PADUCAH GASEOUS DIFFUSION PLANT CITIZENS ADVISORY BOARD

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Paducah Gaseous Diffusion Plant Citizens Advisory Board
Burial Grounds Subcommittee Meeting Summary
May 16, 2013

The Burial Grounds Subcommittee met at the Environmental Information Center (EIC) in Paducah, Kentucky on Thursday, May 16th at 5:50 p.m.

Board members present: Judy Clayton, Glenda Adkisson, Ken Wheeler, Robert Coleman, Dianne O'Brien, Roger Truitt, Mike Kemp, Ben Peterson, Richard Rushing, Renie Barger, Ralph Young, Jim Tidwell, and Tom Grassham.

U.S. Department of Energy (DOE) related employees: Rob Seifert, Buz Smith, Jennifer Woodard, DOE; Joe Walker, LATA Environmental Services of Kentucky (LATA); Gaye Brewer, KDWM; Yvette Cantrell, Restoration Services, Inc. (RSI); Eric Roberts, Jim Ethridge, EHI Consultants (EHI).

Burial Grounds Subcommittee Meeting

Roberts started the meeting at 5:50 pm, and introduced **Woodard** for her presentation on the Burial Grounds at PGDP.

Kemp: (SWMU's) Four, five, and six are the only ones in 2019?	**Woodard:** They are all a part of it.
Young: Do you have a Record of Decision for any of these units?	**Woodard:** There was one for SWMU 2 in 1995.
Truitt: Why did we bury this stuff in the first place?	**Woodard:** At that time, it was common practice to bury it.
Clayton: So five and six you will be working on first?	**Woodard:** Yes.
Peterson: Site nine for the CERCLA cell is on top of five and six, so if you work on those two SWMU's, I assume that that eliminates site nine as an option. Surely you would do work on the SWMU's and spend more money for the cell at the same location.	**Woodard:** There are problems that we would have to work through but it would not eliminate that option.
Peterson: Site nine would also cover 7, 30, 5, 6, 2 and 3. Looks like if site nine is going to be considered, you would have to consider all of those SWMU's together.	**Woodard:** The decision on the cell will be made before any of the others, outside of 5 & 6.
Paxton: What is the decision to build or not to build the CERCLA cell based on?	**Woodard:** The decision will be based on whether or not to build it on-site or off-site, and the preferred site in the Record of Decision is part of that. The first decision point is do we have one at all. The second is where it will be located.

Wheeler: I know we have the CERCLA cell locations on the map, but do we have the waste cells on that same map?	**Woodard:** That would be easy to get for you.
Young: Will it give you some indication of what might have changed since '99 (in SWMU's 7&30)?	**Woodard:** You will in some cases.
Wheeler: Are you basing your conclusions solely on analysis or are you taking into consideration any records there might be?	**Woodard:** We have good records on SWMU 5, so we look at them. We have very few records on SWMU 4, so we so the best we can with it. We have also done interviews with former plant workers.
Wheeler: Is there a possibility that you would take no action based solely on records?	**Woodard:** No.
Kemp: Could you describe how you set your priorities about which one of these to address first?	**Woodard:** Because of the groundwater contamination, we are driven to address SMWU's 4, 5, and 6 before the others.
O'Brien: Are you taking into account that surface water may change your sampling?	**Woodard:** I don't think we adjust because of a change.
O'Brien: I'm asking if you saw a difference in your sampling because of a large rain event.	**Woodard:** I can't tell you if we saw a difference after the flood, for example. I can see if I can find that out for you.
Paxton: You said that if you had an extra $100 million you might do something else. Are we assuming we will have the money to do all of this going forward?	**Woodard:** We have to schedule our work from start to end, and right now the end of that work is 2032. We have adjusted our schedule for flat-line funding for five years, however we are optimistic that we will see a ramp-up of funding starting in 2019.
O'Brien: When are we going to get to the point of saying stop sampling and just treat?	**Woodard:** To be honest, every project is different. There are different levels of risk associated with each project that determine what we do. Sometimes the level of sampling is needed to make an informed decision about the project.
Clayton: Do you anticipate that the groundwater table will be a factor for SWMU 4?	**Woodard:** We anticipate that we will have waste in the water samples. We just put in seven piezometers, which are wells to sample the water level, and they are located in the middle of these areas in SWMU 4.
O'Brien: What happens if you get a five inch rain?	**Woodard:** There is a cap on the SWMU that is arched to allow a rain event to run off to the sides.
Tidwell: How radioactive is the waste in SWMU 5?	**Woodard:** It is low level.
Peterson: SWMU's 5&6 are close to each other. Would you ever decide to treat them with different solutions?	**Woodard:** You could cap 5 and dig up 6, or you could dig up 5 and cap 6, although that probably wouldn't make sense because they are so close together. If you are going to dig up 5, you would probably just go a little further and get 6 too.
Truitt: Did I understand you to say that you believe you will just end up capping this?	**Woodard:** The Proposed Plan that is getting ready to come out is suggesting that. **Brewer:** But nothing is decided until after the public comment period.

