

# **Preliminary Hazard Classification for Closure Activities at the 600-23 Site**

***Prepared for the U.S. Department of Energy, Richland Operations Office  
Office of Environmental Restoration***

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***Submitted by: Bechtel Hanford, Inc.***

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**Approval:** M. J. Haass, BHI Project Engineer

Matthew J. Haass  
Signature

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Date

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# **Preliminary Hazard Classification for Closure Activities at the 600-23 Site**

## **Author**

C. A. Kahler-Royer  
CH2M HILL Hanford, Inc.

## **Date Published**

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## EXECUTIVE SUMMARY

This document provides the preliminary hazard classification for the sampling and closure activities to be conducted at the 600-23 site. The report has been prepared to determine the authorization basis requirements for the closure activities. The closure activities described herein will not rely upon, nor does this report take credit for, any engineered safety structures, systems, or components that could mitigate the severity of the hazards intrinsic to this project.

In general, closure and remediation activities at the 600-23 site will involve removal and disposal of contaminated soil, construction debris, liquid-filled drums, and equipment.

The material at risk associated with the site does not have an inventory of radionuclides that, individually or as a sum of the ratios, is sufficient to exceed the *40 Code of Federal Regulations (CFR) 302* reportable quantities. However, the sum of the ratios of chemical constituents is greater than 40 CFR 302.4, Table 302.4, "Final RQs." While the 40 CFR 302.4 "Final RQs" are exceeded, nonradionuclide hazardous substance thresholds for 29 CFR 1910.119, Appendix A, and 40 CFR 68.130 are not exceeded. Hence, the hazard classification for closure of this site is classified as "*non-nuclear*."

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## ACRONYMS

CFR	<i>Code of Federal Regulations</i>
EDPI	Engineering Department Project Instructions
ERDF	Environmental Restoration Disposal Facility
LCM	Loose Cubic Meters
PHC	preliminary hazard classification
RQ	reportable quantity
TQ	threshold quantity
WIDS	Waste Information Data System

## 1.0 INTRODUCTION AND PURPOSE

This report documents the preliminary hazard classification (PHC) for closure activities at the 600-23 site located in the 100-IU-6 Operable Unit on the Hanford Site. It also documents the authorization basis requirements for these activities. This report was prepared in accordance with the applicable provisions of U.S. Department of Energy Orders 5481.1B and 5480.23 and applicable Bechtel Hanford, Inc. Engineering Department Project Instructions (EDPIs) (BHI-DE-01, *Design Engineering Procedures*, EDPI 4.28, Rev. 3) and engineering guidance (BHI 1999). The requirements for hazard classification determination are described in *DOE Limited Standard, Hazard Baseline Documentation* (DOE 1994). This PHC is based on a comparison of the total contaminant inventory associated with the mass of soil being processed to the reportable quantities (RQs) as listed in 40 *Code of Federal Regulations* (CFR) 302, 40 CFR 68.130 threshold quantities (TQs), 29 CFR 1910.119, Appendix A TQs, and DOE-STD-1027-92, Attachment A.1, Categories 2 and 3 TQs (DOE 1992).

The material at risk associated with the site does not have an inventory of radionuclides that, individually or as a sum of the ratios, is sufficient to exceed the 40 CFR 302 reportable quantities. However, the sum of the ratios of chemical constituents is greater than 40 CFR 302.4, Table 302.4, "Final RQs." While the 40 CFR 302.4 "Final RQs" are exceeded, nonradionuclide hazardous substance thresholds for 29 CFR 1910.119, Appendix A, and 40 CFR 68.130 are not exceeded. Hence, the hazard classification for closure of this site is classified as "*non-nuclear*."

This report provides project description information of sufficient detail to support the assumptions and conclusions provided in this PHC. More detailed process information can be found in the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2000a) and the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2000b).

In addition to the remediation activities, the scope of the project also includes the transportation of wastes from this site to the Environmental Restoration Disposal Facility (ERDF) for disposal. The ERDF is located near the southeastern corner of the 200 West Area on the Hanford Site.

## 2.0 DESCRIPTION

### 2.1 SITE DESCRIPTION

This section provides a brief history of the 600-23 site addressed in this PHC. Waste sites 600-23 and JA Jones No. 1 were added to the 100-IU-6 Operable Unit by the *Explanation of Significant Difference for the 100 Area Remaining Sites ROD* (EPA 2000) issued in June 2000.



