0071475

Waste Site Reclassification Form

Date Submitted: 8/29/06 **Originator:** L. M. Dittmer **Phone:** 372-9664	**Operable Unit(s):** 100-DR-1 **Waste Site ID:** 100-D-24 **Type of Reclassification Action:** Rejected ☐ Closed Out ☐ Interim Closed Out ☐ No Action ☒	**Control Number:** 2006-004 **Lead Agency:** Ecology

This form documents agreement among the parties listed below authorizing classification of the subject unit as rejected, closed out, interim closed out, or no action and authorizing backfill of the site, if appropriate. Final removal from the National Priorities List of no action, interim closed-out, or closed-out sites will occur at a future date.

Description of current waste site condition:

The 100-D-24 Sample Building Drywell waste site was a drywell that received drainage from a floor drain in the 119-D Sample Building. Confirmatory sampling was conducted on November 3, 2005. Sampling and evaluation of this site have been performed in accordance with remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington. The selected action involved demonstrating through confirmatory sampling that cleanup goals have been met and proposing the site for classification as no action.

Basis for reclassification:

The 100-D-24 Sample Building Drywell site meets the remedial action objectives specified in the Remaining Sites ROD. The results demonstrate that residual contaminant concentrations support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. These results also show that residual concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River and meet applicable ecological risk screening levels. The site does not have a deep zone; therefore, no deep zone institutional controls are required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-24 Sample Building Drywell* (attached).

K. D. Bazzell DOE-RL Project Manager	[signature] Signature	9/6/2006 Date
J. Price Ecology Project Manager	[signature] Signature	9/19/2006 Date
N/A EPA Project Manager	Signature	Date

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REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-24, 119-D SAMPLE BUILDING DRYWELL

Attachment to Waste Site Reclassification Form 2006-004

September 2006

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-24, 119-D SAMPLE BUILDING DRYWELL

EXECUTIVE SUMMARY

The 100-D-24, 119-D Sample Building Drywell was a drywell that received drainage from a floor drain in the 119-D Sample Building. The 119-D Sample Building was situated over the intake and exhaust ducts to the 117-D Filter Building and was used to sample effluent gases and particulates. The building has been demolished and the surrounding area graded. The drywell was connected to the building by a 5-cm (2-in.) drainage pipe buried at least 0.9 m (3 ft) below grade. A 1.9-cm (0.75-in.) drain line from the building's evaporative cooler connected into the 5-cm (2-in.) drain line near the southern edge of the building. It is likely the floor drain also received sample waste and janitorial waste because the building had no other drains or connections to an alternative sewer system. The site dimensions are 0.6 m (2 ft) long by 0.6 m (2 ft) wide by 3.1 m (10 ft) deep.

Confirmatory sampling of the 100-D-24 waste site was conducted on November 3, 2005. The drywell was not located during excavation, so samples were taken of the soils presumed to underlie the former location of the drywell. The sample results indicate that the 100-D-24 waste site achieved compliance with the remedial action objectives. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the confirmatory sampling are used to make reclassification decisions for the 100-D-24 site in accordance with the TPA-MP-14 (DOE-RL 1998) process.

In accordance with this evaluation, the confirmatory sampling results support a reclassification of this site to no action. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of potential concern and other constituents. Screening levels were not exceeded for the site constituents, with the exception of boron and vanadium. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. It is believed that the presence of these constituents does not pose a risk to ecological receptors as residual vanadium concentrations are below site background levels, and boron concentrations are consistent with those seen elsewhere at the Hanford Site (no established background value is available). A baseline risk assessment for the river corridor portion of Hanford began in 2004, which includes a more complete quantitative ecological risk assessment. That baseline risk assessment will be used to support the final closeout decision for the 100-D-24 site.

Table ES-1. Summary of Remedial Action Objectives for the 100-D-24 Site.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/yr dose rate above background over 1,000 years.	Residual concentrations of radionuclide COPCs were detected below statistical background levels.	Yes
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All individual hazard quotients are less than 1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (2.3×10^{-3}) is less than 1.	
	Attain an excess cancer risk of <1 x 10^{-6} for individual carcinogens.	The excess cancer risk for hexavalent chromium, the only carcinogen detected above background levels, is 1.1×10^{-7}.	
	Attain a cumulative excess cancer risk of <1 x 10^{-5} for carcinogens.	The cumulative excess cancer risk (1.1×10^{-7}) is less than 1×10^{-5}.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river protection RAGs.	Residual concentrations of radionuclide COPCs were detected below statistical background levels.	Yes
	Attain national primary drinking water standards:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.	Residual concentrations of radionuclide COPCs were detected below statistical background levels.	
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5.[b]	Residual concentrations of radionuclide COPCs were detected below statistical background levels.	
	Meet total uranium standard of 21.2 pCi/L.[c]	Uranium analytical values are below statistical background for this site.	
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Maximum detected results for all nonradionuclides are below groundwater and river protection RAGs.	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and the Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Areas, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater*, 0100X-CA-V0038 (BHI 2001).
COPC = contaminant of potential concern
RAG = remedial action goal
MCL = maximum contaminant level (drinking water standard)

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-24, 119-D SAMPLE BUILDING DRYWELL

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 100-D-24 site meets the objectives for no action as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required.