O'Brien: Describe to us what a good cap would be?	**Woodard:** I'm not a cap person but by the time the cap goes on it will be about six feet above grade. It will have layers of clay. It will probably have two membrane layers. It will have soil layers, plus it will have the top layer of about three feet of topsoil.
Roberts: What's the legacy management for a cap like that? Does it have to have a fence?	**Woodard:** It doesn't have to have a fence. It is not a requirement. It would be an option decided by the parties involved. There would just be an obligation to manage it whether there is a fence or not.
Clayton: Is SWMU 5 classified?	**Woodard:** Yes.
Clayton: Then I suppose it would have a fence around it forever.	**Woodard:** That is part of the evaluation. It is not required as part of the CERCLA process, it is required for a different reason.

After the presentation there was discussion about using comparisons to help explain the data about this project to the public, when the time comes.

The meeting was adjourned at 7:48 pm.

Burial Grounds Overview

Jennifer Woodard
DOE FFA Manager
5-16-13

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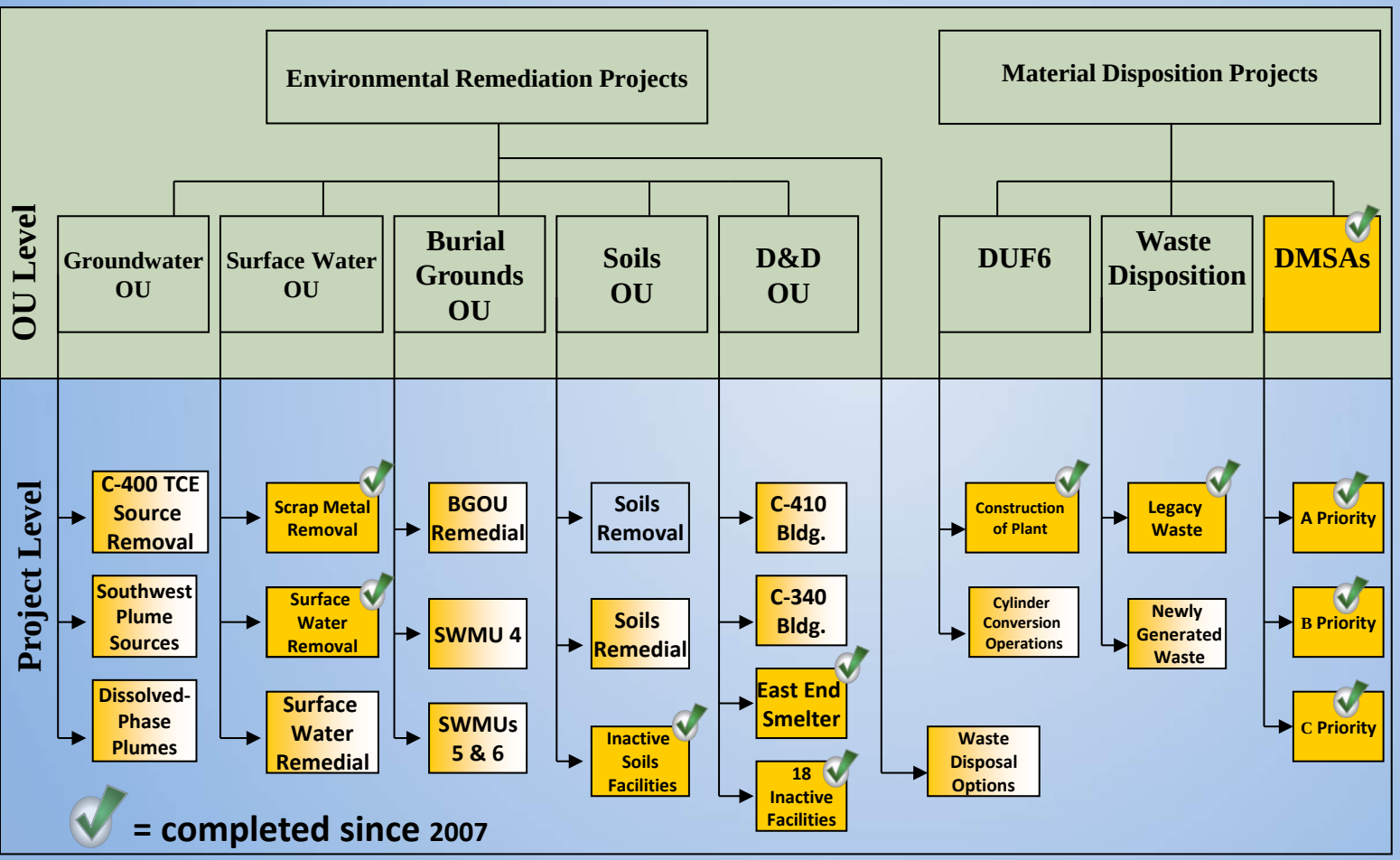
EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

