0077589

Date Submitted: 02/06/08 Originator: J. M. Capron Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-FR-1 Waste Site Code: 100-F-26:12 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2007-034

This form documents agreement among parties listed authorizing classification of the subject unit as Closed Out, Interim Closed Out, No Action, RCRA Postclosure, Rejected, or Consolidated. This form also authorizes backfill of the waste management unit, if appropriate, for Closed Out and Interim Closed Out units. Final removal from the NPL of No Action and Closed Out waste management units will occur at a future date.

Description of current waste site condition:

The 100-F-26:12 waste site was an approximately 308-m (1,011-ft)-long, 1.8-m (72-in.)-diameter east-west-trending reinforced concrete pipe that joined the North Process Sewer Pipelines (100-F-26:1) and the South Process Pipelines (100-F-26:4) with the 1.8-m (72-in.) reactor cooling water effluent pipeline (100-F-19). Remediation and verification sampling 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: (1) evaluating the site using available process information, (2) remediating the site, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the verification 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 Remaining Sites ROD. The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow-zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-F-26:12, 1.8-m (72-in.) Main Process Sewer Pipeline* (attached).

Waste Site Controls:
Engineered Controls: Yes ☐ No ☒ Institutional Controls: Yes ☐ No ☒ O&M requirements: Yes ☐ No ☒
If any of the Waste Site Controls are checked Yes specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents.

S. L. Charboneau DOE Federal Project Director (printed)	Stacy Charboneau Signature	4/11/08 Date
N/A Ecology Project Manager (printed)	Signature	Date
R. A. Lobos EPA Project Manager (printed)	Signature	4/29/08 Date

attached to 0077558

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-26:12, 1.8-M (72-IN.) MAIN PROCESS SEWER PIPELINE

Attachment to Waste Site Reclassification Form 2007-034

February 2008

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-26:12, 1.8-M (72-IN.) MAIN PROCESS SEWER PIPELINE

EXECUTIVE SUMMARY

The 100-F-26 site includes the underground process and sanitary sewer pipelines associated with the 100-F Area pre-reactor cooling water treatment facilities. For the confirmatory sampling effort, the 100-F-26 site was divided into 16 subsites based on the intended use of the pipe (e.g., sanitary sewer or process water), expected sources of contamination, and potential remedial actions. The 100-F-26:12 underground pipeline subsite consists of an approximately 308-m (1,011-ft)-long, 1.8 m (72 in.) east-west-trending reinforced concrete pipe that joined the North Process Sewer Pipelines (100-F-26:1) and the South Process Pipelines (100-F-26:4) with the 1.8-m (72-in.) reactor cooling water effluent pipeline (100-F-19).

Radiological field measurements and staining discovered during excavation of the 100-F-19 pipeline in August 2001 indicated that contamination was present within the 100-F-26:12 sewer pipe and its surrounding soils. The site was referred to remedial action without requiring any additional confirmatory sampling (Feist 2004).

Remediation of the 100-F-26:12 waste site was performed from January 11 through October 4, 2007. The site was excavated between 4.0 m (13 ft) and 6.0 m (20 ft) below grade, resulting in approximately 2,900 bank cubic meters (BCM) (3,800 bank cubic yards [BCY]) of material disposed of at the Environmental Restoration Disposal Facility. Approximately 23,340 BCM (30,530 BCY) of overburden soil was removed and stockpiled for use as clean backfill.

Verification sampling for the 100-F-26:12 pipeline site was performed between September and October 2007 (WCH 2007a, 2007b) to collect data to determine if the remedial action goals (RAGs) had been met. A total of 30 samples were collected (8 from the excavation plus 1 duplicate, 12 from the overburden stockpile plus 1 duplicate and 8 from below-cleanup-level stockpiles). The samples were analyzed by gamma energy analysis, and for gross alpha, gross beta, carbon-14, tritium, nickel-63, strontium-90, inductively coupled plasma metals, mercury, and hexavalent chromium in accordance with the verification work instruction. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 100-F-26:12 waste site in accordance with the *Tri-Party Agreement Handbook Management Procedures,* TPA-MP-14 (DOE-RL 2007) procedure.

In accordance with this evaluation, the verification 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* (Remaining Sites ROD) (EPA 1999). The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow-zone soils (i.e., surface to 4.6 m [15 ft] deep). The

results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

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 antimony, boron, manganese, selenium, 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 because concentrations of antimony, manganese, and vanadium are below site background levels; selenium is within the range of background levels; and boron concentrations are consistent with those seen elsewhere at the Hanford Site (no established background value is available for boron). A more complete quantitative ecological risk assessment will be presented in the baseline risk assessment for the river corridor portion of the Hanford Site and will be used to support the final closeout decision for this site.

Table ES-1. Summary of Remedial Action Goals for the 100-F-26:12 Waste Site. (2 Pages)

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.	The maximum all pathways dose rate calculated by RESRAD is 9.14 mrem/yr over 1,000 years.	Yes
Direct Exposure Nonradionuclides	Attain individual COC/COPC RAGs.	All individual COC/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 <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (1.1×10^{-2}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The total excess cancer risk for hexavalent chromium (6.7×10^{-7}), the only nonradionuclide carcinogen detected above background levels, is $<1 \times 10^{-5}$.	
	Attain a total excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.		
Groundwater/River Protection – Radionuclides	Attain single COC/COPC groundwater and river protection RAGs.	The only radionuclide COC/COPC predicted to reach groundwater is tritium at a predicted peak concentration of 14,400 pCi/L which is less than the MCL of 20,000 pCi/L. Groundwater and river RAGs are therefore attained.	Yes
	Attain national primary drinking water regulations:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.	Because only tritium was predicted to reach groundwater, it was not necessary to perform the calculation of cumulative organ specific dose via the groundwater (and river) pathway to determine that the 4 mrem/yr drinking water dose limitation was met.	
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide from DOE Order 5400.5.[b]	There are no alpha-emitting radionuclide COC/COPCs.	

Table ES-1. Summary of Remedial Action Goals for the 100-F-26:12 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
	Meet total uranium standard of 21.2 pCi/L.[c]	Uranium was not identified as a COC/COPC for verification sampling, U-235 and U-238 were not detected in samples analyzed by gamma energy analysis.	N/A
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Residual concentrations of lead and selenium exceeded the soil RAG for the protection of groundwater and/or the Columbia River. However, it is predicted that these constituents will not migrate to groundwater (and thus the Columbia River) at concentrations exceeding groundwater or river criteria within 1,000 years.[d] Therefore, residual concentrations achieve the remedial action objectives 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 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 2001a).

[d] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), these constituents are not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years (based on the lowest soil-partitioning coefficient distribution [lead] of 30 mL/g). The vadose zone underlying the remediation footprint is approximately 5.5 m (18 ft) thick.

COC = contaminant of concern
COPC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose assessment model)

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-26:12, 1.8-M (72-IN.) MAIN PROCESS SEWER PIPELINE

STATEMENT OF PROTECTIVENESS

The 100-F-26:12, 1.8-m (72-in.) Main Process Sewer Pipeline subsite sample results demonstrate that the site achieves the remedial action objectives and remedial action goals (RAGs) established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (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* (commonly called the Remaining Sites Record of Decision [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. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

A comparison against ecological risk screening levels has been made for the site contaminants of concern (COCs), contaminants of potential concern (COPCs), and other constituents. Screening levels were not exceeded for the site constituents, with the exception of antimony, boron, manganese, selenium, 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 because concentrations of antimony, manganese, and vanadium are below site background levels; selenium concentrations are within the range of background levels; and boron concentrations are consistent with those seen elsewhere at the Hanford Site (no established background value is available for boron). A more complete quantitative ecological risk assessment will be presented in the baseline risk assessment for the river corridor portion of the Hanford Site and will be used to support the final closeout decision for this site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-F-26 site includes the underground process and sanitary sewer pipelines associated with the 100-F Area reactor cooling water treatment facilities. For the confirmatory sampling effort, the 100-F-26 site was divided into 16 subsites based on the intended use of the pipe (e.g., sanitary sewer or process water), expected sources of contamination, and potential remedial actions. The 16 subsites are as follows:

- 100-F-26:1 North process sewer collection pipelines
- 100-F-26:2 Process water pipelines to the aquatic biology and strontium gardens
- 100-F-26:3 184-F Powerhouse pipelines
- 100-F-26:4 South process pipelines
- 100-F-26:5 190-F bypass pipelines
- 100-F-26:6 190-F Reservoir pipelines

- 100-F-26:7 Sodium dichromate and sodium silicate pipelines
- 100-F-26:8 1607-F1 sanitary sewer pipelines
- 100-F-26:9 1607-F2 sanitary sewer pipelines
- 100-F-26:10 1607-F3 sanitary sewer pipelines
- 100-F-26:11 1607-F4 sanitary sewer pipelines
- 100-F-26:12 1.8-m (72-in.) main process sewer pipeline
- 100-F-26:13 108-F drain pipelines
- 100-F-26:14 116-F-5 influent pipelines
- 100-F-26:15 Miscellaneous pipelines associated with the 1608-F sump
- 100-F-26:16 Reactor cooling water pipelines.

This remaining sites verification package only addresses areas within the 100-F-26:12 subsite (1.8-m [72-in.] Main Process Sewer Pipeline). The 100-F-26:12 pipeline subsite consists of an approximately 308-m (1,011-ft)-long, 1.8-m (72-in.) diameter east-west-trending reinforced concrete pipe (Figure 1). The 100-F-26:12 pipeline was the collection main for the pre-reactor process sewers (100-F-26:1 and 100-F-26:4), discharging to a cooling water effluent pipeline (100-F-19:1), which ultimately discharged to the Columbia River via the 116-F-8, 1904-F Outfall. The pipeline runs between the coal storage and the 184-F Powerhouse (Figure 3), crossing under the coal conveyor. The 184-F Powerhouse Piping (100-F-26:3) joined the 100-F-26:12 pipeline to the west of the 184-F Powerhouse.

The 100-F-26:12 pipeline subsite was referred to remedial action after evidence of radioactive and chemical contamination was encountered in August 2001 while excavating the 100-F-19 pipeline site. Radiological field measurements and staining indicated that contamination was present within the 100-F-26:12 sewer pipe and surrounding soils. The contamination of the pipeline and surrounding soils may be associated with backflow material from the 100-F-19 sewer main (Feist 2004). As a result, the pipeline may have received flow originating from any of the process waste streams in the 100-F Area that eventually discharged to the outfall.

The largest contributor to the effluent waste stream was the 105-F Reactor Building. A continuous supply of high-quality cooling water was essential to reactor operations to prevent damage to the reactor core from excess heat generated by the fission reactions. While the water was in the reactor, it absorbed thermal energy from the nuclear process and became contaminated with radioactive isotopes. The resulting reactor cooling water effluent contained radioactive species from the reactor and chemical contaminants added to treat the raw water before use.

Many of the facilities in the 100-F Area were part of this cooling water system. The 181-F River Pump House drew water from the Columbia River and pumped it to other facilities where it was extensively treated before passing through the 105-F Reactor. Treatment of the water included settling, chemical treatment, filtering, and pH management.

Figure 1. 100-F-26:12 Overall Site Location Map.

