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Date Submitted: 2/22/06 Originator: R. A. Carlson Phone: 373-1440	Operable Unit(s): 100-DR-1 Waste Site ID: 1607-D4 Type of Reclassification Action: Rejected ☐ Closed Out ☐ Interim Closed Out ☒ No Action ☐	Control Number: 2005-036 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 1607-D4 Septic System was a septic tank and tile field that received sanitary sewage from the 115-D/DR Gas Recirculation Facility. This septic system operated from 1944 to 1968. Decommissioning took place in 1985 and 1986 when all above-grade features were demolished and the tank backfilled. Confirmatory sampling and evaluation of this site have been performed in accordance with remedial action objectives and remedial action 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 confirmatory sampling demonstrated that cleanup goals have been met.

Basis for reclassification:

The 1607-D4 Septic System meets the remedial action objectives specified in the Remaining Sites ROD. The results demonstrate that residual contaminant concentrations do not preclude any future land uses (as bounded by a rural-residential scenario), and allows for unrestricted future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The results also show 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. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 1607-D4 Septic System* (attached).

Ecology comments:

The RSVP for the 1607-D4 Septic System shows that the maximum result for aroclor-1254 (0.034 mg/kg) does not meet the RAG for soil cleanup level for groundwater or river protection (0.017 mg/kg), but does pass RESRAD Modeling. The maximum result for aroclor-1254 passed when compared to the soil concentration protective of groundwater calculated using the fixed parameter three-phase partitioning model (Table 747-1 in WAC-173-340-747(4)).

Maximum results were compared to Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals (WAC 173-340-900 Table 749-3). Maximum results in the RSVP passed for all analytes detected except for boron and vanadium. For boron, the maximum result (2.7 mg/kg) exceeded the ecological concentration for the protection of plants (0.5 mg/kg). The maximum result for vanadium exceeded the ecological concentration for the protection of plants; however, is below background.

K. Bazzell DOE-RL Project Manager	Signature	23Feb06 Date
J. Price Ecology Project Manager	Signature	23-Feb-06 Date
NA EPA Project Manager	Signature	Date

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REMAINING SITES VERIFICATION PACKAGE FOR THE 1607-D4 SEPTIC SYSTEM

Attachment to Waste Site Reclassification Form 2005-036

February 2006

REMAINING SITES VERIFICATION PACKAGE FOR THE 1607-D4 SEPTIC SYSTEM

EXECUTIVE SUMMARY

The 1607-D4 Septic System was a rectangular prismatic septic tank and tile field that serviced the 115-D/DR Gas Recirculation Facility in the 100-DR-1 Operable Unit, which is located in the 100-D Area of the Hanford Site. Historic drawings indicate that the septic tank was 0.6 by 1.2 m (2 by 4 ft) in plan and 2.5 m (8.3 ft) deep. The design waste capacity of the tank was 795 L (210 gal), leaving up to 1.4 m (4.5 ft) of freeboard/headspace. The tank was constructed of reinforced concrete with 0.2-m (8-in.)-thick walls and a 0.15-m (6-in.)-thick floor. Historic piping layouts show the influent to the tank as a 0.15-m (6-in.) vitrified clay pipe running from the southeast corner of the 115-D/DR Building. The Waste Information Data System describes the tile field as being constructed of at least 14.6 m (48 ft) of 0.1-m (4-in.) vitrified pipe, concrete pipe, or drain tile with open-jointed laterals spaced at 2.4 m (8 ft).

This site received sanitary sewage from the 115-D/DR Gas Recirculation Facility. The Waste Information Data System lists an operational period from 1944 to 1968 and states that the 115-D/DR facility was decommissioned in situ during 1985 and 1986, including demolition of above-grade features. The 1607-D4 septic tank is believed to have been backfilled with local soils at some point after its operational lifetime (DOE-RL 1994).

Confirmatory sampling of the 1607-D4 Septic System was conducted on July 5, 2005. The sample results indicate that the previous waste removal action achieved compliance with the remedial action objectives for the 1607-D4 site. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the confirmation sampling are used to make reclassification decisions for the 1607-D4 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 interim closed out. 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* (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 interim action ROD based on a limited ecological risk assessment. 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 as part of the final ROD for this site.

Table ES-1. Summary of Remedial Action Goals for the 1607-D4 Septic System 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.	No radionuclide COPCs were detected above 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 hazard quotients are less than 1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (2.2×10^{-2}) is less than 1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for carcinogens is less than 1×10^{-6}.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The cumulative excess cancer risk (7.2×10^{-8}) is less than 1×10^{-5}.	
Groundwater/River Protection – Radionuclides	Attain single-COPC groundwater and river protection RAGs.	All single-COPC groundwater and river RAGs have been attained.	Yes
	Attain national primary drinking water standards:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.	No beta/gamma-emitting COPCs were identified for this site.	
	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]	No beta/gamma-emitting COCs were identified for this site.	
	Meet total uranium standard of 30 µg/L (21.2 pCi/L).[c]	Uranium statistical values are below background for this site.	
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Maximum detected results for aroclor-1254 are above groundwater and river protection RAGs. However, generic RESRAD model results (DOE-RL 2005b)[d] indicate that aroclor-1254 will not reach groundwater (and therefore the Columbia River) within 1,000 years. Therefore, residual concentrations achieve the RAOs for groundwater and river protection.	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* (BHI 2001).
[d] *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b).

COC = contaminant of concern
COPC = contaminant of potential concern
MCL = maximum contaminant level (drinking water standard)
RAG = remedial action goal
RAO = remedial action objective
RESRAD = RESidual RADioactivity (dose model)