2019 Scope

Current Project Status



- Originally defined as scope that could be completed in cooperation with USEC plant operations.
- Burial Grounds Investigation part of scope

Pre-Shutdown Scope

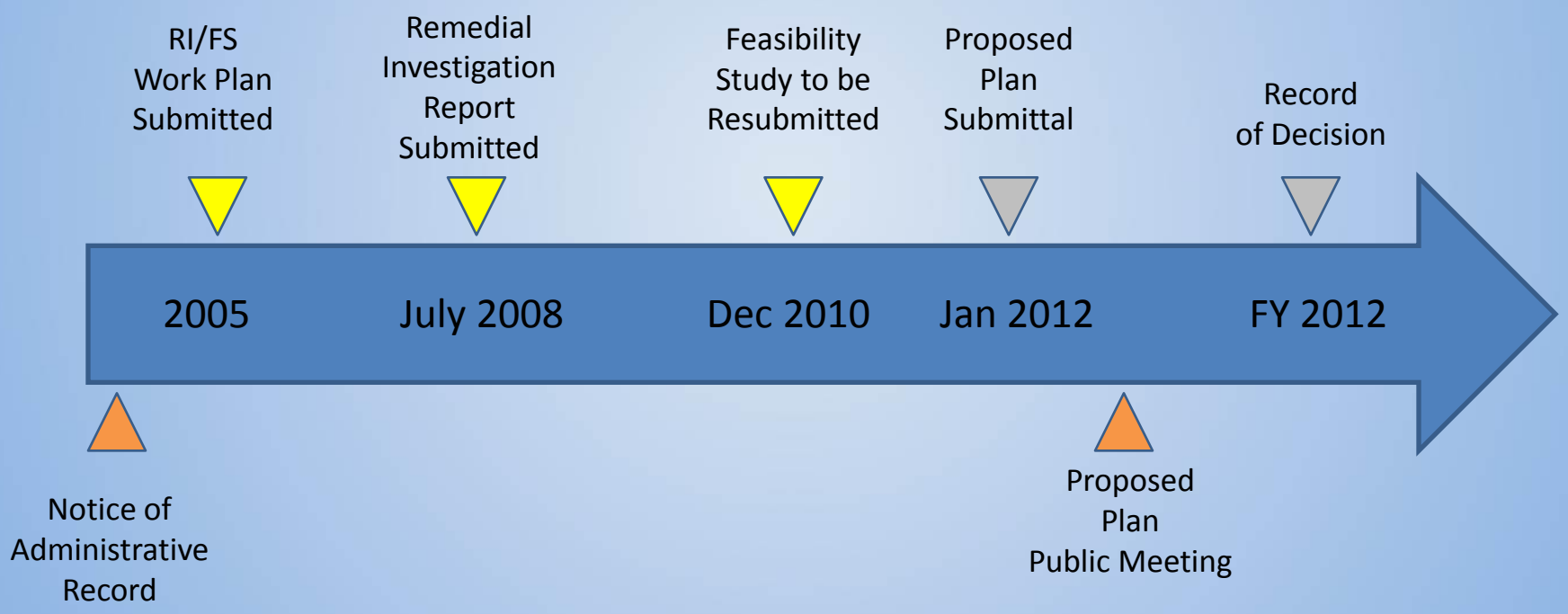
NOTE: Each environmental project is expected to have a corresponding CERCLA decision document (i.e., ROD, AM)

BGOU Overview

- The Burial Grounds Operable Unit (BGOU) consists of areas of contamination associated with burial areas and landfills concentrated in the northwest quadrant of the plant.
- There are 10 burial areas within the Burial Grounds Operable Unit.
- These areas typically have items buried less than 20 feet from the surface.