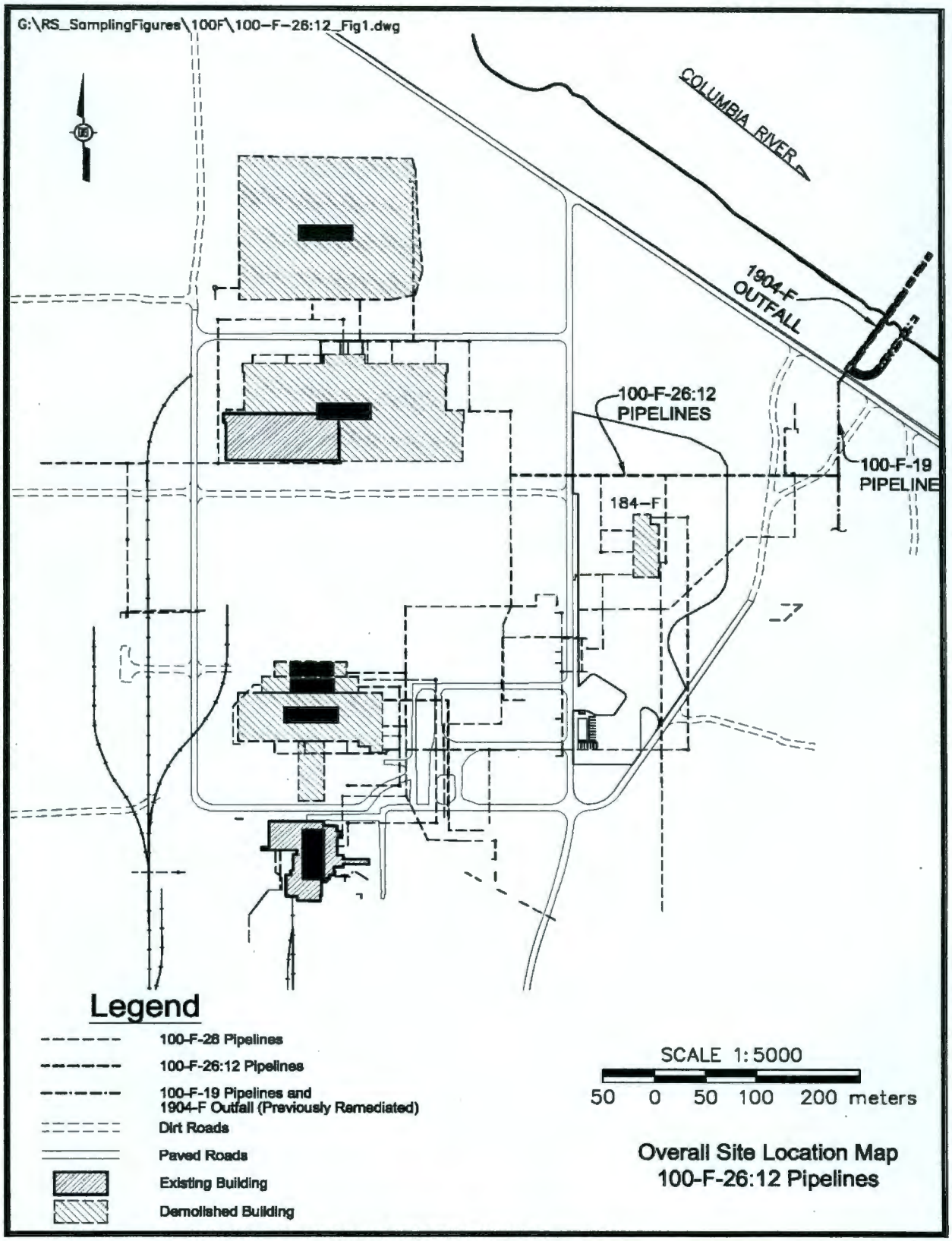


Figure 2. 100-F-26:12 Pipeline Site Plan.

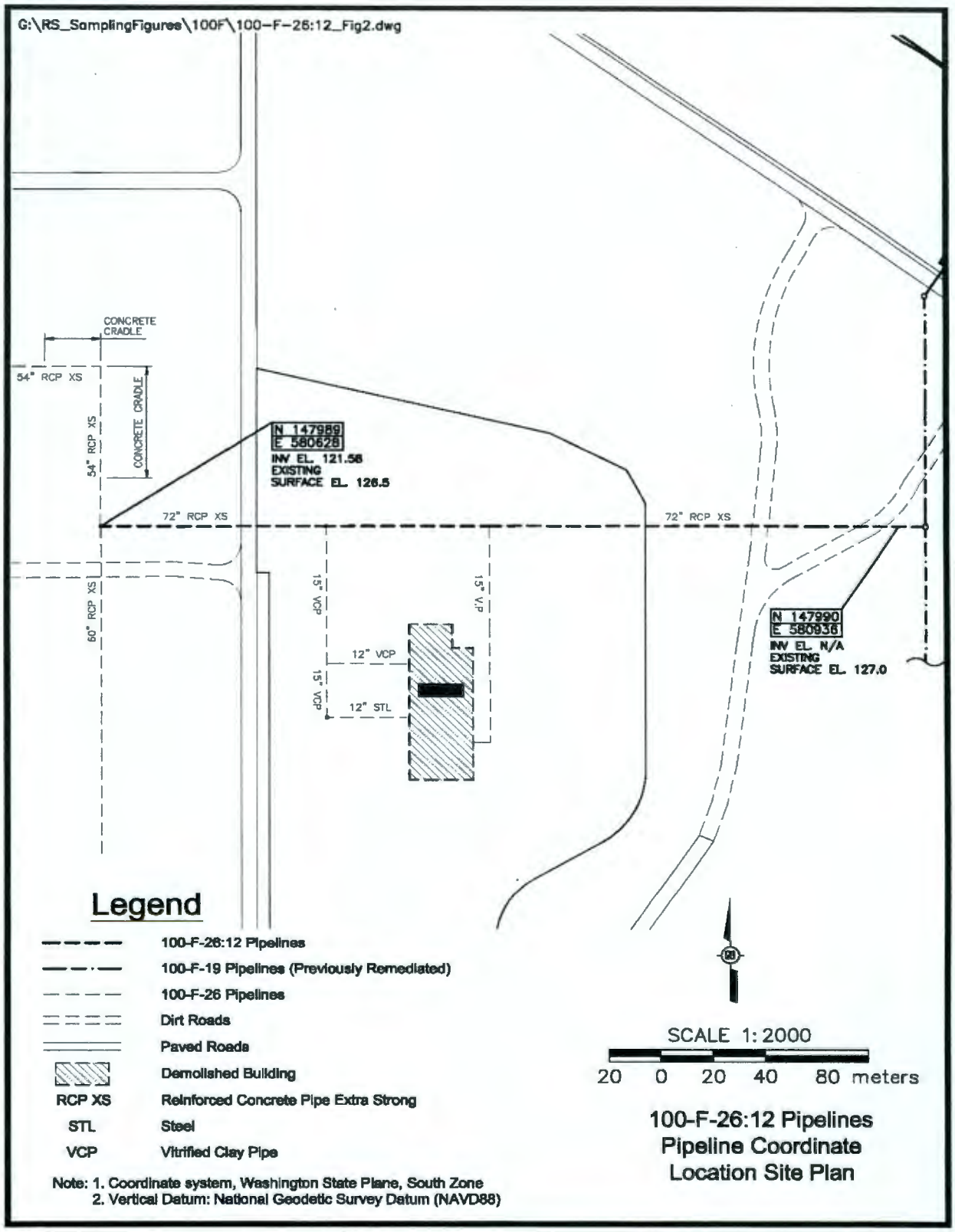
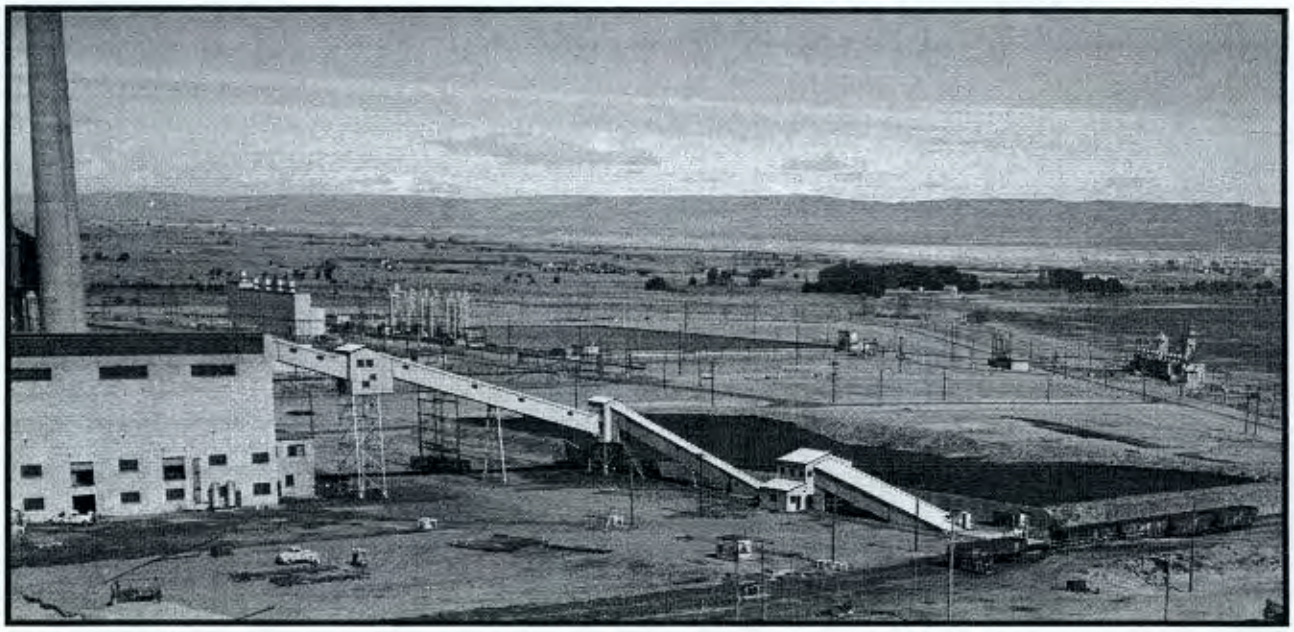


Figure 3. 184-F Powerhouse and Coal Storage (July 5, 1949).



Other facilities that contributed to the flow in the process sewer pipeline were those described below:

- The 182-F Reservoir and pumphouse operated between 1945 and 1965 and provided raw water for emergency reactor cooling as well as raw export water for the 100-200 Area inter-tie system. No organic or inorganic contaminants are associated with this site. Low-level radioactive waste may be associated with the site (BHI 2001b).

- The 183-F Filter Plant (water treatment facility) operated between 1945 and 1965 was designed to treat raw river water before it entered the reactor. The facility included the Head House, Flocculation and Sedimentation Basins, Filter Building, and Clearwells and Pump House. Aluminum sulfate, hydrated calcium oxide, sulfuric acid, and chlorine were added to the water as treatment chemicals. Beginning in 1970, the clearwells was used for the disposal of demolition debris that is believed to contain asbestos and possibly low-level radioactively contaminated debris (BHI 2001b, WHC 1993).

- The 184-F Powerhouse, which operated between 1945 and 1965, was located to the northeast of the 105-F Reactor Building. This coal-fired facility was designed to supply power to steam turbine pumps as a secondary reactor coolant system. Sodium sulfate, trisodium phosphate, and chromates were used at this facility as boiler water treatment chemicals (BHI 2001b).

- The 190-F Pumphouse, located to the north of the 105-F Reactor Building, housed cooling water tanks and pumps associated with the 105-F Reactor operations. The tanks, pumps, and related piping systems at the 190-F Pumphouse were operated upstream of the reactor and likely contained only nonradioactive reactor process water. Water treatment chemicals used or stored in and near the building included alum, sulfuric acid, chlorine, and sodium dichromate (BHI 2001b, WHC 1993).

- The 108-F Building was used as a reactor laboratory between 1945 and 1950 and then as a biological laboratory between 1950 and 1976. While serving as a reactor laboratory, large quantities of sodium dichromate, sodium silicate, oxalic acid, lime, and sulfuric acid were used or stored in the facility. While used as a biological laboratory, the facility was used to study the effects of radiation on plants and animals. Chemicals from this facility were drained to the sewers, sumps, and french drains that connected to the process sewer pipeline (BHI 2001b, WHC 1993).

- The 1717-F combined shops included a machine shop, carpenter shop, pipe shop, sheet metal shop, electrical shop, forge shop, tool room, six offices, and a restroom. Additionally, oils, paints, and solvents were stored or used in this facility (BHI 2001b).

CONFIRMATORY SAMPLING ACTIVITIES

Radiological field measurements and staining discovered during excavation of the 100-F-19 pipeline in August 2001 indicated that contamination was present within the 100-F-26:12 sewer pipe and surrounding soils. The site was referred to remedial action without requiring additional confirmatory sampling (Feist 2004).

