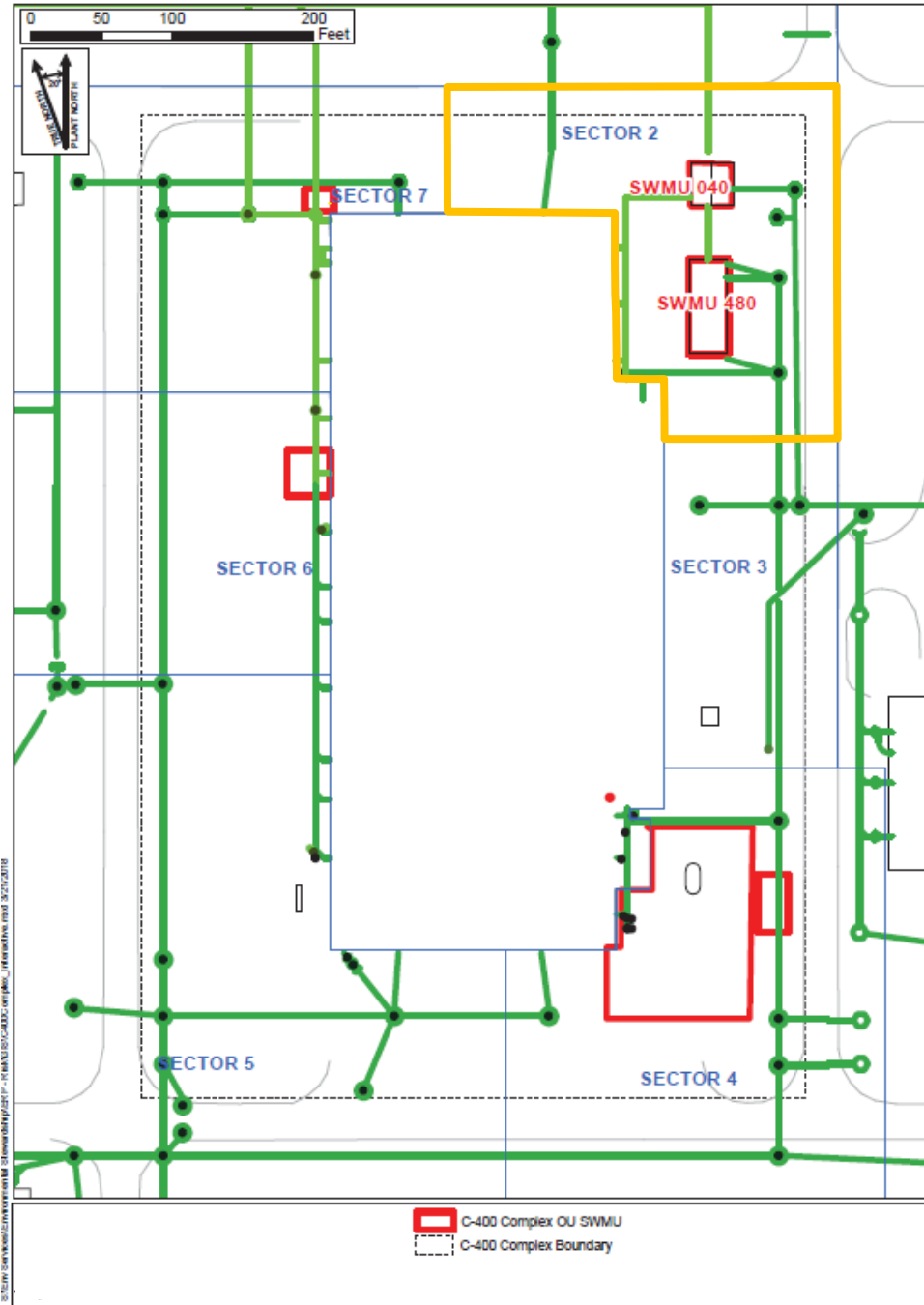




# Sampling Plan Strategy Sector 2 Example

# Location of Sector 2



# Sector 2 Background

Concrete and asphalt pavement covers much of current area of Sector 2

- Area of ~38,000 ft<sup>2</sup>
- Concrete apron on north end of building is original construction
- Limited area of exposed soil

