative 1; therefore, no additional risks to workers, the public, or the environment would be incurred. The existing elements cause Alternative 1 to be effective in the short-term.

6.4.1.3.3 Implementability

The No Action alternative is implementable. If future monitoring in accordance with the post-closure permit indicates that additional remedial action is necessary, this alternative would not impede implementation of other remedial activities in the future.

The ongoing public awareness program would require regular coordination with the DOE, KY, and EPA.

6.4.1.3.4 Cost

The preliminary cost estimates for Alternative 1 serve as a baseline for comparison of the other remedial alternatives. These cost estimates are based upon FS-level scoping and are intended to aid with selection of a preferred alternative. There are no capital or O&M costs associated with Alternative 1; thus, the cost rating is high.

6.4.2 Alternative 3—Containment, Surface Controls, LUCs, and Monitoring

Alternative 3 prevents direct contact with waste and contaminated soil through the existing RCRA Subtitle C cap and LUCs. The existing cap mitigates vertical infiltration of water and promotes runoff. Upon property transfer, riprap would be placed over the RCRA Subtitle C cap.

Uncertainties. As previously stated, there are uncertainties associated with (1) possible radiological contamination of the surface soil on/in the existing RCRA Subtitle C cap, (2) the integrity of the existing Subtitle C cap, (3) the integrity of the clay bottom liner (i.e., the well-tamped clay floor that served as the floor of the former surface impoundment), and (4) the integrity of the concrete leachate collection sump/pit (see Section 1.5.7, Table 1.13, Section 1.6.3.1, and Section 1.6.3.2).

In order to address these uncertainties, Alternative 3 will include a Remedial Design Site Investigation (RDSI) to evaluate each uncertainty. The RDSI activities will include a radiological survey and/or soil sampling to assess the cap contamination, an evaluation of performance data to determine the degree to which the cap may be leaking, additional groundwater elevation studies to determine if groundwater is intruding into the waste through the clay bottom liner, and a detailed evaluation of the sump/pit to determine if it is leaking.

An Engineering Evaluation will be conducted to determine whether interim measures need to be implemented for the cap to support the riprap. The Engineering Evaluation also will consider the RDSI data to determine if additional measures need to be implemented to address any/all of the uncertainties. Additional measures to address the uncertainties may include additional cover over the existing cap to address radiological contamination, additional liners over the existing cap to prevent rain water infiltration, slurry walls to prevent groundwater intrusion through the clay bottom liner, and/or lining or replacement of the sump/pit to prevent leakage.

If it is determined that the SWMU 3 cap is radiologically contaminated and has caused surficial/shallow radiological contamination beyond the SWMU 3 administrative boundary, then this contamination will be addressed by Alternative 3.

6.4.2.1 Overall protection of human health and the environment

This alternative is protective of human health and the environment through a combination of containment and LUCs. The waste is reliably contained and leachate is collected and treated. Note that there are uncertainties associated leachate pit (see Section 1.5.7). The existing Subtitle C cap augmented with riprap (contingent upon property transfer), and LUCs prevent direct contact with the waste.

6.4.2.2 Compliance with ARARs

Alternative 5 would meet this threshold criterion for SWMU 3.

Action-specific ARARs for this alternative are summarized in Appendix F.

No chemical-specific ARARs have been identified.

A wetlands assessment would be performed prior to remedy implementation. Although it is not anticipated, if an action should involve discharge of dredge or fill material into waters of the United States, including jurisdictional wetlands, potential location-specific ARARs are summarized in Appendix F.

6.4.2.3 Long-term effectiveness and permanence

Alternative 3 would be moderately effective regarding long-term effectiveness and permanence. It would mitigate the uncertainty of contact with surface soil and prevent exposure to waste and subsurface contamination at concentrations above RGs. It minimizes the contribution of contaminants to the RGA;

however, waste and associated risk would remain at the unit. LUCs would protect current and future receptors (Section 2.4.1.1).

The degree of long-term effectiveness and permanence is dependent upon maintenance of the existing Subtitle C cap, O&M of the leachate ~~extraction system~~ pit, and groundwater monitoring.

Magnitude of Residual Risk. This alternative effectively manages direct contact risk by extending the depth from the surface to the buried waste. Signs and the multilayer cap also inform the intruder of the potential dangers associated with direct contact to the waste and contaminated soil.

This remedy includes groundwater monitoring, which will monitor remedy effectiveness at preventing COC migration to the RGA.

Need for Five-Year Review. Because this remedy will not result in UU/UE conditions, five-year reviews will be required to ensure that the remedy remains protective.

Adequacy and Reliability of Controls. The physical and administrative controls listed in this remedy are adequate to meet threshold criteria. The physical controls to protect from direct contact require a low degree of maintenance to maintain adequacy.

6.4.2.4 Reduction of toxicity, mobility, or volume through treatment

Alternative 3 includes very minimal treatment to reduce mobility, toxicity, or volume through treatment. Treatment only is accomplished for COCs collected through the leachate collection system.

PTW. The PTW identified at SWMU 3 would remain in place untreated.

6.4.2.5 Short-term effectiveness

The short-term effectiveness of Alternative 3 is high because it largely leaves waste undisturbed.

Protection of Community during Remedial Actions. Implementation of Alternative 3 has low potential for impact to the community during remedial action.

Protection of Workers during Remedial Actions. Implementation of Alternative 3 has low potential for remediation worker exposure. Exposure to contaminated surface soils, subsurface soils, and groundwater during environmental sampling also is low. Potential exposure pathways include inhalation of dust containing surficial soils, dermal contact with surficial and subsurface soils, exposure to external penetrating radiation associated with buried waste, and dermal contact with contaminated groundwater.

Environmental Impacts. No ecological impacts at the BGOU are anticipated under this alternative. The BGOU is located at an active operational facility already disturbed by construction and operational activities and does not support any unique or significant ecological resources. No known archaeological or historical sites or T&E species would be impacted by this alternative. Risk assessment and mitigation of potential risks for ecological receptors in nearby drainage ditches are within the scope of the Surface Water OU.

6.4.2.6 Implementability

Implementation of the remedial action components of Alternative 3 is technically feasible, and the alternative consists of demonstrated technologies, standard construction methods, materials, and equipment that are available from vendors and contractors.

Ability to Construct and Operate Technology. All construction components of Alternative 3 are highly implementable consisting of demonstrated technologies and standard construction methods, materials, and equipment. Therefore, this alternative is highly implementable in the short-term.

Reliability of Technology. All of the technologies employed in Alternative 3 are highly reliable.

Ease of Undertaking Additional Remediation. The addition of riprap (to the existing cap) could impede additional remediation should it be undertaken (e.g., would increase the cost of a future excavation), but it would not prevent additional remediation.

Monitoring Considerations. As indicated in Chapter 3, SWMU 3 is located over a contaminant plume (i.e., the PGDP Northwest Plume), so there would be impediments to the evaluation of groundwater monitoring data. Statistical evaluations and trending would be used to identify any groundwater impacts that may be attributable to SWMU 3.

Coordination with Other Agencies. The means and methods for coordinating with other agencies are established in the PGDP FFA. This remedy would not require involvement of new agencies.

Availability of Equipment and Specialists. All equipment and specialists are readily available.

6.4.2.7 Cost

Consistent with EPA guidance (EPA 2000), the cost estimates in this FS consist of a 1,000-year period due to the nature of the contaminants, including long-lived radionuclides. Net present value/worth cost estimates are presented for the individual and comparative analysis of alternatives and for remedy selection (EPA 1988). The real discount rate has been obtained from OMB guidance (reference Appendix C in OMB circular A-94). In addition, nondiscounted cost estimates (i.e., capital and average annual O&M) are presented for comparison purposes only.

Net Present Worth Cost	\$
Nondiscounted Cost	
• Capital Cost	\$
• Average Annual O&M Cost	\$

6.4.3 Alternative 5—Excavation, Disposal, Treatment, LUCs, and Monitoring

Alternative 5 anticipates waste disposal using existing pathways (commercial or federally owned).

Based on the original C-404 design drawings, the floor of the original impoundment was at elevation 373 ft. For estimating purposes, a 4 ft over-excavation is assumed. For estimating purposes, it is assumed that all soils above elevation 372 will be removed with a contingency included to remove one additional ft of soil (to elevation 371).

Excavation, treatment of excavated waste, and disposal of waste materials and affected soils for Alternative 5 is based on removal of the entire area of SWMU 3 (137 ft × 387 ft) to a depth of approximately 4 ft below pond bottom. This excavation will generate approximately 28,000 yd³ (loose) of contaminated waste materials. The LLW/MLLW (20,000 yd³) may be treated on-site, in accordance with ARARs, or off-site, then disposed of off-site at a licensed commercial or federal facility, or a potential

OSWDF, if available. The remaining soil volume would be disposed of at C-746-U Landfill (7,000 yd³) on-site at PGDP. If it is determined that the SWMU 3 cap is radiologically contaminated and has caused surficial/shallow radiological contamination beyond the SWMU 3 administrative boundary, then this contamination will be addressed by Alternative 5.

6.5 COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 6.8 summarizes the detailed analysis conducted in Section 6.4. Table 6.9 provides a comparative analysis for source area alternatives for SWMU 3.