REMEDIAL ACTION SUMMARY

Remediation of the 100-F-26:12 pipeline site was performed from January 11 through October 4, 2007. The site was excavated between 4.0 m (13 ft) and 6.0 m (20 ft) below grade, resulting in approximately 2,900 bank cubic meters (BCM) (3,800 bank cubic yards [BCY]) of material disposed of at the Environmental Restoration Disposal Facility, including removal of approximately 308 m (1,011 ft) of pipeline. Approximately 23,340 BCM (30,530 BCY) of overburden was removed and stockpiled for use as clean backfill. Overburden (in this context) refers to soil that was above the elevation of the pipeline and was excavated to allow for the removal of the pipeline and underlying contamination. The overburden was segregated into two different piles. The material excavated nearest the pipeline was separated from that taken at shallower depths as a precaution. For convenience in distinguishing the two types of stockpiled material, the former was identified as below-cleanup-level (BCL), while the latter was identified as overburden. Both stockpiles were sampled for the same analyte list.

The entire pipeline was constructed of steel-reinforced concrete. The portion of the pipeline that ran beneath the railroad crossing (near the coal conveyor structure) was encased in concrete to support the additional load. The pipeline encased in concrete was removed, but the large concrete monolith associated with the coal conveyor was abandoned in place. The coal conveyor structure was evaluated and found to be absent of hydraulic systems. No anomalies or stained soil were discovered during remediation. Figure 4 provides an aerial photograph of the pipeline excavation. Additional photographs of the remediation are provided in Appendix A. Refer to Figure 5 for the post-excavation topography.

FIELD SCREENING

Radiological field screening was conducted during the site remedial actions. Field screening was used to guide the excavation to quickly assess the presence and level of contamination. Field screening at the site included using a radiological data mapping system survey (Global Positioning Environmental Radiological Surveyor [GPERS]) and hand-held sodium iodide (NaI) detectors. The radiological surveys performed in the excavation and of the overburden stockpiles did not indicate the presence of radioactive contamination following remediation. The GPERS radiological surveys for the 100-F-26:12 pipeline site are provided in Appendix B.

Figure 4. 100-F-26:12 Post-Excavation Aerial Photograph (August 2007).

VERIFICATION SAMPLING ACTIVITIES

The RAGs are the specific numeric goals against which the cleanup verification data are evaluated to demonstrate attainment of the remedial action objectives for the site. Verification sampling for the 100-F-26:12 pipeline site was performed between September and October 2007 (WCH 2007a, 2007b) to collect data to determine if the RAGs had been met. The following subsections provide additional discussion of the information used to develop the verification sampling design. The results of verification sampling are also summarized to support interim closure of the site.

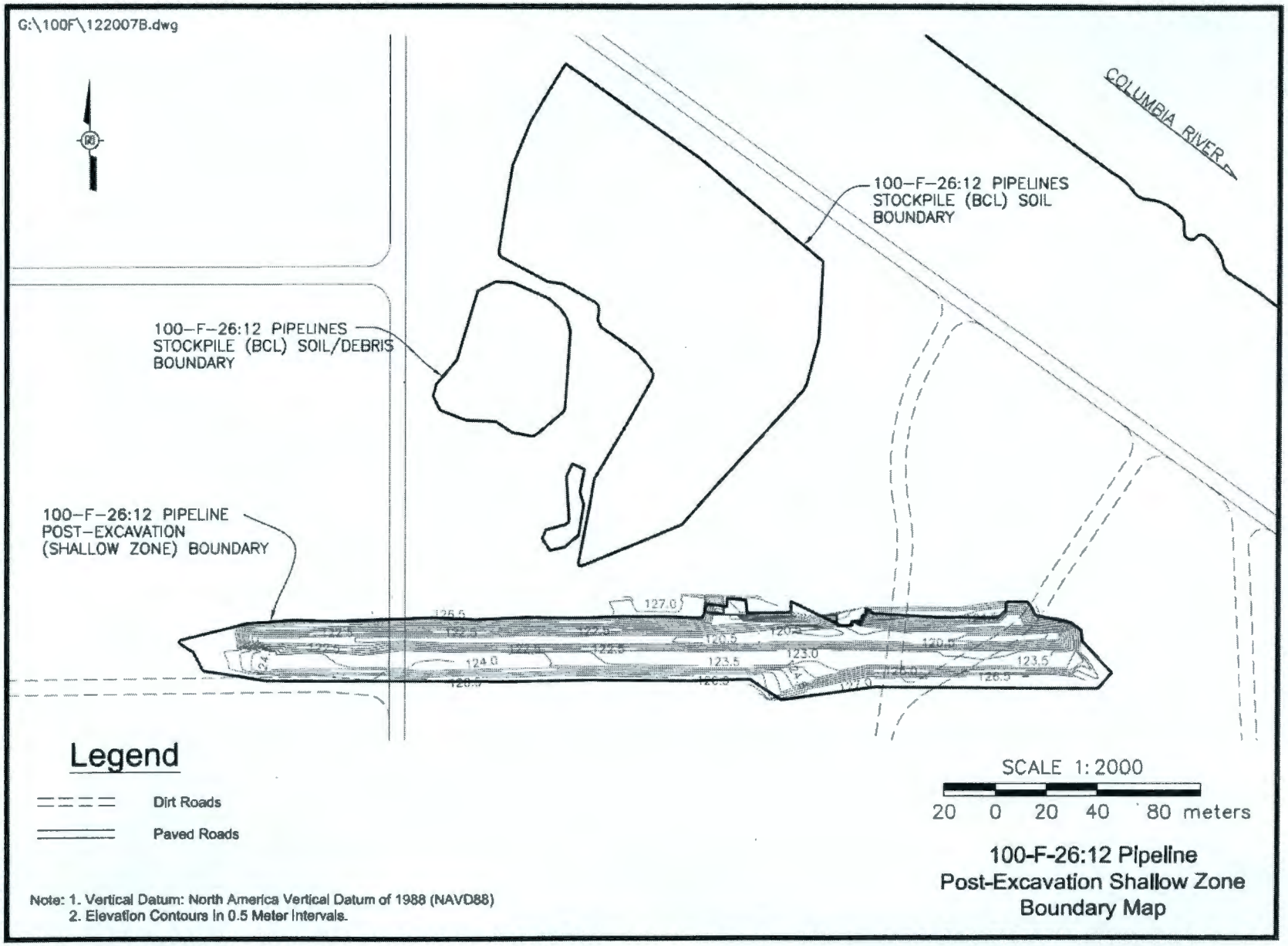


Figure 5. 100-F-26:12 Post-Excavation Topography.

Contaminants of Concern and Contaminants of Potential Concern

The COC/COPCs for verification sampling were identified in the 100-F-26:12 Waste Site RTD Report attached to the interoffice memorandum *100-FR-1 Operable Unit Remaining Site For Remedial Action* (Feist 2004) as carbon-14, cesium-137, cobalt-60, europium-152, europium-154, europium-155, nickel-63, strontium-90, hexavalent chromium, arsenic, barium, cadmium, total chromium, lead, mercury, selenium, and silver. Contingencies were provided for adding to the COPC list if anomalies were discovered during confirmatory sampling. No suspected asbestos-containing material or petroleum-stained soil was observed during sampling; therefore, asbestos and total petroleum hydrocarbon analyses were not requested. Field screening for volatile organic compounds (VOCs) was performed and none were detected during sampling; therefore, laboratory analysis for VOCs was not requested.

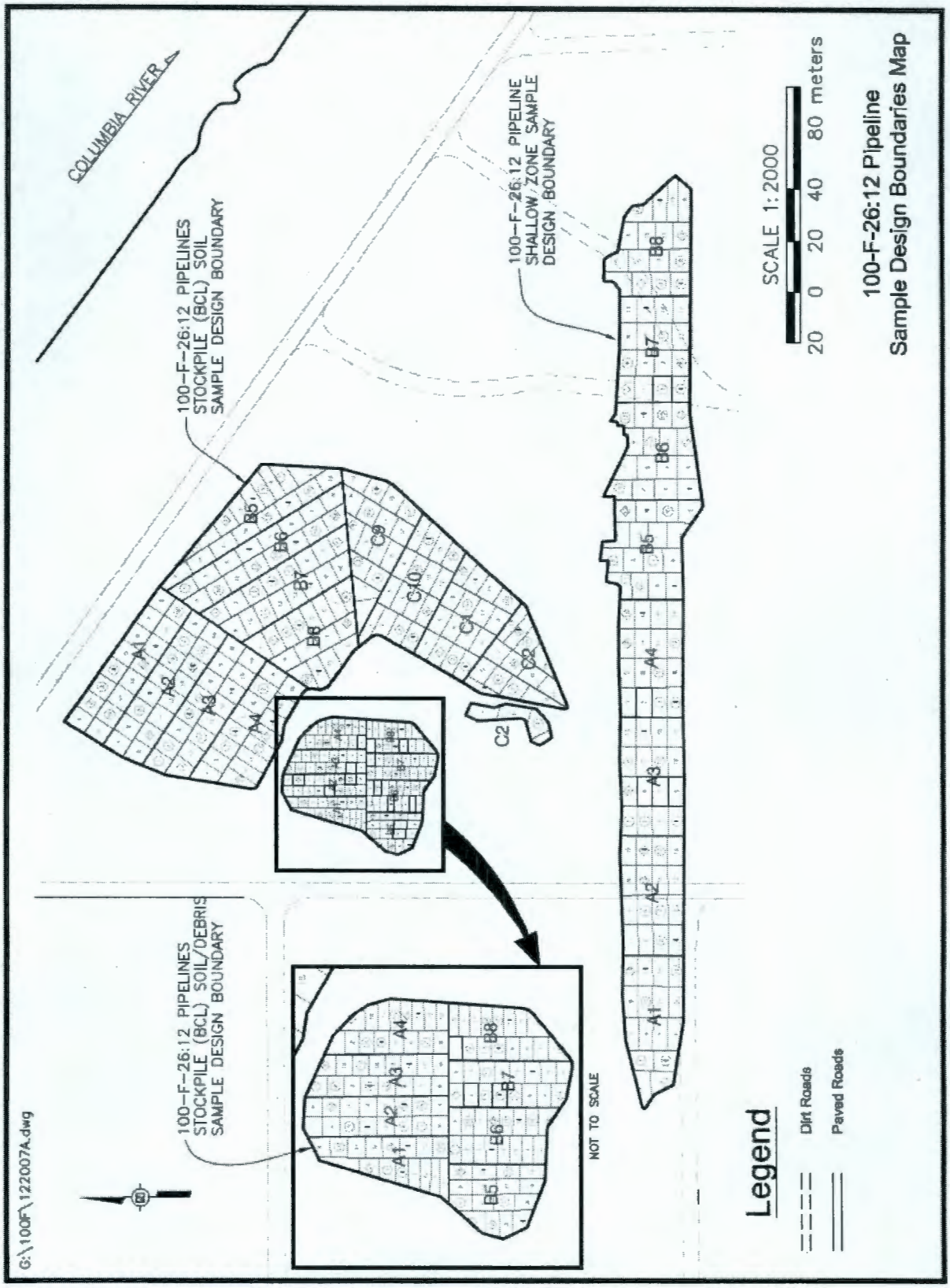
Verification Sampling Design

The sampling design for the 100-F-26:12 pipeline site was developed using the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2005a). The site was divided into decision units (e.g., shallow zone and deep zone). These decision units are broken into smaller subunits based on surface area. The subunits are further broken into equal-sized sampling areas. Variance samples are collected from these sampling areas and analyzed. The results are used to determine the number of verification samples to collect in each decision unit.

The division of the site into decision units is also a function of the applicable RAGs. The direct exposure, groundwater protection, and river protection RAGs are applicable to soils within 4.6 m (15 ft) of the ground surface. This soil zone is referred to as the shallow zone. The groundwater protection and river protection RAGs are applicable to soils greater than 4.6 m (15 ft) below the ground surface. This soil zone is referred to as the deep zone. The excavation contained areas applicable to both the shallow and deep zone. To be conservative and for simplicity, the entire area was considered as being the shallow zone.

The 100-F-26:12 pipeline site contains three decision units: (1) the shallow zone excavation footprint, and (2) the overburden stockpiles, and (3) the BCL stockpiles. The calculation of the number of verification samples to collect in each of the decision units resulted in eight composite samples being collected for the shallow-zone excavation footprint, twelve composite samples being collected for the overburden stockpile and eight composite samples being collected for the BCL stockpile. This calculation, and the sample locations, is located in the sample design calculation in Appendix C. Figure 6 provides an overview of the two sample designs.

Figure 6. Verification Soil Sample Locations at the 100-F-26:12 Pipeline Subsite.