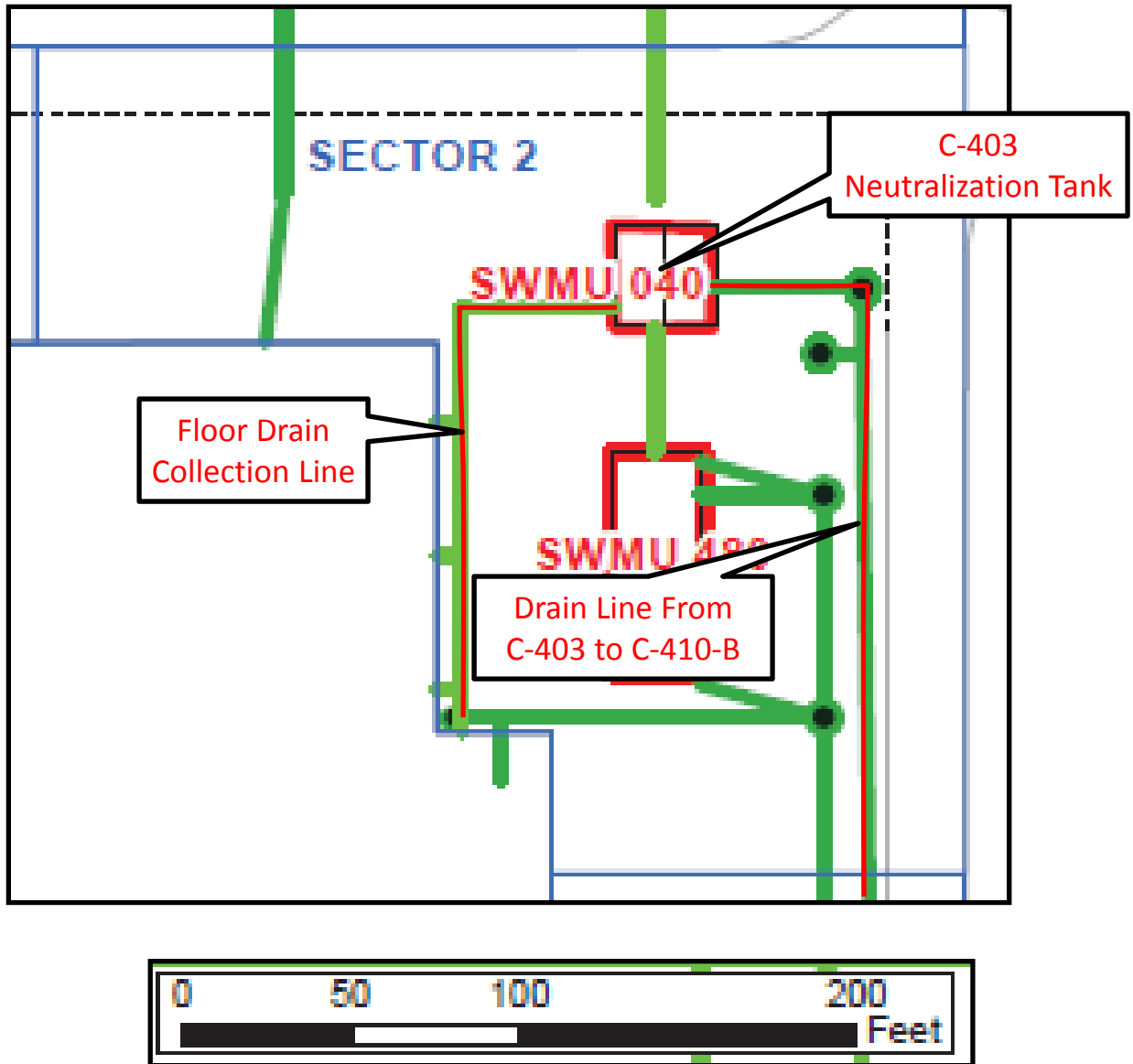
Key context from WAG 6 RI

- Surface soils are sparsely represented
  - PAHs are present (detects in 3 of 6 samples), locally elevated
  - PCBs are present above the WAG 6 screening level in 1 sample
- 31 subsurface soil samples from 19 locations
  - Sampled between 5 and 49 ft bgs
  - Analyzed for VOCs, SVOCs, and metals
  - 22 samples screened for PCBs – not a problem
  - PAHs present near building (all detections -3 locations - below 1,000 ug/kg)
- Identified areas of contamination
  - Floor drain collection line on outer perimeter of the building (drained to C-403/SWMU 40)
    - Radionuclides detected between 15 and 40 ft bgs
  - C-403 Neutralization Tank and drain line from C-403/SWMU 40 to C-410-B Lagoon
    - Radionuclides detected in C-403 backfill (to 30 ft depth)
    - Radionuclides, silver, and antimony detected in soils adjacent and below drain line from C-403 to C-410-B Lagoon