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ATTACHMENT 3

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Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
Groundwater monitoring requirements																
Groundwater monitoring requirements for RCRA hazardous waste landfills	<p>The owner or operator's regulated unit or units are not subject to regulation for releases into the uppermost aquifer under this subpart if:</p> <p>(2) He operates a unit which the Regional Administrator finds:</p> <p>(i) Is an engineered structure,</p> <p>(ii) Does not receive or contain liquid waste or waste containing free liquids,</p> <p>(iii) Is designed and operated to exclude liquid, precipitation, and other run-on and run-off,</p> <p>(iv) Has both inner and outer layers of containment enclosing the waste,</p> <p>(v) Has a leak detection system built into each containment layer,</p> <p>(vi) The owner or operator will provide continuing operation and maintenance of these leak detection systems during the active life of the unit and the closure and post-closure care periods, and</p> <p>(vii) To a reasonable degree of certainty, will not allow hazardous constituents to migrate beyond the outer containment layer prior to the end of the post-closure care period.</p> <p><i>Note: The determination on use of an exemption will be documented in a CERCLA decision document (i.e. ROD, ROD Amendment, or ESD) subject to review and approval under the FFA process.</i></p>	Groundwater monitoring of hazardous constituents from a RCRA regulated unit as defined in 40 CFR 264.90(a)(2) — applicable to SWMU 3	<p>40 CFR § 264.90(b)</p> <p>40 CFR § 264.90(b)(2)</p>						✓							
Groundwater monitoring requirements for a RCRA hazardous waste landfills regulated unit	<p>All or part of the requirements for releases from solid waste management units of 40 CFR §§ 264.91 through 264.100 may be replaced with alternative requirements for groundwater monitoring and corrective action for releases to groundwater set out in the enforceable CERCLA document where it has been determined that: <u>The Regional Administrator may replace all or part of the requirements of §§264.91 through 264.100 applying to a regulated unit with alternative requirements for groundwater monitoring</u></p>	<p>Conducting monitoring for responding to releases from units with hazardous waste left in place under <u>Groundwater monitoring of hazardous constituents from a RCRA regulated unit as defined in 40 CFR § 264.90(a)(2) —applicable to SWMU 3</u></p>	<p>40 CFR § 264.90(f)</p> <p>401 KAR 34:060 § 1</p>						✓							

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p><u>and corrective action for releases to groundwater set out in the permit (or in an enforceable document) (as defined in 40 CFR 270.1(c)(7)) where the Regional Administrator determines that:</u></p> <p>(1) The regulated unit is situated among solid waste management units (or areas of concern), a release has occurred, and both the regulated unit and one or more solid waste management unit(s) (or areas of concern) are likely to have contributed to the release; and</p> <p>(2) It is not necessary to apply the groundwater monitoring and corrective action requirements of 40 CFR §§ 264.91 through 264.100 because alternative requirements will protect human health and the environment.</p> <p><i>Note: Alternate groundwater monitoring requirements will be documented in a CERCLA decision document (i.e. ROD, ROD Amendment, or ESD) subject to review and approval under the FFA process.</i></p>		<p>40 CFR § 264.90(f)(1) and (2) 401 KAR 34:060 § 1</p> <p>40 CFR § 264.90(f)(2) 401 KAR 34:060 § 1</p>													
Point of Compliance for meeting GW protection standards	<p>The Regional Administrator will specify in the facility permit the point of compliance at which the ground-water protection standard of §264.92 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.</p> <p><i>Note: Permitting is an administrative requirement and not ARAR. The point of compliance will be specified in the appropriate FFA CERCLA primary document.</i></p> <p>The waste management area is the limit projected in the horizontal plane of the area on which waste will be placed during the active life of a regulated unit.</p> <p>(1) The waste management area includes horizontal space taken up by any liner, dike,</p>	Groundwater monitoring of hazardous constituents from a RCRA regulated unit as defined in 40 CFR 264.90(a)(2) — applicable to SWMU 3	<p>40 CFR § 264.95(a) 401 KAR 34:060 § 6</p> <p>40 CFR § 264.95(b) 401 KAR 34:060 § 6</p> <p>40 CFR § 264.95(b)(1) 401 KAR 34:060 § 6</p>					✓								

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
SWMU 30: Alt 3: Cap, LUCs, and Monitoring
SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p><u>or other barrier designed to contain waste in a regulated unit.</u></p> <p><u>(2) If the facility contains more than one regulated unit, the waste management area is described by an imaginary line circumscribing the several regulated units.</u></p>		<p><u>40 CFR § 264.95(b)(2)</u> <u>401 KAR 34:060 § 6</u></p>													
<p><u>Compliance period for GW protection</u></p>	<p><u>Owners and operators subject to this subpart must conduct a monitoring and response program as follows:</u></p> <p><u>Whenever hazardous constituents under §264.93 from a regulated unit are detected at a compliance point under §264.95, the owner or operator must institute a compliance monitoring program under §264.99. Detected is defined as statistically significant evidence of contamination as described in §264.98(f);</u></p> <p><u>Note: The decision to move from detection monitoring into compliance monitoring will be included in an ESD that identifies the substantive requirements in 40 CFR § 264.92, 264.93, 264.94, 264.96, and 264.99 as ARARs.</u></p> <p><u>Whenever the ground-water protection standard under §264.92 is exceeded, the owner or operator must institute a corrective action program under §264.100. Exceeded is defined as statistically significant evidence of increased contamination as described in §264.99(d);</u></p> <p><u>Note: The decision to move from compliance monitoring into a corrective action program will be included in a ROD Amendment that identifies the ARARs including 40 CFR § 264.100.</u></p> <p><u>Whenever hazardous constituents under §264.93 from a regulated unit exceed concentration limits under §264.94 in ground water between the compliance point under §264.95 and the downgradient facility property boundary, the owner or operator must institute a corrective action program under §264.100; or</u></p> <p><u>Note: The decision to move from compliance</u></p>	<p><u>Operation of a RCRA regulated unit as defined in 40 CFR § 264.90(a)(2), e.g., hazardous waste landfill — applicable to SWMU 3</u></p>	<p><u>40 CFR § 264.91(a)</u></p> <p><u>40 CFR § 264.91(a)(1)</u> <u>401 KAR 34:060 § 2</u></p> <p><u>40 CFR § 264.91(a)(2)</u> <u>401 KAR 34:060 § 2</u></p> <p><u>40 CFR § 264.91(a)(3)</u> <u>401 KAR 34:060 § 2</u></p>						✓							

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<i>monitoring into a corrective action program will be included in a ROD Amendment that identifies the ARARs including 40 CFR § 264.100.</i>															
	<u>In all other cases, the owner or operator must institute a detection monitoring program under §264.98.</u>	Groundwater monitoring of hazardous constituents from a RCRA regulated unit as defined in 40 CFR 264.90(a)(2) — applicable to SWMU 3	40 CFR § 264.91(a)(4) 401 KAR 34:060 § 2						✓							
	<u>The Regional Administrator will specify in the facility permit the specific elements of the monitoring and response program. The Regional Administrator may include one or more of the programs identified in paragraph (a) of this section in the facility permit as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs will be required.</u> <i>Note: Permitting is an administrative requirement. Specific elements of the groundwater monitoring and response program will be included in the appropriate FFA CERCLA primary document.</i>		40 CFR § 264.91(b) 401 KAR 34:060 § 2						✓							
<u>Groundwater monitoring well construction</u>	All monitoring wells must be cased in a manner that maintains the integrity of the monitoring-well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground-water samples. The annular space (i.e., the space between the bore hole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the ground water.	<u>Construction of RCRA groundwater monitoring well — applicable to SWMU 3</u>	40 CFR § 264.97(c) 401 KAR 34:060 § 8						✓							
	The concentration in the ground water of a hazardous constituent: <ul style="list-style-type: none"> • Must not exceed the background level of that constituent in the ground water. • Must not exceed those listed in 401 KAR 34:060 § 5. NOTE: Concentration limits in the ground water for hazardous constituents will be		40 CFR § 264.94(a) 401 KAR 34:060 § 5						✓							

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	specified as part of a FFA CERCLA document.															
Groundwater monitoring requirements for RCRA hazardous waste landfills (Continued)	<p>Alternate concentration limits for a hazardous constituent may be established if regional administrator finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded, considering:</p> <p>(1) Potential adverse effects on ground-water quality</p> <p>(2) Potential adverse effects on hydraulically connected surface water quality</p> <p>NOTE: Alternate Concentration Limits shall be made as part of the FFA CERCLA document review and approval process.</p>	<p>Conducting monitoring for responding to releases from landfills with hazardous waste remaining in place under 40 CFR § 264.90—applicable to SWMU 3.</p>	<p>40 CFR § 264.94(b)</p> <p>401 KAR 34:060 § 5</p>						✓							
Groundwater monitoring requirements for RCRA hazardous waste landfill	<p>The ground-water monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths to yield ground-water samples from the uppermost aquifer that</p> <ul style="list-style-type: none"> • Represent the quality of background groundwater; <ul style="list-style-type: none"> (1) Represent the quality of background ground water that has not been affected by leakage from a regulated unit <ul style="list-style-type: none"> (i) A determination of background ground-water quality may include sampling of wells that are not hydraulically upgradient of the waste management area where: <ul style="list-style-type: none"> (A) Hydrogeologic conditions do not allow the owner or operator to determine what wells are hydraulically upgradient; and (B) Sampling at other wells will provide an indication of background ground-water quality that is representative or more representative than that provided by the upgradient wells; and • Represent the quality of ground water passing the point of compliance; and <ul style="list-style-type: none"> (2) Represent the quality of ground water 	<p>Operation of a groundwater monitoring program under 40 CFR § 264.98—applicable to SWMU 3.</p>	<p>40 CFR § 264.97(a)</p> <p>401 KAR 34:060 § 8</p> <p>40 CFR § 264.97(a)(1)</p> <p>401 KAR 34:060 § 8</p> <p>40 CFR § 264.97(a)(2)</p> <p>401 KAR 34:060 § 8</p>						✓							