REMAINING SITES VERIFICATION PACKAGE FOR THE 1607-D4 SEPTIC SYSTEM

STATEMENT OF PROTECTIVENESS

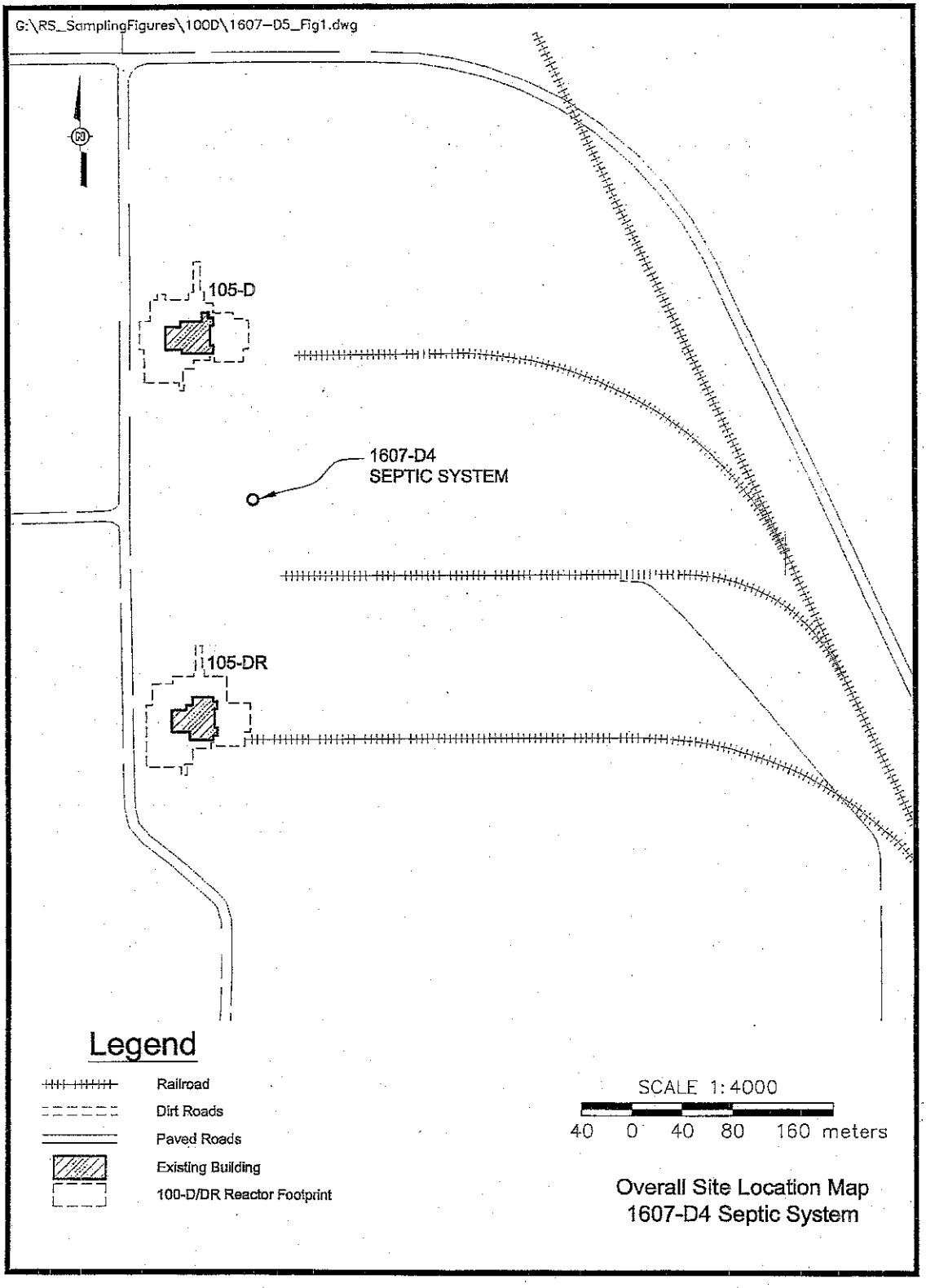
This report demonstrates that the 1607-D4 site meets the objectives for ~~no action~~ Interim closed out as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 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.

GENERAL SITE INFORMATION AND BACKGROUND

The 1607-D4 Septic System consists of a septic tank and tile field in the 100-DR-1 Operable Unit. Operational dates for the septic system span from 1944 to 1968. This septic system received sanitary sewage from the 115-D/DR Gas Recirculation Facility. That facility was decommissioned in 1985 and 1986, including demolition of above-grade features. The 1607-D4 Septic System may have been filled in as part of the decommissioning of the 115-D/DR facility, or at some other time after its operational lifetime ended in 1968 (DOE-RL 1994).

The 1607-D4 Septic System is located between the 105-D and the 105-DR Reactors (Figure 1). Historic drawings indicate that the 1607-D4 Septic System consisted of a rectangular prismatic septic tank and tile field. The tank dimensions are 0.6 by 1.2 m (2 by 4 ft) in plan and 2.5 m (8.3 ft) deep. The design waste capacity of the tank was 795 L (210 gal), leaving up to 1.4 m (4.5 ft) of freeboard/headspace. The tank was constructed of reinforced concrete with 0.2-m (8-in.)-thick walls and a 0.15-m (6-in.)-thick floor. Historic piping layouts show the influent to the tank as a 0.15-m (6-in.) vitrified clay pipe (VCP) running from the southeast corner of the 115-D/DR Building. The Waste Information Data System describes the tile field as being constructed of at least 14.6 m (48 ft) of 0.1-m (4-in.) vitrified pipe, concrete pipe, or drain tile with open-jointed laterals spaced at 2.4 m (8 ft).

Figure 1. 1607-D4 Septic System Site Location Map.



CONFIRMATORY SAMPLING ACTIVITIES

Nonintrusive Investigation Results

Historic site drawings show the 1607-D4 Septic System in two different locations near the 115-D/DR Gas Recirculation Facility. One group of drawings showed the tank located east of the southeast corner of the 115-D/DR Building (H-1-19821 [GE 1962] and M-1904-D, sheet 5 [GE no date]), and the second group of drawings placed the tank east of the approximate center of that facility (H-1-8543 and H-1-8552 [GE 1949]). The Waste Information Data System indicated a third possible location for the tank, which is approximately 10.7 m (35 ft) south-southeast of the location shown in M-1904-D, sheet 5 (GE no date).

A geophysical survey conducted in 1992 (Bergstrom and Mitchell 2004) and field observations made during a site visit in February 2005 were used to conclude that the first possible location, east of the southeast corner of the 115-D/DR Building (Figure 2), was the best place to locate the remaining structure of 1607-D4 Septic System.