# WAG 6 RI

## Identified Areas of Contamination



# Sampling Strategies: Targeted vs Random

## Anticipated remedial action(s)

- Excavation of C-403 (certain)
- Removal of surface soil (likely action)

## Primary recognized uncertainties

- Nature and extent of surface soil contamination (addressed by surface soil removal)
- Near-field extent (lateral and vertical) of metals and radionuclides associated with identified areas of contamination

## Sample strategies

- No surface soil samples collected for targeted sampling approach. Baseline Risk Assessment requires surface soil samples.
- Sample 3 subsoil horizons
  - HU1: ~ 10 ft depth
  - HU2A: ~ 20 ft depth
  - HU3: ~ 35 ft depth
- Targeted – contaminant sources and COCs from WAG 6 RI Baseline Risk Assessment
  - Sampling to update extent of contaminants

OR

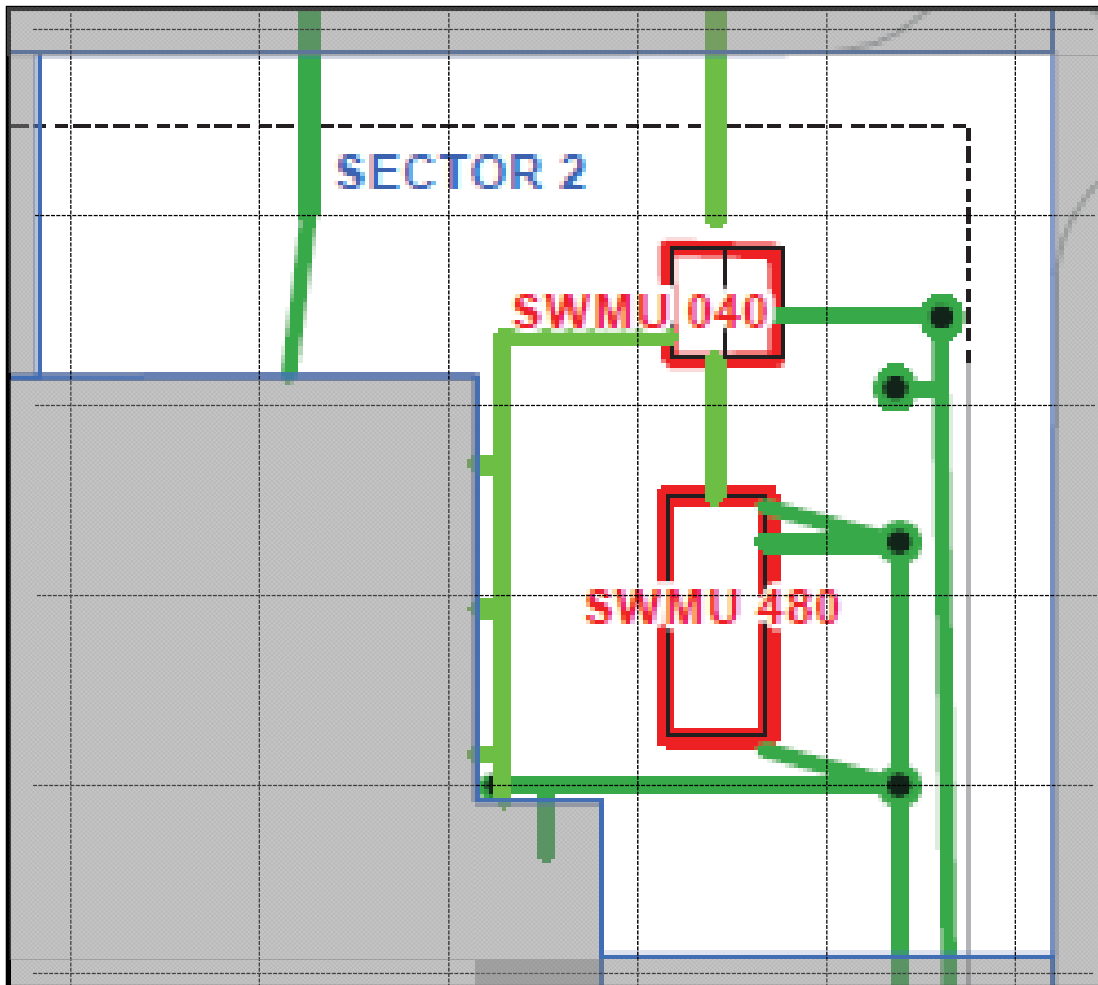
- Random - taking no benefit from WAG 6 RI
  - Sampling to support baseline risk assessment and define nature and extent