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30		
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5	
Groundwater monitoring requirements for RCRA hazardous waste landfills (Continued)	passing the point of compliance; and <ul style="list-style-type: none"> Allow for the detection of contamination when the hazardous waste or constituents have migrated from the waste management area to the uppermost aquifer. (3) Allow for the detection of contamination when hazardous waste or hazardous constituents have migrated from the waste management area to the uppermost aquifer.		40 CFR § 264.97(a)(3) 401 KAR 34:060 § 8														
	Groundwater The ground-water monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide a reliable indication of ground-water quality below the waste management area. <u>At a minimum the program must include procedures and techniques for:</u> (1) Sample collection; (2) Sample preservation and shipment; (3) Analytical procedures; and (4) Chain of custody control.	Operation of a detection <u>groundwater</u> monitoring program under 40 CFR § 264.98— applicable to SWMU 3.	40 CFR § 264.97(d) 401 KAR 34:060 § 8						✓								
	Groundwater The ground-water monitoring program must include sampling and analytical methods that are appropriate and accurately measure hazardous constituents in ground-water samples.	Operation of a <u>groundwater monitoring program</u> under 40 CFR § 264.98— applicable to SWMU 3.	40 CFR § 264.97(e) 401 KAR 34:060 § 8						✓								
	Ground-water monitoring program must include a determination of the ground-water surface elevation each time ground water is sampled.	Conducting monitoring for responding to releases from landfills with hazardous waste remaining in place <u>Operation of a groundwater monitoring program</u> under 40 CFR § 264.9098— applicable to SWMU 3.	40 CFR § 264.97(f) 401 KAR 34:060 § 8						✓								
	The number and kinds of samples collected to establish background shall be appropriate for the form of statistical test employed following generally accepted statistical principles. <u>In detection monitoring or where appropriate in compliance monitoring, data on each hazardous constituent specified in the permit will be collected from background wells and wells at the</u>	Operation of a <u>groundwater monitoring program</u> under 40 CFR § 264.98— applicable to SWMU 3.	40 CFR § 264.97(g) 401 KAR 34:060 § 8						✓								

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p><u>compliance point(s). The number and kinds of samples collected to establish background shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. The sample size shall be as large as necessary to ensure with reasonable confidence that a contaminant release to ground water from a facility will be detected. The owner or operator will determine an appropriate sampling procedure and interval for each hazardous constituent listed in the facility permit which shall be specified in the unit permit upon approval by the Regional Administrator. This sampling procedure shall be:</u></p> <p><u>(1) A sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained, by reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants, or</u></p> <p><u>(2) an alternate sampling procedure proposed by the owner or operator and approved by the Regional Administrator.</u></p> <p><i>Note: Permitting is an administrative requirement. The appropriate sampling procedure and sampling interval will be included in the appropriate FFA CERCLA primary document.</i></p>		<p><u>40 CFR § 264.97(g)(1)</u> <u>401 KAR 34:060 § 8</u></p> <p><u>40 CFR § 264.97(g)(2)</u> <u>401 KAR 34:060 § 8</u></p>													
	<p><u>Use one of the statistical methods specified in 40 CFR § 264.97(h)(1)-(5) for evaluating groundwater monitoring data. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. Where PQLs are used in any of the following statistical procedures to comply with § 264.97(i)(5), any statistical methods must be protective of human health and the environment.</u></p> <p><u>NOTE: EPA approval of PQLs will be obtained by approval of a FFA CERCLA</u></p>	<p><u>Operation of a groundwater monitoring program under 40 CFR § 264.98—applicable to SWMU 3.</u></p>	<p>40 CFR § 264.97(h) 401 KAR 34:060 § 8</p>						✓							

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p>document. The owner or operator will specify one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent which, upon approval by the Regional Administrator, will be specified in the unit permit. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. Where practical quantification limits (pql's) are used in any of the following statistical procedures to comply with §264.97(i)(5), the pql must be proposed by the owner or operator and approved by the Regional Administrator. Use of any of the following statistical methods must be protective of human health and the environment and must comply with the performance standards outlined in paragraph (i) of this section.</p> <p>A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.</p> <p>An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.</p> <p>A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.</p> <p>A control chart approach that gives control limits for each constituent.</p> <p>Another statistical test method submitted by</p>		<p><u>40 CFR § 264.97(h)(1)</u> <u>401 KAR 34:060 § 8</u></p> <p><u>40 CFR § 264.97(h)(2)</u> <u>401 KAR 34:060 § 8</u></p> <p><u>40 CFR § 64.97(h)(3)</u> <u>401 KAR 34:060 § 8</u></p> <p><u>40 CFR § 264.97(h)(4)</u> <u>401 KAR 34:060 § 8</u></p> <p><u>40 CFR § 264.97(h)(5)</u></p>													

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<u>the owner or operator and approved by the Regional Administrator.</u> <i>Note: Permitting is an administrative requirement. The statistical method for evaluating groundwater monitoring data will be specified in the appropriate FFA CERCLA primary document.</i>		<u>401 KAR 34:060 § 8</u>													
	<u>Any statistical method chosen under §264.97(h) for specification in the unit permit shall comply with the following performance standards, as appropriate.</u> <u>The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.</u> <u>If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experimentwise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts.</u> <u>If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be proposed by the owner or operator and approved by the Regional Administrator if he or she finds it to be protective of human</u>	<u>Operation of a groundwater monitoring program under 40 CFR § 264.98—applicable to SWMU 3.</u>	<u>40 CFR § 264.97(i)</u> <u>401 KAR 34:060 § 8</u> <u>40 CFR § 264.97(i)(1)</u> <u>401 KAR 34:060 § 8</u> <u>40 CFR § 264.97(i)(2)</u> <u>401 KAR 34:060 § 8</u> <u>40 CFR § 264.97(i)(3)</u> <u>401 KAR 34:060 § 8</u>						✓							

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p><u>health and the environment.</u></p> <p><i>Note: Permitting is an administrative requirement. If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values will be included in the appropriate FFA CERCLA primary document.</i></p> <p><u>If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be proposed by the owner or operator and approved by the Regional Administrator if he or she finds these parameters to be protective of human health and the environment. These parameters will be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.</u></p> <p><i>Note: Permitting is an administrative requirement. If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain will be included in the appropriate FFA CERCLA primary document.</i></p> <p><u>The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any PQL approved by the Regional Administrator under § 264.97(h) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.</u></p> <p><u>If necessary, the statistical method shall</u></p>		<p><u>40 CFR § 264.97(i)(4)</u> <u>401 KAR 34:060 § 8</u></p> <p><u>40 CFR § 264.97(i)(5)</u> <u>401 KAR 34:060 § 8</u></p> <p><u>40 CFR § 264.97(i)(6)</u></p>													

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<u>include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.</u>		401 KAR 34:060 § 8													
Detection monitoring	Must monitor for specified indicator parameters, waste constituents or reaction products that provide a reliable indication of the presence of hazardous constituents in groundwater. <u>The owner or operator must monitor for indicator parameters (e.g., specific conductance, total organic carbon, or total organic halogen), waste constituents or reaction products that provide a reliable indication of the presence of hazardous constituents in ground water. The Regional Administrator will specify the parameters or constituents to be monitored in the facility permit, after considering the following factors:</u> <u>(1) The types, quantities, and concentrations of constituents in wastes managed at the regulated unit;</u> <u>(2) The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;</u> <u>(3) The detectability of indicator parameters, waste constituents, and reaction products in ground water; and,</u> <u>(4) The concentrations or values and coefficients of variation of proposed monitoring parameters or constituents in the ground-water background.</u> <u>Note: Permitting is an administrative requirement and not ARAR. The indicator parameters will be included in the appropriate FFA CERCLA primary documents.</u>	<u>Operation of a detection monitoring program under 40 CFR § 264.98— applicable to SWMU 3</u>	40 CFR § 264.98(a) 401 KAR 34:060 § 9 40 CFR § 264.98(a)(1) 401 KAR 34:060 § 9 40 CFR § 264.98(a)(2) 401 KAR 34:060 § 9 40 CFR § 264.98(a)(3) 401 KAR 34:060 § 9 40 CFR § 264.98(a)(4) 401 KAR 34:060 § 9						✓							
	Must <u>The owner or operator must install a ground-water monitoring system at the compliance point as specified under 40 CFR § 264.95, that complies with 40 CFR § 264.97(a)(2), (b), and (c).</u>	<u>Operation of a detection monitoring program under 40 CFR § 264.98— applicable to SWMU 3</u>	40 CFR § 264.98(b) 401 KAR 34:060 § 9							✓						

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	Must conduct a monitoring program for each specified chemical parameter and hazardous constituent. The owner or operator must conduct a ground-water monitoring program for each chemical parameter and hazardous constituent specified in the permit pursuant to paragraph (a) of this section in accordance with §264.97(g). The owner or operator must maintain a record of ground-water analytical data as measured and in a form necessary for the determination of statistical significance under §264.97(h).	<u>Operation of a detection monitoring program under 40 CFR § 264.98— applicable to SWMU 3</u>	40 CFR § 264.98(c) 401 KAR 34:060 § 9							✓						
	Sampling frequency shall be sufficient. The Regional Administrator will specify the frequencies for collecting samples and conducting statistical tests to determine whether there is statistically significant evidence of contamination for any parameter or hazardous constituent specified in the permit conditions under paragraph (a) of this section in accordance with §264.97(g). <i>Note: Permitting is an administrative requirement. The frequencies for collecting samples and conducting statistical tests will be included in the appropriate FFA CERCLA primary document.</i>	<u>Operation of a detection monitoring program under 40 CFR § 264.98— applicable to SWMU 3</u>	40 CFR § 264.98(d) 401 KAR 34:060 § 9							✓						
Groundwater monitoring requirements for RCRA hazardous waste landfills (Continued)	Must The owner or operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Conducting monitoring for responding to releases from landfills with hazardous waste remaining in place under 40 CFR § 264.90— applicable to SWMU 3. <u>Operation of a detection monitoring program under 40 CFR § 264.98— applicable to SWMU 3</u>	40 CFR § 264.98(e) 401 KAR 34:060 § 9							✓						
	Must The owner or operator must determine whether there is statistically significant evidence of contamination of any specified chemical parameter or hazardous constituent specified in the permit pursuant to paragraph (a) of this section at a specified frequency specified under paragraph (d) of this section. (1) In determining whether statistically significant evidence of contamination exists,	<u>Operation of a detection monitoring program under 40 CFR § 264.98— applicable to SWMU 3</u>	40 CFR § 264.98(f) 401 KAR 34:060 § 9 40 CFR § 264.98(f)(1) 401 KAR 34:060 § 9							✓						