Contaminants of Potential Concern

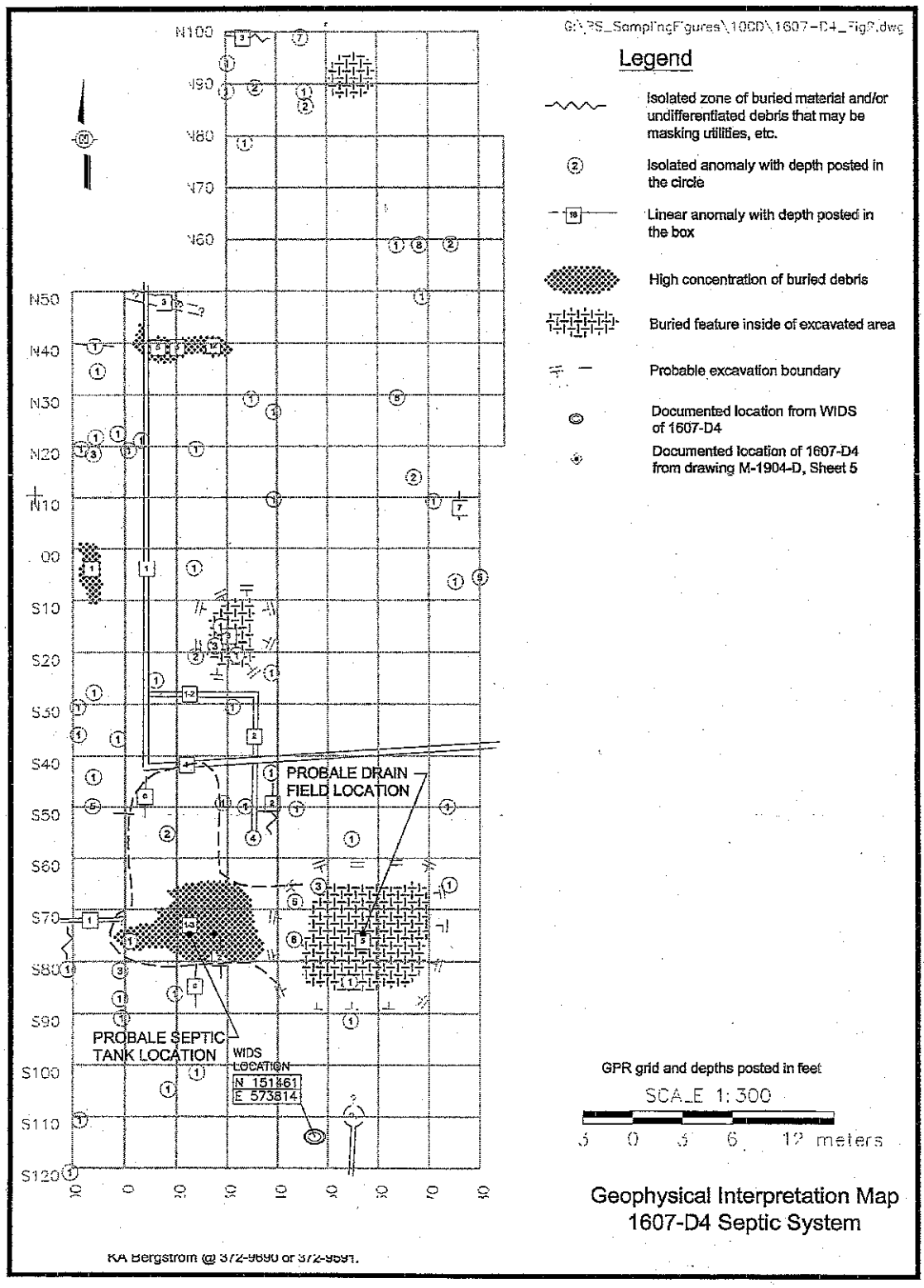
The contaminants of potential concern (COPCs) for the 1607-D4 Septic System were identified based on existing historical information for the site. The COPC list identified in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2005a) includes lead, pesticides, and semivolatile organic compounds. Based on further site-specific evaluations of septic systems, polychlorinated biphenyls were also included as COPCs in the work instruction (BHI 2005d).

Although not included in the list of COPCs, arsenic, antimony, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc concentrations were evaluated by performing the expanded inductively coupled plasma metals analyses. Mercury levels were similarly evaluated for the site. The presence of nitrates, nitrites, and other inorganic anions were also evaluated.

There were no radionuclide COPCs for this site. However, the presence of radiological contaminants was evaluated using field radiological survey instrumentation (capable of detecting alpha, beta, and gamma radiation) during excavation and sampling. Field instrumentation detected no radiological contamination. Samples for radiological analysis were collected, however, to ensure that no uncertainty would remain as to the radiological status of the site.

During confirmatory sampling (BHI 2005d), field screening for volatile organic compounds was performed to assess the need for volatile organic analysis. As no volatile organic compounds were detected in the field, volatile organic analysis was not included in the requested analyses for any samples.

Figure 2. 1607-D4 Septic System Geophysical Interpretation Map.



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. The field team did find a paper-wrapped VCP while collecting a sample from the 1607-D4 drain field. The paper wrap was sampled and analyzed for asbestos.

Confirmatory Sample Design

A focused sampling design was implemented on July 5, 2005, in accordance with *Work Instruction for the 1607-D4 Septic* System (BHI 2005d). The 1607-D4 site was investigated through field observations and focused sampling and analysis to determine if hazardous or radiological contaminants were present.

One test trench was excavated in the area identified as the most likely location of the septic tank. The septic tank was located within the trench and a sample collected from below it. The work instruction also called for a residual sludge sample to be collected from within the septic tank if sufficient residual sludge was found. The septic tank was found backfilled with clean fill unrelated to the operational history of the septic tank and no sludge was sampled from within the septic tank.

The septic tank and the geophysical interpretation map indicated the location of the drain field. Along the VCP pipeline between the septic tank and the drain field, a "tee" section of 0.15-m (6-in.) VCP was found. It is standard practice to sample at the top of drain fields. A sediment sample was collected from within the VCP "tee" at 2 m (6.5 ft) below ground surface. A soil sample and sample duplicate were collected from below the VCP at 2.5 m (8 ft) below ground surface. The sample location (Figure 3) would appear to be outside of the drain field. However, the drain field indicated in Figure 3 has been adapted from the geophysical map (Figure 2), which does not identify the entire scope of the underground structure. The "tee," found between the septic tank and the main portion of the drain field, is the first division of several in the pipeline used to create the drain field. The "tee" it is effectively the top of the drain field.

During excavation, the field sampler inspected the sidewalls and excavated materials for the presence of stained soil, evidence of burning, and/or debris. In the excavation at the top of the drain field, an 0.2-m (8-in.) piece of paper-wrapped pipe was found. The original function of the small section of pipe is unknown, but the wrapping was suspected to be asbestos. A sample of the paper coating on the pipe was taken and analyzed for asbestos.

Sample Summary

A summary of the collected samples for the 1607-D4 Septic System 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 1607-D4 Septic System.