# How Many Subsoil Samples?

Sector 2 consists of approximately 38,000 sq ft:

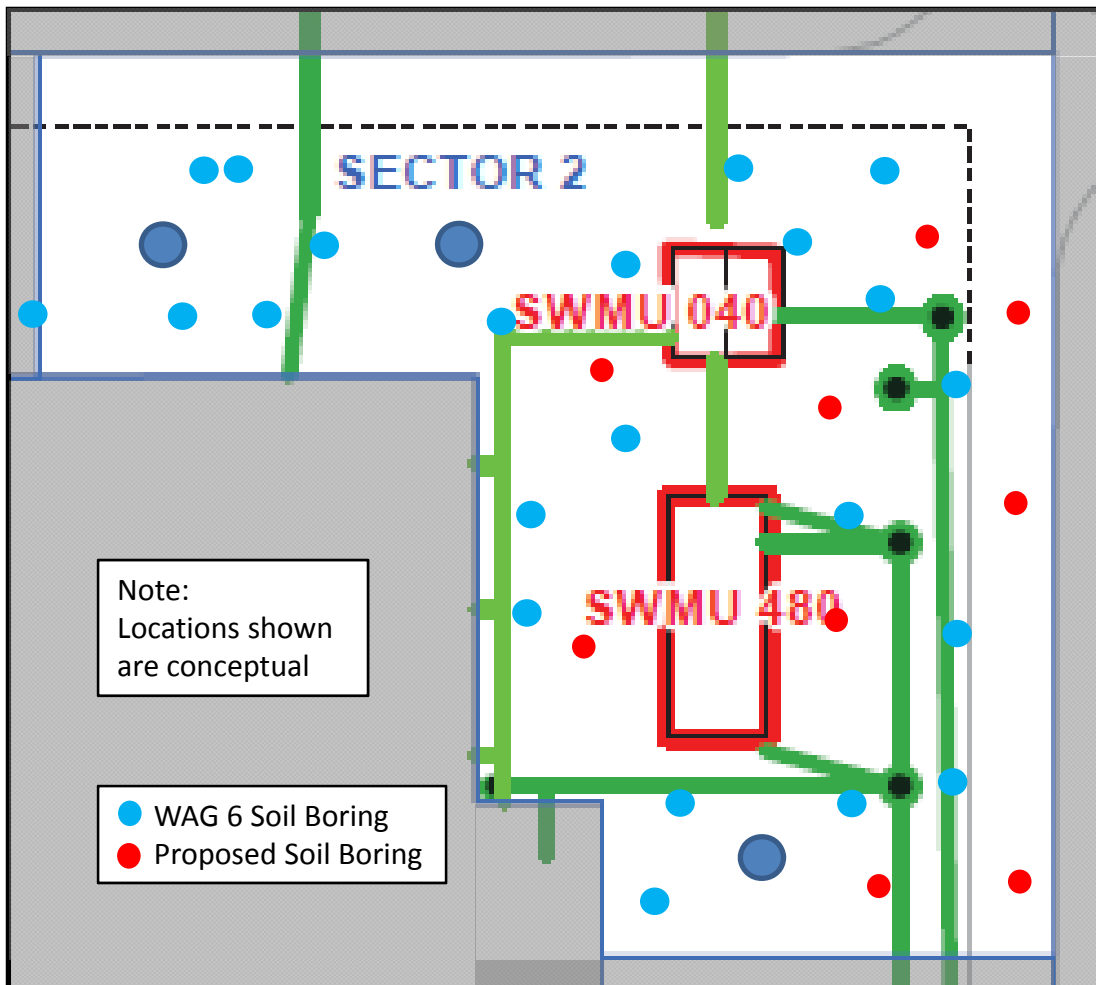
If each sample characterizes a 50 ft x 50 ft area, ~9 samples are required to characterize the site with 95% confidence at 80% coverage