Verification Sampling Results

Verification samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. The laboratory-reported data results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to submission for archival in the Hanford Environmental Information System (HEIS) site-wide database and are summarized in Appendix D.

Evaluation of the verification data from the three decision units (excavation footprint, overburden stockpiles, and BCL stockpiles) was calculated using the 95% upper confidence limit (UCL) on the true population mean for residual concentrations of COCs/COPCs. The calculations were also performed on other analytes included in the analysis requested for the COCs/COPCs. These calculations are provided in Appendix C. When a nonradionuclide analyte was detected in fewer than 50% of the verification samples collected, the maximum detected value was used for comparison against the RAGs. If no detections for a given analyte were reported in the data set, then no statistical evaluation or calculations were performed for that analyte.

Comparisons of the statistical results for analytes with the RAGs for the three decision units are summarized in Tables 1a, 1b and 1c. All three decision units were evaluated using the shallow-zone cleanup criteria. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the *Cleanup Levels and Risk Calculations Database* (Ecology 2005) under *Washington Administrative Code* (WAC) *173-340-740*(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents are not considered site COCs. Potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were detected in samples collected at the site, but are not considered within statistical calculations or the following tables, as these isotopes are not related to the operational history of the site and were detected below background levels (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]).

Table 1a. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:12 Excavation Footprint Verification Sampling Event.

COCs/COPCs	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony[b]	1.0 (<BG)	32	5[c]	5[c]	No	--
Arsenic	3.5 (<BG)	20	20	20	No	--
Barium	52.9 (<BG)	5,600	132[c]	224	No	--
Beryllium	0.18 (<BG)	10.4[d]	1.51[c]	1.51[c]	No	--
Boron[e]	1.5	16,000	320	--[f]	No	--
Chromium (total)	7.8 (<BG)	80,000	18.5[c]	18.5[c]	No	--
Cobalt	5.0 (<BG)	1,600	32	--[f]	No	--
Copper	13.7 (<BG)	2,960	59.2	22.0[c]	No	--
Hexavalent Chromium	0.31	2.1	4.8[g]	2	No	--
Lead	7.1 (<BG)	353	10.2[c]	10.2[c]	Yes[h]	Yes[i]
Manganese	223 (<BG)	11,200	512[c]	512[c]	No	--
Mercury	0.04 (<BG)	24	0.33[c]	0.33[c]	No	--
Molybdenum[e]	0.48	400	8	--[f]	No	--
Nickel	9.2 (<BG)	1,600	19.1[c]	27.4	No	--
Vanadium	28.1 (<BG)	560	85.1[c]	--[f]	No	--
Zinc	31.9 (<BG)	24,000	480	67.8[c]	No	--

[a] Lookup values and RAGs obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) or calculated per WAC-173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] Hanford Site-specific background not available. Value is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[c] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996).

[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996) and an airborne particulate mass-loading rate of 0.0001 g/m^3 (WDOH 1997).

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

[f] No cleanup level is available from the *Cleanup Levels and Risk Calculations (CLARC) 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]).

[g] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on updated oral reference dose value (as provided in the Integrated Risk Information System) (EPA 2006).

[h] Lead failed the WAC 173-340-740(7)(e) three part test for nonradionuclides since more than 10% of the results exceeded the cleanup limit.

[i] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), residual concentrations are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years based on the soil-partitioning coefficient for lead of 30 mL/g. The vadose zone underlying the remediation footprint is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of selenium are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = Remedial Design Report/Remedial Action Work Plan
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = Washington Administrative Code

Table 1b. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:12 Overburden Stockpile Verification Sampling Event. (2 Pages)

COCs/COPCs	Statistical Result (pCi/g)	Generic Site Lookup Values[a] (pCi/g)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value	Groundwater Protection Lookup Value	River Protection Lookup Value		
Cesium-137	0 (<BG)	6.2	--[b]	--[b]	No	--
Europium-152	0.048	3.3	--[b]	--[b]	No	--
Strontium-90	0 (<BG)	4.5	--[b]	--[b]	No	--
Tritium	1.39	15.8	15.8	106.8	No	--
COCs/COPCs	**Statistical Result (mg/kg)**	**Remedial Action Goals[a] (mg/kg)**			**Does the Statistical Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Antimony[c]	1.2 (<BG)	32	5[d]	5[d]	No	--
Arsenic	2.5 (<BG)	20	20	20	No	--
Barium	52.5 (<BG)	5,600	132[d]	224	No	--
Beryllium	0.26 (<BG)	10.4[e]	1.51[d]	1.51[d]	No	--
Boron[f]	1.5	16,000	320	--[g]	No	--
Cadmium[c]	0.18 (<BG)	13.9	0.81[d]	0.81[d]	No	--
Chromium (total)	8.3 (<BG)	80,000	18.5[d]	18.5[d]	No	--
Cobalt	4.9 (<BG)	1,600	32	--[g]	No	--
Copper	11.9 (<BG)	2,960	59.2	22.0[d]	No	--
Hexavalent Chromium	1.40	2.1	4.8[h]	2	No	--
Lead	5.8 (<BG)	353	10.2[d]	10.2[d]	No	--
Manganese	237 (<BG)	11,200	512[d]	512[d]	No	--
Molybdenum[f]	0.78	400	8	--[g]	No	--
Nickel	9.6 (<BG)	1,600	19.1[d]	27.4	No	--
Selenium	1.3	400	5	1	Yes	Yes[i]

Table 1b. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:12 Overburden Stockpile Verification Sampling Event. (2 Pages)

COCs/COPCs	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Vanadium	29.9 (<BG)	560	85.1[d]	--[g]	No	--
Zinc	30.4 (<BG)	24,000	480	67.8[d]	No	--

[a] Lookup values and RAGs obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) or calculated per WAC-173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] The 100 Area RDR/RAWP (DOE-RL 2005b) does not provide soil cleanup levels for this contaminant to be protective of groundwater and the Columbia River. Based on the lowest radionuclide soil-partitioning coefficient (for strontium-90 [25 mL/g]), this contaminant is not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 5.5 m (18 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

[c] Hanford Site-specific background not available. Value is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[d] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996).

[e] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996) and an airborne particulate mass-loading rate of 0.0001 g/m^3 (WDOH 1997).

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

[g] No cleanup level is available from the *Cleanup Levels and Risk Calculations (CLARC) 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]).

[h] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on updated oral reference dose value (as provided in the Integrated Risk Information System) (EPA 2006).

[I] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), residual concentrations are not expected to migrate more than 1 m (3.3 ft) vertically in 1,000 years based on the soil-partitioning coefficient for selenium of 150 mL/g. The vadose zone underlying the remediation footprint is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of selenium are predicted to be protective of groundwater and the Columbia River.

--	= not applicable	RAG	= remedial action goal
BG	= background	RDR/RAWP	= Remedial Design Report/Remedial Action Work Plan
COC	= contaminant of concern	RESRAD	= RESidual RADioactivity (dose assessment model)
COPC	= contaminant of potential concern	WAC	= *Washington Administrative Code*

Table 1c. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:12 BCL Stockpile Verification Sampling Event. (2 Pages)

COCs/COPCs	Statistical Result (pCi/g)	Generic Site Lookup Values[a] (pCi/g)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value	Groundwater Protection Lookup Value	River Protection Lookup Value		
Carbon-14	1.43	5.16	--[b]	--[b]	No	--
Cesium-137	0.039	6.2	--[b]	--[b]	No	--
Strontium-90	0.260	4.5	--[b]	--[b]	No	--
Tritium	4.68	15.8	15.8	106.8	No	--
COCs/COPCs	**Statistical Result (mg/kg)**	**Remedial Action Goals[a] (mg/kg)**			**Does the Statistical Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Antimony[c]	0.10 (<BG)	32	5[d]	5[d]	No	--
Arsenic	3.6 (<BG)	20	20	20	No	--
Barium	72.3 (<BG)	5,600	132[d]	224	No	--
Beryllium	0.26 (<BG)	10.4[e]	1.51[d]	1.51[d]	No	--
Boron[f]	3.4	16,000	320	--[g]	No	--
Cadmium[c]	0.17 (<BG)	13.9	0.81[d]	0.81[d]	No	--
Chromium (total)	10.7 (<BG)	80,000	18.5[d]	18.5[d]	No	--
Cobalt	5.9 (<BG)	1,600	32	--[g]	No	--
Copper	13.4 (<BG)	2,960	59.2	22.0[d]	No	--
Hexavalent Chromium	0.33	2.1	4.8[h]	2	No	--
Lead	7.1 (<BG)	353	10.2[d]	10.2[d]	No	--
Manganese	261 (<BG)	11,200	512[d]	512[d]	No	--
Mercury	0.05 (<BG)	24	0.33[d]	0.33[d]	No	--
Molybdenum[f]	0.59	400	8	--[g]	No	--
Nickel	10.8 (<BG)	1,600	19.1[d]	27.4	No	--

Table 1c. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:12 BCL Stockpile Verification Sampling Event. (2 Pages)

COCs/COPCs	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Vanadium	37.4 (<BG)	560	85.1[d]	--[g]	No	--
Zinc	42.5 (<BG)	24,000	480	67.8[d]	No	--

[a] Lookup values and RAGs obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) or calculated per WAC-173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] The 100 Area RDR/RAWP (DOE-RL 2005b) does not provide soil cleanup levels for this contaminant to be protective of groundwater and the Columbia River. Based on the lowest radionuclide soil-partitioning coefficient (for strontium-90 [25 mL/g]), this contaminant is not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 5.5 m (18 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

[c] Hanford Site-specific background not available. Value is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[d] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996).

[e] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996) and an airborne particulate mass-loading rate of 0.0001 g/m^3 (WDOH 1997).

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

[g] No cleanup level is available from the *Cleanup Levels and Risk Calculations (CLARC) 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]).

[h] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on updated oral reference dose value (as provided in the Integrated Risk Information System) (EPA 2006).

--	= not applicable	RAG	= remedial action goal
BG	= background	RDR/RAWP	= Remedial Design Report/Remedial Action Work Plan
COC	= contaminant of concern	RESRAD	= RESidual RADioactivity (dose assessment model)
COPC	= contaminant of potential concern	WAC	= *Washington Administrative Code*

DATA EVALUATION

Evaluation of the results listed in Tables 1a, 1b, and 1c from the verification sampling at the 100-F-26:12 pipeline site indicates that all detected COC/COPCs were quantified below RAGs and lookup values, except for selenium. Residual concentrations of selenium in the overburden stockpile decision unit (1.3 mg/kg) slightly exceed the soil RAG for river protection (1 mg/kg). Data was not collected on the vertical extent of contamination for this area, but given the soil-partitioning coefficient for selenium (150 mL/g), this contaminant would not be expected to migrate more than 1 m (3.3 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying the 100-F-26:12 pipeline site excavation is approximately 5.5 m (18 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of the Columbia River.

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test. The application of the three-part test for the 100-F-26:12 remediation footprint is included in the statistical calculations (Appendix C). All residual COC/COPC concentrations for the 100-F-26:12 remediation footprint pass the three-part test, except for lead. Similarly to the transport mechanisms of selenium noted above, lead is not predicted to migrate more

than 2 m (6.6 ft) vertically in 1,000 years, based on a soil-partitioning coefficient of 30 mL/g (BHI 2005). Therefore, residual concentration of lead within the remediation footprint sampling area is also protective of groundwater and the Columbia River.

Assessment of the risk requirements for the 100-F-26:12 pipeline site is determined by calculation of the hazard quotient and excess carcinogenic risk values for nonradionuclides. These calculations are located in Appendix C. The requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative excess carcinogenic risk of less than 1×10^{-5}. These risk values were conservatively calculated for the entire waste site using the highest of the statistical values from each of the three decision units. Risk values were not calculated for constituents that were not detected or were detected at concentrations below Hanford Site or Washington State background values. The calculations indicated that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-F-26:12 pipeline site is 1.1×10^{-2}. All individual cumulative carcinogenic risk values are less than 1×10^{-6}. The only nonradionuclide carcinogen detected above background was hexavalent chromium. The resulting cumulative carcinogenic risk value is 6.7×10^{-7}. Therefore, nonradionuclide risk requirements are met.

Evaluation of RAG attainment for radionuclides was performed using the single-radionuclide dose-equivalence lookup values. The model used to develop these dose-equivalence lookup values is presented in the RDR/RAWP (DOE-RL 2005).