### **2.1.1 Site 600-23**

According to the Waste Information Data System, the 600-23 site is an area of buried debris inside a large gravel pit (Gravel Pit 11, site code 600-248). This site is located north of the Wye Barricade on Route 2 South near mile marker number 6, on the east side of the road. Most of the waste is located in the northern portion of a middle terrace at the west end of the pit that was used for dumping of construction debris and drums. Some metal and wood debris is visible on the surface of the middle terrace. Based on interviews with Hanford Site employees, drums and construction debris from 1706 KE are located at this site. Drum contents are unknown. Drums filled with a thick sludge were found during excavation at the 600-23 site. The contents of a drum were sampled and those data reported (samples B11KM8 and B11KM9).

Transite building siding was observed at the site, so asbestos may be present. Large pieces of equipment from the 300 Area may also have been buried at the site. It has been indicated that the equipment is located on the eastern edge of the pit. The northern portion of the pit is still actively used as a gravel source.

It was previously assumed that there are no radiological contaminants at this site. However, some radiological material was found at the 600-23 site during excavation. This material includes quarter-sized metallic disks, metal cans containing a soil-like substance ("tuna cans"), and paper disks in petri dishes ("hockey pucks"). Samples of these materials were sent for analysis. As of April 25, 2001, data for the quarter-sized metallic disk (sample B11863-A) and the "tuna can" contents (sample B11862-A) have been reported.

## **2.2 SUMMARY OF PLANNED REMEDIATION ACTIVITIES**

In general, closure and remediation activities at the 600-23 site will involve removal and disposal of contaminated soil, construction debris, liquid-filled drums, and equipment.

No site features have been identified that are anticipated to adversely impact the excavation operation. Slopes for the excavation will be determined in accordance with the requirements of 29 CFR 1926. During waste site excavation planning, local topography will be investigated to determine if there is a potential for precipitation run-off from the waste site that could potentially spread contamination. There is no potential for flooding from precipitation-induced run-off from adjacent areas to the waste site because uncontrolled contaminated run-off is prohibited by contractual requirements. The contractor will make provisions to collect any run-off.

This hazard classification is based strictly on comparison of estimated gross inventory with RQs and TQs. The contaminated soils excavated from the waste site may consist of silts, sands, gravels, cobble, and concrete rubble. In general, 50% by weight of the material is expected to be larger than 1.27 cm (0.5 in.). It may be concluded that at least 50% of the excavated soil is too large to become airborne by wind erosion or other mechanical entrainment processes.

The only population that might be adversely affected by the 600-23 site remediation would be the workers at the excavation site or the workers in the vicinity of the transportation route. It is

estimated that approximately 20 onsite workers will be present at each waste site during excavation.

The remedial design report for the 100 Areas (DOE-RL 2000b) indicates the following scope of work for this remediation project:

- Performance of all necessary activities for removal and disposal of contaminated subsurface soil to within specified limits. These activities include soil treatment or soil volume reduction, as appropriate, to prepare the waste for disposal.
- Restoration or reclamation of the sites consistent with future land use.
- Establishment of necessary interfaces with existing site services (e.g., utilities and support personnel) and with the ERDF.

This PHC was performed to determine the authorization basis requirements for the activities identified in the scope of work. Subcontractors will perform the remediation activities. Dust emissions during transportation of excavated waste to the ERDF can and will be eliminated as a result of a procedural requirement for covering the loads. The use of a water spray or the application of a soil fixative may also eliminate dust emissions during excavation and truck-loading operations.

### **3.0 INVENTORY OF HAZARDOUS SUBSTANCES**

#### **3.1 NONRADIOACTIVE HAZARDOUS SUBSTANCES**

The evaluations of nonradioactive hazardous inventories for the 600-23 site are summarized in Appendix A. Appendix A is taken from Calculation No. 0300X-CA-V0005, Rev. 1, *Determination of MAR for JA Jones 1 and 600-23* (BHI 2001).

Drums filled with a thick sludge were found at 600-23. The contents of a drum were sampled and those data reported (samples B11KM8 and B11KM9).

Data for soil have been obtained directly from an analogous site because little applicable sample data were available. It is assumed that organic chemical concentrations in soil existing at the 600-23 site are similar to concentrations found at an analogous site of similar origin (Landfill 1a, site code 300-49). The analogous site is considered such because it is known to have received wastes that were similar in terms of physical form, source, and inventory as those wastes placed in the remediation sites. Inorganic data from samples B11KM8 and B11KM9 was used as concentration in soil, because there was little inorganic soil data available. This is conservative because it is expected that the concentrations in the drums are higher than the concentrations in soil.

