



Department of Energy

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JUL 23 2009

PPPO-03-322-09

Ms. Maria Galanti
Ohio Environmental Protection Agency
Southeast District Office
2195 Front Street
Logan, Ohio 43138

Dear Ms. Galanti:

RESULTS FOR ADDITIONAL INVESTIGATION AT THE X-344C SOLID WASTE MANAGEMENT UNIT AT THE PORTSMOUTH GASEOUS DIFFUSION PLANT

The Department of Energy (DOE) is submitting the enclosed report presenting the results of the investigation completed at the X-344C Solid Waste Management Unit (SWMU). The investigation was completed in accordance with the *Work Plan for Additional Investigation at the X-344C Solid Waste Management Unit at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio* (DOE/PPPO/03-0076&D2) approved by Ohio EPA on March 10, 2009.

No metals or other contaminants of potential concern were detected above preliminary remediation goals and risk-based screening levels in the groundwater or soil sampled as part of this investigation. Based on the results of the investigation, a No Further Action determination is requested for the X-344C SWMU.

If you have any questions or require additional information, please contact Melda Rafferty of my staff at (740) 897-5521.

Sincerely,

A handwritten signature in black ink, appearing to read "W. E. Murphie", is written over a horizontal line.

William E. Murphie
Manager

Portsmouth/Paducah Project Office

Enclosure:

Results of Investigation at the X-344C SWMU

cc w/enclosure:

W. Franz, LPP/PORTS
Administrative Records
PPPO Records, LEX

Results for the Additional Investigation at the X-344C Solid Waste Management Unit

1. BACKGROUND

On March 10, 2009, the Ohio Environmental Protection Agency (Ohio EPA) approved the *Work Plan for Additional Investigation at the X-344C Solid Waste Management Unit at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio* (DOE/PPPO/03-0076&D2). The work plan described the approach for collecting additional groundwater and soil characterization data near the former X-344C Hydrogen Fluoride (HF) Storage Building at the U.S. Department of Energy (DOE) Portsmouth Gaseous Diffusion Plant (PORTS). The X-344C building and associated HF storage tanks were demolished and removed in May 2006. The concrete secondary containment pad and storage tank supports were left in place. The X-344C Solid Waste Management Unit (SWMU) is defined as the vadose zone soils and groundwater beneath the former X-344C HF Storage Building.

The primary purpose of the investigation was to determine whether metals contamination exists in the Gallia groundwater near the former X-344C HF Storage Building. Secondly, if the groundwater was found to be contaminated with metals, the investigation was also intended to determine whether soils beneath the former X-344C facility site may be contributing to the groundwater contamination.

2. RESULTS

2.1 Groundwater

Groundwater samples were collected during two sampling events (March 24, 2009 and April 30, 2009) from three Gallia groundwater monitoring wells: X344C-01G, X745F-01G, and NDD-03G (see Figure 1). Prior to sampling, the wells were developed to remove excess silt from the well casing and sand pack (to the extent possible), dislodge screen obstructions, and stabilize field parameters (e.g., conductivity, pH, turbidity, and temperature).

Samples from each well were analyzed for the metals of potential concern (arsenic, beryllium, cadmium, chromium, lead, nickel, and vanadium). Samples from well X344C-01G were also analyzed for selected volatile organic compounds (VOCs) and radionuclides at Ohio EPA's request. The VOCs that were analyzed included 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, *cis*-1,2-dichloroethene, *trans*-1,2-dichloroethene, benzene, ethylbenzene, toluene, trichloroethene, vinyl chloride, and xylenes (total). The radionuclides that were analyzed included technetium-99, uranium (total), uranium-233/234, uranium-235, uranium-236, and uranium-238.

Results for metals in groundwater were compared to the preliminary remediation goals (PRGs) listed in the work plan. As shown in Table 1, no metals were detected above PRGs in the groundwater samples from each of the three wells.