# Option 1: Targeted Sampling Approach

Example targeted approach:

- Assumes C-403 Neutralization Tank (SWMU 40) will be excavated
- Assumes removal of surface soil
- Approximates an even distribution around the remaining contaminant sources to define contaminant levels at the contaminant sources and away from the sources
- Samples will be collected from HU1, HU2, and HU3 depths at each proposed sample location
- Total of 9 soil borings/27 soil samples

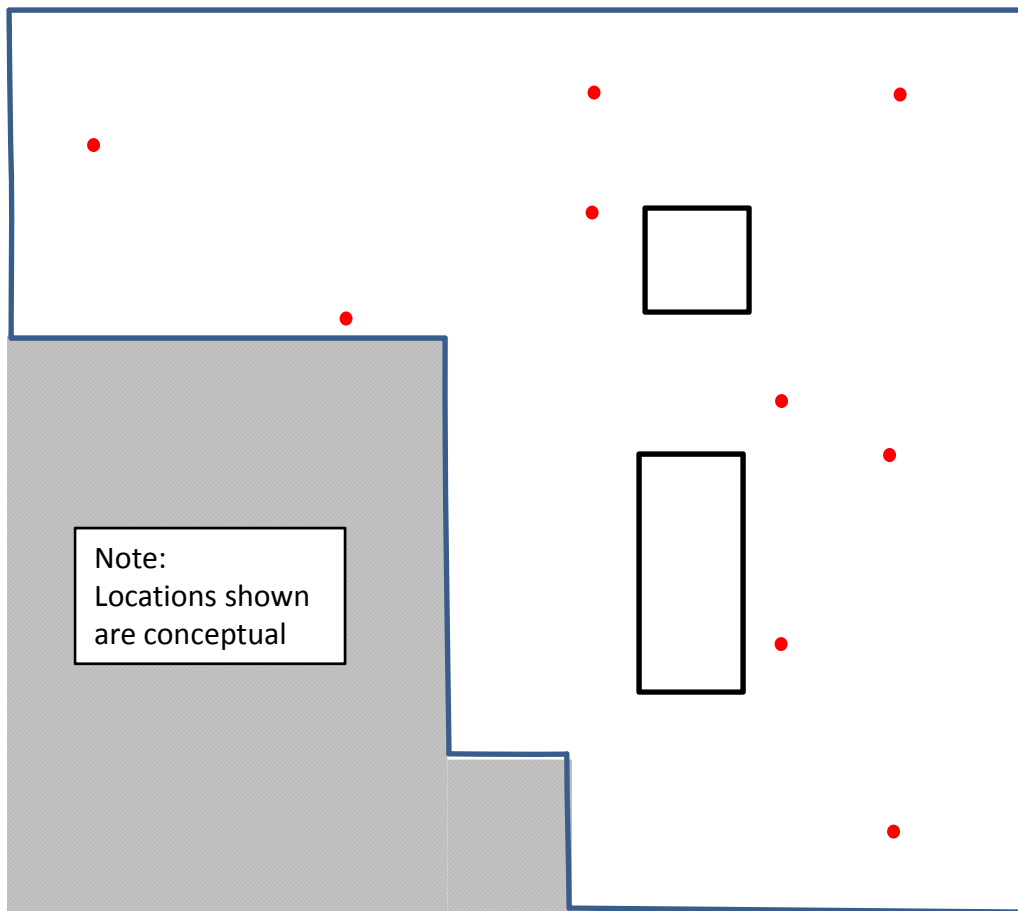


# Option 2: Random Sampling Approach

## Sample all 3 HUs in each borehole

Example random approach (9 total sample locations):

- 50 ft x 50 ft grid further refined into 9 cells per grid
- Assumes all potential sample locations are of equal value (sampling locations identified at C-403/SWMU 40 location would be moved to an adjacent grid cell)
- Samples will be collected from HU1, HU2, and HU3 depths at each sample location
- Total of 9 soil borings/27 soil samples





# Subsoil Sample Approach Summary

3 Options:

1) Targeted Sampling Approach

- Risk Screening Investigation based on WAG 6 RI Baseline Risk Assessment
- Sampling and analysis to confirm nature of contamination and characterize current extent of contamination
- Strengths
  - Uses existing knowledge (WAG 6 RI characterization)

2) Random Sampling Approach: Sample all HUs in Each Borehole

- Baseline Risk Assessment Investigation