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p><u>the owner or operator must use the method(s) specified in the permit under §264.97(h). These method(s) must compare data collected at the compliance point(s) to the background ground-water quality data.</u></p> <p><u>(2) The owner or operator must determine whether there is statistically significant evidence of contamination at each monitoring well as the compliance point within a reasonable period of time after completion of sampling. The Regional Administrator will specify in the facility permit what period of time is reasonable, after considering the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of ground-water samples.</u></p> <p><i>Note: Permitting and timeframes are administrative requirements and not ARARs. The process for conducting determinations to identify statistically significant evidence of contamination will be included in the appropriate FFA CERCLA primary document.</i></p>		<p><u>40 CFR § 264.98(f)(2)</u> <u>401 KAR 34:060 § 9</u></p>													
	<p>If there is statistically significant evidence of contamination at any monitoring well at the compliance point, must follow the substantive provisions of this subsection. If the owner or operator determines pursuant to paragraph (f) of this section that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she must:</p>	<p><u>Operation of a detection monitoring program under 40 CFR § 264.98 — applicable to SWMU 3</u></p>	<p><u>40 CFR § 264.98(g)</u> <u>401 KAR 34:060 § 9</u></p>						✓							
	<p><u>Notify the Regional Administrator of this finding in writing within seven days. The notification must indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination.</u></p> <p><i>Note: Notifications and timeframes are administrative requirements and are not ARARs. Notifications will be performed in</i></p>	<p><u>Statistically significant evidence of contamination for a specified chemical parameters or hazardous constituents at any monitoring well at the compliance point — applicable to SWMU 3</u></p>	<p><u>40 CFR § 264.98(g)(1)</u> <u>401 KAR 34:060 § 9</u></p>						✓							

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<u>accordance with the CERCLA FFA process.</u>															
	<p>Immediately sample the ground water in all monitoring wells and determine whether constituents in the list of appendix IX of this part are present, and if so, in what concentration. However, the Regional Administrator, on a discretionary basis, may allow sampling for a site-specific subset of constituents from the appendix IX list of this part and other representative/related waste constituents.</p> <p>For any appendix IX compounds found in the analysis pursuant to paragraph (g)(2) of this section, the owner or operator may resample within one month or at an alternative site-specific schedule approved by the Administrator and repeat the analysis for those compounds detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If the owner or operator does not resample for the compounds in paragraph (g)(2) of this section, the hazardous constituents found during this initial appendix IX analysis will form the basis for compliance monitoring.</p> <p><i>Note: Permitting and timeframes are administrative requirements and are not ARARs. Any approved use of a site-specific subset of hazardous constituents from Appendix IX and the sampling schedule will be established in an appropriate FFA CERCLA primary document.</i></p>	<p>Statistically significant evidence of contamination for a specified chemical parameters or hazardous constituents at any monitoring well at the compliance point— applicable to SWMU 3</p> <p>Operation of a detection monitoring program under 40 CFR § 264.98— applicable to SWMU 3</p>	<p>40 CFR § 264.98(g)(2) 401 KAR 34:060 § 9</p> <p>40 CFR § 264.98(g)(3) 401 KAR 34:060 § 9</p>						✓							
	<p>If the owner or operator determines, pursuant to paragraph (f) of this section, that there is a statistically significant difference for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. The owner operator may make a</p>	<p>Statistically Significant difference for specified chemical parameters or hazardous constituents at any monitoring well at the compliance point— applicable to SWMU 3</p>	<p>40 CFR § 264.98(g)(6) 401 KAR 34:060 § 9</p>							✓						

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p><u>demonstration under this paragraph in addition to, or in lieu of, submitting a permit modification application under paragraph (g)(4) of this section; however, the owner or operator is not relieved of the requirement to submit a permit modification application within the time specified in paragraph (g)(4) of this section unless the demonstration made under this paragraph successfully shows that a source other than a regulated unit caused the increase, or that the increase resulted from error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:</u></p> <p><u>(i) Notify the Regional Administrator in writing within seven days of determining statistically significant evidence of contamination at the compliance point that he intends to make a demonstration under this paragraph;</u></p> <p><u>(ii) Within 90 days, submit a report to the Regional Administrator which demonstrates that a source other than a regulated unit caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation;</u></p> <p><u>(iii) Within 90 days, submit to the Regional Administrator an application for a permit modification to make any appropriate changes to the detection monitoring program facility; and</u></p> <p><u>(iv) Continue to monitor in accordance with the detection monitoring program established under this section.</u></p> <p><i>Note: Notification, reporting, timeframes, and permit applications are administrative requirements and are not ARARs. The process for making an alternative source demonstration will be included in the appropriate FFA CERCLA primary document. Any alternative source demonstration will be provided in a separate FFA CERCLA secondary document that is subject to review, approval, and dispute under the FFA process or in an appropriate FFA CERCLA primary document.</i></p>															

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt containing RCRA Subpart F entries only]

ARAR = applicable or relevant and appropriate requirement
 BMP = Best Management Practices
 CAMU = corrective action management unit
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
 CI = compression ignition
 CR = contingent remedy includes LUCs and monitoring
 CWA = Clean Water Act
 DOE = U.S. Department of Energy

DOE M = DOE Manual
 DOE O = DOE Order
 DOT = U.S. Department of Transportation
 DPE = dual-phase extraction
 EDE = effective dose equivalent
 E.O. = Executive Order
 EPA = U.S. Environmental Protection Agency
 ERH = electrical resistance heating
 FFA = Federal Facility Agreement

HAP = hazardous air pollutant
 HMR = Hazardous Material Regulations
 KAR = *Kentucky Administrative Regulations*
 KPDES = Kentucky Pollutant Discharge Elimination System
 mrem = millirem
 NO_x = nitrogen oxide
 NRC = Nuclear Regulatory Commission
 NWP = Nationwide Permit
 PCB = polychlorinated biphenyl

PGDP = Paducah Gaseous Diffusion Plant
 PPE = personal protective equipment
 PQL = practical quantitation limit
 RCRA = Resource Conservation and Recovery Act
 ROD = record of decision
 SWMU = solid waste management unit
 TBC = to be considered
 TCLP = Toxicity Characteristic Leaching Procedure

TOC = total organic compound
 TSCA = Toxic Substances Control Act
 UTS = Universal Treatment Standards
 VOC = volatile organic compound
 VOHAP = volatile organic hazardous air pollutant
 WAC = waste acceptance criteria
 WWTU = wastewater treatment unit
 ZVI = zero-valent iron