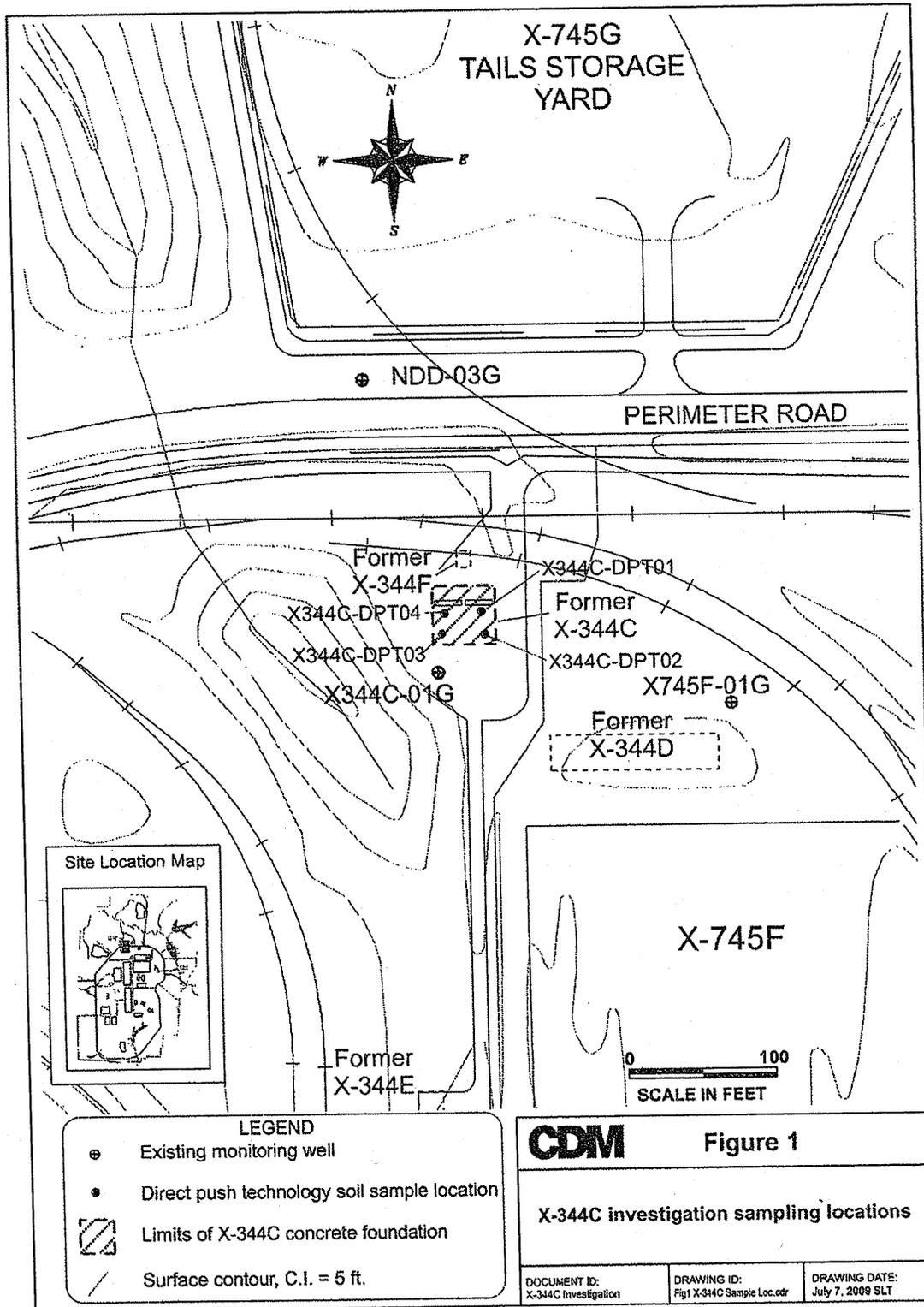


Table 1. X-344C groundwater sampling results (in $\mu\text{g/L}$) for the metals of potential concern

Analyte	PRG	Well X344C-01G						Well X745F-01G				Well NDD-03G			
		03/24/09		Duplicate 03/24/09		04/30/09		03/24/09		04/30/09		03/24/09		04/30/09	
Arsenic	92	1.9	B	1.7	B	0.75	B	0.35	B	0.22	B	0.97	B	0.82	B
Beryllium	6.5	1	U	0.1	B	0.09	B	1	U	1	U	1	U	1	U
Cadmium	6.5	0.47	B	0.51	B	0.47	B	0.69	B	0.77	B	0.42	B	0.56	B
Chromium	100	2.2		1.9	B	0.71	B	1.4	B	1.1	B	1.4	B	2.1	
Lead	16	0.82	B	0.71	B	0.31	B	1	U	1	U	0.28	B	0.29	B
Nickel	100	20		19		19		27		26		13		14	
Vanadium	260	3.1	B	2.8	B	0.77	B	0.45	B	5	U	5	U	0.28	B

B – The reported value is less than the practical quantitation limit but greater than the instrument detection limit. U – undetected.

Two VOCs, *cis*-1,2-dichloroethene and *trans*-1,2-dichloroethene, were detected at concentrations well below PRGs in the samples collected from well X344C-01G (see Table 2). *Cis*-1,2-dichloroethene was detected at concentrations between 1.6 and 1.8 $\mu\text{g/L}$ in each of the samples collected from well X344C-01G. These results are less than the PRG of 70 $\mu\text{g/L}$ for *cis*-1,2-dichloroethene. *Trans*-1,2-dichloroethene was detected at an estimated concentration of 0.19 $\mu\text{g/L}$ in the sample collected from well X344C-01G in April 2009, but was not detected in the samples collected from the well in March 2009. This detection is less than the PRG of 100 $\mu\text{g/L}$ for *trans*-1,2-dichloroethene. No other VOCs were detected in well X344C-01G.