Sample Location	Sample Media	Sample Number	Coordinate Locations	Depth (bgs)	Sample Analysis
Septic tank	Soils underlying tank	J03717	N 151475 E 573808	3 m	ICP metals, mercury, PCB, SVOA, pesticides, nitrate/nitrite, IC anions, GEA, gross alpha, gross beta, KPA
Drain field	Drain tile sediments	J03730	N 151475 E 573811	2 m	ICP metals, mercury, PCB, SVOA, pesticides, nitrate/nitrite, IC anions, GEA, gross alpha, gross beta, KPA
Drain field	Soils underlying drain field	J03718	N 151475 E 573811	2.5 m	ICP metals, mercury, PCB, SVOA, pesticides, nitrate/nitrite, IC anions, GEA, gross alpha, gross beta, KPA
Drain field duplicate	Soils underlying drain field	J03719	N 151475 E 573811	2.5 m	ICP metals, mercury, PCB, SVOA, pesticides, nitrate/nitrite, IC anions, GEA, gross alpha, gross beta, KPA
Drain field	Paper coating	J036X9	N 151475 E 573811	2 m	Asbestos
Equipment blank	Silica sand	J03716	NA	NA	ICP metals, mercury, SVOA

Source: *Remaining Sites Field Sampling*, Logbook EL-1578-7 (BHI 2005c).
bgs = below ground surface
GEA = gamma energy analysis
IC = ion chromatography
ICP = inductively coupled plasma
KPA = kinetic phosphorescence analysis
NA = not applicable
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis

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 are excluded from Table 2. Potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were detected by gamma energy analysis, but these isotopes are unrelated to the operational history of the site and were detected at levels below statistical background activities (based on an assumption of secular equilibrium, the background activities for radium-228 and thorium-228 are equal to the statistical background activity of 1.32 pCi/g for thorium-232 provided in DOE-RL [1996]). These isotopes are not considered further, but 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.

Figure 3. Confirmatory Sample Locations at the 1607-D4 Septic System Site.

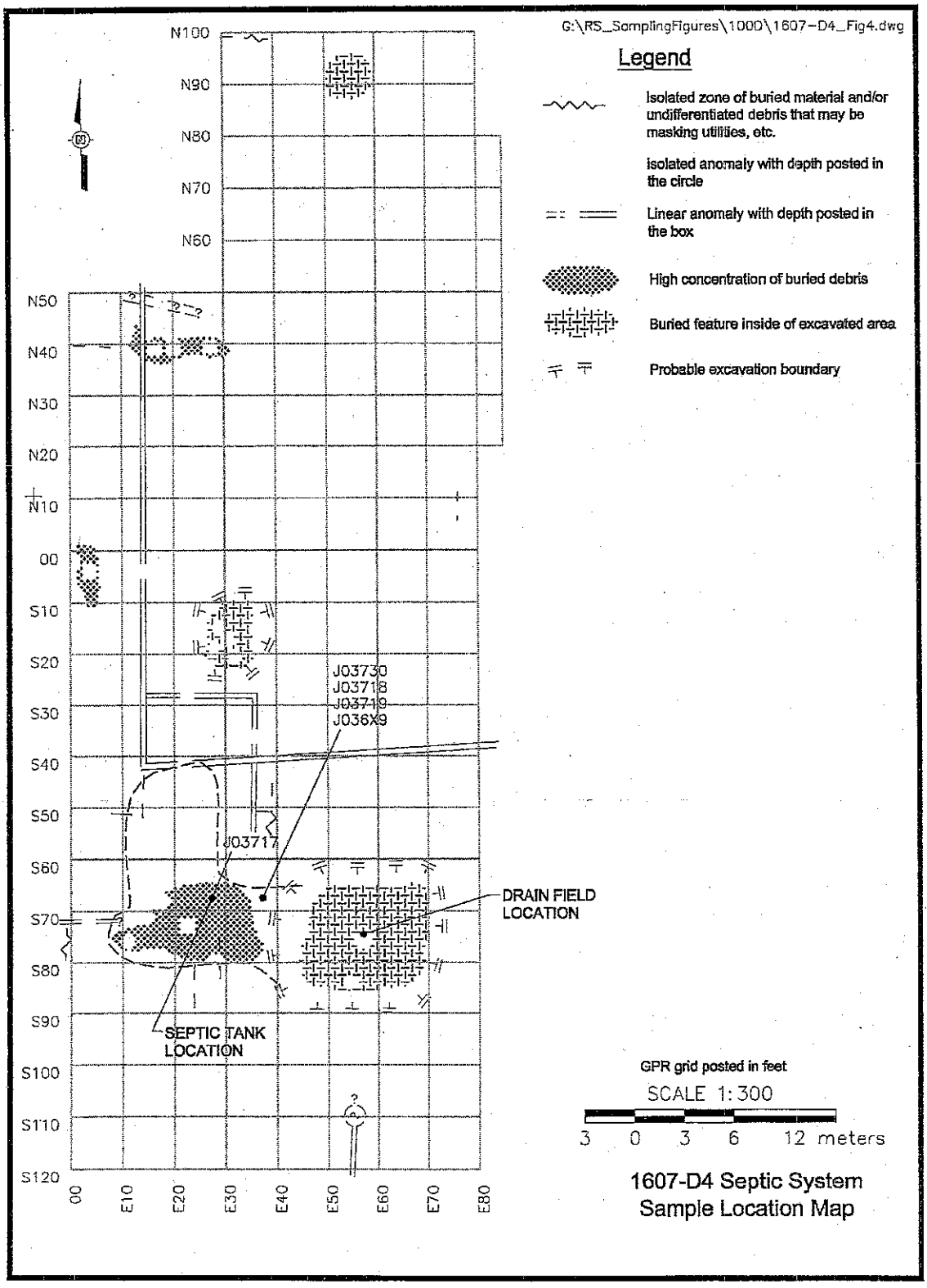


Table 2. Comparison of Maximum Soil Values to Action Levels for the 1607-D4 Septic System. (2 Pages)

COPC	Maximum Result (pCi/g)	Generic Site Lookup Values (pCi/g)			Does the Maximum Result Meet RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value[a]	Soil Concentration Protective of Groundwater	Soil Concentration Protective of the River		
Uranium-233/234	0.53[b] (<BG)	1.1[c]	1.1[c]	1.1[c]	Yes	--
Uranium-235	0.024[b](<BG)	0.61	0.5[d]	0.5[d]	Yes	--
Uranium-238	0.53[b] (<BG)	1.1[c]	1.1[c]	1.1[c]	Yes	--
COPC	**Maximum Result (mg/kg)**	**Remedial Action Goals (mg/kg)**			**Does the Maximum Result Meet RAGs?**	**Does the Maximum Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Antimony[e]	0.48 (<BG)	32[f]	5[g]	5[g]	Yes	--
Arsenic	4.2 (<BG)	20[h]	20[h]	20[h]	Yes	--
Barium	54 (<BG)	5,600[f]	132[g]	--[i]	Yes	--
Beryllium	0.90 (<BG)	10.4[j]	1.51[g]	1.51[g]	Yes	--
Boron[k]	2.7	16,000[f]	320	--[i]	Yes	--
Cadmium[e]	0.35 (<BG)	13.9[j]	0.81[g]	0.81[g]	Yes	--
Chromium	8.8 (<BG)	120,000[f]	18.5[g]	18.5[g]	Yes	--
Cobalt	7.4 (<BG)	1,600[b]	32	--[i]	Yes	--
Copper	16.4 (<BG)	2,960[b]	59.2	22[g]	Yes	--
Lead	5 (<BG)	353[l]	10.2[g]	10.2[g]	Yes	--
Manganese	269 (<BG)	11,200[f]	512[g]	--[i]	Yes	--
Mercury	0.07 (<BG)	24[f]	0.33[g]	0.33[g]	Yes	--
Molybdenum[k]	0.34	400[f]	8	--[i]	Yes	--
Nickel	11.2 (<BG)	1,600[f]	19.1[g]	27.4	Yes	--
Uranium (total)	1.58 (<BG)	240	3.21[c]	3.21[c]	Yes	--
Vanadium	54.5 (<BG)	560[f]	85.1[g]	--[i]	Yes	--
Zinc	44.2 (<BG)	24,000[f]	480	67.8[g]	Yes	--
Nitrate (as nitrogen)	2.6	128,000[m]	40[m]	40[m]	Yes	--
Sulfate	5.2	--	25,000	--	Yes	--
Aroclor-1254	0.034	0.5[n]	0.017[o]	0.017[o]	No	Yes[p]