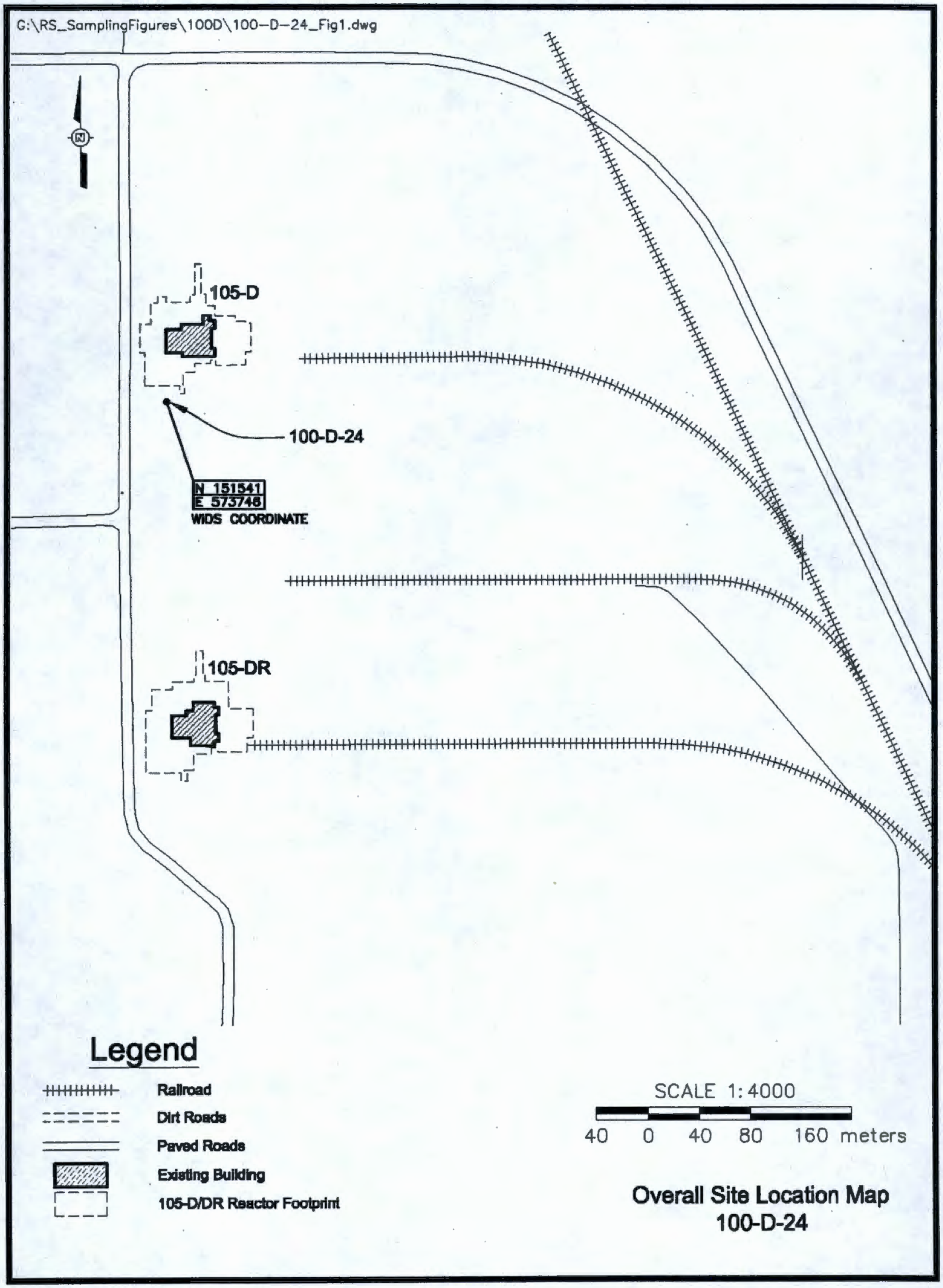
Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of potential concern and other constituents. Screening levels were not exceeded for the site constituents, with the exception of boron and vanadium. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. It is believed that the presence of these constituents does not pose a risk to ecological receptors as residual vanadium concentrations are below site background levels, and boron concentrations are consistent with those seen elsewhere at the Hanford Site (no established background value is available). A baseline risk assessment for the river corridor portion of Hanford began in 2004, which includes a more complete quantitative ecological risk assessment. That baseline risk assessment will be used to support the final closeout decision for the 100-D-24 site.

GENERAL SITE INFORMATION AND BACKGROUND

The Waste Information Data System (WIDS) (WCH 2005c) describes the 100-D-24 site as a drywell that received drainage from a floor drain in the 119-D Sample Building. The 119-D Sample Building has been demolished and the surrounding area graded. The drywell was connected to the building by a 5-cm (2-in.) drainage pipe buried at least 0.9 m (3 ft) below grade. A 1.9-cm (0.75-in.) drain line from the building's evaporative cooler connected into the 5-cm (2-in.) drain line near the southern edge of the building. It is likely the floor drain also received sample waste and janitorial waste because the building had no other drains or connections to an alternative sewer system. The site dimensions are 0.6 m (2 ft) long by 0.6 m (2 ft) wide by 3.1 m (10 ft) deep.

The 100-D-24 site is located south of the 105-D Reactor (Figure 1), south of the former 119-D Building and between the intake and exhaust ducts for the 117-D Filter Building.

Figure 1. 100-D-24 Sample Building Drywell Site Location Map.



The WIDS location provided for the drywell is based on Hanford Site Drawings H-1-19802 (GE 1963) and H-1-19810 (GE no date), which show a location (Washington State Plane coordinates N 151537.1, E 573745.4) slightly south of that provided in the WIDS summary report (Washington State Plane coordinates N 151540.8, E 573745.6).

The 119-D Sample Building was situated over the intake and exhaust ducts to the 117-D Filter Building and was used to sample effluent gases and particulates.

CONFIRMATORY SAMPLING ACTIVITIES

Geophysical Survey Results

Geophysical survey data for this site were collected simultaneously with data from other proximate sites. Ground-penetrating radar data indicated that most of the area is heavily disturbed and contains low to high concentrations of buried debris from the surface to more than 2 m (7 ft) in depth (Figure 2). This buried debris is believed to be from the demolished 117-D Filter Building and associated ducts. The 100-D-24 site was located between the intake and exhaust ducts of the 117-D Filter Building. No specific anomalies were identified that could be uniquely assigned to the 100-D-24 drywell location, but the feature would likely be obscured by the scattered demolition debris (Bergstrom and Mitchell 2004).

Contaminants of Potential Concern

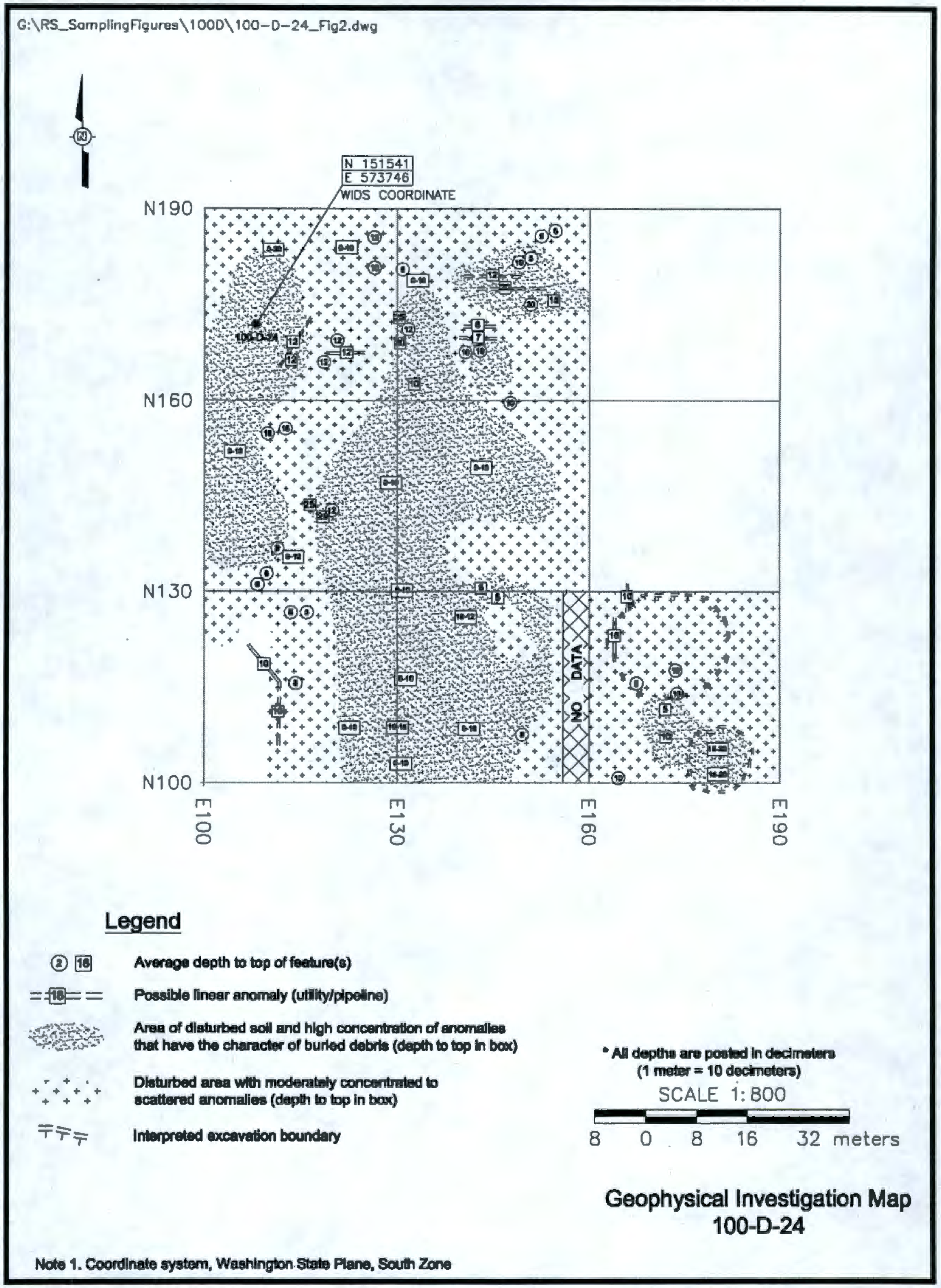
The contaminants of potential concern (COPCs) for the 100-D-24 site were identified based on existing information for the site. The COPC list identified in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2005a) includes carbon-14, cobalt-60, cesium-137, europium-152, europium-154, europium-155, tritium, strontium-90, uranium-234, uranium-235, uranium-238, hexavalent chromium, mercury, lead, semivolatile organic compounds (SVOCs), and volatile organic compounds.