Table 2. Additional X-344C groundwater sampling results

Analyte	Units	Well X344C-01G					
		03/24/09		Duplicate 03/24/09		04/30/09	
1,1-Dichloroethane	$\mu\text{g/L}$	1	U	1	U	1	U
1,2-Dichloroethane	$\mu\text{g/L}$	1	U	1	U	1	U
1,1-Dichloroethene	$\mu\text{g/L}$	1	U	1	U	1	U
<i>cis</i> -1,2-Dichloroethene	$\mu\text{g/L}$	1.6		1.6		1.8	
<i>trans</i> -1,2-Dichloroethene	$\mu\text{g/L}$	1	U	1	U	0.19	J
Benzene	$\mu\text{g/L}$	1	U	1	U	1	U
Ethylbenzene	$\mu\text{g/L}$	1	U	1	U	1	U
Toluene	$\mu\text{g/L}$	1	U	1	U	1	U
Trichloroethene	$\mu\text{g/L}$	1	U	1	U	1	U
Vinyl Chloride	$\mu\text{g/L}$	1	U	1	U	1	U
Xylenes, Total	$\mu\text{g/L}$	2	U	2	U	2	U
Uranium, Total	$\mu\text{g/L}$	0.1372		0.2127		0.1866	
Uranium-233/234	pCi/L	0.06482		0.05931		0.05851	
Uranium-235	pCi/L	0.004704	U	0.004878	U	0.004812	U
Uranium-236	pCi/L	0.004223	U	0	U	-0.004312	U
Uranium-238	pCi/L	0.04567		0.07103		0.06228	
Technetium-99	pCi/L	-1.03	U	-0.979	U	-0.437	U

J – The reported value is less than the practical quantitation limit but greater than the instrument detection limit. U – undetected.

Radionuclides were undetected or detected at low levels typical of naturally-occurring uranium and below PRGs in the samples collected from well X344C-01G (see Table 2).

2.2 Soil

Soil samples were collected from four locations beneath the footprint of the former X-344C HF Storage Building (see Figure 1) on April 21 and 22, 2009. Direct push technology (DPT) was used to collect samples at four different depths starting immediately below the base of the concrete pad/gravel subgrade to a depth of 12 ft below ground surface (bgs).

Each soil sample was analyzed for the metals of potential concern (arsenic, beryllium, cadmium, chromium, lead, nickel, and vanadium). In addition, a soil sample was collected at the 10 to 12 ft depth from location X344C-DPT02 and analyzed for selected VOCs at Ohio EPA's request. The VOCs that were analyzed included 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, *cis*-1,2-dichloroethene, *trans*-1,2-dichloroethene, benzene, ethylbenzene, toluene, trichloroethene, vinyl chloride, and xylenes (total). Following collection of the soil samples, the DPT locations were filled with bentonite to prevent surface runoff from migrating into the subsurface.

Table 3 lists the results for metals detected in soil at each of the sampling locations. The average concentrations of each metal detected in soil are below the PRGs listed in the work plan. Each of the individual detections is below the PRG, with the exception of the concentration of nickel detected in the 10-12 ft depth at X344C-DPT04. Nickel was detected at 35 mg/kg at this depth and location, which slightly exceeds the PRG of 34 mg/kg.

Table 3. X-344C soil sampling results for the metals of potential concern

Sample Location	Sample Depth/ Interval (ft bgs)	Analyte (mg/kg, corresponding PRG in parentheses)						
		Arsenic (31)	Beryllium (3.2)	Cadmium (2.0)	Chromium (1,400)	Lead (400)	Nickel (34)	Vanadium (260)
X344C-DPT01	2/0-2	5.6	0.28	0.14	11	9.2	7.6	21
	6/4-6	14	0.93	0.2	22	17	27	32
	9/7-9	7.8	0.81	0.12	20	15	20	32
	9/7-9 ^a	11	0.88	0.16	18	13	25	29
	12/10-12	9.8	0.47	0.13	19	14	14	35
X344C-DPT02	2/0-2	7.6	0.36	0.11	12	9.7	9.1	25
	6/4-6	11	0.82	0.27	18	13	27	25
	9/7-9	9.9	1	0.16	19	17	20	31
	12/10-12	9.4	0.84	0.18	22	12	29	26
X344C-DPT03	2/0-2	7.9	0.51	0.17	12	8.4	11	26
	6/4-6	8.3	1.1	0.13	20	14	29	28
	9/7-9	10	0.87	0.15	18	17	15	32
	12/10-12	9.6	0.94	0.17	18	13	26	27
X344C-DPT04	2/0-2	12	0.62	0.17	14	16	10	29
	6/4-6	8.3	0.84	0.18	18	16	20	29
	9/7-9	7.7	0.74	0.14	15	14	13	28
	12/10-12	8.8	1.1	0.26	23	13	35	29
AVERAGE		9.3	0.77	0.17	18	14	20	28