Since the new data for the organics were in terms of  $\mu\text{g/L}$ , the ratios for these constituents were calculated separately using an estimated volume of liquid per drum and an estimated number of drums. For the organic data from samples B11KM8 and B11KM9, maximum values were used. The data with a dilution factor of 500 were used to be conservative. Data with U qualifiers were used because the dilution factor caused the quantitation limit to be above the regulatory limit. Therefore, the quantitation limit was used if no other data were available. The two chemical sums of ratios were added together.

The soil volume used for calculations of the 600-23 site estimated inventory is the mass calculated in 0600X-CA-C0021, Rev. 1 (BHI 2000). The hazardous chemical concentration is assumed to be uniform throughout the volume of soil being considered. Multiplying the maximum chemical concentrations in soil by the total volume of an individual site produces a conservative estimate of the releasable inventory. This estimate is also conservative in that the calculations treat the total site volume as the material at risk. The volume of soil at the 600-23 site is 9,091 loose cubic meters (LCM). Appendix A shows a sum of the ratios for 40 CFR 302, 40 CFR 68.130, and 29 CFR 1910.119 (Appendix A) for the site mass. The project will excavate the contaminated soil and debris for subsequent disposal at the ERDF.

### 3.2 RADIOACTIVE INVENTORIES

The evaluations of radioactive inventories for the 600-23 site are summarized in Appendix B. Appendix B is taken from Calculation No. 0300X-CA-V0005, Rev. 1, *Determination of MAR for JA Jones 1 and 600-23* (BHI 2001).

Before excavation started, no radiological materials were expected to be present at this site. However, some radiological material was found at the 600-23 site during excavation. This material includes quarter-sized metallic disks, "tuna cans" filled with a soil-like substance, and paper disks in petri dishes ("hockey pucks"). Samples of these materials were sent for analysis. As of April 25, 2001, data for the quarter-sized disk (sample B11863-A) and the "tuna can" (sample B11862-A) have been reported. Data for the "hockey puck" have not been reported as of April 25, 2001; therefore, the concentrations reported for the "tuna can" were used as analogous data. Field screening of the "tuna can" and "hockey puck" showed them to be similar. If results for the "hockey puck" are higher than those assumed, this PHC will be revised. The ratios for these materials were calculated separately due to the different sizes, masses, and radionuclide concentrations of the materials. However, since these materials are all at the 600-23 site, the radiological sums of the ratios were added together.

Volumes of the quarter-sized metallic disks, "tuna cans," and "hockey pucks" were estimated in Calculation No. 0300X-CA-V0005, Rev. 1, *Determination of MAR for JA Jones 1 and 600-23* (BHI 2001). The radiological concentration is assumed to be uniform throughout the volume of the item being considered. Multiplying the maximum radiological concentrations in the item by the mass of an individual item and multiplying by the number of items estimated to be present at the site produces a conservative estimate of the inventory. Appendix B shows a sum of the ratios for 40 CFR 302 RQs, and DOE-STD-1027 Category 3 and 2 TQs for the mass of the items. The

ratios are used to determine the site classification. The project will excavate the contaminated soil and debris for subsequent disposal at the ERDF.

## **4.0 HAZARDS CLASSIFICATION EVALUATIONS**

### **4.1 NONRADIOACTIVE HAZARDOUS CHEMICAL EVALUATIONS**

Organic chemical hazards are present at this waste site. Appendix A provides a list of the hazardous chemical concentrations found at the site. The chemicals listed in Appendix A would define the risk envelope relative to toxic chemicals. The total inventories of hazardous chemicals in Appendix A are calculated on the basis of the total mass of soil used in the calculations. Because no correction is made for the fraction of the total mass with particle sizes too large for wind entrainment, the total inventory figure is considered to be conservative with respect to safety.

### **4.2 RADIOACTIVE EVALUATIONS**

Appendix B provides a list of the radiological concentrations found in the items estimated to be present at the site. The radionuclides listed for each type of item in Appendix B defines the risk envelope relative to radionuclides. The total inventories of radionuclides in Appendix B are calculated on the basis of the total mass of radioactive items that was used in the calculations. Because no correction is made for the fraction of the total mass with particle sizes too large for wind entrainment, the total inventory figure is considered to be conservative with respect to safety.