Although not considered COPCs, antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc concentrations were also measured by analyzing for the expanded inductively coupled plasma (ICP) metals analytical list.

If oily soils or evidence of burning were observed during field activities, the work instruction called for the samples to be subjected to analyses for total petroleum hydrocarbons. No burned or oily soils were observed; therefore, the samples were not analyzed for total petroleum hydrocarbons.

If suspected asbestos-containing materials were encountered during field activities, the work instruction called for the suspect material to be sampled and analyzed. No asbestos-containing materials were encountered; therefore, the samples were not analyzed for asbestos.

Figure 2. 100-D-24 Sample Building Drywell Geophysical Interpretation Map.



Confirmatory Sample Design

A focused sampling design was implemented on November 3, 2005, in accordance with the *Work Instruction for 100-D-24, 119-D Sample Building Drywell* (WCH 2005c). The 100-D-24 site was investigated through field observations and focused sampling and analysis for the purpose of determining if hazardous or radiological contaminants were present.

Per discussion with the Washington Department of Ecology and review of historical drawings referenced by the WIDS summary report, the coordinates provided in WIDS for the drywell were determined to be incorrect. Accordingly, one test pit was excavated at the drywell location shown on historic drawings. The drywell was not identified within the test pit area and was, therefore, presumed to have been removed at the time of decommissioning and demolition activities. Therefore, in accordance with the work instruction, the excavation proceeded to 3 m (10 ft) below ground surface (bgs), at the suspected location of the former base of the drywell. One soil grab sample was collected at 2.4 m (8 ft) bgs, and another grab sample was collected at 3 m (10 ft) bgs.

During excavation, surveys were performed for organics, radiation, and for any debris within the test pit. No organics or radiation were detected, and there was no sign of debris (WCH 2005a).

Sample Summary

A summary of the collected samples for the 100-D-24 Sample Building Drywell is provided in Table 1. Sample locations are depicted in Figure 3. Sample results are presented in Appendix A.

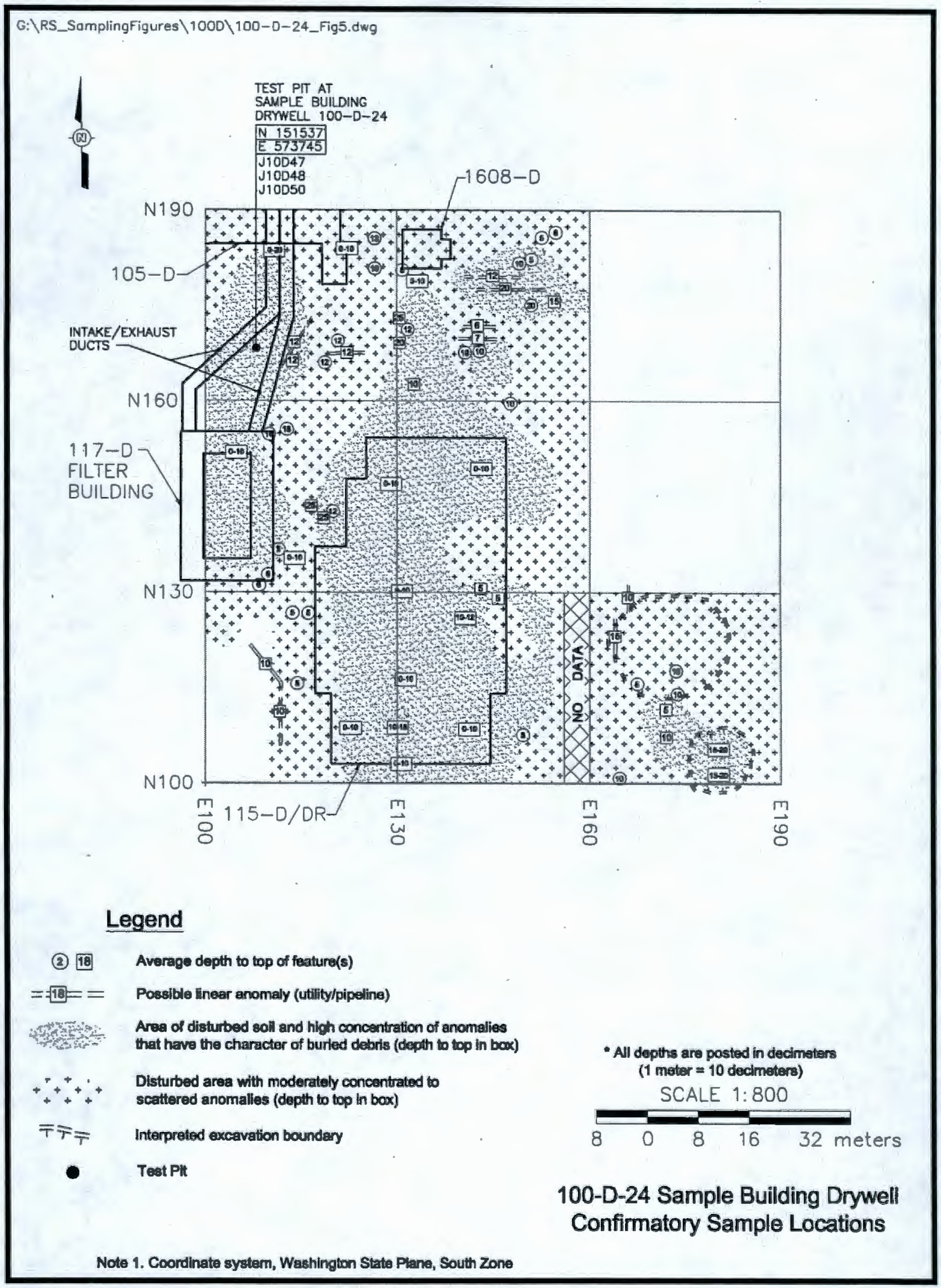
Table 1. Confirmatory Sample Summary for the 100-D-24 Sample Building Drywell.