- Sampling and analysis to identify risk drivers and define extent
- Strengths
  - Simplifies selection of soil boring location
- Weakness
  - Ignores existing data (for baseline risk) WAG 6 data could be used qualitatively for determining response action.
  - Likely requires 2<sup>nd</sup> stage of sampling to define extent adequately

Preference is 1) Targeted Sampling Approach



# Sector 2 Analyses

Option 1: Targeted Sampling Approach (based on WAG 6 RI Baseline Risk Assessment)

- Metals (chromium as total chromium)
- PCBs
- Radionuclides
- SVOCs
- VOCs (includes toluene)

Option 2: Random Sampling Approach

- COPCs as defined in Table 2.1 of Risk Methods Document
  - Including all metals (chromium as total, only)
  - Including toluene
  - Excluding dioxins/furans

Groundwater samples: sample existing UCRS well MW177 for same chemical analytical suites as soil sampling approach

Geotechnical samples (in general):

- Engineering properties, transport properties, and risk assessment
- Geotechnical properties likely consistent across C-400 OU Complex
  - 3 per sector to define characteristic value and variability for C-400 OU Complex
  - Samples from minimally affected soil



# Adaptation of Table 2.1 Significant Chemicals and Radionuclides of Potential Concern at PGDP

from *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*  
DOE/LX/07-0107&D2/R8/V1