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

ATTACHMENT 4

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Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30			
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5		
Designation and management of CAMUs	CAMUs may be designated at a facility. To implement remedies under § 264.101 or RCRA Section 3008(h), or to implement remedies at a permitted facility that is not subject to § 264.101, the Regional Administrator may designate an area at the facility as a corrective action management unit under the requirements in this section. CAMUs are areas means an area within a facility that are is used only for managing CAMU-eligible wastes for implementing corrective action or cleanup at the facility. A CAMU must be located within the contiguous property under the control of the owner or operator where the wastes to be managed in the CAMU originated. One or more CAMUs may be designated at a facility. <i>NOTE: Designation of a CAMU will be documented in a CERCLA decision document (i.e., ROD, ROD Amendment, or ESD) subject to review and approval under the FFA process.</i>	Management of CAMU-eligible wastes within a CAMU— applicable .	40 CFR § 264.552(a)				✓	✓		✓				✓	✓		✓	
	CAMU-eligible waste means: all All solid and hazardous wastes, and all media (including ground water, surface water, soils, and sediments) and debris that are managed for implementing cleanup. As-generated wastes (either hazardous or non-hazardous) from ongoing industrial operations at a site are not CAMU-eligible wastes.			40 CFR § 264.552(a)(1)(i)				✓	✓		✓				✓	✓		✓
	Wastes that would otherwise meet the description in paragraph (a)(1)(i) of this section are not “CAMU-Eligible Wastes” where: (A) The wastes are hazardous wastes found during cleanup in intact or substantially intact containers, tanks, or other non-land-based units found above ground, unless the wastes are first placed in these units the tanks, containers or nonland-based units as part of cleanup, or the units containers or tanks are excavated during the course of cleanup.			40 CFR § 264.552(a)(1)(ii)				✓	✓		✓				✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<u>Notwithstanding paragraph (a)(1)(i) of this section, where appropriate, as-generated non-hazardous waste may be placed in a CAMU where such waste is being used to facilitate treatment or the performance of the CAMU.</u>		<u>40 CFR § 264.552(a)(1)(iii)</u>				✓	✓		✓			✓	✓		✓
	Placement of CAMU-eligible wastes into or within a CAMU does not constitute land disposal of hazardous wastes.		40 CFR § 264.552(a)(4)				✓	✓		✓			✓	✓		✓
	Consolidation or placement of CAMU-eligible wastes into or within a CAMU does not constitute creation of a unit subject to minimum technology requirements.		40 CFR § 264.552(a)(5)				↯	↯		↯			↯	↯		↯
Design, operation, and closure of a CAMU	The requirements for a CAMU designation shall include the following:	Treatment of CAMU-eligible wastes within a new, replacement, or laterally expanded CAMUs located within the contiguous property under the control of the owner or operator— applicable.	40 CFR § 264.552(e)				↯	↯		↯			↯	↯		↯
Design, operation, and closure of a CAMU (Continued)	Areal configuration of the CAMU.	Treatment of CAMU-eligible wastes within a new, replacement, or laterally expanded CAMUs located within the contiguous property under the control of the owner or operator— applicable.	40 CFR § 264.552(e)(1)				↯	↯		↯			↯	↯		↯
<u>Minimum treatment requirements</u>	<u>Minimum treatment requirements:</u> Unless the wastes will be placed in a CAMU for storage and/or treatment only in accordance with paragraph (f) of this section, CAMU eligible wastes that, absent this section, would be subject to the treatment requirements of part 268 of this chapter, and that the Regional Administrator determines contain principal hazardous constituents must be treated to the standards specified in paragraph (e)(4)(iii) of this section.	<u>Treatment of CAMU-eligible wastes within a new, replacement, or laterally expanded CAMUs located within the contiguous property under the control of the owner or operator— applicable.</u>	40 CFR § 264.552(e)(4)				✓	✓		✓			✓	✓		✓
	(i) Principal hazardous constituents are those constituents that the Regional Administrator determines pose a risk to human health and the environment substantially higher than		<u>40 CFR § 264.552(e)(4)(i)</u>				✓	✓		✓			✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p>the cleanup levels or goals at the site.</p> <p>(A) In general, the Regional Administrator will designate as principal hazardous constituents:</p> <p>(1) Carcinogens that pose a potential direct risk from ingestion or inhalation at the site at or above 10⁻³; and</p> <p>(2) Non-carcinogens that pose a potential direct risk from ingestion or inhalation at the site an order of magnitude or greater over their reference dose.</p> <p>(B) The Regional Administrator will also designate constituents as principal hazardous constituents, where appropriate, when risks to human health and the environment posed by the potential migration of constituents in wastes to ground water are substantially higher than cleanup levels or goals at the site; when making such a designation, the Regional Administrator may consider such factors as constituent concentrations, and fate and transport characteristics under site conditions.</p> <p>(C) The Regional Administrator may also designate other constituents as principal hazardous constituents that the Regional Administrator determines pose a risk to human health and the environment substantially higher than the cleanup levels or goals at the site.</p> <p><i>NOTE: Designation of principal hazardous constituents will be approved by EPA in the ROD documented in a CERCLA decision document (i.e., ROD, ROD Amendment, or ESD) subject to review and approval under the FFA process.</i></p>															
	<p><u>(ii) In determining which constituents are “principal hazardous constituents,” the Regional Administrator must consider all constituents which, absent this section, would be subject to the treatment requirements in 40 CFR part 268.</u></p>		<p>40 CFR § 264.552(e)(4)(ii)</p>				✓	✓		✓			✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30		
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5	
	<u>(iii) Waste that the Regional Administrator determines contains principal hazardous constituents must meet treatment standards determined in accordance with paragraph (e)(4)(iv) or (e)(4)(v) of this section.</u>		<u>40 CFR § 264.552(e)(4)(iii)</u>				✓	✓		✓				✓	✓		✓
	<u>(iv) Treatment standards for wastes placed in CAMUs. (A) For non-metals, treatment must achieve 90 percent reduction in total principal hazardous constituent concentrations, except as provided by paragraph (e)(4)(iv)(C) of this section. (B) For metals, treatment must achieve 90 percent reduction in principal hazardous constituent concentrations as measured in leachate from the treated waste or media (tested according to the TCLP) or 90 percent reduction in total constituent concentrations (when a metal removal treatment technology is used), except as provided by paragraph (e)(4)(iv)(C) of this section. (C) When treatment of any principal hazardous constituent to a 90 percent reduction standard would result in a concentration less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times the Universal Treatment Standard is not required. Universal Treatment Standards are identified in § 268.48 Table UTS of this chapter. (D) For waste exhibiting the hazardous characteristic of ignitability, corrosivity or reactivity, the waste must also be treated to eliminate these characteristics. (E) For debris, the debris must be treated in accordance with § 268.45 of this chapter, or by methods or to levels established under paragraphs (e)(4)(iv)(A) through (D) or paragraph (e)(4)(v) of this section, whichever the Regional Administrator determines is appropriate. (F) Alternatives to TCLP. For metal bearing wastes for which metals removal treatment</u>		<u>40 CFR § 264.552(e)(4)(iv)</u>				✓	✓		✓				✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p>is not used, the Regional Administrator may specify a leaching test other than the TCLP (SW846 Method 1311, 40 CFR 260.11(c)(3)(v)) to measure treatment effectiveness, provided the Regional Administrator determines that an alternative leach testing protocol is appropriate for use, and that the alternative more accurately reflects conditions at the site that affect leaching.</p> <p><i>NOTE: Specification of a leaching test as an alternative to TCLP for metal bearing wastes will be documented in the appropriate-FFA CERCLA primary document and subject to review and approval under the FFA process.</i></p>															
	<p>(v) Adjusted standards. The Regional Administrator may adjust the treatment level or method in paragraph (e)(4)(iv) of this section to a higher or lower level, based on one or more of the following factors, the treatment levels in paragraph (e)(4)(iv) may be adjusted, as appropriate. The adjusted level or method must be protective of human health and the environment:</p> <p>(A) The technical impracticability of treatment to the levels or by the methods in paragraph (e)(4)(iv) of this section;</p> <p>(B) The levels or methods in paragraph (e)(4)(iv) of this section would result in concentrations of principal hazardous constituents (PHCs) that are significantly above or below cleanup standards applicable to the site (established either site-specifically, or promulgated under state or federal law);</p> <p>(C) The views of the affected local community on the treatment levels or methods in paragraph (e)(4)(iv) of this section as applied at the site, and, for treatment levels, the treatment methods necessary to achieve these levels;</p> <p>(D) The short-term risks presented by the on-site treatment method necessary to achieve the levels or treatment methods in</p>		40 CFR § 264.552(e)(4)(v)				✓	✓		✓			✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
Design, operation, and closure of a CAMU (Continued)	<p>paragraph (e)(4)(iv) of this section;</p> <p>(E) The long-term protection offered by the engineering design of the CAMU and related engineering controls:</p> <p>(1) Where the treatment standards in paragraph (e)(4)(iv) of this section are substantially met and the principal hazardous constituents in the waste or residuals are of very low mobility; or</p> <p>(2) Where cost-effective treatment has been used and the CAMU meets the Subtitle C liner and leachate collection requirements for new land disposal units at §264.301(c) and (d); or</p> <p>(3) Where, after review of appropriate treatment technologies, the Regional Administrator determines that cost-effective treatment is not reasonably available, and the CAMU meets the Subtitle C liner and leachate collection requirements for new land disposal units at §264.301(c) and (d); or</p> <p>(4) Where cost-effective treatment has been used and the principal hazardous constituents in the treated wastes are of very low mobility; or</p> <p>(5) Where, after review of appropriate treatment technologies, the Regional Administrator determines that cost-effective treatment is not reasonably available, the principal hazardous constituents in the wastes are of very low mobility, and either the CAMU meets or exceeds the liner standards for new, replacement, or laterally expanded CAMUs in paragraphs (e)(3)(i) and (ii) of this section, or the CAMU provides substantially equivalent or greater protection.</p> <p><i>NOTE: The Regional Administrator determinations will be made and approved in the ROD. Any adjusted treatment level or method, along with appropriate factor(s), will be documented in a FFA CERCLA decision document. Should it be necessary to subsequently adjust any treatment level or method after the initial signed ROD, then</i></p>	Treatment of CAMU-eligible wastes within a new, replacement, or laterally expanded CAMUs located within the contiguous property under the control of the owner or operator— applicable. (continued)	40 CFR § 264.552(e)(4)(v) (continued)													