Sample Location	Sample Media	Sample Number	Coordinate Locations	Depth (bgs)	Sample Analysis
Test pit	Soil from test pit	J10D47	N 151537 E 573745	2.4 m (8 ft)	ICP metals, mercury, SVOA, VOA, hexavalent chromium, GEA, gross alpha, gross beta, carbon-14, tritium, and isotopic uranium
Duplicate of J10D47	Soil from test pit	J10D48	N 151537 E 573745	2.4 m (8 ft)	ICP metals, mercury, SVOA, VOA, hexavalent chromium, GEA, gross alpha, gross beta, carbon-14, tritium, and isotopic uranium
Test pit	Soil from test pit	J10D50	N 151537 E 573745	3 m (10 ft)	ICP metals, mercury, SVOA, VOA, hexavalent chromium, GEA, gross alpha, gross beta, carbon-14, tritium, and isotopic uranium
Equipment blank	Silica sand	J10D49	NA	NA	ICP metals, mercury, and SVOA

Source: *Remaining Sites Field Sampling*, Logbook EL-1578-7 (WCH 2005a).

bgs = below ground surface
GEA = gamma energy analysis
ICP = inductively coupled plasma
NA = not applicable
SVOA = Semivolatile organic analysis
VOA = Volatile organic analysis

Figure 3. Confirmatory Test Pit Location at the 100-D-24 Sample Building Drywell.



Confirmatory Sampling Results

Confirmatory samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. A comparison of the maximum concentrations of detected analytes and the site remedial action goals (RAGs) is summarized in Table 2. Contaminants that were not detected by laboratory analysis, or that are not being considered as COPCs for reasons stated in the following text, are excluded from Table 2. Calculated cleanup levels are not presented in the Model Toxics Control Act Cleanup Levels and Risk Calculations database under *Washington Administrative Code* (WAC) 173-340-740(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents are not considered COPCs. Radium-226, radium-228, thorium-228, thorium-232, and potassium-40 were detected by gamma energy analysis, but these isotopes are unrelated to the operational history of the 100-D-24 waste site, and are not considered further. These isotopes are excluded from evaluation as COPCs based on environmental fate, decay rates, natural occurrence, and analogous site information. The laboratory-reported data results for all constituents are stored in the Environmental Restoration project-specific database prior to archiving in the Hanford Environmental Information System and are presented in Appendix A.

Table 2. Comparison of Maximum Soil Values to Action Levels for the 100-D-24 Sample Building Drywell.* (2 Pages)

COPC	Maximum Result (pCi/g)	Generic Site Lookup Values (pCi/g)			Does the Maximum Exceed RAGs?
		Shallow Zone Lookup Value	Soil Concentration Protective of Groundwater	Soil Concentration Protective of the River	
Uranium-233/234	0.567 (<BG)	1.1[a]	1.1[a]	1.1[a]	No
Uranium-238	0.657 (<BG)	1.1[a]	1.1[a]	1.1[a]	No
COPC	**Maximum Result (mg/kg)**	**Remedial Action Goals (mg/kg)**			**Does the Maximum Exceed RAGs?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**	
Arsenic	2.3 (<BG)	20	20	20	No
Barium	60.3 (<BG)	5,600	132[b]	224	No
Beryllium	0.27 (<BG)	10.4[c]	1.51[b]	1.51[b]	No
Boron[d]	1.9	16,000	320	--[e]	No
Cadmium[f]	0.2 (<BG)	13.9	0.81[b]	0.81[b]	No
Chromium	6.2 (<BG)	80,000	18.5[b]	18.5[b]	No
Cobalt	7.6 (<BG)	1,600	32	--[e]	No
Copper	15.3 (<BG)	2,960	59.2	22[b]	No

Table 2. Comparison of Maximum Soil Values to Action Levels for the 100-D-24 Sample Building Drywell. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals (mg/kg)			Does the Maximum Exceed RAGs?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection	
Hexavalent chromium	0.24	2.1	8	2	No
Lead	4.1 (<BG)	353	10.2[b]	10.2[b]	No
Manganese	295 (<BG)	11,200	512[b]	512[b]	No
Mercury	0.06 (<BG)	24	0.33[b]	0.33[b]	No
Molybdenum[d]	0.47	400	8	--[e]	No
Nickel	9.8 (<BG)	1,600	19.1[b]	27.4	No
Vanadium	48.7 (<BG)	560	85.1[b]	--[e]	No
Zinc	41.6 (<BG)	24,000	480	67.8[b]	No
Di-n-butylphthalate	0.022	8,000	160	540	No

* Site lookup values and RAGs are taken from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b), where available, without further consideration of updated toxicity data or amendments (2001) to cleanup regulations in WAC-173-340. RAG values for beryllium, boron, cobalt, copper, molybdenum, nickel, vanadium, and di-n-butylphthalate are not provided in DOE-RL (2005b) and have been calculated per WAC-173-340-720, 730, and 740, Method B, 1996, unless otherwise noted.

[a] The calculated RAG is below the Hanford Site-specific soil background activity. The value presented is the Hanford Site-specific soil background activity.

[b] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996).[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3], 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (WDOH 1997).

[d] No Hanford Site-specific or Washington State background value available.

[e] No cleanup level is available from the Ecology Cleanup Levels and Risk Calculations database (Ecology 2005), and no bioconcentration factor or ambient water quality criteria values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

[f] Hanford Site-specific background is not available; not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

-- = not applicable
BG = background
WAC = *Washington Administrative Code*
RAG = remedial action goal
COPC = contaminant of potential concern

DATA EVALUATION

All detected analytes were reported at concentrations below direct exposure, groundwater protection, and river protection RAGs.

Nonradionuclide risk requirements for the 100-D-24 site include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, individual contaminant carcinogenic risks of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. These risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background values (Appendix A). All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background is 2.3×10^{-3}. The individual carcinogenic risk values for carcinogenic constituents above background are all below 1×10^{-6}. The cumulative excess carcinogenic risk value for the site is 1.1×10^{-7}, which is below 1×10^{-5}. These calculations are provided in Appendix B.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) review was performed to compare the sampling approach and analytical data with the sampling and data requirements specified by the confirmatory sampling work instruction (WCH 2005c). This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (EPA 2000). The assessment review completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data process.