- SWMU 2: C-749 Uranium Burial Ground
- SWMU 3: C-404 Low-Level Radioactive Waste Burial Ground
- SWMU 4: C-747 Contaminated Burial Yard and C-748-B Burial Area
- SWMU 5: C-746-F Burial Yard
- SWMU 6: C-747-B Burial Ground
- SWMUs 7 and 30: C-747-A Burial Ground and Burn Area
- SWMU 145: Area P (residential/inert borrow area) and old North-South Diversion Ditch (NSDD); SWMUs 9 and 10 lie within the footprint of SWMU 145.

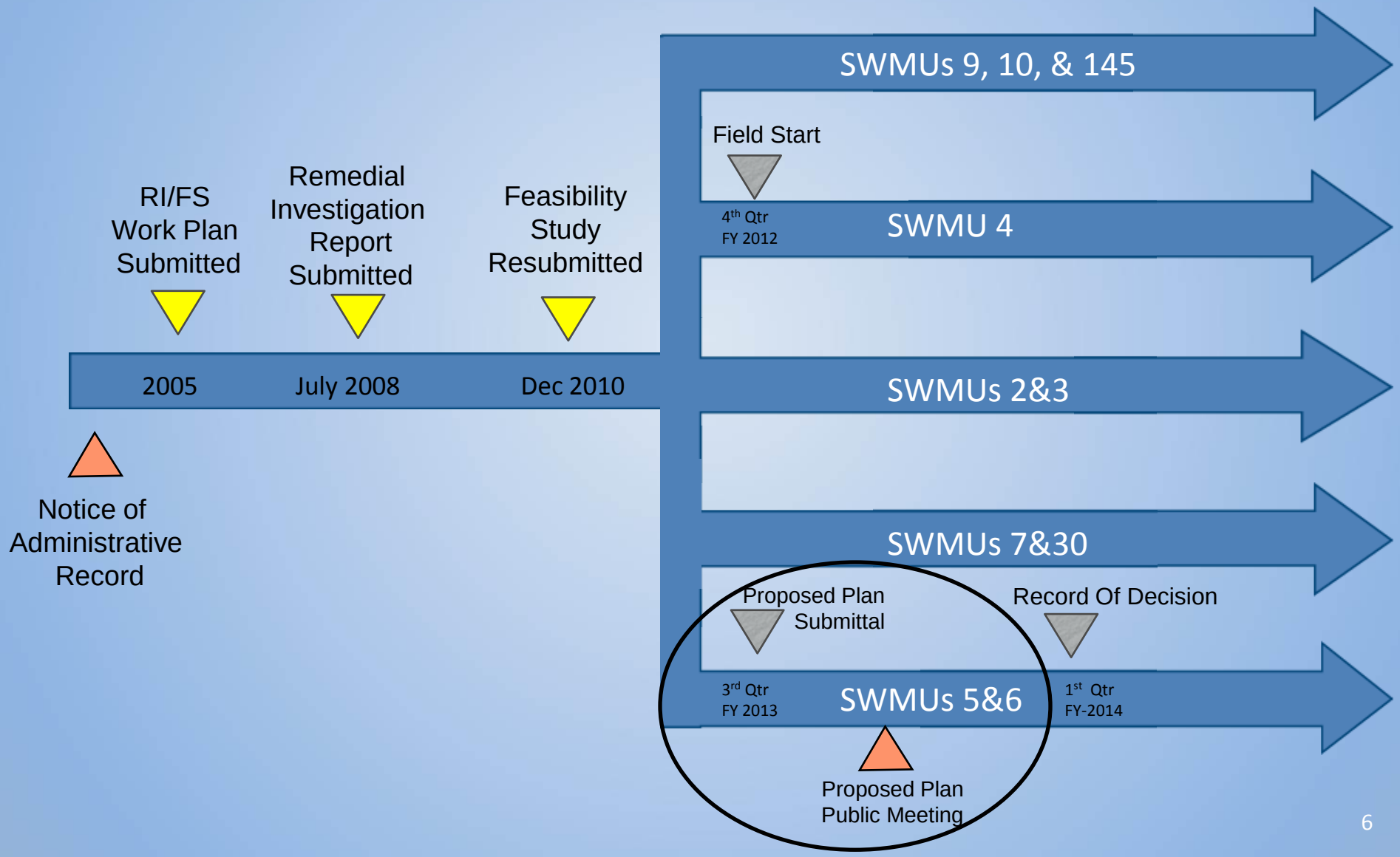
Original Approach



BGOU SWMU Remedial Action Alternative Summary
(from D1 BGOU FS)