Table 2. Comparison of Maximum Soil Values to Action Levels for the 1607-D4 Septic System. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals (mg/kg)			Does the Maximum Result Meet RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Bis(2-ethylhexyl)phthalate	0.31	71.4[n]	0.6	0.36	Yes	--
Di-n-butylphthalate	0.08	8,000[f]	160	540	Yes	--

[a] Activity corresponding to a single-radionuclide 15 mrem/yr exposure as calculated using a generic RESRAD model (DOE-RL 2005b).
[b] Isotopic activity calculated based on the maximum reported uranium concentration of 1.58 µg/g and the ratio of isotopic activities of uranium-234, uranium-235, and uranium-238 in secular equilibrium.
[c] The calculated RAG is below the Hanford Site-specific soil background activity. The value presented is the Hanford Site-specific soil background activity.
[d] The calculated RAG is below the MDA. The value presented is the MDA.
[e] 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).
[f] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), Method B, 1996.
[g] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996).
[h] The cleanup value of 20 mg/kg has been agreed to by Tri-Party project managers. The basis for 20 mg/kg is provided in Section 2.1.2.1 of the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b).
[i] No cleanup level is available from the Ecology Cleanup Levels and Risk Calculations database, and no toxicity values are available to calculate cleanup levels (Ecology 2005).
[j] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996).
[k] No Hanford Site-specific or Washington State background value available.
[l] A WAC 173-340-740(3) (1996) value for lead is not available. This value is based on the *Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children* (EPA 1994).
[m] RAG calculated based on reference dose value provided in the Integrated Risk Information System (IRIS), available at: <http://www.epa.gov/iris>.
[n] Carcinogenic cleanup level calculated per WAC 173-340-740(3), Method B, 1996.
[o] Where cleanup levels are less than the required detection limit (RDL), cleanup levels default to the RDL (WAC 173-340-707[2], 1996).
[p] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005a), with the groundwater table elevation of 118 m above mean sea level and a clean zone extending from groundwater to an elevation of 140 m above mean sea level.

-- = not applicable
BG = background
COPC = contaminant of potential concern
IRIS = Integrated Risk Information System
MDA = minimum detectable activity
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

DATA EVALUATION

All detected analytes, with the exception of aroclor-1254, were reported at concentrations below direct exposure, groundwater protection, and river protection RAGs. Aroclor-1254 was detected at a concentration exceeding the soil RAGs for protection of groundwater and the Columbia River. However, based on a soil-partitioning coefficient value of 75.6 mL/g, the results of the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005a) indicate that this constituent will not reach groundwater (and therefore the Columbia River) within 1,000 years for a groundwater elevation of 118 m (387 ft) above mean sea level and a clean zone from there up to the sample location at 140 m (459 ft) above mean sea level. Therefore, residual concentrations of this constituent satisfy the remedial action objectives.

Nonradionuclide risk requirements for the 1607-D4 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 B). All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detection levels is 2.2×10^{-2}. The individual carcinogenic risk values for carcinogenic constituents above background or detection levels are all below 1×10^{-6}. The cumulative carcinogenic risk value for the site is 7.2×10^{-8}, which is below 1×10^{-5}.

When using a statistical sampling approach, a requirement for nonradionuclides is the *Washington Administrative Code* 173-340-740(7)(e) three-part test. However, this test is not applicable to the focused confirmatory sampling results because maximum detected concentrations are used as the compliance basis.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the sample locations and the resulting field and analytical data with the sampling and data requirements specified by the project objectives and performance specifications. This review was used to determine if samples were collected in accordance with the sample design. The review also involved an evaluation of the analytical data to determine if they are the right type, quality, and quantity to support project decisions (i.e., remedial action needs, interim site closure). A DQA completes the data life cycle of planning, implementation, and assessment that was initiated by the data process.

The data set for the 1607-D4 site consisted of three sample delivery groups (SDGs): 05-A-3708, H3247, and H3248.

There were no deficiencies found in SDG 05-A-3708, an analysis of one sample for asbestos.

SDG H3247 was submitted for third-party validation (BHI 2005b), which identified several minor deficiencies in the data. Generally, the deficiencies resulted in qualifying the data as estimates with "J" flags, but are still useable for decision-making purposes. Specifically, the deficiencies and qualifications are as follows:

- Sample J03716 was qualified with "UJ" as estimated nondetects for chromium and lead due to the appearance of these metals in the method blank.
- Samples J03716, J03717, J03718, and J03719 were all qualified with "UJ" as estimated nondetects for boron due to its appearance in the method blank.
- Samples J03716, J03717, J03718, and J03719 were all qualified with "J" as estimates for antimony due to a low matrix spike (MS) recovery.

- Samples J03717, J03718, and J03719 were all qualified with "J" as estimates for thorium-232 due to a high relative percent difference (RPD) of 40%. This result is attributed to heterogeneity in the sample.

- Samples J03717, J03718, and J03719 were all qualified with "J" as estimates for nitrate and nitrite due to a hold time that was exceeded by less than two times the normal hold time.

- Samples J03716, J03717, J03718, and J03719 were all qualified for bis(2-ethylhexyl)phthalate with "U" as undetected, and the results were raised to the required quantitation limit, due to contamination found in the method blank.

- Samples J03717, J03718, and J03719 were all qualified with "U" as undetected for di-n-butyl phthalate, and the sample results were raised to the required quantitation limit due to contamination found in the method blank.

- Samples J03716, J03717, J03718, and J03719 were all qualified with "J" as estimates for 4,6-dinitro-2-methylphenol due to a MS duplicate recovery that was out of criteria resulting in a high RPD (155%) between the MS and the MS duplicate.