Table 2 compares the maximum statistical result for the overburden stockpiles, and the BCL stockpiles radionuclide cleanup verification results presented in the 95% upper confidence limit calculations (Appendix C) to direct exposure single radionuclide 15 mrem/yr dose-equivalence values and shows the sum of fractions evaluations. The columns on the left side of the table are the COC/COPCs and the 95% UCL values, corrected for background, as appropriate. The fourth column presents the single radionuclide 15 mrem/yr dose-equivalence activity, and the last two columns present the statistical values divided by the dose-equivalence activity. As demonstrated by the summation of these fractions, the cumulative dose contributed by residual radionuclide populations will be significantly less than the 15 mrem/yr RAG.

Table 2. Attainment of Radionuclide Direct Exposure RAG. (2 Pages)

COCs	95% UCL Statistical Values (pCi/g)		Activity Equivalent to 15 mrem/yr Dose[a] (pCi/g)	Fraction	
	Overburden	BCL		Overburden	BCL
Carbon-14	ND	1.43	5.16	0	0.277
Cesium-137	0 (<BG)	0.039	6.2	0	0.006
Europium-152	0.048	ND	3.3	0.015	0
Strontium-90	0 (<BG)	0.260	4.5	0	0.058
Tritium	1.39	4.68	510	0.003	0.009
			Total	0.018	0.350
			Equivalent Dose (mrem/yr)	<0.27	<5.25

[a] Single radionuclide 15 mrem/yr dose-equivalence values and derivation methodology are presented in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005).

BG = background COC = contaminant of concern UCL = upper confidence limit
BCL = below cleanup level ND = not detected (in all samples in the data set)

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications. The DQA for the 100-F-26:12 pipeline site established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. All analytical data were found to be acceptable for decision-making purposes. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The detailed DQA is presented in Appendix E.

SUMMARY FOR INTERIM CLOSURE

The 100-F-26:12 pipeline site has been remediated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2005b). The site was remediated by removing approximately 2,900 BCM (3,800 BCY) of material for disposal at the Environmental Restoration Disposal Facility. Statistical sampling to verify the completeness of remediation was performed, and analytical results for the three decision units (shallow zone excavation footprint, overburden stockpiles, and BCL stockpiles) were shown to meet the cleanup objectives for direct exposure, groundwater protection, and river protection. Accordingly, an Interim Closure reclassification is supported for the 100-F-26:12 pipeline site. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls.

REFERENCES

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations,* as amended.

BHI, 2001a, *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater*, 0100X-CA-V0038, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001b, *100-F Reactor Area Underground Pipeline Historical Information Summary*, BHI-01504, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2005, *100 Area Analogous Sites RESRAD Calculations,* 0100X-CA-V0050, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

DOE Order 5400.5, *Radiation Protection of the Public and Environment*, as amended, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1996, *Hanford Site Background: Part 2, Soil Background for Radionuclides,* DOE/RL-96-12, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2005a, *100 Area Remedial Action Sampling and Analysis Plan*, DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

DOE-RL, 2007, *Tri-Party Agreement Handbook Management Procedures,* RL-TPA-90-0001, Rev. 1, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 1994, *Natural Background Soil Metals Concentrations in Washington State,* Publication No. 94-115, Washington State Department of Ecology, Olympia, Washington.

Ecology, 2005, *Cleanup Levels and Risk Calculations (CLARC) Database*, Washington State Department of Ecology, Olympia, Washington, available at: <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.

EPA, 1999, *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*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2006, *Integrated Risk Information System (IRIS)*, U.S. Environmental Protection Agency, Washington, D.C., available at: <http://www.epa.gov/iris>.

Feist, E.T., 2004, *100-FR-1 Operable Unit Remaining Site For Remedial Action*, CCN 117910, Interoffice Memorandum to R. A. Carlson, dated December 13, 2004, Bechtel Hanford, Inc., Richland, Washington.

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

WCH, 2007a, *100-F Remedial Sampling*, Logbook ELF-1174-3, pp. 63-94, Washington Closure Hanford, Richland, Washington.

WCH, 2007b, *100-F Remedial Sampling*, Logbook ELF-1174-4, pp. 7-8, Washington Closure Hanford, Richland, Washington.

WDOH, 1997, *State of Washington Department of Health Interim Regulatory Guidance: Hanford Guidance for Radiological Cleanup*, WDOH/320-015, Rev. 1, Washington Department of Health, Richland, Washington.

WHC, 1993, *100-F Reactor Site Technical Baseline Report Including Operable Units 100-FR-1 and 100-FR-2*, WHC-SD-EN-TI-169, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

REMEDIATION PHOTOGRAPHS

100-F-26:12 Pipeline Site Removal of Overburden (Looking East).

100-F-26:12 Pipeline Site Removal of Overburden (Looking West).

1.8-m (72-in.) Main Process Sewer (100-F-26:12) Pipeline Uncovered (Looking Southeast).

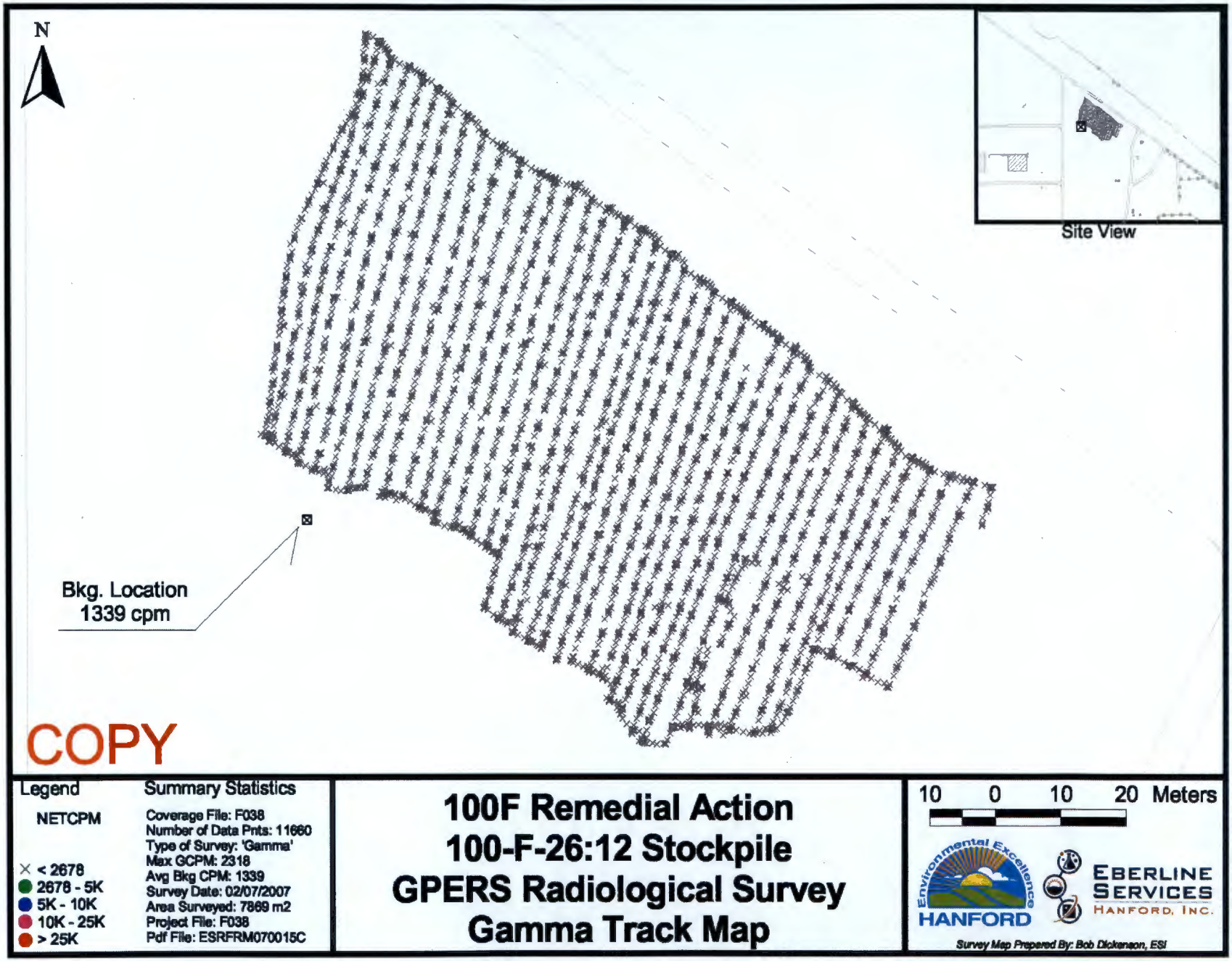
100-F-26:12 Pipeline Being Demolished (Looking East).

100-F-26:12 Pipeline Site Removal of Overburden (Looking Southwest).

100-F-26:12 Pipeline Site Rubble Being Loaded Out (Looking Southeast; May 10, 2007).