Alternative	1	2	3	4	5	6	7	8	9
Alternative Description	No Action	Limited Action	Soil Cover and Long Term Monitoring	Soil Cover with in situ DNAPL Source Treatment and Long Term Monitoring	RCRA Cover with Hydraulic Isolation and Long Term Monitoring	Excavation and Disposal	Excavation and Disposal combined with insitu DNAPL Source Treatment and Long Term Monitoring	Excavation and Disposal combined with exsitu DNAPL Source Treatment and Long Term Monitoring	Insitu containment and Long Term Monitoring
SWMU 2	X				X		X	X	X
SWMU 3	X	X				X			X
SWMU 4	X						X	X	
SWMU 5	X		X			X			
SWMU 6	X	X							
SWMU 7	X			X			X	X	
SWMU 30	X		X			X			
SWMU 145	X		X			X			

Burial Grounds Project Schedule
2012 Regulatory Subdivision/Flat Funding Impact



Current Status

Current Status: SWMU 5 and 6

- Informal Dispute (regarding D2/R2 FS) resolved December 2012
- DOE issued Feasibility Study (D2/R3) February 2013
- EPA and KY approved Feasibility Study (D2/R3) February 2013
- DOE issued Proposed Plan (D1) May 2013
- EPA and KY currently are reviewing Proposed Plan (D1)
- Remedial action is scheduled to begin in mid-2015

Document Key

D1 – First regulatory review
D2 – Changes made from D1 review
R# - Revision based on additional reviews
A# - Additional text added to previously approved documents

Current Status: SWMUs 2, 3, 7 and 30

- DOE issued FS (D1) April 2012
- KY issued comments August 2012 and February 2013
- EPA issued comments March 2013
- DOE currently is resolving EPA and KY comments and developing Feasibility Study (D2)
- Schedule for Feasibility Study (D2) is under negotiation with EPA and KY
- SWMUs 2 & 3 Record of Decision (D1) is scheduled to be issued 4th Quarter FY2022
- SWMUs 7 & 30 Record of Decision (D1) is scheduled to be issued 2nd Quarter FY2024

Current Status: SWMU 4

- EPA and KY approved the Addendum to the Work Plan (D2/A2/R2) July 2012
- Phase I (64 passive soil gas and 154 soil samples) sampling activities completed October 2012
- Phase II (22 shallow borings) completed April 2013
- Phase III (10 deep borings) fieldwork initiated May 13, 2013
- Phases IV and V completion scheduled June 2014
- RI Report (D1) is scheduled to be issued December 2014

Detailed Analysis Summary for SWMUs 5 and 6

Alternative	1	5	6	6a
Evaluation Criteria	No Action	Kentucky Subtitle D Cap, LUCs, and Monitoring	Excavation and Disposal of Waste Materials and Affected Soils	Excavation and Disposal of Waste Materials and Affected Soils (at Proposed On-Site Disposal Unit)
Overall Protection of Human Health and the Environment	Does not meet the threshold criterion	Meets the threshold criterion	Meets the threshold criterion	Meets the threshold criterion
Compliance with ARARs	No ARARs identified	Meets the threshold criterion	Meets the threshold criterion	Meets the threshold criterion
Long-term Effectiveness and Performance	Low	Moderate to High	High	High
Reduction of Toxicity, Mobility, or Volume through treatment	None	None	No reduction through treatment other than incidental to treatment of collected waste to meet disposal facility waste acceptance criteria. Water collected as incidental to excavation would be treated and discharged to existing ditches.	No reduction through treatment other than incidental to treatment of collected waste to meet disposal facility waste acceptance criteria. Water collected as incidental to excavation would be treated and discharged to existing ditches.
Short-term Effectiveness	High	High	Moderate	Moderate
Implementability	High	High	High	High (applicable only if an on-site disposal cell is available)
Cost	Low	Moderate	High	Moderate to High
Capital Cost	5.8	5.4	4.6	4.6
Average Annual O&M Cost	$0	$63,784	$6,844	$6,844
Net Present Worth Cost	$0	$10,006,000	$240,408,000	$72,919,000

SWMUs 5 & 6

SWMUs 5 & 6 Remedial Investigation Findings

- Waste materials have limited mobility
- No identified groundwater threats at either SWMU
- Seeps observed along south edge of SWMU 5 in 1997
- PAHs identified as COC in surface soils at SMWU 5
- Limited SWMU 5 surface soil data results in uncertainty of surface soil conditions
- No waste sampling data results in uncertainty of source conditions

What do these mean from a risk perspective?