## **5.0 RESULTS**

The inventory of all nonradioactive constituents is above the 40 CFR 302.4 Table 302.4, "Final RQs," both for individual contaminants and using sum of the ratios, but does not exceed nonradioactive hazardous substance thresholds for 29 CFR 1910.119, Appendix A, and 40 CFR 68.130. The inventory of all radioactive constituents is below the 40 CFR 302.4, Table 302.4, "Final RQs," both for individual contaminants and using sum of the ratios. Therefore, the PHC for the closure activities authorized by this report (Section 2.2) at the 600-23 site is "*non-nuclear*."

The inventories are calculated by multiplying the concentrations by the total waste site volume and then comparing the inventory to applicable CFR thresholds. The classification of the closure activities and the total inventory calculation are conservative for the following reasons:

- The only mechanisms for release of contaminated dust from the closure project involve fugitive dust emissions caused either by wind erosion of soil or mechanical dust entrainment created by material handling operations with soil. In the case of mechanical dust entrainment by soil handling, the source term is limited by the relatively low throughput rate of the closure activities. Dust emissions are also limited by work procedure requirements for covering loads during transportation of the waste to the disposal facility.
- It may be assumed that a large percentage of the excavated soil particles are too large to become airborne by wind erosion or other mechanical entrainment processes.

## 5.1 CRITICALITY SAFETY

On a criticality safety basis, this site or its aliases are not known to contain recordable amounts of fissionable material based on the Criticality Evaluation 0000X-CE-N0004, Rev. 1, *Hanford Waste Sites that Do or May Contain Fissionable Materials* (BHI 1998). Because no fissionable materials are known to be present at the site, further evaluations of criticality safety issues are not necessary.

## 6.0 REFERENCES

- 29 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemicals," *Code of Federal Regulations*, as amended.
- 29 CFR 1926, "Safety and Health Regulations for Construction," *Code of Federal Regulations*, as amended.
- 40 CFR 68, "Chemical Accident Prevention Program," *Code of Federal Regulations*, as amended.
- 40 CFR 68.130, "Emergency Planning and Notification," *Code of Federal Regulations*, as amended.
- 40 CFR 302, "Designation, Reportable Quantities, and Notification," *Code of Federal Regulations*, as amended.
- BHI-DE-01, *Design Engineering Procedures*, Bechtel Hanford, Inc., Richland, Washington.
- BHI, 1998, *Criticality Evaluation, Hanford Waste Sites that Do or May Contain Fissionable Materials*, 0000X-CE-N0004, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.
- BHI, 1999, *Performing and Documenting Preliminary Hazard Classifications*, 000X-EG-N001, Rev. 3, Bechtel Hanford, Inc., Richland, Washington.

- BHI, 2000, *JA Jones and 600-23 Site Remediation Earthwork Volume Calculation*, 0600X-CA-C0021, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.
- BHI, 2001, *Determination of MAR for JA Jones 1 and 600-23*, 0300X-CA-V0005, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.
- DOE, 1992, *Hazard Classification and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, DOE-STD-1027-92, U.S. Department of Energy, Washington, D.C.
- DOE, 1994, *DOE Limited Standard, Hazard Baseline Documentation*, DOE-EM-STD-5502-94, U.S. Department of Energy, Washington, D.C.
- DOE Order 5480.23, *Nuclear Safety Analysis Reports*, as amended, U.S. Department of Energy, Washington, D.C.
- DOE Order 5481.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*, as amended, U.S. Department of Energy, Washington, D.C.
- DOE-RL, 2000a, *100 Area Remedial Action Sampling and Analysis Plan*, DOE-RL-96-22, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE-RL, 2000b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, DOE/RL-96-17, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- EPA, 2000, *Explanation of Significant Difference for the 100 Area Remaining Sites ROD*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

**APPENDIX A**

**EVALUATIONS OF CHEMICAL CONTAMINANTS AND  
DETERMINATIONS OF ESTIMATED INVENTORIES**

# Appendix A - Evaluations of Chemical Contaminants and Determinations of Estimated Inventories

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**Table A-1. Evaluation of Chemical Contaminants and Determination of Estimated Inventory for Site 600-23.**

Site ID: 600-23

Soil Volume (1): 9,091 LCM

Density (g/cc) 1.9

Assumed to be an average value throughout the site.