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<i>any such changes, along with the appropriate factor(s), will be documented in an ESD subject to review and approval under the FFA process.</i>															
	(vi) The treatment required by the treatment standards must be completed prior to, or within a reasonable time after, placement in the CAMU.		40 CFR § 264.552(e)(4)(vi)				✓	✓		✓			✓	✓		✓
	(vii) For the purpose of determining whether wastes placed in CAMUs have met site-specific treatment standards, the Regional Administrator may, as appropriate, specify a subset of the principal hazardous constituents in the waste as analytical surrogates for determining whether treatment standards have been met for other principal hazardous constituents. This specification will be based on the degree of difficulty of treatment and analysis of constituents with similar treatment properties. <i>NOTE: Specification of a subset of the principal hazardous constituents in the waste as analytical surrogates will be included in the appropriate-FFA CERCLA primary document and subject to review and approval under the FFA process.</i>		40 CFR § 264.552(e)(4)(vii)				✓	✓		✓			✓	✓		✓
Designation, design, operation, and closure of a CAMU used for storage and/or treatment only	CAMUs used for storage and/or treatment only are CAMUs in which wastes will not remain after closure. Such CAMUs must be designated in accordance with all of the requirements 40 CFR 264.552 of this section, except as follows. Such CAMUs that are used for storage and/or treatment only and that operate in accordance with the time limits established in the staging pile regulations at §264.554(d)(1)(iii), (h), and (i) are subject to the requirements for staging piles at 40 CFR §264.554(d)(1)(i) and (ii), §264.554(d)(2), §264.554(e) and 264.554(f) , and §264.554(j) and (k) in lieu of performance standards and requirements for CAMUs in this section at paragraphs (c) and (e)(3) through (6). <i>NOTE: It is recognized that a CAMU for</i>	Management of CAMU-eligible wastes within a CAMU used for storage and/or treatment only— applicable.	40 CFR § 264.552(f)				✓	✓		✓			✓	✓		✓
		CAMU used for storage and/or treatment only and that operate in accordance with the time limits established in the staging pile regulations at 40 CFR § 264.554(d)(1)(iii), (h), and (i)— applicable.	40 CFR § 264.552(f)(1)				✓	✓		✓			✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<i>storage and/or treatment may need to be operated past the two-year time limit. Any time period for storage and/or treatment of waste greater than two years will be documented and justified in the ROD appropriate FFA CERCLA primary document subject to review and approval under the FFA process. The ROD would provide a process for further Post-ROD extensions of the operating term by using a memorandum in the administrative record that documents the justification with the concurrence of the FFA parties.</i>															
	(g) CAMUs into which wastes are placed where all wastes have constituent levels at or below remedial levels or goals applicable to the site do not have to comply with the requirements for liners at paragraph (e)(3)(i) of this section, caps at paragraph (e)(6)(iv) of this section, ground water monitoring requirements at paragraph (e)(5) of this section or, for treatment and/or storage-only CAMUs, the design standards at paragraph (f) of this section.		40 CFR § 264.552(g)				✓	✓		✓			✓	✓		✓
Temporary tanks and container storage areas used to treat or store hazardous remediation wastes	(a) EPA For temporary tanks and container storage areas used to treat or store hazardous remediation wastes during remedial activities required under § 264.101 or RCRA 3008(h), or at a permitted facility that is not subject to § 264.101, the Regional Administrator may designate a unit at the facility, as a temporary unit. A temporary unit must be located within the contiguous property under the control of the owner/operator where the wastes to be managed in the temporary unit originated. For temporary units, the Regional Administrator may replace the design, operating, or closure standards applicable to these units under this part 264 or part 265 of this chapter with alternate alternative requirements that which protect human health and the environment. (b) Any temporary unit to which alternative requirements are applied in accordance with paragraph (a) of this section	Use of temporary tanks and container storage areas to treat or store hazardous remediation wastes during remedial activities— applicable .	40 CFR § 264.553(a) and (b) 401 KAR 34:287		✓	✓	✓	✓		✓			✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p>shall be: must be</p> <p>(1) located Located within the contiguous property under the control of the owner/operator where the wastes to be managed in the temporary unit originated facility boundary; and</p> <p>(2) Used only for treatment or storage of remediation wastes.</p> <p>NOTE: EPA approval of alternate design, operating, or closure requirements for a temporary unit will be obtained by approval of a FFA CERCLA document. The designation of temporary units will be documented in a CERCLA decision document (e.g. ROD, ROD Amendment or ESD) subject to review and approval under the FFA process. Alternate design, operating, and/or closure requirements for a temporary unit will be documented in the appropriate FFA CERCLA primary document subject to review and approval under the FFA process.</p>															
Temporary tanks and container storage areas used to treat or store hazardous remediation wastes (Continued)	<p>In establishing standards to be applied to a temporary unit, the Regional Administrator shall consider the following factors shall be considered:</p> <p>(1) Length of time such unit will be in operation;</p> <p>(2) Type of unit;</p> <p>(3) Volumes of wastes to be managed;</p> <p>(4) Physical and chemical characteristics of the wastes to be managed in the unit;</p> <p>(5) Potential for releases from the unit;</p> <p>(6) Hydrogeological and other relevant environmental conditions at the facility which may influence the migration of any potential releases; and</p> <p>(7) Potential for exposure of humans and environmental receptors if releases were to occur from the unit.</p>	Use of temporary tanks and container storage areas to treat or store hazardous remediation wastes during remedial activities— applicable .	40 CFR § 264.553(c) 401 KAR 34:287		✓	✓	✓	✓		✓			✓	✓		✓
	<p>(d) The Regional Administrator shall specify in the permit or order the length of time a temporary unit will be allowed to operate, to be no longer than a period of one year. The</p>	Use of temporary tanks and container storage areas to treat or store hazardous remediation wastes during	40 CFR § 264.553(d) and (e)		✓	✓	✓	✓		✓			✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
 SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
 SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
 SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
 SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
 SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
 SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
 SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
 SWMU 30: Alt 3: Cap, LUCs, and Monitoring
 SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

Revisions to Table F.2. Action-Specific ARARs and TBC Guidance for BGOU FS—SWMUs 2, 3, 7, and 30 [excerpt contains 40 CFR § 264.552 CAMU and 40 CFR § 264.553 TU entries only]

Action	Requirement	Prerequisite	Citation	SWMU 2					SWMU 3		SWMU 7				SWMU 30	
				Alt 3	Alt 4 (SS)	Alt 4 (CI)	Alt 5	Alt 6	Alt 3	Alt 5	Alt 4 (P&T)	Alt 4 (ERH)	Alt 5 (P&T)	Alt 5 (ERH)	Alt 3	Alt 5
	<p><u>Regional Administrator shall also specify the design, operating, and closure requirements for the unit.</u></p> <p><u>(e) The Regional Administrator may extend the operational period of a temporary unit once for no longer than a period of one year beyond that originally specified in the permit or order, if the Regional Administrator determines that:</u></p> <p><u>(1) Continued operation of the unit will not pose a threat to human health and the environment; and</u></p> <p><u>(2) Continued operation of the unit is necessary to ensure timely and efficient implementation of remedial actions at the facility.</u></p> <p><u>NOTE: It is recognized that a treatment unit may need to be operated past the one-year limit. Any time period for operating greater than one year will be documented and justified in the appropriate FFA CERCLA primary document subject to review and approval under the FFA process.</u></p>	<p><u>remedial activities—applicable.</u></p>	<p><u>401 KAR 34:287</u></p>													
	<p><u>(g) The Regional Administrator shall document the rationale for designating a temporary unit and for granting time extensions for temporary units and shall make such documentation available to the public.</u></p> <p><u>NOTE: The rationale for designating temporary units will be documented in a CERCLA decision document (e.g. ROD, ROD Amendment or ESD) subject to review and approval under the FFA process. Any time extensions for a temporary unit along with the rationale will be documented in the appropriate FFA CERCLA primary document subject to review and approval under the FFA process.</u></p>	<p><u>Use of temporary tanks and container storage areas to treat or store hazardous remediation wastes during remedial activities—applicable.</u></p>	<p><u>40 CFR § 264.553(g)</u></p> <p><u>401 KAR 34:287</u></p>		✓	✓	✓	✓		✓			✓	✓		✓

SWMU 2: Alt 3 Containment, Surface Controls, LUCs, and Monitoring
SWMU 2: Alt 4 (SS): Containment, Stabilization/Solidification, Surface Controls, LUCs, and Monitoring
SWMU 2: Alt 4 (CI): Containment, Chemical Injection, Surface Controls, LUCs, and Monitoring
SWMU 2: Alt 5: Excavation, Treatment, Disposal, LUCs, and Monitoring
SWMU 2: Alt 6: Targeted Excavation, Treatment, Disposal, Containment, LUCs, and Monitoring
SWMU 3: Alt 3: Cap, Surface Controls, LUCs, and Monitoring
SWMU 3: Alt 5: Excavation and Disposal, LUCs, and Monitoring

SWMU 7: Alt 4 (P&T): Cap, P&T, LUCs, and Monitoring
SWMU 7: Alt 4 (ERH): Cap, ERH, LUCs, and Monitoring
SWMU 7: Alt 5 (P&T): Excavation and Disposal, P&T, LUCs, and Monitoring
SWMU 7: Alt 5 (ERH): Excavation and Disposal, ERH, LUCs, and Monitoring
SWMU 30: Alt 3: Cap, LUCs, and Monitoring
SWMU 30: Alt 5: Excavation and Disposal, LUCs, and Monitoring

ATTACHMENT 5

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EPA Condition #2

Revisions to the *Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-1274&D2*

Excerpt from Table ES.8. Summary of Representative Process Options

General Response Actions	Technology Types	Representative Process Options
LUCs	Institutional Controls	Property record notice Deed and/or lease restriction CERCLA Section 120(h) Excavation/penetration permit (E/PP) program <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>
	Physical Controls	Fences Signs

Excerpt from Table 2.1. BGOU SWMUs 2, 3, 7, and 30 GRA, Technology Type, and Process Option Screening

Technology Type	Process Options	Description	Technology Status	Screening Comments
General Response Action—LAND USE CONTROLS				
Physical Controls	Warning Signs	Warning signs notify workers of potential hazards and restrict access.	Available	Technically implementable. Retained for possible alternative development.
	Fences	Fences restrict access to potentially hazardous areas.	Available	Technically implementable. Retained for possible alternative development.
Institutional Controls	Property Record Notice/ CERCLA Section 120(h)	Property notice that waste left in place and survey plat of its location filed at McCracken County Clerk’s office. CERCLA Section 120(h) requires certain notices and covenants for transfer of federally owned property.	Available	Technically implementable. Retained for possible alternative development.
	Deed and/or Lease Restrictions	Deed and/or lease restrictions prohibiting residential development or agricultural development within the BGOU source area will be put in place contingent upon the property transfer.	Available	Technically implementable. Retained for possible alternative development.
	E/PP Program	E/PP program requires review and approval of any proposed intrusive activities to protect workers and remedy integrity.	Available	Technically implementable. Retained for possible alternative development.
	<u>Environmental Covenant</u>	<u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer.</u>	<u>Available</u>	<u>Technically implementable. Retained for possible alternative development.</u>

Excerpt from 2.4.1.1 LUC technologies/process options

LUCs will be implemented at BGOU SWMUs where waste is left in place or source area-related contamination remains after active remediation that precludes UU/UE. In such cases, DOE will implement and maintain a LUC program that is protective based on current or reasonably anticipated future land use as described in the following subsections. LUCs will include institutional controls such as property record notices, the E/PP Program, and physical controls (warning signs), and an Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer. Upon transfer of the property, DOE will comply with Section 120(h) of CERCLA ~~and will implement deed restrictions as described in Section 2.4.1.1.~~

The LUC implementation actions, including inspections, monitoring, and continued maintenance, will be provided in a land use control implementation plan (LUCIP) that will be prepared by DOE and submitted as a component of the RD.