This DQA review was performed in accordance with WCH-EE-01, *Environmental Investigations Procedures*. Specific data quality objectives for the site are found in the SAP (DOE-RL 2005a). This DQA included a review of the work instruction (WCH 2005c) and the field logbook (WCH 2005a, 2005b). All samples were collected per the sample design. To ensure quality data sets, the SAP data assurance requirements, as well as the validation procedures for chemical and radiochemical analysis (BHI 2000a, 2000b), are followed where appropriate.

The *Work Instruction for 100-D-24, 119-D Sample Building Drywell* (WCH 2005c) listed volatile organic analysis, semivolatile organic analysis, ICP metals, mercury, hexavalent chromium, carbon-14, tritium, isotopic uranium, gross alpha, gross beta, and gamma spectroscopy as analytical methods for the confirmation sampling of the 100-D-24 waste site. All of the confirmation data generated for the 100-D-24 site are included in sample delivery group (SDG) K0093. Third-party validation was performed on SDG K0093 (WCH 2006) and resulted in no major deficiencies. Minor deficiencies found are discussed below. All of the 100-D-24 confirmatory data were found to be useable for decision-making purposes.

<u>SDG K0093</u>

VOC Analysis: The common laboratory contaminant methylene chloride was found in the method blank. All of the methylene chloride data in SDG K0093 were qualified "U" as nondetected and the reported values were raised to the required detection limit (RDL) (10 µg/kg). The data remain useable for decision-making purposes.

SVOC Analysis: Method blank contamination by the common laboratory contaminant bis(2-ethylhexyl)phthalate was found. All of the samples and the method blank were at concentrations below the RDL for bis(2-ethylhexyl)phthalate. Third-party validation requalified the bis(2-ethylhexyl)phthalate in all of the samples with "U" as nondetects and raised all of the reported values to the RDL (660 µg/kg). Also in the SVOC analysis, a laboratory error in the preparation of the matrix spike (MS) resulted in 19 analytes with percent recoveries that were below the acceptance criteria. The analytical laboratory attributed the low recoveries to losses during extraction, but examination of the entire data set shows that the matrix spike analytes that were within the acceptance criteria were generally near the lower boundaries. This is indicative of a systemic loss, which is sometimes difficult to recognize because the losses are superimposed over the variable recoveries that the semivolatile organic analytes exhibit normally. A systemic loss is usually caused by an incomplete transfer of the spiking mixture into the sample. It is also possible that, during the concentration of the matrix spike sample extract, the solution physically displaced some of the extract liquid out of the concentration flask. Losses of an unknown percentage of the spiked analytes result in systemic lowered recoveries because the losses are not accounted for in the calculation of percent recovery. The lowered recovery in the MS also resulted in an increase in the relative percent difference (RPD) between the MSs and the matrix spike duplicates (MSDs), exceeding the criterion (+/- 30%) for 18 analytes. Three MSD recoveries and seven laboratory control samples were also below acceptance criteria. Third-party validation qualified all of the affected analytes in samples in SDG K0093 with "J" as estimates for the low MSs, MSDs, and laboratory control samples, as well as for the high RPDs (Table 3). Third-party validation also qualified all 3-nitroanaline results with "J" as estimates.

Table 3. Quality Assurance/Quality Control of Semivolatile Organic Compounds Resulting in Estimated or "J" Qualified Data. (2 Pages)

Analyte	MS (%)	MSD (%)	RPD (%)	LCS (%)
project-specific acceptance criteria[a]	50 – 150[b]	50 – 150[b]	±30	50 – 150
bis(2-chloroethyl)ether	19	--	116	--
2-chlorophenol	34	--	80	--
1,3-dichlorobenzene	11	--	147	--
1,4-dichlorobenzene	11	--	72	--
1,2-dichlorobenzene	16	--	128	--
2-methylphenol	55	--	38	--
bis(2-Chloro-1-methylethyl)ether	26	--	89	--
Hexachloroethane	17	--	112	--
Nitrobenzene	24	--	72	--
Isophorone	43	58	--	--
2-nitrophenol	32	--	51	48
2,4-dimethyphenol	48	--	--	48
bis(2-chloroethoxy)methane	33	--	48	--
1,2,4-trichlorobenzene	29	--	62	44
Naphthalene	30	55	52	--
Hexachlorobutadiene	28	--	70	--
2-methylnaphthalene	46	58	--	53

Table 3. Quality Assurance/Quality Control of Semivolatile Organic Compounds Resulting in Estimated or "J" Qualified Data. (2 Pages)

Analyte	MS (%)	MSD (%)	RPD (%)	LCS (%)
Carbazole	57	--	--	49
2,4-dichlorophenol	--	--	--	45
Phenol	--	--	49	--
n-nitroso-di-n-propylamine	--	--	40	--
4-chloroanaline	--	--	39	--
Hexachlorocyclopentadiene	--	--	68	--

[a] Project-specific acceptance criteria for EPA Method 8270, as provided in the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2005a).
[b] Project-specific acceptance criteria are not provided in DOE-RL (2005a) for MS/MSD recoveries, deferring to the statistically derived laboratory analyte-specific criteria. The general range listed is from the EPA's Contract Laboratory Program guidelines, which also specifies the procedures used to determine the laboratory-specific criteria.
-- = within acceptance criteria
EPA = U.S. Environmental Protection Agency
MS = matrix spike
MSD = matrix spike duplicate
RPD = relative percent difference
LCS = laboratory control sample

Analytes are routinely detected below the practical quantitation limit. By definition, a practical quantitation limit is "the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during routine laboratory operating conditions" (WAC 173-340-200). Accordingly, the quantitation of analytes below this threshold (such as di-n-butylphthalate in sample J10D50) are qualified with a "J" flag as estimated.

None of the SVOC data were rejected and all remain useable for decision-making purposes.

ICP metals analysis: Third-party validation applied qualification to sample data for method blank contamination and low MS recoveries. Barium, boron, calcium, manganese, and sodium were found in the method blank; accordingly, associated data was flagged with a "C." Boron data in samples J10D49 and J10D50 and sodium data in sample J10D49 were qualified "UJ" as estimated nondetects due to quantified results less than five times the result for the method blank. The analytes calcium and antimony had MS recoveries below the acceptance criteria at 59.1% and 58.5%, respectively. All of the calcium and antimony data were qualified "J" as estimated. The data remain useable for decision-making purposes.

Radiochemistry Analysis: No MSs were run for carbon-14 or tritium, as the analytical methods used are not compatible with spiking—a small sample volume is used and there are no available materials that can be consistently spiked into the sample. The analytical methodology used is robust in ensuring that the maximum amounts of carbon-14 and tritium are released from the sample matrix. All of the carbon-14 and tritium data were qualified "J" as estimated. The data remain useable for decision-making purposes.