APPENDIX B

POST-REMEDIATION RADIOLOGICAL SURVEYS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Avg Bkg CPM: 1339
Survey Date: 02/07/2007
Area Surveyed: 7869 m2
Project File: F038
Pdf File: ESRFRM070015C
100F Remedial Action
100-F-26:12 Stockpile
GPERS Radiological Survey
Gamma Track Map
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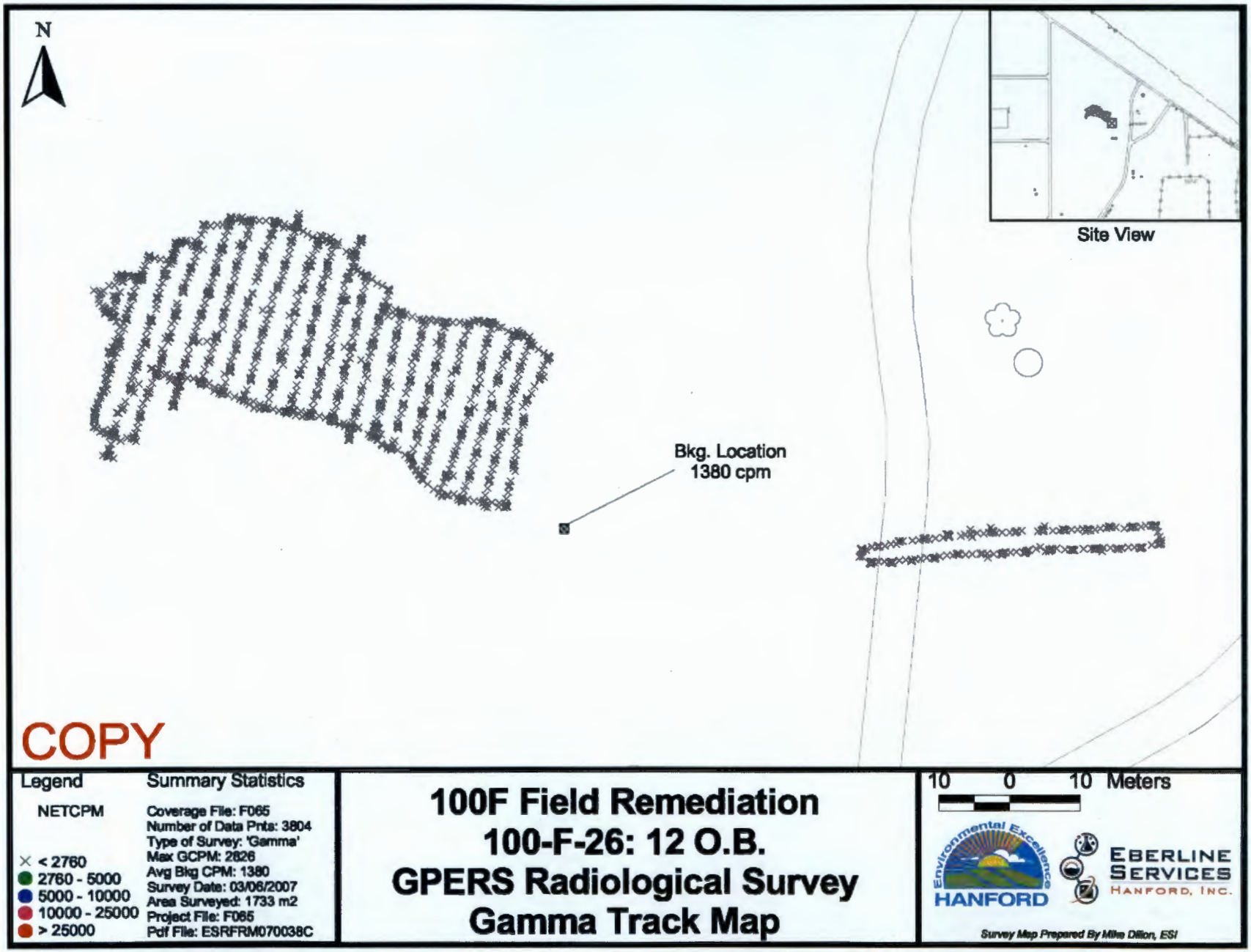
Environmental Excellence
HANFORD
EBERLINE SERVICES
HANFORD, INC.
Survey Map Prepared By: Bob Dickenson, ESI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Avg Bkg CPM: 1380
Survey Date: 03/06/2007
Area Surveyed: 1733 m2
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Pdf File: ESRFRM070038C
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100-F-26: 12 O.B.
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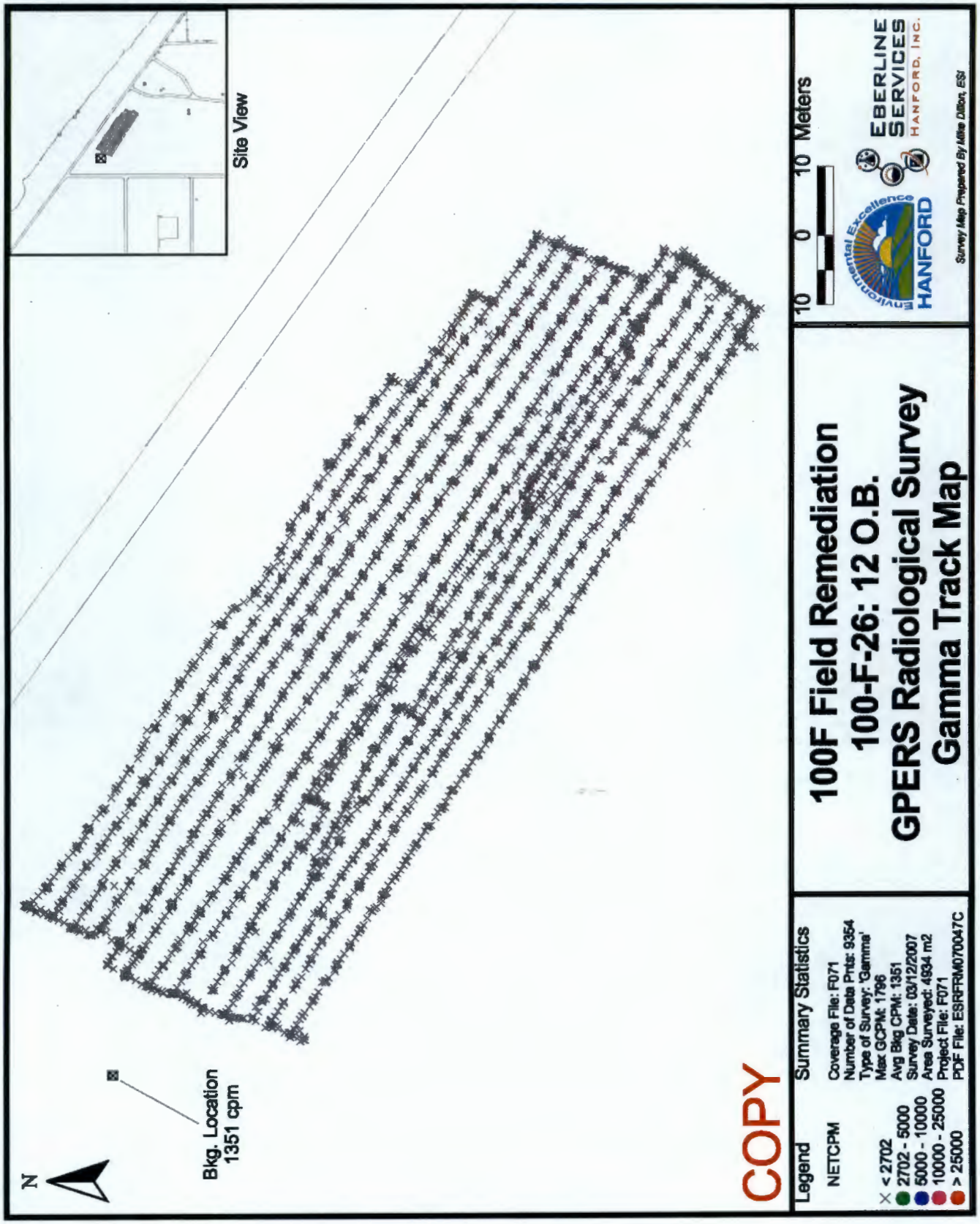
Environmental Excellence
HANFORD
EBERLINE SERVICES
HANFORD, INC.
Survey Map Prepared By Mike Dillon, ESI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Area Surveyed: 4934 m2
Project File: F071
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Gamma Track Map
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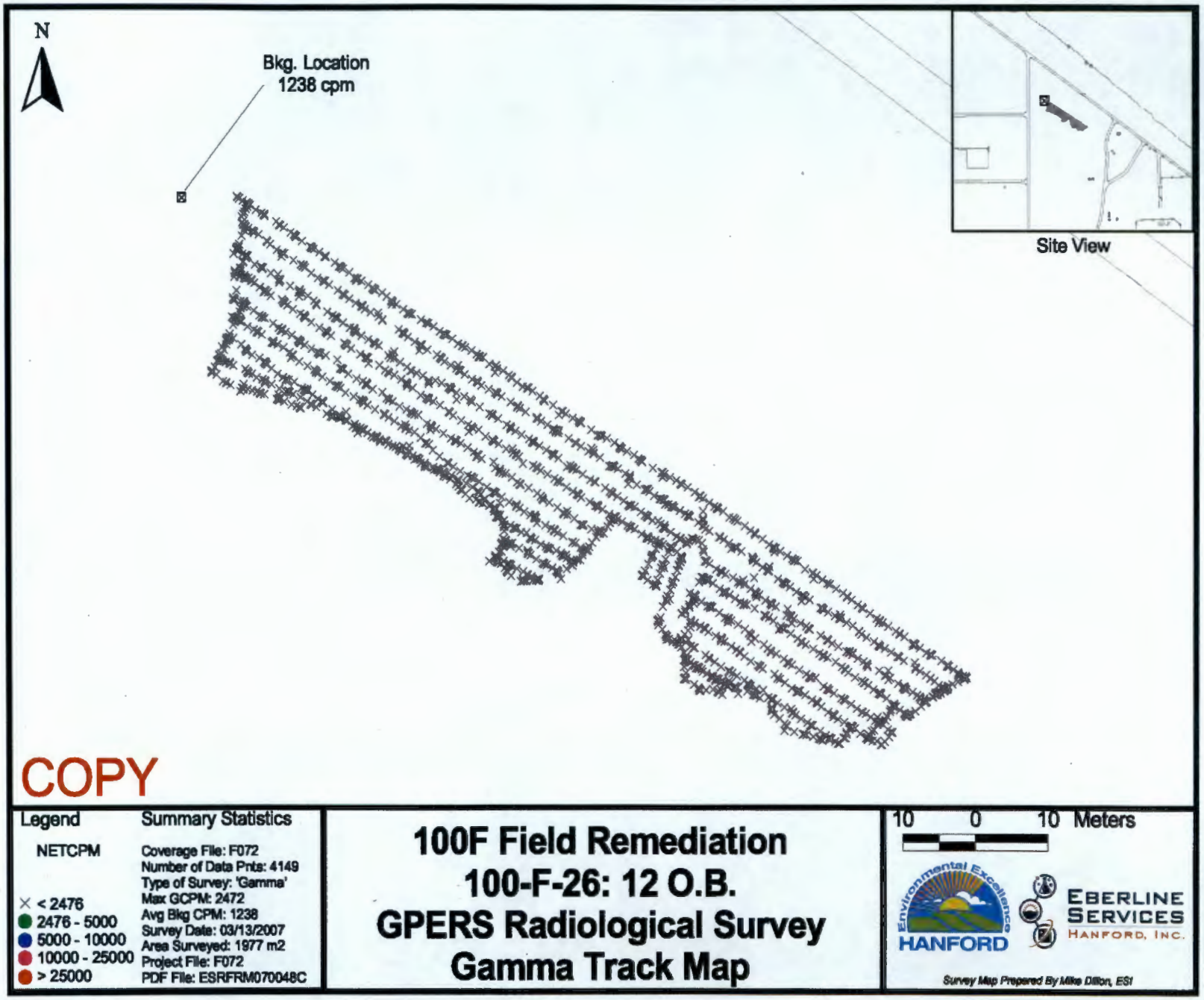
Environmental Excellence
HANFORD
EBERLINE SERVICES
HANFORD, INC.
Survey Map Prepared By Mike Dillon, ESI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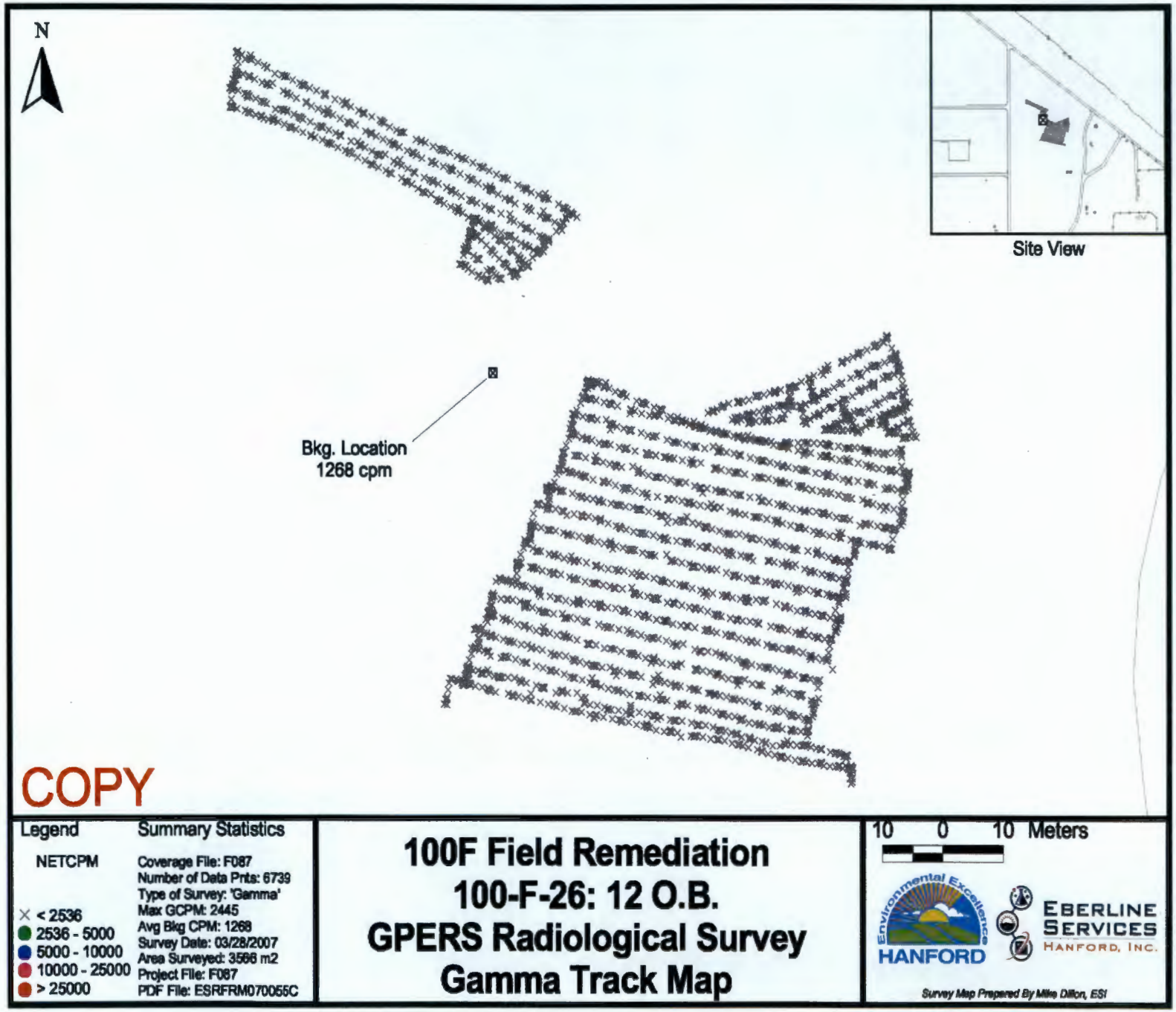
Environmental Excellence
HANFORD
EBERLINE SERVICES
HANFORD, INC.
Survey Map Prepared By Mike Dillon, ESI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Bkg. Location
1268 cpm
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NETCPM
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5000 - 10000
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> 25000
Summary Statistics
Coverage File: F087
Number of Data Prnts: 6739
Type of Survey: 'Gamma'
Max GCPM: 2445
Avg Bkg CPM: 1268
Survey Date: 03/28/2007
Area Surveyed: 3566 m2
Project File: F087
PDF File: ESRFRM070055C
100F Field Remediation
100-F-26: 12 O.B.
GPERS Radiological Survey
Gamma Track Map
10 0 10 Meters
Environmental Excellence
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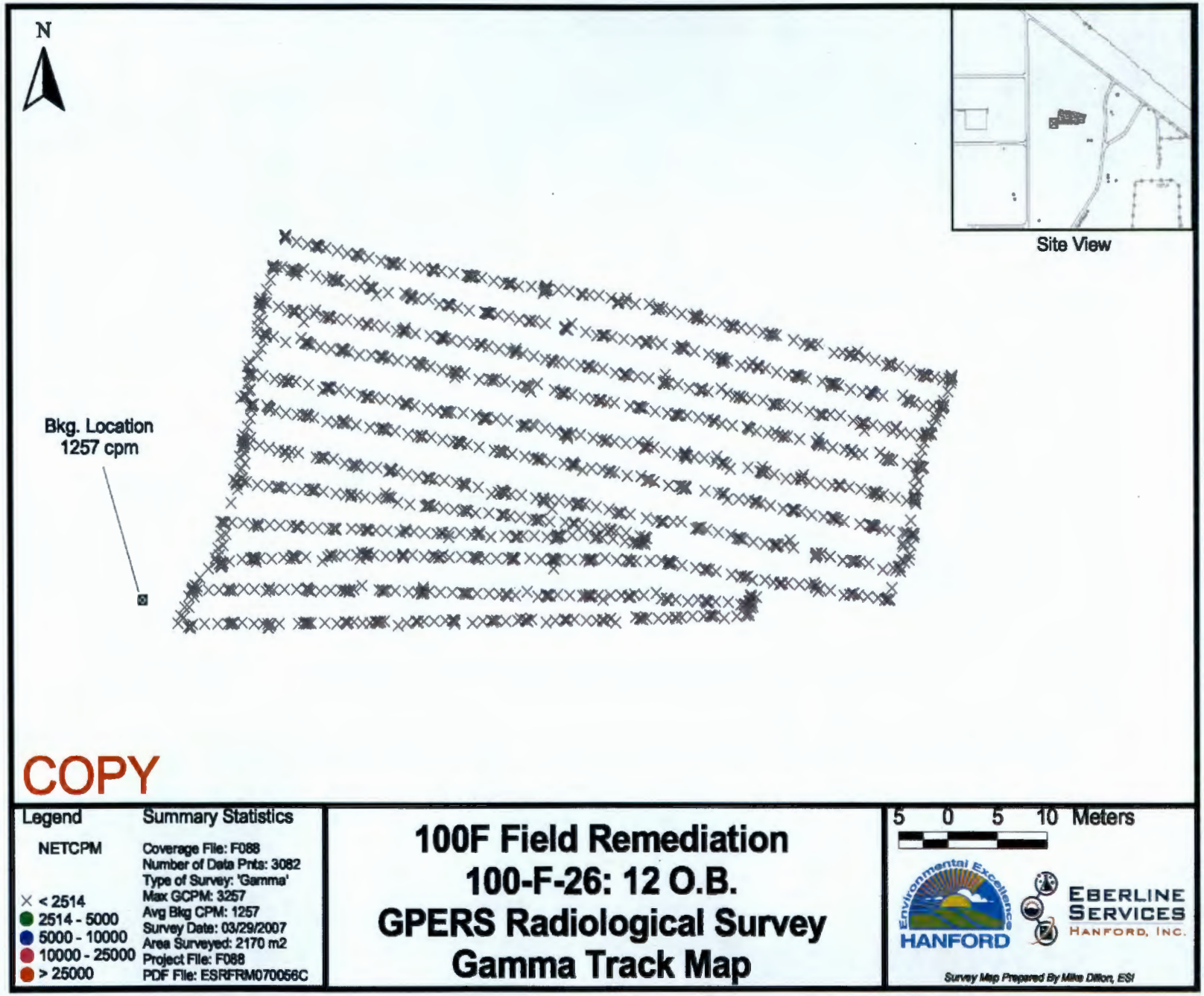
Survey Map Prepared By Mike Dillon, ESI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Bkg. Location
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> 25000