In addition to LUCs selected and implemented as part of the BGOU remedy selection process, other existing DOE plant controls maintained outside of CERCLA, and that will not be a part of this remedy, currently are on-going and are discussed further in Section 1.3.1.6. Accordingly, PGDP is a federal facility with restricted access by the general public. Physical access to PGDP is prohibited by security fencing, and armed guards patrol the DOE property 24 hours per day to restrict worker entry and prevent uncontrolled access by the public/site visitors. These existing access controls are being maintained outside of the requirements of CERCLA due to the nature and security needs of the facility; nonetheless, the existing controls serve to protect against unacceptable/uncontrolled exposures.

Warning Signs. Warning signs are a physical control that will be placed at the source areas at the beginning of the remedial action to provide warning of potential contaminant exposure, will continue to be posted pending a final decision under the Comprehensive Site OU, or until such time as contaminant levels have been reduced that would allow for unrestricted use.

Fences. Fences are a physical control that may be placed at the source areas restricting access to hazardous areas.

Property Record Notice. In the event contamination and/or waste is left in place that will preclude UU/UE, a Property Record Notice (Notice) will be filed at the McCracken County Clerk's Office, in accordance with state and federal law, within 120 days of regulatory approval of the LUCIP and will remain in effect until DOE, KDEP, and EPA approve a request to modify or delete it. The Notice will include the purpose of the Notice, a brief summary of the main COCs and location of any waste remaining in-place, along with a description of the CERCLA remedial action and a DOE program contact. The Notice also will include a survey plat, accomplished by a registered land surveyor (under the direction and approval of a DOE official and consistent with applicable security requirements), that depicts the contamination and the area subject to LUCs. The Notice also will inform the reader that, upon title transfer of the property, the deed will include applicable land use restrictions and information required by CERCLA Section 120(h)(3). The Property Record Notice will alert anyone searching property records that an environmental covenant will be filed simultaneous with transfer of a fee simple interest in the property to a non-federal entity. DOE will file both the Notice and survey plat in the register of deeds (e.g., Real Estate Office) of the McCracken County Clerk.

Deed and/or Lease Restriction. For alternatives that will preclude UU/UE, DOE will implement and maintain a LUC program that includes the use of deed and/or lease restrictions that prohibit residential development or agricultural development within the BGOU source area and will be put in place contingent upon the property transfer. Deed and/or lease restriction prohibiting residential development,

agricultural development, or excavation and drilling, unless written approval from DOE is obtained within the BGOU source area, will be put in place contingent on the property transfer.

Environmental Covenant. Should the Federal Government convey by deed a fee simple interest for contaminated real property at SWMUs 2, 3, 7, or 30, an environmental covenant pursuant to Subchapter 80 of KRS Chapter 224 will be created, granted to the holder and recorded that will contain the land use restrictions required in the Record of Decision or any amendments made thereto. The environmental covenant will impose no obligation on DOE independent of CERCLA requirements but will provide an additional means to assure the use of the property by a subsequent owner is consistent with restrictions that are established under the CERCLA remedy.

CERCLA Section 120(h). In the event that DOE should enter into any contract for the sale or transfer of any of the site, DOE will comply with the provisions found in CERCLA § 120(h) and Section XLII of the PGDP FFA pursuant to Section 120(h) of CERCLA, each deed entered into for the transfer of property is required to contain, to the extent such information is available ...

Excerpt from Table 2.2. Evaluation of SWMUs 2, 3, 7, and 30 Technology Types and Process Options

Technology Type	Process Option	Effectiveness			Implementability		Relative Cost	
		Long-Term Effectiveness	Short-Term Effectiveness	Demonstrated Effectiveness and Reliability	Technical	Administrative	Capital	O&M
General Response Action—LAND USE CONTROLS								
Institutional Controls	E/PP Program	Moderate—only effective for duration of plant operations	High—effective at preventing worker exposure	High—already implemented	High—already implemented	High—already implemented	Low	Low
	Property Record Notice	Moderate—relies on continued future implementation	High—effective for preventing groundwater and property use	High to moderate	High	High	Low	Low
	CERCLA Section 120(h)	Moderate—relies on continued future implementation	High—effective for preventing groundwater and property use	High to moderate	High	High	Low	Low
	Deed and/or Lease Restrictions	Moderate—relies on continued future implementation	High—effective for preventing groundwater and property use	High to moderate	High	High	Low	Low
	<u>Environmental Covenant</u>	<u>Moderate—relies on continued future implementation</u>	<u>High—effective for preventing groundwater and property use</u>	<u>High to moderate</u>	<u>High</u>	<u>High</u>	<u>Low</u>	<u>Low</u>
Physical Controls	Warning Signs	Moderate— prevents and controls access; does not reduce contaminant levels	High—effective at preventing worker exposure	High—already implemented; requires inspections and maintenance	High—already implemented	High—already implemented	Low	Low
	Fences	Moderate— prevents and controls access; does not reduce contaminant levels	High—effective at preventing worker exposure	High—requires inspections and maintenance	High	High	High	High

Excerpt from Table 2.3. Selection of Representative Process Options

General Response Actions	Technology Type	Representative Process Options	Basis for Selection
Land Use Controls	Institutional Controls	Property record notice, contingent deed and/or lease restriction, CERCLA Section 120(h), E/PP Program, <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>	Effective and implementable. Low cost.

Excerpt from Section 5.3.2.3 Land use controls

Property Record Notice, Deed, and/or Lease Restrictions, and Environmental Covenant. These administrative controls are described in Section 2.4.1.1, and all are effective means of ensuring protection under the reasonably anticipated industrial future land use. These proprietary controls help ensure the land use remains industrial. Additionally, any land use change would be identified through the five-year review process, per CERCLA 121(c), and DOE would be required to take appropriate measures to ensure the continued protection of human health and the environment under the changed land use. These administrative LUCs are highly implementable and at a low cost.

Based on an evaluation of effectiveness, implementability and cost, Alternative 3 at SWMU 2, which leaves waste in place, will include the following LUCs as described in Section 2.4.1.1. Specific implementation details would be further defined in the LUCIP.

- Warning signs
- E/PP Program
- Property record notices
- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways. Fences are not included as a LUC for this alternative at SWMU 2 because they offer limited additional effectiveness at increased cost.

Excerpt from Table 5.3. SWMU 2, Alternative 3 Components

General Response Action	Technologies	RPOs
LUCs	Physical Controls	Warning signs
	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Property record notices • Deed and/or lease restrictions contingent upon transfer • CERCLA 120(h) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

5.3.3.4 Land use controls

Alternative 4 at SWMU 2 leaves waste in place. Because Alternatives 3 and 4 rely on containment and LUCs in the same manner, the evaluation of LUC process options is the same for both alternatives; therefore, SWMU 2-specific Alternative 4 will include the following LUCs for the same reasons derived in Section 5.3.2.3.

- Warning signs
- E/PP Program
- Property record notices
- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways.

Excerpt from Table 5.6. Alternative 4 (SS) Components

General Response Action	Technologies	RPOs
LUCs	Physical Controls	Warning signs
	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Property record notices • Deed and/or lease restrictions (contingent upon transfer) • CERCLA 120(h) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Table 5.7. Alternative 4 (CI) Components

General Response Action	Technologies	RPOs
LUCs	Physical Controls	Warning signs
	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Property record notices • Deed and/or lease restrictions (contingent upon transfer) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Section 5.3.4.5 Land use controls

Property Record Notice, Deed, and/or Lease Restrictions, and Environmental Covenant. These administrative controls are described in Section 2.4.1.1, and all are effective means of ensuring protection under the reasonably anticipated industrial future land use. These proprietary controls help ensure the land use remains industrial. Additionally, any land use change would be identified through the five-year review process, per CERCLA 121(c), and DOE would be required to take appropriate measures to ensure the continued protection of human health and the environment under the changed land use. These administrative LUCs are highly implementable and at a low cost. Property record notices would not be necessary because the waste will be removed.

LUCs Summary. Alternative 5 at SWMU 2, which removes the source term to a depth of 20 ft bgs, but may leave treated underlying, nonmobile LLW in place, will include the following LUCs:

- Deed and/or lease restrictions (contingent upon transfer)

- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways. Specific implementation details would be defined further in the LUCIP.

Excerpt from Section 5.3.4.7 Summary of SWMU-specific alternative

Based upon the evaluation of process options for effectiveness, implementability, and cost specific to SWMU 2, the following SWMU-specific alternative has been assembled and will be brought forward for detailed analysis at SWMU 2. No further screening of alternatives is necessary because the alternative screening was performed following the assembly of General Alternatives in Section 3.