Limited, random, or sample matrix-specific influenced batch quality control issues such as these are a potential for any analysis. The number and types seen in these data sets were within expectations for the matrix types and analyses performed. The DQA review for the 100-D-24 site found the results to be accurate within the standard errors associated with the methods, including sampling and sample handling. The data are of the right type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected as a result of quality assurance and quality control deficiencies. All analytical data were found acceptable for decision-making purposes. The confirmatory sampling analytical data are stored in the environmental restoration project-specific database prior to archiving in the Hanford Environmental Information System and are summarized in Appendix A.

SUMMARY FOR NO ACTION

On November 3, 2005, excavation at the location where historical drawings placed the 100-D-24 Sample Building Drywell did not locate the drywell; focused confirmatory samples were collected from soils presumed to formerly underlie the drywell. The analytical results from soil samples were shown to meet the cleanup objectives for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 100-D-24 site to no action.

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APPENDIX A

100-D-24 SAMPLE BUILDING DRYWELL SAMPLE RESULTS
(4 Pages)

Table A-1. 100-D-24 Confirmatory Sampling Results. (4 Pages)

Sample Location	HEIS Number	Sample Date	Americium-241 GEA			Carbon-14			Cesium-137			Cobalt-60			Europium-152			Europium-154		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Test Pit	J10D47	11/3/05	0.4	U	0.4	0.134	UJ	3.7	0.040	U	0.040	0.043	U	0.043	0.11	U	0.11	0.14	U	0.14
Duplicate	J10D48	11/3/05	0.15	U	0.15	-0.432	UJ	3.4	0.038	U	0.038	0.041	U	0.041	0.091	U	0.091	0.13	U	0.13
Test Pit	J10D50	11/3/05	0.14	U	0.14	-0.619	UJ	3.3	0.030	U	0.030	0.028	U	0.028	0.092	U	0.092	0.094	U	0.094

Sample Location	HEIS Number	Sample Date	Europium-155			Gross alpha			Gross beta			Potassium-40			Radium-226			Radium-228		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Test Pit	J10D47	11/3/05	0.14	U	0.14	9.69		3.7	18.2		5.9	21.8		0.35	0.78		0.067	1.35		0.17
Duplicate	J10D48	11/3/05	0.10	U	0.10	9.14		3.6	21.9		6.4	11.1		0.45	0.481		0.075	0.707		0.22
Test Pit	J10D50	11/3/05	0.099	U	0.099	7.81		3.3	20.1		5.4	6.89		0.24	0.288		0.054	0.481		0.10

Sample Location	HEIS Number	Sample Date	Thorium-228 GEA			Thorium-232 GEA			Tritium			Uranium-233/234			Uranium-235		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Test Pit	J10D47	11/3/05	1.12		0.06	1.35		0.17	0.208	UJ	2.4	0.567		0.23	0	U	0.28
Duplicate	J10D48	11/3/05	0.544		0.048	0.707		0.22	-0.044	UJ	2.3	0.406		0.24	0.038	U	0.29
Test Pit	J10D50	11/3/05	0.565		0.055	0.481		0.1	0.515	UJ	2.2	0.563		0.24	0	U	0.29

Sample Location	HEIS Number	Sample Date	Uranium-235 GEA			Uranium-238			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Test Pit	J10D47	11/3/05	0.18	U	0.18	0.537		0.23	4.9	U	4.9
Duplicate	J10D48	11/3/05	0.14	U	0.14	0.657		0.24	4.4	U	4.4
Test Pit	J10D50	11/3/05	0.14	U	0.14	0.469		0.24	3.3	U	3.3

Acronyms and notes apply to all of the tables in this appendix.

Note: Data qualified with C, D, and/or J are considered acceptable values.

C = method blank contamination (inorganic constituents)

D = diluted

GEA = gamma energy analysis

HEIS = Hanford Environmental Information System

J = estimate

MDA = minimum detectable activity

PQL = practical quantitation limit

Q = qualifier

U = undetected

Table A-1. 100-D-24 Confirmatory Sampling Results. (4 Pages)

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron			Cadmium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit	J10D47	11/3/05	4490		2	0.44	UJ	0.44	2.3		0.37	57.4	C	0.02	0.27		0.01	1.9	C	0.29	0.14		0.08
Duplicate	J10D48	11/3/05	3990		2	0.43	UJ	0.43	2.1		0.36	53.9	C	0.02	0.24		0.01	1.4	C	0.29	0.19		0.08
Test Pit	J10D50	11/3/05	3880		2.1	0.45	UJ	0.45	2.3		0.39	60.3	C	0.02	0.23		0.01	1.1	UJ	0.31	0.20		0.08
Equipment Blank	J10D49	11/3/05	29.1		1.8	0.39	UJ	0.39	0.33	U	0.33	0.86	C	0.02	0.01	U	0.01	0.36	UJ	0.26	0.07	U	0.08

Sample Location	HEIS Number	Sample Date	Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium			Iron			Lead		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit	J10D47	11/3/05	6580	CJ	1.3	6.2		0.17	7.6		0.13	15.3		0.13	0.22	U	0.22	20800		3.5	4.1		0.34
Duplicate	J10D48	11/3/05	5970	CJ	1.3	4.6		0.17	6.7		0.13	14.5		0.13	0.22	U	0.22	18600		3.4	3.5		0.33
Test Pit	J10D50	11/3/05	6190	CJ	1.3	5.0		0.18	7.3		0.14	14.1		0.14	0.24		0.21	19800		3.6	3.6		0.35
Equipment Blank	J10D49	11/3/05	18.9	CJ	1.2	0.16	U	0.16	0.12	U	0.12	0.12	U	0.12				65		3.1	0.3	U	0.3

Sample Location	HEIS Number	Sample Date	Magnesium			Manganese			Mercury			Molybdenum			Nickel			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit	J10D47	11/3/05	4100		1.5	276	C	0.02	0.06		0.02	0.42		0.14	9.8		0.14	790		6	0.39	U	0.39
Duplicate	J10D48	11/3/05	3560		1.4	253	C	0.02	0.06		0.02	0.29		0.14	7.0		0.14	714		5.9	0.38	U	0.38
Test Pit	J10D50	11/3/05	3670		1.5	295	C	0.02	0.04		0.02	0.47		0.15	7.6		1	710		6.3	0.41	U	0.41
Equipment Blank	J10D49	11/3/05	4.9		1.3	2.2	C	0.02	0.01	U	0.01	0.13	U	0.13	0.13	U	0.13	12.1		5.4	0.35	U	0.35

Sample Location	HEIS Number	Sample Date	Silicon			Silver			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit	J10D47	11/3/05	484		0.89	0.15	U	0.15	178	C	0.19	48.7		0.1	41.6		0.05
Duplicate	J10D48	11/3/05	545		0.87	0.15	U	0.15	165	C	0.18	40.3		0.1	34.8		0.05
Test Pit	J10D50	11/3/05	523		0.93	0.16	U	0.16	154	C	0.19	45.5		0.1	36.4		0.06
Equipment Blank	J10D49	11/3/05	28.7		0.8	0.14	U	0.14	5.6	UJ	0.17	0.09	U	0.09	2.0		0.05

Table A-1. 100-D-24 Confirmatory Sampling Results. (4 Pages)