Contaminant	Soil (mg/kg)	Inventory (kg)	40 CFR 302 RQ (kg)	Ratio	40 CFR 68.130 TQ (kg)	Ratio	29 CFR 1910.119 App. A TQ (lb)	Ratio
<b>Volatile Organics</b>								
Naphthalene (2)	1.1E+01	1.9E+02	45.40	4.2E+00	No tabled value	0.0E+00	No tabled value	0.0E+00
Xylenes (total) (2)	6.6E+00	1.1E+02	45.4	2.5E+00	No tabled value	0.0E+00	No tabled value	0.0E+00
<b>Semi-Volatile Organics</b>								
Acenaphthene (2)	5.0E-01	8.6E+00	45.40	1.9E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
Aroclor-1254 (2)	4.7E+00	8.1E+01	0.45	1.8E+02	No tabled value	0.0E+00	No tabled value	0.0E+00
Di-n-Butyl phthalate (2)	2.6E+00	4.5E+01	4.54	9.9E+00	No tabled value	0.0E+00	No tabled value	0.0E+00
Phenol (2)	3.3E-01	5.7E+00	454.00	1.3E-02	No tabled value	0.0E+00	No tabled value	0.0E+00
<b>Inorganics</b>								
Chromium, total (3)	5.0E-01	8.6E+00	2270.00	3.8E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Copper, total (3)	3.2E-01	5.5E+00	2270.00	2.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Sodium, total (3)	7.2E+02	1.2E+04	4.54	2.7E+03	No tabled value	0.0E+00	No tabled value	0.0E+00
Nickel, total (3)	1.7E+00	2.9E+01	45.40	6.5E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
Lead, total (3)	2.2E+00	3.8E+01	4.54	8.4E+00	No tabled value	0.0E+00	No tabled value	0.0E+00
Zinc, total (3)	6.5E+00	1.1E+02	454.00	2.5E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
					40 CFR 302 sum of ratios: 3.0E+03	40 CFR 68.130 sum of ratios: 0.0E+00	29 CFR 1910.119 sum of ratios: 0.0E+00	

## Calculations:

Estimated inventory = (mg/kg) x LCM x (1.0E+06 cc/LCM) x (g/cc) x (kg/1.0E+03 g) x (kg/1.0E+06 mg)

40 CFR 302 ratio = EI / 40 CFR 302 RQ

40 CFR 68.130 ratio = EI / 40 CFR 68.130 TQ

29 CFR 1910.119 Appendix A ratio = EI / 29 CFR 1910.119 Appendix A TQ

Note: "No tabled value" means there are no report quantities available.

## References:

(1) Soil volume and density from Calculation 0600X-CA-C0021, Rev. 0

(2) Data from analogous site Landfill 1a (300-49). Maximum values from sample nos. B101W1 and B101W2 were used.

(3) Inorganic data from samples B11KM8 and B11KM9. Maximum values were used. No data with U qualifiers were used.



# Appendix A - Evaluations of Chemical Contaminants and Determinations of Estimated Inventories

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**Table A-2. Evaluation of Chemical Contaminants and Determination of Estimated Inventory for Site 600-23, Liquid Contents of Drums.**

Site ID: 600-23

Total Volume (1): 1,541 gal

Total Volume (1): 5,833 L

Contaminant	Chemical Concentrations (µg/L) (2)	Inventory (kg)	40 CFR 302 RQ (kg)	Ratio	40 CFR 68.130 TQ (kg)	Ratio	29 CFR 1910.119 App. A TQ (lb)	Ratio
<b>Organics</b>								
1,2,4-Trichlorobenzene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
1,2-Dichlorobenzene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
1,3-Dichlorobenzene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
1,4-Dichlorobenzene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
2,4,5-Trichlorophenol	1.2E+05	7.0E-01	4.54	1.5E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
2,4,6-Trichlorophenol	5.0E+04	2.9E-01	4.54	6.4E-02	No tabled value	0.0E+00	No tabled value	0.0E+00
2,4-Dichlorophenol	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
2,4-Dimethylphenol	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
2,4-Dinitrophenol	1.2E+05	7.0E-01	4.54	1.5E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
2,4-Dinitrotoluene	5.0E+04	2.9E-01	4.54	6.4E-02	No tabled value	0.0E+00	No tabled value	0.0E+00
2,6-Dinitrotoluene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
2-Chloronaphthalene	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
2-Chlorophenol	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
2-Nitrophenol	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
3,3'-Dichlorobenzidine	5.0E+04	2.9E-01	0.45	6.4E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
4,6-Dinitro-2-methylphenol	1.2E+05	7.0E-01	4.54	1.5E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
4-Bromophenylphenyl ether	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
4-Chloro-3-methylphenol	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
4-Chloroaniline	5.0E+04	2.9E-01	454.00	6.4E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
4-Chlorophenylphenyl ether	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
4-Nitrophenol	1.2E+05	7.0E-01	45.40	1.5E-02	No tabled value	0.0E+00	No tabled value	0.0E+00