Inorganic Chemicals		Organic Compounds				Radionuclides	
Analyte	CAS Number	Analyte	CAS Number	Analyte	CAS Number	Analyte	CAS Number
Aluminum	7429-90-5	Acenaphthene	83-32-9	Total Dioxins/Furans	1746-01-6	Americium-241	14596-10-2
Antimony	7440-36-0	Acenaphthylene	208-96-8	2,3,7,8-HpCDD	37871-00-4	Cesium-137+D	10045-97-3
Arsenic	7440-38-2	Acrylonitrile	107-13-1	2,3,7,8-HpCDF	38998-75-3	Neptunium-237+D	13994-20-2
Barium	7440-39-3	Anthracene	120-12-7	2,3,7,8-HxCDD	34465-46-8	Plutonium-238	13981-16-3
Beryllium	7440-41-7	Benzene	71-43-2	2,3,7,8-HxCDF	55684-94-1	Plutonium-239	15117-48-3
Boron	7440-42-8	Bromodichloromethane	75-27-4	OCDD	3268-87-9	Plutonium-240	14119-33-6
Cadmium	7440-43-9	Carbazole	86-74-8	OCDF	39001-02-0	Technetium-99	14133-76-7
Chromium III	146065-83-1	Carbon tetrachloride	56-23-5	2,3,7,8-PeCDD	36088-22-9	Thorium-230	14269-63-7
Chromium VI	18540-29-9	Chloroform	67-66-3	1,2,3,7,8-PeCDF	57117-41-6	Uranium-234	13966-29-5
Total Chromium	7440-47-3	1,1-Dichloroethene	75-35-4	2,3,4,7,8-PeCDF	57117-31-4	Uranium-235+D	15117-96-1
Cobalt	7440-48-4	1,2-Dichloroethane	107-06-2	2,3,7,8-TCDD	1746-01-6	Uranium-238+D	7440-61-1
Copper	7440-50-8	1,2-Dichloroethane (mixed)	540-59-0	2,3,7,8-TCDF	5127-31-9		
Fluoride	16984-48-8	trans-1,2-Dichloroethene	156-60-5	Total Carcinogenic PAHs	50-32-8		
Iron	7439-89-6	cis-1,2-Dichloroethene	156-59-2	Benz(a)anthracene	56-55-3		
Lead	7439-92-1	Dieldrin	60-57-1	Benzo(a)pyrene	50-32-8		
Manganese	7439-96-5	Ethylbenzene	100-41-4	Benzo(b)fluoranthene	205-99-2		
Mercury	7439-97-6	Fluoranthene	206-44-0	Benzo(k)fluoranthene	207-08-9		
Molybdenum	7439-98-7	Fluorene	86-73-7	Chrysene	218-01-9		
Nickel	7440-02-0	Hexachlorobenzene	118-74-1	Dibenz(a,h)anthracene	53-70-3		
Selenium	7782-49-2	Naphthalene	91-20-3	Indeno(1,2,3-cd)pyrene	193-39-5		
Silver	7440-22-4	2-Nitroaniline	88-74-4	Total PCBs	1336-36-3		
Thallium	7440-28-0	N-Nitroso-di-n-propylamine	621-64-7	Aroclor 1016	12674-11-2		
Uranium	NA	Pentachlorophenol	87-86-5	Aroclor 1221	11104-28-2		
Vanadium	7440-62-2	Phenanthrene	85-01-8	Aroclor 1232	11141-16-5		
Zinc	7440-66-6	Pyrene	129-00-0	Aroclor 1242	53469-21-9		
		Tetrachloroethene	127-18-4	Aroclor 1248	12672-29-6		
		Toluene	108-88-3	Aroclor 1254	11097-69-1		
		1,1,1-Trichloroethane	71-55-6	Aroclor 1260	11096-82-5		
		1,1,2-Trichloroethane	79-00-5	Vinyl chloride	75-01-4		
		Trichloroethene	79-01-6	Xylenes (Mixture)	1330-20-7		
				p-Xylene	106-42-3		
				m-Xylene	108-38-3		
				o-Xylene	95-47-6		

<sup>1</sup> This list of chemicals, compounds, and radionuclides was compiled from COPCs retained as COCs in baseline risk assessments performed at PGDP between 1990 and 2013 (i.e., DOE 1996a; DOE 1996b; DOE 1999a; DOE 1999b; DOE 2000a; DOE 2001; DOE 2005; DOE 2008; DOE 2010; DOE 2013).

<sup>2</sup> List may be added to during project scoping based on additional information.