- Samples J03716, J03717, J03718, and J03719 were all qualified with "J" as estimates for benzo(k)fluoranthene due to a high RPD (probably a result of heterogeneity in the sample).

All of these deficiencies are considered minor and have only resulted in qualifying the sample results as estimates. Under the statement of work, estimated data are still useable for decision-making purposes.

SDG H3248 also had minor deficiencies. The laboratory control sample recovery for endosulfan sulfate was above the acceptance criteria. This suggests a high bias in the data for endosulfan sulfate, which was not detected in the field samples. Therefore, there is no impact on the sample data. The MS recovery for antimony was out of criteria. However, a post-digestion spike and serial dilution were performed, bringing antimony back into criteria. There is no impact on the sample data. The MS recovery for phosphate was above the acceptance criteria, which suggests a slightly high bias in the data for phosphate. The impact on the sample data is minimal. The data are useable for decision-making purposes. The laboratory control sample for gross alpha had a recovery of 68%. The contract required limit is 70%. Therefore, the recovery is 2% below limit. An examination of the sample data shows that a slightly low value for gross alpha will have had no effect on the data relative to passing or not passing the RAGs.

The DQA review was performed in accordance with BHI-EE-01, *Environmental Investigations Procedures*. Specific data quality objectives for the site are found in the SAP (DOE-RL 2005a). The SAP data quality assurance requirements were followed, where appropriate. The data review for the 1607-D4 waste site determined that the analytical data are the right type, quality, and quantity to support site remediation decisions within specified error tolerances. All analytical data were found acceptable for decision-making purposes.

SUMMARY FOR INTERIM CLOSURE

On July 5, 2005, focused confirmatory samples were collected from under the septic tank and from within the drain field tile and below the drain field. Examination of the data has led to the conclusion that the site passes the RAGs without further remedial action. In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 1607-D4 site to interim closed out. The analytical results from soil and drain field samples were shown to meet the cleanup objectives for direct exposure, groundwater protection, and river protection.

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APPENDIX A

1607-D4 SAMPLE RESULTS
(5 Pages)

Table A-1. 1607-D4 Confirmatory Sampling Results. (5 Pages)

Sample Location	HEIS Number	Sample Date	Americium-241 GEA			Cesium-137			Cobalt-60			Europium-152			Europium-154			Europium-155		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil under tank	J03717	07/05/05	0.14	U	0.14	0.078	U	0.078	0.04	U	0.04	0.098	U	0.098	0.12	U	0.12	0.099	U	0.099
Soil under drainfield	J03718	07/05/05	0.12	U	0.12	0.031	U	0.031	0.035	U	0.035	0.076	U	0.076	0.13	U	0.13	0.085	U	0.085
Soil under drainfield	J03719	07/05/05	0.19	U	0.19	0.03	U	0.03	0.029	U	0.029	0.066	U	0.066	0.1	U	0.1	0.093	U	0.093
Drain tile sediment	J03730	07/05/05	0.16	U	0.16	0.063	U	0.063	0.048	U	0.048	0.12	U	0.12	0.16	U	0.16	0.12	U	0.12

Sample Location	HEIS Number	Sample Date	Gross alpha			Gross beta			Potassium-40			Radium-226			Radium-228			Thorium-228 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil under tank	J03717	07/05/05	4.32		2.7	14.4		5.6	9.87		0.47	0.394		0.08	0.673		0.19	0.512		0.042
Soil under drainfield	J03718	07/05/05	7.25		3.1	14.7		5.7	8.97		0.31	0.348		0.061	0.412		0.16	0.462		0.04
Soil under drainfield	J03719	07/05/05	4.71		3.4	15.5		5.5	9.58		0.32	0.394		0.051	0.486		0.13	0.566		0.05
Drain tile sediment	J03730	07/05/05	4.36		2.6	13.7		5.7	10.7		0.48	0.55		0.08	0.745		0.21	0.656		0.048

Sample Location	HEIS Number	Sample Date	Thorium-232 GEA			Uranium-235			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil under tank	J03717	07/05/05	0.673	J	0.19	0.14	U	0.14	4.5	U	4.5
Soil under drainfield	J03718	07/05/05	0.412	J	0.16	0.12	U	0.12	4.5	U	4.5
Soil under drainfield	J03719	07/05/05	0.486	J	0.13	0.12	U	0.12	3.6	U	3.6
Drain tile sediment	J03730	07/05/05	0.745		0.21	0.17	U	0.17	5.8	U	5.8

Table A-1. 1607-D4 Asbestos Result. (5 Pages)

Sample Location	HEIS	Date	Result
Paper coating in drainfield	J036X9	7/5/2005	None Detected

Acronyms and notes apply to all of the tables in this appendix.
Note: Data qualified with B, C, and/or J are considered acceptable values for decision-making purposes.
B = blank contamination (organic constituents)
BHC = hexachlorocyclohexane
C = blank contamination (inorganic constituents)
GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
J = estimate
KPA = kinetic phosphorescence analysis
MDA = minimum detectable activity
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
Q = qualifier
SVOA = semivolatile organic analyte
U = undetected

Table A-1. 1607-D4 Confirmatory Sampling Results.

Sample Location	HEIS Number	Sample Date	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
Equipment Blank	J03716	07/05/05	0.33	UJ	0.33	0.37	U	0.37	1.2	C	0.02	0.05		0.008	0.48	UJ	0.19	0.02	U	0.02
Soil under tank	J03717	07/05/05	0.34	UJ	0.34	1.5		0.38	41.9	C	0.02	0.9		0.009	1.1	UJ	0.2	0.07		0.03
Soil under drainfield	J03718	07/05/05	0.35	UJ	0.35	0.86		0.39	37.3	C	0.02	0.66		0.009	0.63	UJ	0.2	0.33		0.03
Soil under drainfield	J03719	07/05/05	0.35	UJ	0.35	0.64		0.39	38.3	C	0.02	0.62		0.009	0.59	UJ	0.2	0.35		0.03
Drain tile sediment	J03730	07/05/05	0.48		0.39	4.2		0.44	54	C	0.02	0.52		0.01	2.7	C	0.23	0.17		0.03

Sample Location	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Lead			Manganese			Mercury		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Equipment Blank	J03716	07/05/05	0.25	UJ	0.06	0.07	U	0.07	0.09	C	0.07	0.36	UJ	0.21	4.4	C	0.02	0.02	U	0.02
Soil under tank	J03717	07/05/05	3.5		0.06	7.4		0.08	14.7	C	0.07	2.6		0.21	269	C	0.02	0.01	U	0.01
Soil under drainfield	J03718	07/05/05	2.8		0.06	6		0.08	13.7	C	0.07	2.2		0.22	245	C	0.02	0.01	U	0.01
Soil under drainfield	J03719	07/05/05	3		0.06	6.1		0.08	13.9	C	0.07	2.4		0.22	252	C	0.02	0.02	U	0.02
Drain tile sediment	J03730	07/05/05	8.8	C	0.07	6.7		0.09	16.4		0.08	5	C	0.25	167		0.02	0.07	C	0.02