Summary Statistics
Coverage File: F088
Number of Data Pnts: 3082
Type of Survey: 'Gamma'
Max GCPM: 3257
Avg Bkg CPM: 1257
Survey Date: 03/29/2007
Area Surveyed: 2170 m2
Project File: F088
PDF File: ESRFRM070056C
100F Field Remediation
100-F-26: 12 O.B.
GPERS Radiological Survey
Gamma Track Map
5 0 5 10 Meters
Environmental Excellence
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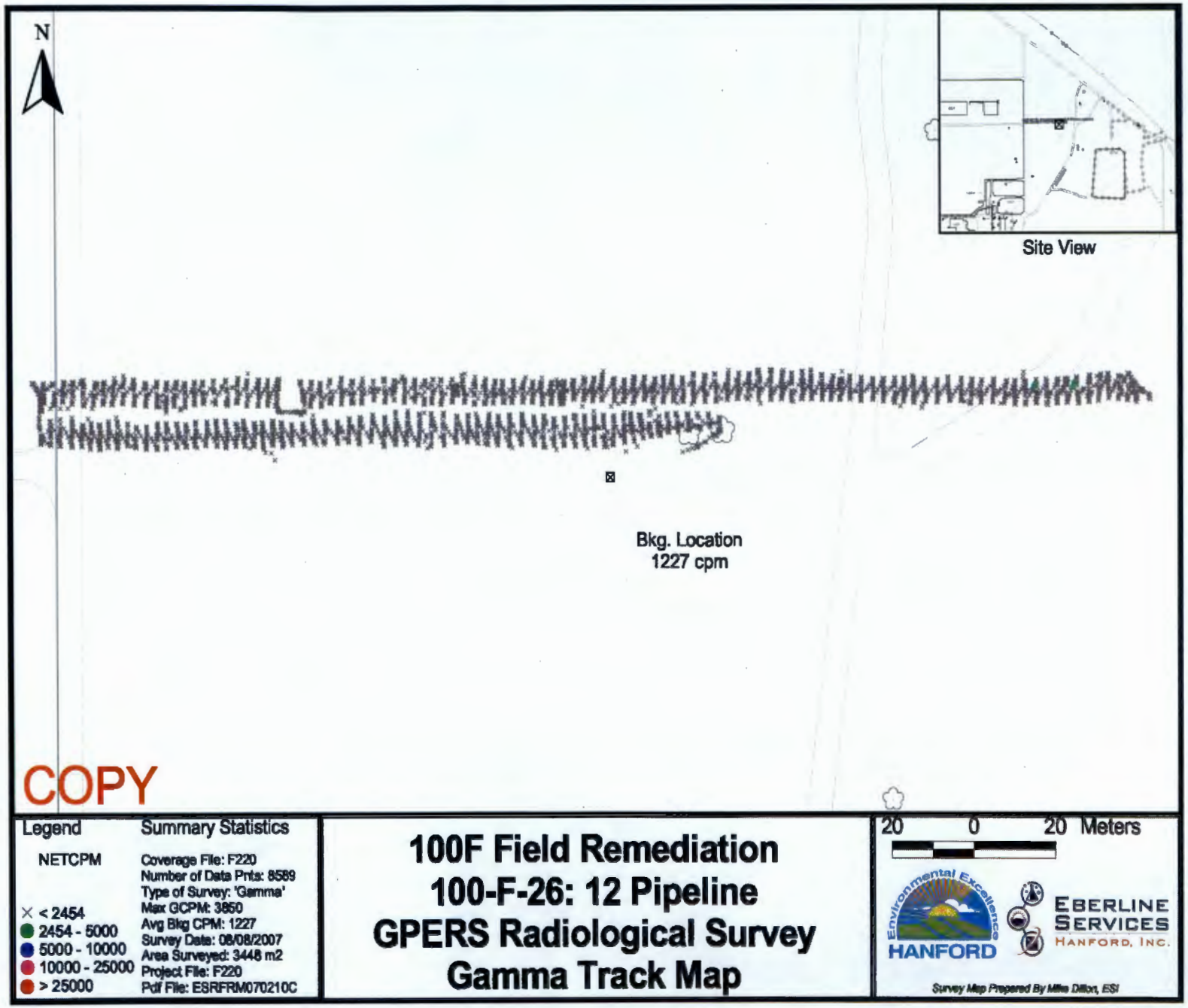
HANFORD, INC.
Survey Map Prepared By Mike Dillon, ESI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Site View
Bkg. Location
1227 cpm
COPY
Legend
NETCPM
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5000 - 10000
10000 - 25000
> 25000
Summary Statistics
Coverage File: F220
Number of Data Pnts: 8589
Type of Survey: 'Gamma'
Max GCPM: 3850
Avg Bkg CPM: 1227
Survey Date: 08/08/2007
Area Surveyed: 3448 m2
Project File: F220
Pdf File: ESRFRM070210C
100F Field Remediation
100-F-26: 12 Pipeline
GPERS Radiological Survey
Gamma Track Map
20 0 20 Meters
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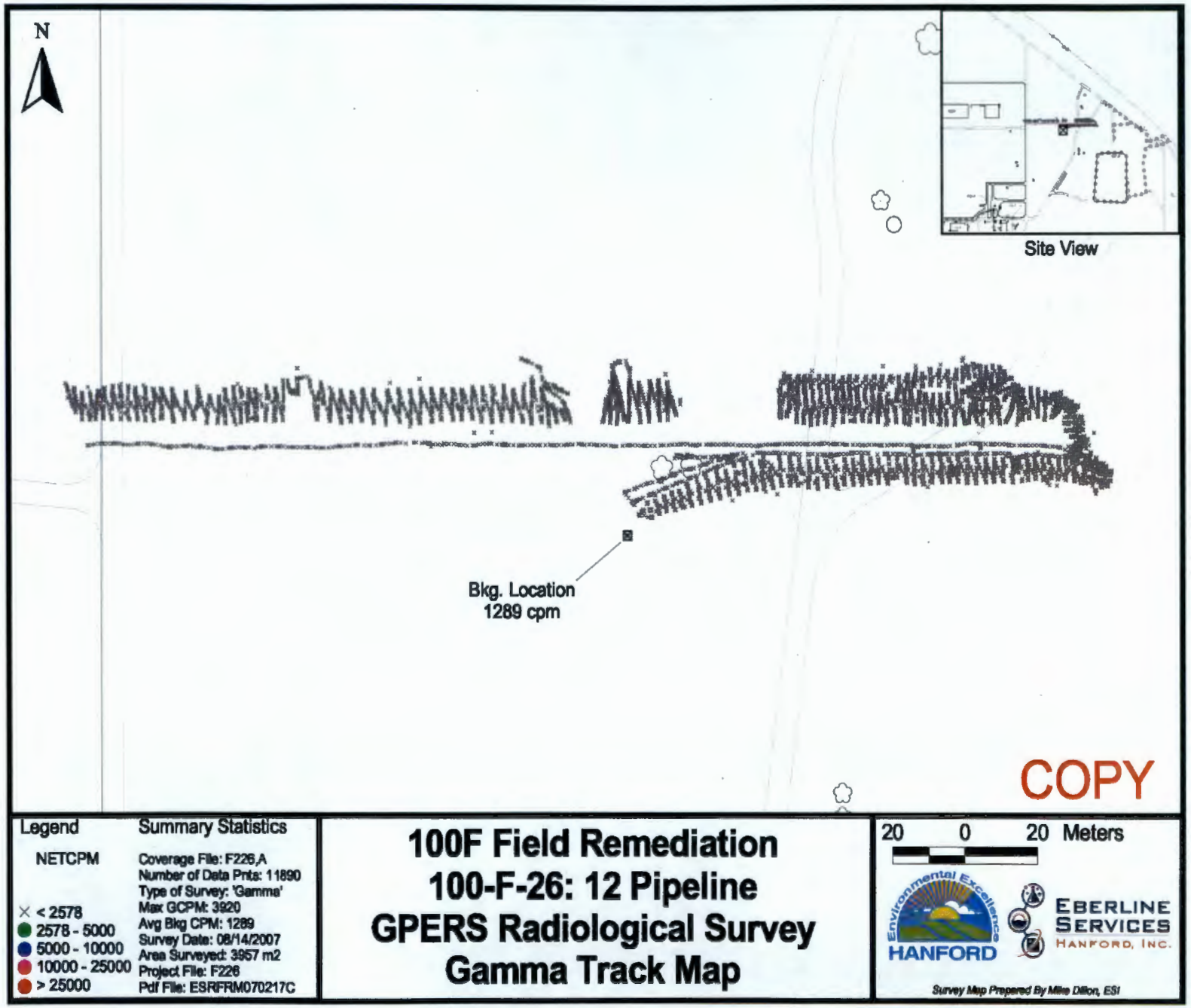
Survey Map Prepared By Mike Dillon, ESI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Site View
Bkg. Location
1289 cpm
COPY
Legend
NETCPM
< 2578
2578 - 5000
5000 - 10000
10000 - 25000
> 25000
Summary Statistics
Coverage File: F226,A
Number of Data Pnts: 11890
Type of Survey: 'Gamma'
Max GCPM: 3920
Avg Bkg CPM: 1289
Survey Date: 08/14/2007
Area Surveyed: 3957 m2
Project File: F226
Pdf File: ESRFRM070217C
100F Field Remediation
100-F-26: 12 Pipeline
GPERS Radiological Survey
Gamma Track Map
20 0 20 Meters
Environmental Excellence
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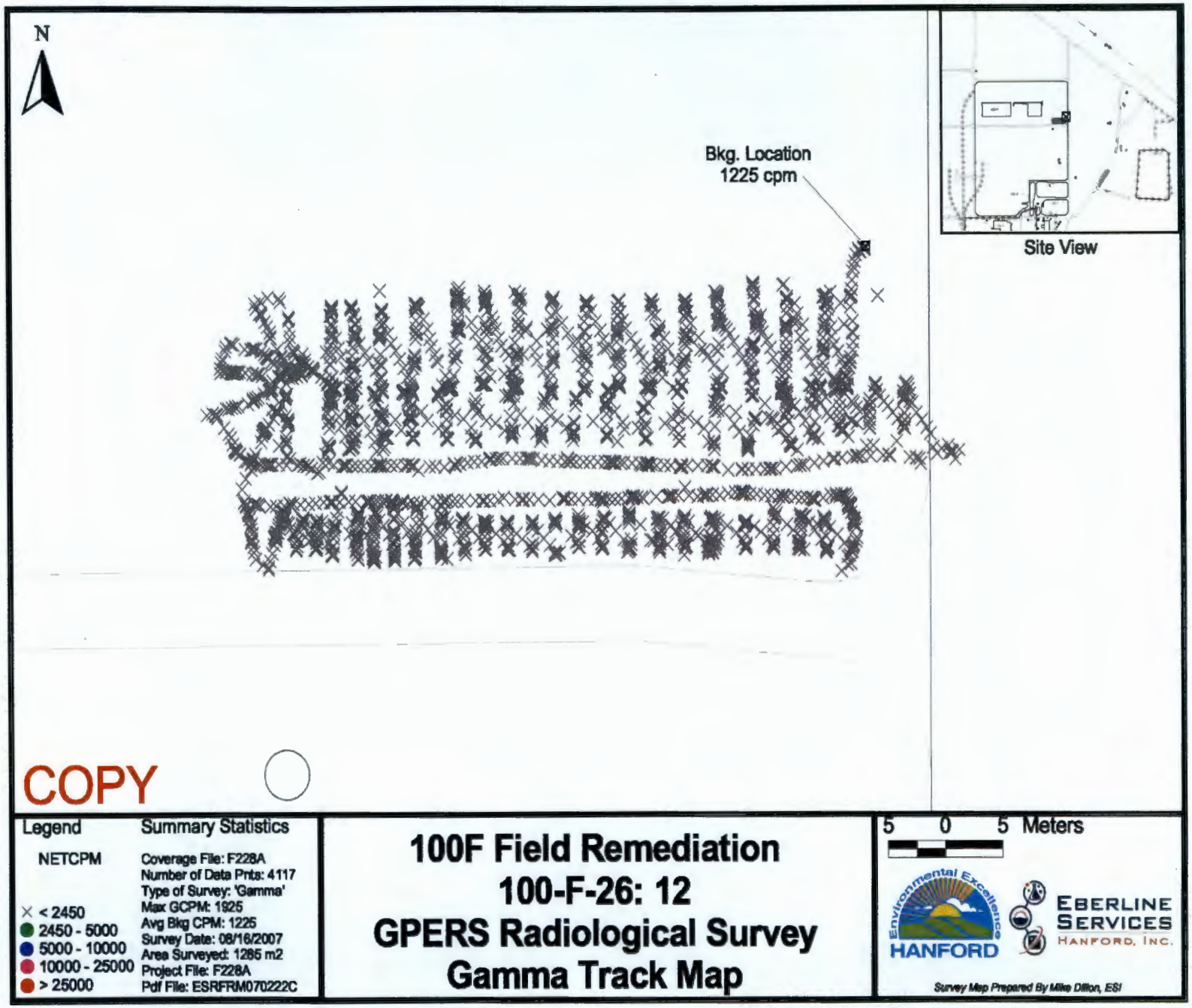
Survey Map Prepared By Mike Dillon, ESI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Bkg. Location
1225 cpm
Site View
COPY
Legend
NETCPM
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2450 - 5000
5000 - 10000
10000 - 25000
> 25000
Summary Statistics
Coverage File: F228A
Number of Data Pnts: 4117
Type of Survey: 'Gamma'
Max GCPM: 1925
Avg Bkg CPM: 1225
Survey Date: 08/16/2007
Area Surveyed: 1285 m2
Project File: F228A
Pdf File: ESRFRM070222C
100F Field Remediation
100-F-26: 12
GPERS Radiological Survey
Gamma Track Map
5 0 5 Meters
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Survey Map Prepared By Mike Dillon, ESI