- Eliminate direct contact with waste and impacted soil
- Resolve uncertainty associated with surface soils and seeps (SMWU 5)

Considerations for FS alternative evaluation

- Wastes are not amenable to treatment
- Removal addresses all issues, but costly
- Land Use Controls and Containment (cap) both prevent direct contact
- Monitoring can identify unanticipated COC migration from the SWMU

SWMUs 5 & 6 FS Alternatives

- All developed action alternatives meet threshold criteria (overall protection of human health and the environment and compliance with ARARs).
- Developed alternatives provide trade-offs between balancing criteria such as short-term effectiveness, long-term effectiveness, and cost.

SWMU 2
Site Background and History

- Used from 1951 to 1977 for the disposal of uranium and uranium-contaminated wastes. (270 tons of uranium, 59,000 gallons of oil, 450 gallons of TCE, drummed wastes consist primarily of uranium from machine shop turnings, shavings, and sawdust, most waste in the unit is believed to consist of pyrophoric uranium metal.
- Area of approximately 32,000 ft^2 with dimensions of approximately 160 by 200 ft
- During use, pits were excavated to an estimated depth of 7 to 17 feet
- After use, the area was covered with a 6-inch thick clay cap and a 18-inch thick soil layer covered with vegetation

SWMU 3
Site Background and History

- Approximately 1.2 acres located in the west-central portion of the secured area
- Originally constructed as a rectangular above-ground surface impoundment measuring 387 feet by 137 feet with a floor area of approximately 53,000 ft^2
- The floor of the surface impoundment was constructed of well tamped earth, and clay dikes provided a depth of 6 feet
- In March 2003, an additional 37,000 ft^2 was added to the SWMU when a ditch area, which ran northeast-southwest and just east of SWMU 3, was included.
- The landfill was covered with a RCRA multi-layered cap and certified closed in 1987
- Currently regulated under RCRA as a land disposal unit and is required to comply with a RCRA post-closure permit issued in 1992
- Primarily, groundwater monitoring is required

Previous Investigations

- No remedial investigations
- Post closure monitoring for groundwater

SWMU 4
Site Background and History

- Located in western section of the PGDP
- Operated from 1951 to 1958
- Literature indicates the burial yard consists of two pits measuring 50 ft x 50 ft and 50 ft x 150 ft, which were excavated to a depth of approximately 15 ft below ground surface
- Surface water drains to the north, east, and west with discharge eventually into KPDES Outfall 015
- Pits were used for the disposal of contaminated and uncontaminated debris (e.g., steel, Monel, etc.)
- Contaminated debris was associated with natural and slightly depleted uranium from C-410 UF_6 feet plant
- Specific locations of burial pits are unknown
- Literature indicates that SWMU is a potential source for 99Tc and TCE
- May have received sludges designated for disposal at C-404 burial grounds as well as 99TC, magnesium fluoride, and uranium-contaminated solid waste
- Total volume of wastes disposed within the SWMU is unknown
- Debris covered with 2 ft to 3 ft of soil, then covered with 6 inches of clay in 1982

SWMU 5
Site Background and History

- Located in western section of the PGDP
- Operated from 1965 to 1987
- Literature indicates operating area was approximately 168,000 ft^2
- Disposal pits were located on a grid system and consisted of 10 ft x 10 ft cells excavated to depths of 6 to 15 ft below ground surface
- Literature indicates that pits were used for the burial of security-classified weapons components, some radionuclide-contaminated scrap metal, and slag from nickel and aluminum smelters
- Some of the wastes may be chemically unstable and/or incompatible compounds or metals (speculation based on underground fire in SE corner of SWMU boundary which burned for several weeks in 1976)
- Waste placed in disposal pits was covered with 2 to 3 ft of soil
- Total quantity and specific types of wastes buried at the yard are unknown
- Surface water drains to the north, west, and south with discharge into KPDES Outfall 001
- Historical records indicate that contaminants associated with SWMU 5 may include 99Tc, uranium, 60Co, tritium, and 182Ta
- Site is not believed to be a source of TCE contamination