Sample Location	HEIS Number	Sample Date	Molybdenum			Nickel			Selenium			Silver			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Equipment Blank	J03716	07/05/05	0.13	U	0.13	0.28	C	0.18	0.41	U	0.41	0.07	U	0.07	0.06		0.05	3.3		0.04
Soil under tank	J03717	07/05/05	0.18		0.14	8.1	C	0.19	0.42	U	0.42	0.08	U	0.08	54.5		0.05	38.1		0.04
Soil under drainfield	J03718	07/05/05	0.28		0.14	6.8	C	0.19	0.43	U	0.43	0.08	U	0.08	49.1		0.05	35.6		0.04
Soil under drainfield	J03719	07/05/05	0.14	U	0.14	7	C	0.19	0.43	U	0.43	0.08	U	0.08	45.8		0.05	35.3		0.04
Drain tile sediment	J03730	07/05/05	0.34		0.16	11.2		0.22	0.48	UC	0.48	0.09	U	0.09	29.9		0.06	44.2		0.05

Sample Location	HEIS Number	Sample Date	Uranium (KPA)		
			mg/kg	Q	MDA
Soil under tank	J03717	07/05/05	1.38		0.01
Soil under drainfield	J03718	07/05/05	1.56		0.01
Soil under drainfield	J03719	07/05/05	1.58		0.01
Drain tile sediment	J03730	07/05/05	1.17		0.01

Table A-1. 1607-D4 Confirmatory Sampling Results. (5 Pages)

Sample Location	HEIS Number	Sample Date	Bromide			Chloride			Fluoride			Nitrate			Nitrite			Nitrogen in Nitrite and Nitrate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil under tank	J03717	07/05/05	1.28	U	1.28	1.28	U	1.28	1.28	U	1.28	2.46	J	1.28	1.28	UJ	1.28	0.715		0.21
Soil under drainfield	J03718	07/05/05	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	2.28	J	1.3	1.3	UJ	1.3	0.55		0.21
Soil under drainfield	J03719	07/05/05	1.24	U	1.24	1.24	U	1.24	1.24	U	1.24	2.23	J	1.24	1.24	UJ	1.24	0.552		0.21
Drain tile sediment	J03730	07/05/05	1.45	U	1.45	1.45	U	1.45	1.45	U	1.45	11.2		1.45	1.45	U	1.45	2.6		0.23

Sample Location	HEIS Number	Sample Date	Phosphate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL
Soil under tank	J03717	07/05/05	1.28	U	1.3	4.32		1.3
Soil under drainfield	J03718	07/05/05	1.3	U	1.3	2.08		1.3
Soil under drainfield	J03719	07/05/05	1.24	U	1.2	1.97		1.2
Drain tile sediment	J03730	07/05/05	10.9		1.4	5.2		1.4

Table A-1. 1607-D4 Confirmatory Sampling Results. (5 Pages)

Constituent	J03716 Equipment Blank Sample Date 07/05/05			J03717 Soil under tank Sample Date 07/05/05			J03718 Soil under drainfield Sample Date 07/05/05			J03719 Soil under drainfield Sample Date 07/05/05			J03730 Drain tile sediment Sample Date 07/05/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls (PCBs)															
Aroclor-1016				14	U	14	14	U	14	14	U	14	120	U	120
Aroclor-1221				14	U	14	14	U	14	14	U	14	120	U	120
Aroclor-1232				14	U	14	14	U	14	14	U	14	120	U	120
Aroclor-1242				14	U	14	14	U	14	14	U	14	120	U	120
Aroclor-1248				14	U	14	14	U	14	14	U	14	120	U	120
Aroclor-1254				14	U	14	14	U	14	14	U	14	34	J	120
Aroclor-1260				14	U	14	14	U	14	14	U	14	120	U	120
Pesticides															
Aldrin				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
Alpha-BHC				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
alpha-Chlordane				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
beta-1,2,3,4,5,6-Hexachlorocyclohexane				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
Delta-BHC				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
Dichlorodiphenyldichloroethane				3.5	U	3.5	3.5	U	3.5	3.5	U	3.5	58	U	58
Dichlorodiphenyldichloroethylene				3.5	U	3.5	3.5	U	3.5	3.5	U	3.5	58	U	58
Dichlorodiphenyltrichloroethane				3.5	U	3.5	3.5	U	3.5	3.5	U	3.5	58	U	58
Dieldrin				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
Endosulfan I				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
Endosulfan II				3.5	U	3.5	3.5	U	3.5	3.5	U	3.5	58	U	58
Endosulfan sulfate				3.5	U	3.5	3.5	U	3.5	3.5	U	3.5	58	U	58
Endrin				3.5	U	3.5	3.5	U	3.5	3.5	U	3.5	58	U	58
Endrin aldehyde				3.5	U	3.5	3.5	U	3.5	3.5	U	3.5	58	U	58
Endrin ketone				3.5	U	3.5	3.5	U	3.5	3.5	U	3.5	58	U	58
Gamma-BHC (Lindane)				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
gamma-Chlordane				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
Heptachlor				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
Heptachlor epoxide				1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	29	U	29
Methoxychlor				17	U	17	17	U	17	17	U	17	290	U	290
Toxaphene				170	UJ	170	170	UJ	170	170	UJ	170	2900	U	2900
Semivolatile Organic Analytes (SVOAs)															
1,2,4-Trichlorobenzene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
1,2-Dichlorobenzene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
1,3-Dichlorobenzene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
1,4-Dichlorobenzene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2,4,5-Trichlorophenol	840	U	840	870	U	870	870	U	870	870	U	870	970	U	970
2,4,6-Trichlorophenol	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2,4-Dichlorophenol	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2,4-Dimethylphenol	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2,4-Dinitrophenol	840	U	840	870	U	870	870	U	870	870	U	870	970	U	970
2,4-Dinitrotoluene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2,6-Dinitrotoluene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2-Chloronaphthalene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2-Chlorophenol	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2-Methylnaphthalene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2-Methylphenol (cresol, o-)	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
2-Nitroaniline	840	U	840	870	U	870	870	U	870	870	U	870	970	U	970
2-Nitrophenol	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390

Table A-1. 1607-D4 Confirmatory Sampling Results. (5 Pages)