- Excavation, Treatment, Disposal, LUCs, and Monitoring

Table 5.10 identifies the key features of the SWMU-specific alternative Excavation, Treatment, Disposal, LUCs, and Monitoring.

While not specifically identified in this FS as a separate alternative, disposal costs also will be evaluated assuming that an OSWDF is available for use.

Alternative 5 satisfies the first RAO. The potential for contamination of groundwater is mitigated through both removal and subsequent treatment of residual COCs, if necessary.

Alternative 5 satisfies the second RAO and mitigates the potential for direct contact through removal. If UU/UE is not achieved, then deed and/or lease restrictions would be implemented (contingent upon property transfer) and an Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer.

Alternative 5 satisfies the third RAO. The potential for contamination of groundwater is mitigated through both removal and subsequent treatment of residual COCs, if necessary. Alternative 5 would treat COCs below the excavation, if necessary, and it also would treat wastes to the degree necessary to meet WAC requirements for disposal.

Excerpt from Table 5.10. Alternative 5 Components

General Response Action	Technologies	RPOs
LUCs	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Deed and/or lease restrictions (contingent upon transfer) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Section 5.3.5.7 Land use controls

Alternative 6 at SWMU 2 leaves waste in place. Because Alternative 6 relies on containment and LUCs in the same manner as Alternatives 3 and 4, the evaluation of LUC process options is the same for these alternatives; therefore, SWMU 2-specific Alternative 6 will include the following LUCs for the same reasons derived in Section 5.3.2.3.

- Warning signs
- E/PP Program
- Property record notices
- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways.

Excerpt from Table 5.12. Alternative 6 Components

General Response Action	Technologies	RPOs
LUCs	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Property record notices • Deed and/or lease restrictions (contingent upon transfer) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Section 6.3.3.3 Land use controls

Property Record Notice, Deed, and/or Lease Restrictions, and Environmental Covenant. These administrative controls are described in Section 2.4.1.1, and all are effective means of ensuring protection under the reasonably anticipated industrial future land use. These proprietary controls help ensure the land use remains industrial. Additionally, any land use change would be identified through the five-year review process, per CERCLA 121(c), and DOE would be required to take appropriate measures to ensure the continued protection of human health and the environment under the changed land use. These administrative LUCs are highly implementable and at a low cost.

Alternative 3 at SWMU 3, which leaves waste in place, will include the following LUCs, as described in Section 2.4.1.1. Specific implementation details would be defined further in the LUCIP.

- Warning signs
- E/PP Program
- Property record notices
- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways. Fences are not included as a LUC for this alternative at SWMU 3 because they offer limited additional effectiveness at increased cost.

Excerpt from Table 6.3. SWMU 3, Alternative 3 Components

General Response Action	Technologies	RPOs
LUCs	Physical Controls	Warning signs
	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Property record notices • Deed and/or lease restrictions (contingent upon transfer) • CERCLA 120(h) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Section 6.3.4.4 Land use controls

Property Record Notice, Deed, and/or Lease Restrictions, and Environmental Covenant. These administrative controls are described in Section 2.4.1.1, and all are effective means of ensuring protection under the reasonably anticipated industrial future land use. These proprietary controls help ensure the land use remains industrial. Additionally, should that land use change, the change would be identified through the five-year review process, per CERCLA 121(c), and DOE would be required to take appropriate measures to ensure the continued protection of human health and the environment under the changed land use.

LUCs Summary. Alternative 5 at SWMU 3, which removes the source term but does not meet UU/UE conditions, will include the following LUCs as described in Section 2.4.1.1; the E/PP Program and a property record notice would not be necessary as the waste will be removed. Specific implementation details would be defined further in the LUCIP.

- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative controls afford a layered strategy that provides protection in different ways. Together administrative controls provide enhanced protection of potential receptors. Physical controls are not included as a LUC for this alternative at SWMU 3 because the depth of the waste remaining in place is sufficiently deep that they offer limited additional effectiveness at increased cost.

Excerpt from Table 6.5. Alternative 5 Excavation, Disposal, Treatment, LUCs, and Monitoring

General Response Action	Technologies	Process Options
LUCs	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Deed and/or lease restrictions (contingent upon transfer) • CERCLA 120(h) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Section 7.3.2.4 Land use controls

Property Record Notice, Deed, and/or Lease Restrictions, and Environmental Covenant. These administrative controls are described in Section 2.4.1.1 and are all effective means of ensuring protection under the reasonably anticipated industrial future land use. These proprietary controls help ensure the land use remains industrial. Additionally, any land use change would be identified through the five-year review process per CERCLA 121(c), and DOE would be required to take appropriate measures to ensure the continued protection of human health and the environment under the changed land use. These administrative LUCs are highly implementable and at a low cost.

Alternative 4 at SWMU 7, which leaves waste in place, will include the following LUCs as described in Section 2.4.1.1. Specific implementation details would be further defined in the LUCIP.

- Warning signs
- E/PP Program
- Property record notices
- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways. Fences are not included as a LUC for this alternative at SWMU 7 because they offer limited additional effectiveness at increased cost when evaluated with the alternative’s other physical means of preventing intrusion such as KY Subtitle D cap and warning signs.

Excerpt from Table 7.4. Alternative 4 (P&T) Components

General Response Action	Technologies	RPOs
LUCs	Physical Controls	Warning signs
	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Property record notices • Deed and/or lease restrictions (contingent upon transfer) • CERCLA 120(h) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Table 7.5. Alternative 4 (ERH) Components

General Response Action	Technologies	RPOs
Land Use Controls	Physical Controls	Warning signs
	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Property record notices • Deed and/or lease restrictions (contingent upon transfer) • CERCLA 120(h) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Section 7.3.3.4 Land use controls

Deed and/or Lease Restrictions, and Environmental Covenant. These administrative controls are described in Section 2.4.1.1 and are all effective means of ensuring protection under the reasonably anticipated industrial future land use. These proprietary controls help ensure the land use remains industrial. Additionally, should that land use change, the change would be identified through the five-year review process per CERCLA 121(c) and DOE would be required to take appropriate measures to ensure the continued protection of human health and the environment under the changed land use. These administrative LUCs are highly implementable and at a low cost.

LUCs Summary. Alternative 5 at SWMU 7, which removes the source term but may not meet UU/UE conditions, will include the following LUCs as described in Section 2.4.1.1. The E/PP Program and a property record notice would not be necessary as the waste will be removed. Specific implementation details would be further defined in the LUCIP.

- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways. Physical controls are not included as a LUC for this alternative at SWMU 7 because the depth of any contaminants remaining in place is sufficiently deep that they offer limited additional effectiveness at increased cost.

Excerpt from Table 7.8. Alternative 5 Excavation and Disposal, LUCs, and Monitoring

General Response Action	Technologies	Process Options
LUCs	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Deed and/or lease restrictions (contingent upon transfer) • CERCLA 120(h) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Section 8.3.2.3 Land use controls

Property Record Notice, Deed, and/or Lease Restrictions, and Environmental Covenant. These administrative controls are described in Section 2.4.1.1 and all are effective means of ensuring protection under the reasonably anticipated industrial future land use. These proprietary controls help ensure the land use remains industrial. Additionally, any land use change would be identified through the five-year review process, per CERCLA 121(c), and DOE would be required to take appropriate measures to ensure the continued protection of human health and the environment under the changed land use. These administrative LUCs are highly implementable at a low cost.

Alternative 3 at SWMU 30, which leaves waste in place, will include the following LUCs, as described in Section 2.4.1.1. Specific implementation details would be further defined in the LUCIP.

- Warning signs
- E/PP Program
- Property record notices
- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways. Fences are not included as a LUC for this alternative at SWMU 30 because they offer limited additional effectiveness at increased cost when evaluated with the alternative's other physical means of preventing intrusion, such as KY Subtitle D cap and warning signs.

Excerpt from Table 8.3. Alternative 3 Components

General Response Action	Technologies	RPOs
Land Use Controls	Physical Controls	Warning signs
	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Property record notices • Deed and/or lease restrictions (contingent upon transfer) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>

Excerpt from Section 8.3.3.3 Land use controls

Deed and/or Lease Restrictions, and Environmental Covenant. These administrative controls are described in Section 2.4.1.1 and all are effective means of ensuring protection under the reasonably anticipated industrial future land use. These proprietary controls help ensure the land use remains industrial. Additionally, any land use change would be identified through the five-year review process, per CERCLA 121(c), and DOE would be required to take appropriate measures to ensure the continued protection of human health and the environment under the changed land use. These administrative LUCs are highly implementable at a low cost.

LUCs Summary. Alternative 5 at SWMU 30, which removes the source term but may not meet UU/UE conditions, will include the following LUCs, as described in Section 2.4.1.1 the E/PP program and a property record notice would not be necessary as the waste will be removed. Specific implementation details would be further defined in the LUCIP.

- Deed and/or lease restrictions (contingent upon transfer)
- Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer
- CERCLA 120(h)

These administrative and physical controls together provide enhanced protection and afford a layered strategy that provides protection in different ways. Physical controls are not included as a LUC for this alternative at SWMU 30 because the depth of any contaminants remaining in place is sufficiently deep that they offer limited additional effectiveness at increased cost.

Excerpt from Table 8.5. Alternative 5, Excavation, Disposal, and LUCs

General Response Action	Technologies	Process Options
LUCs	Administrative Controls	<ul style="list-style-type: none"> • E/PP Program • Deed and/or lease restrictions (contingent upon transfer) • CERCLA 120(h) • <u>Environmental Covenant meeting the requirements of KRS 224.80-100 et seq. to be filed at the time of property transfer</u>