# Appendix A - Evaluations of Chemical Contaminants and Determinations of Estimated Inventories

BHI-01457

Rev. 1

Site ID: 600-23

Total Volume (1): 1,541 gal

Total Volume (1): 5,833 L

Contaminant	Chemical Concentrations (µg/L) (2)	Inventory (kg)	40 CFR 302 RQ (kg)	Ratio	40 CFR 68.130 TQ (kg)	Ratio	29 CFR 1910.119 App. A TQ (lb)	Ratio
Acenaphthene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Acenaphthylene	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Anthracene	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Benzo(a)anthracene	5.0E+04	2.9E-01	4.54	6.4E-02	No tabled value	0.0E+00	No tabled value	0.0E+00
Benzo(a)pyrene	5.0E+04	2.9E-01	0.45	6.4E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
Benzo(b)fluoranthene	5.0E+04	2.9E-01	0.45	6.4E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
Benzo(ghi)perylene	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Benzo(k)fluoranthene	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Bis(2-Chloroethoxy)methane	5.0E+04	2.9E-01	454.00	6.4E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Bis(2-chloroethyl) ether	5.0E+04	2.9E-01	4.54	6.4E-02	No tabled value	0.0E+00	No tabled value	0.0E+00
Bis(2-ethylhexyl) phthalate	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Butylbenzylphthalate	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Chrysene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Dibenz[a,h]anthracene	5.0E+04	2.9E-01	0.45	6.4E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
Dibenzofuran	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Diethylphthalate	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Dimethyl phthalate	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Di-n-butylphthalate	5.0E+04	2.9E-01	4.54	6.4E-02	No tabled value	0.0E+00	No tabled value	0.0E+00
Di-n-octylphthalate	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Fluoranthene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Fluorene	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Hexachlorobenzene	5.0E+04	2.9E-01	4.54	6.4E-02	No tabled value	0.0E+00	No tabled value	0.0E+00
Hexachlorobutadiene	5.0E+04	2.9E-01	0.45	6.4E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
Hexachlorocyclopentadiene	5.0E+04	2.9E-01	4.54	6.4E-02	No tabled	0.0E+00	No tabled	0.0E+00

# Appendix A - Evaluations of Chemical Contaminants and Determinations of Estimated Inventories

BHI-01457

Rev. 1

Site ID: 600-23

Total Volume (1): 1,541 gal

Total Volume (1): 5,833 L

Contaminant	Chemical Concentrations (µg/L) (2)	Inventory (kg)	40 CFR 302 RQ (kg)	Ratio	40 CFR 68.130 TQ (kg)	Ratio	29 CFR 1910.119 App. A TQ (lb)	Ratio
					value		value	
Hexachloroethane	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Indeno(1,2,3-cd)pyrene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Isophorone	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Naphthalene	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Nitrobenzene	5.0E+04	2.9E-01	454.00	6.4E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
N-Nitrosodiphenylamine	5.0E+04	2.9E-01	45.40	6.4E-03	No tabled value	0.0E+00	No tabled value	0.0E+00
Pentachlorophenol	1.2E+05	7.0E-01	4.54	1.5E-01	No tabled value	0.0E+00	No tabled value	0.0E+00
Phenanthrene	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Phenol	5.0E+04	2.9E-01	454.00	6.4E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
Pyrene	5.0E+04	2.9E-01	2270.00	1.3E-04	No tabled value	0.0E+00	No tabled value	0.0E+00
			40 CFR 302 sum of ratios: 4.4E+00		40 CFR 68.130 sum of ratios: 0.0E+00		29 CFR 1910.119 sum of ratios: 0.0E+00	

## Calculations:

Estimated Inventory =(ug/L) x L x (g/1.0E+06 ug) x (kg/1.0E+03 g)

40 CFR 302 ratio = EI / 40 CFR 302 RQ

40 CFR 68.130 ratio = EI / 40 CFR 68.130 TQ

29 CFR 1910.119 Appendix A ratio = EI / 29 CFR 1910.119 Appendix A TQ

Note: "No tabled value" means there are no report quantities available.