Constituent	J03716 Equipment Blank Sample Date 07/05/05			J03717 Soil under tank Sample Date 07/05/05			J03718 Soil under drainfield Sample Date 07/05/05			J03719 Soil under drainfield Sample Date 07/05/05			J03730 Drain tile sediment Sample Date 07/05/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
SVOAs (continued)															
3+4 Methylphenol (cresol, m+p)	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
3,3'-Dichlorobenzidine	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
3-Nitroaniline	840	U	840	870	U	870	870	U	870	870	U	870	970	U	970
4,6-Dinitro-2-methylphenol	840	UJ	840	870	UJ	870	870	UJ	870	870	UJ	870	970	U	970
4-Bromophenylphenyl ether	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
4-Chloro-3-methylphenol	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
4-Chloroaniline	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
4-Chlorophenylphenyl ether	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
4-Nitroaniline	840	U	840	870	U	870	870	U	870	870	U	870	970	U	970
4-Nitrophenol	840	U	840	870	U	870	870	U	870	870	U	870	970	U	970
Acenaphthene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Acenaphthylene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Anthracene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Benzo(a)anthracene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Benzo(a)pyrene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Benzo(b)fluoranthene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Benzo(ghi)perylene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Benzo(k)fluoranthene	330	UJ	330	350	UJ	350	350	UJ	350	350	UJ	350	390	U	390
Bis(2-chloro-1-methylethyl)ether	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Bis(2-Chloroethoxy)methane	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Bis(2-chloroethyl) ether	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Bis(2-ethylhexyl) phthalate	660	U	660	660	U	660	660	U	660	660	U	660	310	JB	390
Butylbenzylphthalate	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Carbazole	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Chrysene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Di-n-butylphthalate	710	B	330	660	U	660	660	U	660	660	U	660	74.961	JB	390
Di-n-octylphthalate	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Dibenz[a,h]anthracene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Dibenzofuran	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Diethylphthalate	180	J	180	350	U	350	350	U	350	350	U	350	390	U	390
Dimethyl phthalate	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Fluoranthene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Fluorene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Hexachlorobenzene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Hexachlorobutadiene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Hexachlorocyclopentadiene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Hexachloroethane	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Indeno(1,2,3-cd)pyrene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Isophorone	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
N-Nitroso-di-n-dipropylamine	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
N-Nitrosodiphenylamine	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Naphthalene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Nitrobenzene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Pentachlorophenol	840	U	840	870	U	870	870	U	870	870	U	870	970	U	970
Phenanthrene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Phenol	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390
Pyrene	330	U	330	350	U	350	350	U	350	350	U	350	390	U	390

APPENDIX B

1607-D4 HAZARD QUOTIENT AND CARCINOGENIC RISK CALCULATION
(4 Pages)

CALCULATION COVER SHEET

Project Title 100-D Area Remaining Sites **Job No.** 14655
Area 100-D
Discipline Environmental ***Calc. No.** 0100D-CA-V0265
Subject 1607-D4 Hazard Quotient and Carcinogenic Risk Calculation
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	J. M. Capron 9/20/05	T. M. Blakley 9/20/05	L. M. Dittmer 9/21/05	R. A. Carlson	9/21/05

SUMMARY OF REVISION

*Obtain Calc. No. from DIS

DE01437.03 (12/09/2004)

Washington Closure Hanford, LLC CALCULATION SHEET

Originator:	J. M. Capron	Date:	09/20/05	Calc. No.:	0100D-CA-V0265	Rev.:	0
Project:	100-D Remaining Sites	Job No:	14655	Checked:	T. M. Blakley	Date:	9/20/05
Subject:	1607-D4 Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and carcinogenic (excess cancer) risk for the 1607-D4 Remaining Sites Verification Package (WCH 2005). In accordance with the remedial action goals (RAGs) in *Remedial Design Report/Remedial Action Work Plan for the 100 Areas* (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, 2005, Waste Site Reclassification Form 2005-036, and Attachment *Remaining Sites Verification Package for the 1607-D4 Septic System*, Bechtel Hanford, Inc., Richland, Washington.

SOLUTION:

1) Generate an HQ for each noncarcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the individual HQ of <1.0 (DOE-RL 2005).

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

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the excess cancer risk of $<1 \times 10^{-6}$ (DOE-RL 2005).

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

METHODOLOGY:

Hazard quotient and carcinogenic risk calculations were computed using the data from Table 2 (WCH 2005). Of the contaminants of potential concern for the site, boron 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. Aroclor-1254, nitrate, sulfate, and several semivolatile analytes (as

Washington Closure Hanford, LLC CALCULATION SHEET

Originator:	J. M. Capron	Date:	09/20/05	Calc. No.:	0100D-CA-V0265	Rev.:	0
Project:	100-D Remaining Sites	Job No:	14655	Checked:	T. M. Blakley	Date:	9/20/05
Subject:	1607-D4 Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 3

shown in Table 1, below) are included because they were detected by laboratory analysis. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 2.7 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 1.7×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ is obtained by summing the individual values. The sum of the HQ values is 2.2×10^{-2}. 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 aroclor-1254 is 0.034 mg/kg; divided by 0.5 mg/kg, multiplied as indicated is 6.8×10^{-8}. Comparing this value, and all other individual values, to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk is obtained by summing the individual values. The sum of the excess cancer risk values is 7.2×10^{-8}. 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: 2.2×10^{-2}
3) List individual carcinogens and corresponding excess cancer risk $>1 \times 10^{-6}$: None
4) List the cumulative excess cancer risk: 7.2×10^{-8}.

Table 1 shows the results of the calculations.

Washington Closure Hanford, LLC CALCULATION SHEET

Originator:	J. M. Capron	Date:	09/20/05	Calc. No.:	0100D-CA-V0265	Rev.:	0
Project:	100-D Remaining Sites	Job No:	14655	Checked:	T. M. Blakley	Date:	9/20/05
Subject:	1607-D4 Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	3 of 3

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 1607-D4 Septic System.

Contaminants of Potential Concern	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.7	16,000	1.7E-04	--	--
Molybdenum	0.34	400	8.5E-04	--	--
Anions					
Nitrate (as N)	2.6	128000[c]	2.0E-05	--	--
Sulfate	5.2	--	--	--	--
Semivolatiles					
Bis(2-ethylhexyl) phthalate	0.31	1,600	1.9E-04	71.4	4.3E-09
Di-n-butylphthalate	0.08	8,000	1.0E-05	--	--
Polychlorinated Biphenyls					
Aroclor-1254	0.034	1.6	2.1E-02	0.5	6.8E-08
Totals					
Cumulative Hazard Quotient:			**2.2E-02**		
Cumulative Excess Cancer Risk:					**7.2E-08**

Notes:
RAG = remedial action goal
-- = not applicable
[a] = From WCH 2005.
[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.
[c] = Value calculated based on the reference dose provided in the Integrated Risk Information System (IRIS)

CONCLUSION:

This calculation demonstrates that the 1607-D4 septic system meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2005).