SWMU 6
Site Background and History

- Located in western section of PGDP east of SWMU 5
- Operated from 1960 to 1976
- Literature indicates that there are five separate burial cells (identified as Areas H, I, J, K, and L) that cover an area of 5200 ft^2
- Depth of cells is reported to be 6 ft to 10 ft below ground surface
- No previous investigations have been conducted specifically at SWMU 6

Known Waste Inventories

Area H: 75 ft^3 magnesium scrap

Area I: 8 exhaust fans contaminated with perchloric acid

Area J: 1100 ft^3 aluminum scrap

Area K: 150 ft^3 magnesium scrap

Area L: UF_6 condenser

SWMU 7
Site Background and History

- Comprised the eastern two-thirds of C-747-A
- Bounded on the north and south sides by perimeter ditches, on the west side by the C-747-A Burn Area (SWMU 30), and on the east side by the C-746-E Contaminated Scrap Yard
- Covers approximately 240,900 ft^2 and includes five discrete burial pit areas (Burial Pits B, C, D, F, and G)
- Pit B: 10,200 ft^2
- Pit C: 9,600 ft^2
- Pit D: 2,100 ft^2
- Pit F: five areas each ≤ 1,800 ft^2
- Pit G: 3,300 ft^2
- Records indicate the burial pits were excavated to a depth of 6 to 7 ft below the surface, filled with wastes, and covered with approximately 3 ft of earth
- TB-3 of Phase II Site Investigation discovered waste to a depth of 10 ft on the west side of Burial Pit B
- Drum Mountain previously removed from area
- Burial Pits B, C, and G were used for disposal of noncombustible, contaminated and uncontaminated trash, material and equipment.
- Contaminated concrete removed from the C-410 Feed Plant during May and June 1960 was place in Burial Pit D
- The F Burial Pit was used for disposal of uranium-contaminated scrap metal and equipment. Empty uranium and magnesium powder drums were also reported to have been buried in Burial Pit F

SWMU 30
Site Background and History

- Includes the western one-third of C-747-A
- Consists of a historical burn-and-burial pit (Burial Pit A) and the location of a former incinerator
- Bounded on the north and south sides by ditches, on the west side by Patrol Road, and on the east side by SWMU 7
- Encompasses approximately 128,000 ft^2. The pit is reported to have been excavated to a depth of 12 ft and covered with 4 ft on earth.
- Used from 1951 to 1970 to burn combustible trash which may have contained uranium contamination
- Ash and debris were buried below ground in Burial Pit A beginning in 1962, when use of an on-site incinerator was discontinued
- Research identified images of the incinerator at the location

SWMU 145
Site Background and History

- Approximately 44 acres located north of the PGDP security area
- Began operation in the early 1950s
- C-746-S&T Landfills are located on top of SWMU 145
- Area was used by the contractor for the construction of the PGDP to discard all types of scrap and waste materials
- Use of the area for discarding of scrap and waste by subcontractors was continued until the early 1980s
- Construction debris such as concrete, roofing materials, wire, wood, shingles with asbestos, and welding rods are expected to have been disposed of in the area

Remedial Investigation Data

Remedial Investigation Data

Subsurface soil analytes frequently detected about screening levels

(Screening levels are based on background levels or risk based no action levels for excavation worker)

Source Area	Metals	Organic Compounds	Radionuclides
SWMU 2	Arsenic, Iron, Manganese, Vanadium	-	-
SWMU 3	Arsenic	-	-
SWMU 4	Iron, Manganese, Vanadium	-	^{230}Th, U, ^{234}U, ^{238}U
SWMU 5	Iron, Manganese, Vanadium	-	-
SWMU 6	Iron, Manganese, Vanadium	-	-
SWMU 7	Arsenic, Iron, Manganese	-	$^{235/236}$U
SWMU 30	Iron, Manganese	-	$^{235/236}$U
SWMU 145	Arsenic	-	^{228}Th

- = none
^{228}Th = thorium-228
^{230}Th = thorium-230

U = uranium
^{234}U = uranium-234
$^{235/236}$U = uranium-235/236

Frequently detected means 50% of all samples were detected above the screening level

Remedial Investigation Data

UCRS groundwater analytes frequently detected above screening levels

(Screening levels are based on MCLs or risk based no action levels for child resident)