Constituents	J10D47 Test Pit Sample Date 11/03/05			J10D48 Duplicate Sample Date 11/03/05			J10D49 Equipment Blank Sample Date 11/03/05			J10D50 Test Pit Sample Date 11/03/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Analyses (SVOAs)												
1,2,4-Trichlorobenzene	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
1,2-Dichlorobenzene	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
1,3-Dichlorobenzene	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
1,4-Dichlorobenzene	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
2,4,5-Trichlorophenol	930	U	930	1800	UD	1800	830	U	830	970	U	970
2,4,6-Trichlorophenol	370	U	370	730	UD	730	330	U	330	390	U	390
2,4-Dichlorophenol	370	U	370	730	UD	730	330	U	330	390	U	390
2,4-Dimethylphenol	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
2,4-Dinitrophenol	930	U	930	1800	UD	1800	830	U	830	970	U	970
2,4-Dinitrotoluene	370	U	370	730	UD	730	330	U	330	390	U	390
2,6-Dinitrotoluene	370	U	370	730	UD	730	330	U	330	390	U	390
2-Chloronaphthalene	370	U	370	730	UD	730	330	U	330	390	U	390
2-Chlorophenol	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
2-Methylnaphthalene	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
2-Methylphenol (cresol, o-)	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
2-Nitroaniline	930	U	930	1800	UD	1800	830	U	830	970	U	970
2-Nitrophenol	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
3+4 Methylphenol (cresol, m+p)	370	U	370	730	UD	730	330	U	330	390	U	390
3,3'-Dichlorobenzidine	370	U	370	730	UD	730	330	U	330	390	U	390
3-Nitroaniline	930	UJ	930	1800	UJD	1800	830	UJ	830	970	UJ	970
4,6-Dinitro-2-methylphenol	930	U	930	1800	UD	1800	830	U	830	970	U	970
4-Bromophenylphenyl ether	370	U	370	730	UD	730	330	U	330	390	U	390
4-Chloro-3-methylphenol	370	U	370	730	UD	730	330	U	330	390	U	390
4-Chloroaniline	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
4-Chlorophenylphenyl ether	370	U	370	730	UD	730	330	U	330	390	U	390
4-Nitroaniline	930	U	930	1800	UD	1800	830	U	830	970	U	970
4-Nitrophenol	930	U	930	1800	UD	1800	830	U	830	970	U	970
Acenaphthene	370	U	370	730	UD	730	330	U	330	390	U	390
Acenaphthylene	370	U	370	730	UD	730	330	U	330	390	U	390
Anthracene	370	U	370	730	UD	730	330	U	330	390	U	390
Benzo(a)anthracene	370	U	370	730	UD	730	330	U	330	390	U	390
Benzo(a)pyrene	370	U	370	730	UD	730	330	U	330	390	U	390
Benzo(b)fluoranthene	370	U	370	730	UD	730	330	U	330	390	U	390
Benzo(ghi)perylene	370	U	370	730	UD	730	330	U	330	390	U	390
Benzo(k)fluoranthene	370	U	370	730	UD	730	330	U	330	390	U	390
Bis(2-chloro-1-methylethyl)ether	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
Bis(2-Chloroethoxy)methane	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
Bis(2-chloroethyl) ether	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
Bis(2-ethylhexyl) phthalate	660	U	660	730	UD	730	660	U	660	660	U	660
Butylbenzylphthalate	370	U	370	730	UD	730	330	U	330	390	U	390
Carbazole	370	UJ	370	730	UJD	730	330	UJ	330	390	UJ	390
Chrysene	370	U	370	730	UD	730	330	U	330	390	U	390
Di-n-butylphthalate	370	U	370	730	UD	730	330	U	330	22	J	390
Di-n-octylphthalate	370	U	370	730	UD	730	330	U	330	390	U	390
Dibenz[a,h]anthracene	370	U	370	730	UD	730	330	U	330	390	U	390
Dibenzofuran	370	U	370	730	UD	730	330	U	330	390	U	390
Diethylphthalate	370	U	370	730	UD	730	330	U	330	390	U	390
Dimethyl phthalate	370	U	370	730	UD	730	330	U	330	390	U	390
Fluoranthene	370	U	370	730	UD	730	330	U	330	390	U	390
Fluorene	370	U	370	730	UD	730	330	U	330	390	U	390

Table A-1. 100-D-24 Confirmatory Sampling Results. (4 Pages)

Constituents	J10D47 Test Pit Sample Date 11/03/05			J10D48 Duplicate Sample Date 11/03/05			J10D49 Equipment Blank Sample Date 11/03/05			J10D50 Test Pit Sample Date 11/03/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
SVOAs (continued)												
Hexachlorobenzene	370	U	370	730	U	730	330	U	330	390	U	390
Hexachlorobutadiene	370	UJ	370	730	UJ	730	330	UJ	330	390	UJ	390
Hexachlorocyclopentadiene	370	UJ	370	730	UJ	730	330	UJ	330	390	UJ	390
Hexachloroethane	370	UJ	370	730	UJ	730	330	UJ	330	390	UJ	390
Indeno(1,2,3-cd)pyrene	370	U	370	730	U	730	330	U	330	390	U	390
Isophorone	370	UJ	370	730	UJ	730	330	UJ	330	390	UJ	390
N-Nitrosodiphenylamine	370	U	370	730	U	730	330	U	330	390	U	390
N-Nitroso-di-n-propylamine	370	UJ	370	730	UJ	730	330	UJ	330	390	UJ	390
Naphthalene	370	UJ	370	730	UJ	730	330	UJ	330	390	UJ	390
Nitrobenzene	370	UJ	370	730	UJ	730	330	UJ	330	390	UJ	390
Pentachlorophenol	930	U	930	1800	U	1800	830	U	830	970	U	970
Phenanthrene	370	U	370	730	U	730	330	U	330	390	U	390
Phenol	370	UJ	370	730	UJ	730	330	UJ	330	390	UJ	390
Pyrene	370	U	370	730	U	730	330	U	330	390	U	390
Volatile Organic Analysis (VOAs)												
1,1,1-Trichloroethane	6	U	6	6	U	6				7	U	7
1,1,2,2-Tetrachloroethane	6	U	6	6	U	6				7	U	7
1,1,2-Trichloroethane	6	U	6	6	U	6				7	U	7
1,1-Dichloroethane	6	U	6	6	U	6				7	U	7
1,1-Dichloroethene	6	U	6	6	U	6				7	U	7
1,2-Dichloroethane	6	U	6	6	U	6				7	U	7
1,2-Dichloroethene(Total)	6	U	6	6	U	6				7	U	7
1,2-Dichloropropane	6	U	6	6	U	6				7	U	7
2-Butanone	13	U	13	11	U	11				14	U	14
2-Hexanone	13	U	13	11	U	11				14	U	14
4-Methyl-2-Pentanone	13	U	13	11	U	11				14	U	14
Acetone	13	U	13	11	U	11				14	U	14
Benzene	6	U	6	6	U	6				7	U	7
Bromodichloromethane	6	U	6	6	U	6				7	U	7
Bromoform	6	U	6	6	U	6				7	U	7
Bromomethane	13	U	13	11	U	11				14	U	14
Carbon disulfide	6	U	6	6	U	6				7	U	7
Carbon tetrachloride	6	U	6	6	U	6				7	U	7
Chlorobenzene	6	U	6	6	U	6				7	U	7
Chloroethane	13	U	13	11	U	11				14	U	14
Chloroform	6	U	6	6	U	6				7	U	7
Chloromethane	13	U	13	11	U	11				14	U	14
cis-1,2-Dichloroethylene	6	U	6	6	U	6				7	U	7
cis-1,3-Dichloropropene	6	U	6	6	U	6				7	U	7
Dibromochloromethane	6	U	6	6	U	6				7	U	7
Ethylbenzene	6	U	6	6	U	6				7	U	7
m-Xylene	6	U	6	6	U	6				7	U	7
Methylenechloride	10	U	10	10	U	10				10	U	10
o-Xylene	6	U	6	6	U	6				7	U	7
Styrene	6	U	6	6	U	6				7	U	7
Tetrachloroethene	6	U	6	6	U	6				7	U	7
Toluene	6	U	6	6	U	6				7	U	7
trans-1,2-Dichloroethylene	6	U	6	6	U	6				7	U	7
trans-1,3-Dichloropropene	6	U	6	6	U	6				7	U	7
Trichloroethene	6	U	6	6	U	6				7	U	7
Vinyl chloride	13	U	13	11	U	11				14	U	14
Xylenes (total)	6	U	6	6	U	6				7	U	7