## References:

- (1) See attachment 6 of calculation 0300X-CA-V0005, Rev. 1, for an estimate of the volume per drum and the number of drums.
- (2) Organic data from samples B11KM8 and B11KM9. Maximum values were used. Data with U qualifiers were used because the dilution factor caused the quantitation limit to be above the regulatory limit. Therefore, the quantitation limit was used if no other data were available.

**APPENDIX B**

**EVALUATIONS OF RADIOLOGICAL CONTAMINANTS AND  
DETERMINATIONS OF ESTIMATED INVENTORIES**

# Appendix B - Evaluations of Radiological Contaminants and Determinations of Estimated Inventories

BHI-01457

Rev. 1

**Table B-1. Evaluation of Radiological Contaminants and Determination of Estimated Inventory for Site 600-23, "Quarter-Sized Disks."**

Site ID: 600-23

Debris Mass (1): 11.3 g/Quarter-Sized Disk

2200 Disks Estimated to be Present at the Site (2)

Contaminant	Radiological Concentrations (3) (pCi/g)	Mass of Debris (g)	Radionuclide Inventory (Ci)	40 CFR 302 RQ (Ci)	Ratio	1027 Category 3 TQ (Ci)	Ratio	1027 Category 2 TQ (Ci)	Ratio
Co-60	1.78E+01	2.49E+04	4.4E-07	1.0E+01	4.4E-08	2.8E+02	1.6E-09	1.9E+05	2.3E-12
Cs-137	3.08E+00	2.49E+04	7.7E-08	1.0E+00	7.7E-08	6.0E+01	1.3E-09	8.9E+04	8.6E-13
				40 CFR 302 sum of ratios: 1.2E-07		1027 Category 3 sum of ratios: 2.9E-09		1027 Category 2 sum of ratios: 3.2E-12	

## Calculations:

Estimated inventory = (pCi/g x (LCM x 1.0E+06 cc/LCM x g/cc))/1.0E+12 pCi/Ci

Ratio (40 CFR) = EI/(40 CFR 302 RQ (Ci))

Ratio (Category 3) = EI/(DOE-STD-1027 Category 3 TQ (Ci))

Ratio (Category 2) = EI/(DOE-STD-1027 Category 2 TQ (Ci))

Note: "No tabled value" means there are no report quantities available.

## References:

- (1) See sheet 11 of calculation 0300X-CA-V0005, Rev. 1, for a calculation of the mass of an individual quarter-sized disk.
- (2) See attachment 6 of calculation 0300X-CA-V0005, Rev. 1, for an estimate of the number of quarter sized disks at 600-23.
- (3) Data from sample B11863-A. Maximum values were used. No data with U qualifiers were used.

# Appendix B - Evaluations of Radiological Contaminants and Determinations of Estimated Inventories

BHI-01457

Rev. 1

**Table B-2. Evaluation of Radiological Contaminants and Determination of Estimated Inventory for Site 600-23, "Tuna Cans."**

Site ID: 600-23

Debris Mass (1): 505 g/ "Tuna Can"

500 Cans Estimated to be Present at the Site (2)

Contaminant	Radiological Concentrations (3) (pCi/g)	Mass of Debris (g)	Radionuclide Inventory (Ci)	40 CFR 302 RQ (Ci)	Ratio	1027 Category 3 TQ (Ci)	Ratio	1027 Category 2 TQ (Ci)	Ratio
K-40	2.27E+01	2.53E+05	5.7E-06	1.0E+00	5.7E-06	1.7E+02	3.4E-08	4.7E+03	1.2E-09
Ra-226	4.86E+01	2.53E+05	1.2E-05	1.0E-01	1.2E-04	1.20E+01	1.0E-06	3.62E+03	3.4E-09
Th-228	1.12E+00	2.53E+05	2.8E-07	1.0E-02	2.8E-05	1.00E+00	2.8E-07	9.20E+01	3.1E-09
U-233/234	1.13E+02	2.53E+05	2.9E-05	1.0E-01	2.9E-04	4.2E+00	6.8E-06	2.2E+02	1.3E-07
U-235	5.38E+00	2.53E+05	1.4E-06	1.0E-01	1.4E-05	4.2E+00	3.2E-07	2.4E+02	5.7E-09
U-238	1.24E+02	2.53E+05	3.1E-05	1.0E-01	3.1E-04	4.2E+00	7.5E-06	2.4E+02	1.3E-07
				40 CFR 302 sum of ratios: 7.7E-04		1027 Category 3 sum of ratios: 1.6E-05		1027 Category 2 sum of ratios: 2.7E-07	