Source Area	Metals	Organic Compounds	Radionuclides
SWMU 2	Beryllium, Iron, Manganese, Uranium	1, 1-DCE; TCE	^{234}U, ^{238}U
SWMU 3	Iron, Manganese	TCE	^{234}U
SWMU 4	Arsenic, Iron, Lead, Manganese	*cis*-1, 2-DCE; TCE	-
SWMU 5	Iron, Lead, Manganese, Molybdenum	-	-
SWMU 6	Iron, Lead, Manganese, Molybdenum, Uranium	-	^{99}Tc, ^{234}U, ^{238}U
SWMU 7	Arsenic, Iron, Lead, Manganese, Molybdenum, Nickel	TCE; Vinyl Chloride	^{222}Rn, ^{234}U, ^{238}U
SWMU 30	Arsenic, Iron, Lead, Manganese, Molybdenum, Nickel, Uranium, Vanadium	-	^{234}U, ^{238}U
SWMU 145	Iron, Manganese	-	^{222}Rn, ^{238}U

- = none
DCE = dichlorethene
^{222}Rn = radon-222

TCE = trichloroethene
^{234}U = uranium-234
^{238}U = uranium-238

Frequently detected means 50% of all samples were detected above the screening level

Remedial Investigation Data

Source Area	Metals	Organic Compounds	Radionuclides
SWMU 2	Arsenic, Beryllium, Iron, Manganese, Vanadium	1, 1-DCE; TCE	^{234}U, ^{238}U
SWMU 3	Manganese	-	-
SWMU 4	Manganese	Chloroform, TCE	-
SWMU 5	Lead, Manganese	-	-
SWMU 6	Lead, Manganese	TCE	-
SWMU 7	Arsenic, Iron, Lead, Manganese, Molybdenum, Nickel	TCE	-
SWMU 30	Arsenic, Iron, Manganese	TCE	-
SWMU 145	-	-	-

- = none
DCE = dichlorethene

TCE = trichloroethene
^{234}U = uranium-234
^{238}U = uranium-238

Frequently detected means 50% of all samples were detected above the screening level

Solving Cleanup Challenges Through Risk Reduction

BGOU SWMU Remedial Action Alternative Summary

Alternative	1	2	3	4	5	6	7	8	9
Alternative Description	No Action	Limited Action	Soil Cover and Long-Term Monitoring[a]	Soil Cover combined with *In situ* DNAPL Source Treatment and Long-Term Monitoring	RCRA Cover with Hydraulic Isolation and Long-Term Monitoring	Excavation and Disposal	Excavation and Disposal combined with *In situ* DNAPL Source Treatment and Long-Term Monitoring[b]	Excavation and Disposal combined with *Ex situ* DNAPL Source Treatment and Long-Term Monitoring[c]	*In situ* Containment and Long-Term Monitoring
SWMU No.									
2	X				X		X	X	X
3[d]	X[e]	X[f]				X[g]			X
4[h]	X						X	X	
5	X		X			X[i]			
6	X	X							
7	X			X[j]			X	X	
30	X		X			X			
145	X		X			X[k]			

X-Indicates an alternative that was analyzed in detail for a particular SWMU.

[a] A soil cover was evaluated for those SWMUs where surface contact with the waste management unit is to be prevented and infiltration resulting from precipitation does not appear to pose any threat to human health or groundwater.

[b] *In situ* treatment is evaluated as a contingency alternative at SWMUs 2 and 7 if DNAPL is present upon completion of the excavation.

[c] *Ex situ* treatment is evaluated as a contingency alternative at SWMUs 2 and 7 if DNAPL is present upon completion of the excavation.

[d] SWMU 3 is a closed RCRA landfill lined with compacted soil, covered with a RCRA Subtitle C cap, equipped with a leachate collection system and managed under a RCRA postclosure permit.

[e] No action would be taken at SWMU 3 under the CERCLA program, but it would continue to be managed under the RCRA program.

[f] This alternative is for long-term monitoring based on results of the demonstration required under 40 *CFR* § 294.90(f)(1) and (2), but performed under the CERCLA program.

[g] SWMU 3 was evaluated for excavation of the documented waste disposal volume. No further action is required for the ditch at SWMU 3 under the BGOU.

[h] DNAPL at SWMU 4 is assumed to extend to sufficient depth to be present in both the UCRS and RGA.

[i] Metal melting is evaluated as a supplementary technology to excavation at SWMU 5 for metal recovery/recycle.

[j] A soil cover combined with *in situ* source treatment was evaluated for SWMU 7 where radioactive/inorganic contamination is limited to the surface. *In situ* treatment was evaluated to remediate DNAPL reported potentially to be present at SWMU 7.

[k] Excavation at SWMU 145 will be limited to course of the former North-South Diversion Ditch. Soil cover will be placed over uncovered portions, if necessary.