APPENDIX B

CALCULATION OF HAZARD QUOTIENTS AND EXCESS CARCINOGENIC RISK

(4 Pages)

CALCULATION COVER SHEET

Project Title 100-D Field Remediation Project **Job No.** 14655
Area 100-D
Discipline Environmental ***Calc. No.** 0100D-CA-V0268
Subject 100-D-24 Hazard Quotient and Carcinogenic Risk Calculations
Computer Program Excel **Program No.** Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These documents should be used in conjunction with other relevant documents in the administrative record.

Committed Calculation ☒ **Preliminary** ☐ **Superseded** ☐ **Voided** ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 3 Total = 4	B. S. Wiegman B.S. Wiegman 6/7/06	T. M. Blakley T.M. Blakley 3/8/06	L. M. Dittmer L.M. Dittmer 3/8/06	R. A. Carlson RACarlson	3/13/06

SUMMARY OF REVISION	

*Obtain Calc. No. from DIS

DE01437.03 (12/09/2004)

Washington Closure Hanford CALCULATION SHEET

Originator:	B. S. Wiegman BSW	Date:	3/7/06	Calc. No.:	0100D-CA-V0268	Rev.:	0
Project:	100-D Field Remediation	Job No:	14655	Checked:	T. M. Blakley TMB	Date:	3/8/06
Subject:	100-D-24 Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 3	

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and carcinogenic (excess cancer) risk values for the 100-D-24 Sample Building Drywell site remedial action. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2005), the following criteria must be met:

1) An HQ of <1.0 for all individual noncarcinogens
2) A cumulative HQ of <1.0 for noncarcinogens
3) An excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.

GIVEN/REFERENCES:

1) DOE-RL, 2005, *Remedial Design Report/Remedial Action Work Plan for the 100 Areas,* DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code,* 1996.

3) WCH, 2006, Waste Site Reclassification Form 2006-004, and Attachment *Remaining Sites Verification Package for 100-D-24 Sample Building Drywell,* Washington Closure Hanford, Richland, Washington.

SOLUTION:

1) Calculate an HQ for each noncarcinogenic constituent detected above background and compare it to the individual HQ of <1.0 (DOE-RL 2005).

2) Sum the HQs and compare to the cumulative HQ criterion of <1.0.

3) Calculate an excess cancer risk value for each carcinogenic constituent detected above background and compare it to the individual excess cancer risk criterion of $<1 \times 10^{-6}$ (DOE-RL 2005).

4) Sum the excess cancer risk values and compare to the cumulative cancer risk criterion of $<1 \times 10^{-5}$.

Washington Closure Hanford CALCULATION SHEET

Originator:	B. S. Wiegman	Date:	3/7/06	Calc. No.:	0100D-CA-V0268	Rev.:	0
Project:	100-D Field Remediation	Job No:	14655	Checked:	T. M. Blakley	Date:	3/8/06
Subject:	100-D-24 Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 3	

METHODOLOGY:

Hazard quotient and carcinogenic risk calculations were computed using the data from Table 2 (WCH 2006). Of the contaminants of potential concern listed in Table 2, boron, hexavalent chromium, and molybdenum require the HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 1.9 mg/kg, divided by the noncarcinogenic RAG value of 16,000 mg/kg (boron is identified as a noncarcinogen in WAC 173-340-740[3]), is 1.2×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criteria is met.

2) After the HQ calculations are completed for the appropriate analytes, the cumulative HQ is obtained by summing the individual values. (To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation.) The sum of the HQ values is 2.3×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum value is divided by the carcinogenic RAG value, then multiplied by 1×10^{-6}. For example, the maximum value for hexavalent chromium, the sole carcinogen, is 0.24 mg/kg; divided by 2.1 mg/kg, multiplied as indicated is 1.1×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-6}$, this criteria is met. Because hexavalent chromium is the sole carcinogenic analyte for this site, the cumulative excess cancer risk is also 1.1×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

RESULTS:

1) List individual noncarcinogens and corresponding HQs >1.0: None
2) List the cumulative noncarcinogenic HQ >1.0: None
3) List individual carcinogens and corresponding excess cancer risk $>1 \times 10^{-6}$: None
4) List the cumulative excess cancer risk for carcinogens $>1 \times 10^{-5}$: None.

Table 1 shows the results of the calculation:

Washington Closure Hanford		CALCULATION SHEET					
Originator:	B. S. Wiegman BSW	Date:	3/7/06	Calc. No.:	0100D-CA-V0268	Rev.:	0
Project:	100-D Field Remediation	Job No:	14655	Checked:	T. M. Blakley TMB	Date:	3/8/06
Subject:	100-D-24 Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 3	

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-D-24 Sample Building Drywell.

Contaminants of Potential Concern[a]	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG (mg/kg)	Carcinogen Risk
Metals					
Boron	1.9	16,000	1.2E-04	--	--
Chromium, hexavalent[c]	0.24	240	1.0E-03	2.1	1.1E-07
Molybdenum	0.47	400	1.2E-03	--	--
Totals					
Cumulative Hazard Quotient:			**2.3E-03**		
Cumulative Excess Cancer Risk:					**1.1E-07**

Notes:
RAG = remedial action goal
-- = not applicable
[a] = From Table 2 (WCH 2006).
[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.
[c] = Value for the carcinogen RAG calculated based on the inhalation exposure pathway (WAC) 173-340-750(3), 1996.

CONCLUSION:

This calculation demonstrates that the 100-D-24 Sample Building Drywell waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2005).