^aDuplicate sample

The PRG for nickel provided in the work plan is based on the upper tolerance limit (UTL) for nickel in soil at background sampling locations as developed in the *Background Sampling Investigation of Soil and Groundwater Final Report* (DOE 1996). By definition of the UTL, some measurements of nickel that represent background concentrations (5%) will exceed the UTL, which may be the case for the detection of nickel that exceeds the UTL. The risk-based soil screening level for nickel developed by

U.S. EPA Region 9 for the protection of groundwater is 48 mg/kg; concentrations of nickel detected in the soil samples do not exceed 48 mg/kg.

No VOCs were detected in the soil sample collected from the 10 to 12 ft depth at location X344C-DPT02 (see Table 4).

Table 4. Additional X-344C soil sampling results

Analyte	Units	Location X344C-DPT02 / Interval 10 – 12 (ft bgs)			
		Regular		Duplicate	
1,1-Dichloroethane	µg/kg	5	U	5	U
1,2-Dichloroethane	µg/kg	5	U	5	U
1,1-Dichloroethene	µg/kg	5	U	5	U
cis-1,2-Dichloroethene	µg/kg	2.5	U	2.5	U
trans-1,2-Dichloroethene	µg/kg	2.5	U	2.5	U
Benzene	µg/kg	5	U	5	U
Ethylbenzene	µg/kg	5	U	5	U
Toluene	µg/kg	5	U	5	U
Trichloroethene	µg/kg	5	U	5	U
Vinyl Chloride	µg/kg	5	U	5	U
Xylenes, Total	µg/kg	5	U	5	U

U – undetected.

3. CONCLUSIONS

The decision rule for groundwater contaminants in the work plan states: *If low-flow groundwater sampling results from the two sampling events indicate that the concentration of a metal of potential concern is above the selected PRG, then calculate the cumulative risk posed by the metal contaminant(s) of concern for the projected future land use scenario (industrial/commercial) and compare against target risk goals. If target risk goals are exceeded, then discuss potential remedial alternatives with Ohio EPA. If the concentration of a metal of potential concern is above the selected PRG for only one sampling event, then discuss the need for further evaluation (e.g., additional sampling under the Integrated Groundwater Monitoring Plan with Ohio EPA; otherwise, no further corrective action is warranted for groundwater at the X-344C SWMU.*

Although metals and VOCs detected in the groundwater monitoring wells are well below PRGs, DOE has agreed to sample well X344C-01G annually for VOCs for three years beginning in 2010 and ending in 2012 as previously agreed upon with Ohio EPA during a meeting on June 11, 2009 to discuss the investigation results. This monitoring will provide additional information concerning the low concentrations of *cis*-1,2-dichloroethene and *trans*-1,2-dichloroethene detected in well X344C-01G. This monitoring has been added to the *Integrated Groundwater Monitoring Plan* (DOE/PPPO/03-0032&D3, dated June 2009).

The decision rule for soil contaminants in the work plan states: *If the concentration of a metal of potential concern is above the selected PRG, then determine the lateral and vertical extent of contamination and calculate the cumulative risk posed by the metal contaminant(s) of concern for the projected future land use scenario (industrial/commercial) and compare against target risk goals. If target risk goals are exceeded, then discuss potential remedial alternatives with Ohio EPA; otherwise, no further corrective action is warranted for soils at the X-344C SWMU.*

Concentrations of metals in soil are below the PRGs, with the exception of one detection of nickel, which exceeds the background-based PRG but does not exceed the U.S. EPA Region 9 risk-based soil screening level for the protection of groundwater (48 mg/kg) or the screening level for industrial/commercial land use (20,000 mg/kg). Groundwater sampling data also indicate that nickel concentrations in soil in the X-344C area are not a concern, as nickel was not detected in the groundwater monitoring wells at concentrations exceeding the PRG. No VOCs were detected in the soil sample analyzed for VOCs. Therefore, no further evaluation or corrective action is necessary for soils at the X-344C SWMU.

None of the chemicals identified as contaminants of potential concern in the work plan were identified in the X-344C area above concentrations that exceeded PRGs and risk-based screening levels. Therefore, no further action is necessary at the X-344C SWMU.