## Calculations:

Estimated inventory = (mg/kg) x LCM x (1.0E+06 cc/LCM) x (g/cc) x (kg/1.0E+03 g) x (kg/1.0E+06 mg)

40 CFR 302 ratio = EI / 40 CFR 302 RQ

40 CFR 68.130 ratio = EI / 40 CFR 68.130 TQ

29 CFR 1910.119 Appendix A ratio = EI / 29 CFR 1910.119 Appendix A TQ

Note: "No tabled value" means there are no report quantities available.

## References:

- (1) See sheet 11 of calculation 0300X-CA-V0005, Rev. 1, for a calculation of the mass of an individual "tuna can".
- (2) See attachment 6 of calculation 0300X-CA-V0005, Rev. 1, for an estimate of the number of "tuna cans" at 600-23.
- (3) Data from sample B11862-A. Maximum values were used. No data with U qualifiers were used.

# Appendix B - Evaluations of Radiological Contaminants and Determinations of Estimated Inventories

BHI-01457

Rev. 1

**Table B-3. Evaluation of Radiological Contaminants and Determination of Estimated Inventory for Site 600-23, "Hockey Pucks."**

Site ID: 600-23

Debris Mass (1): 505 g/ Disks Wrapped in Paper  
("Hockey Pucks")

3000 Disks Wrapped in Paper Estimated to be Present at the Site (2)

Contaminant	Radiological Concentrations (3) (pCi/g)	Mass of Debris (g)	Radionuclide Inventory (Ci)	40 CFR 302 RQ (Ci)	Ratio	1027 Category 3 TQ (Ci)	Ratio	1027 Category 2 TQ (Ci)	Ratio
K-40	2.27E+01	2.47E+05	5.6E-06	1.0E+00	5.6E-06	1.7E+02	3.3E-08	4.7E+03	1.2E-09
Ra-226	4.86E+01	2.47E+05	1.2E-05	1.0E-01	1.2E-04	1.20E+01	1.0E-06	3.62E+03	3.3E-09
Th-228	1.12E+00	2.47E+05	2.8E-07	1.0E-02	2.8E-05	1.00E+00	2.8E-07	9.20E+01	3.0E-09
U-233/234	1.13E+02	2.47E+05	2.8E-05	1.0E-01	2.8E-04	4.2E+00	6.7E-06	2.2E+02	1.3E-07
U-235	5.38E+00	2.47E+05	1.3E-06	1.0E-01	1.3E-05	4.2E+00	3.2E-07	2.4E+02	5.5E-09
U-238	1.24E+02	2.47E+05	3.1E-05	1.0E-01	3.1E-04	4.2E+00	7.3E-06	2.4E+02	1.3E-07
				40 CFR 302 sum of ratios: 7.5E-04		1027 Category 3 sum of ratios: 1.6E-05		1027 Category 2 sum of ratios: 2.7E-07	

## Calculations:

Estimated inventory = (mg/kg) x LCM x (1.0E+06 cc/LCM) x (g/cc) x (kg/1.0E+03 g) x (kg/1.0E+06 mg)

40 CFR 302 ratio = EI / 40 CFR 302 RQ

40 CFR 68.130 ratio = EI / 40 CFR 68.130 TQ

29 CFR 1910.119 Appendix A ratio = EI / 29 CFR 1910.119 Appendix A TQ

Note: "No tabled value" means there are no report quantities available.

## References:

- (1) See sheet 11 of calculation 0300X-CA-V0005, Rev. 1, for a calculation of the mass of an individual "hockey puck."
- (2) See attachment 6 of calculation 0300X-CA-V0005, Rev. 1, for an estimate of the number of "hockey pucks" at 600-23.
- (3) Data from sample B11862-A. Maximum values were used. No data with U qualifiers were used.

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