APPENDIX C

CALCULATIONS

CALCULATION BRIEFS

The following calculation briefs have been prepared in accordance with ENG-1, *Engineering Services*, ENG-1-4.5, "Project Calculations," Washington Closure Hanford, Richland, Washington.

100-F-26:12 Pipeline Shallow Zone Variance Calculation, Calculation No. 0100F-CA-V0299, Rev. 0.

100-F-26:12 Pipeline BCL Stockpile Variance Calculation, Calculation No. 0100F-CA-V0300, Rev. 0.

100-F-26:12 Pipeline Shallow Zone and Stockpile (BCL) Soil, Soil/Debris Sampling Plan, Calculation No. 0100F-CA-V0308, Rev. 0.

100-F-26:12 Pipeline BCL Soil/Debris Variance Calculation, Calculation No. 0100F-CA-V0310, Rev. 0.

100-F-26:12 Pipelines Cleanup Verification 95% UCL Calculation, Calculation No. 0100F-CA-V0317, Rev. 0.

100-F-26:12 Pipelines Hazard Quotient and Carcinogenic Risk Calculations, Calculation No. 0100F-CA-V0318, Rev. 0.

100-F-26:12 Main Process Sewer Pipelines Cleanup Verification RESRAD Calculation Brief, Calculation No. 0100F-CA-V0326, Rev. 0.

DISCLAIMER FOR CALCULATIONS

The calculation that is provided in this appendix has been generated to document compliance with established cleanup levels. This calculation should be used in conjunction with other relevant documents in the administrative record.

CALCULATION COVER SHEET

Project Title 100 F Area Remedial Action **Job No.** 14655

Area 100 F

Discipline Environmental ***Calc. No.** 0100F-CA-V0299

Subject **100-F-26:12 Pipeline Shallow Zone Variance Calculation**

Computer Program MS Excel **Program No.** Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These calculations 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	4	J. R. DeBuigne JRDeBuigne 9-25-07	R.T. Coffman RTCoffman 9/25/07	N/A	S.W. Callison SW Callison	9-25-07

SUMMARY OF REVISION

WCH-DE-018 (04/14/2006) *Obtain Calc. No. from R&DC and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD	Date 9-26-07	9/11/2007	Calc. No.	0100F-CA-V0299	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline Shallow Zone Variance Calculation					Sheet No.	1 of 2

Conclusion:

The required number of samples calculated (1sample) for each decision sub-unit is less than the default number (4 samples) specified in the DOE/RL-96-22, Rev 4. Therefore, the default number of samples will be collected from each shallow zone decision sub-unit.

Problem:

Calculate the number of close out samples required for 100-F-26:12 Pipeline Shallow Zone Decision Unit verification sampling as required in "100 Area Remedial Action Sampling and Analysis Plan" (DOE/RL-96-22, Rev 4) and "Instruction Guide for the Remediation of 100 Areas Waste Sites" (0100X-IG-G0001, Rev 5).

Given:

1) Sample locations for the 100-F-26:12 Pipeline Shallow Zone Decision Unit are identified on the 100-F-26:12 Shallow Zone and Stockpiling Soil, Soil Debris (BCL) Sampling Plan, Calculation number 0100F-CA-V0308, Rev. 0.
2) Lookup values from DOE/RL-96-22, Rev 4.
3) Sample Design requirements from DOE/RL-96-22, Rev 4 and 0100X-IG-G0001, Rev 5.
4) Field sampling information from sampling logbook EFL-1174-3.

Solution:

Calculation methodology is described in Appendix A of DOE/RL-96-22, Rev 4. Data from attached worksheets are used to calculate the required number of closeout samples. Variance calculation is based on the same three isotopes used to develop the statistical approach in DOE/RL-96-22, Rev 4. The statistical design is based on the premise that these isotopes are the predominant components of the contamination and are representative of the contamination distribution.

Sheet No.	Contents	Topic
1	Calc. Summary	Summary of Calc Brief
2	Shallow Zone	Required Number of Samples Calculation

Calc. Summary

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD	Date 9-26-07 9/11/2007	Calc. No.	0100F-CA-V0299	Rev. No.	0
Project	100-F Remedial Action	Job No. 14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline Shallow Zone Variance Calculation				Sheet No.	2 of 2

Statistical Evaluation of Analytical Data

The required number of samples resulting from the calculation is highlighted at the bottom of the page.
Each value is reflective of the specific analyte evaluated.
The highest value of the three evaluations is used to determine the required number of samples as compared against the default of four.
Sample locations are from Calculation 0100F-CA-V0308.
Mean, Standard Deviation, *t*, and Number of Samples formulas are from DOE/RL-96-22, Appendix A.

Decision Unit: 100-F-26:12 Pipeline Shallow Zone Variance Calculation
Samples values from GEA analysis
Sample Areas , A1 thru B8

			Constituent					
Sample #	**Sample Date**	**Location**	**Cobalt-60**	Q	**Cs-137**	Q	**Europium-152**	Q
			pCi/g		pCi/g		pCi/g	
Look-up Value (HT) ==========>			**1.4**		**6.2**		**3.3**	
J15H25	9/4/2007	A1-2	0.013	U	0.014	U	0.041	U
J15H26	9/4/2007	A1-3	0.02	U	0.02	U	0.051	U
J15H27	9/4/2007	A1-4	0.028	U	0.025	U	0.068	U
J15H28	9/4/2007	A1-10	0.02	U	0.019	U	0.049	U
J15H29	9/4/2007	A1-13	0.028	U	0.03	U	0.08	U
J15H30	9/4/2007	A1-16	0.042	U	0.041	U	0.104	U
J15H31	9/4/2007	A2-3	0.058	U	0.041	U	0.122	U
J15H32	9/4/2007	A2-6	0.029	U	0.029	U	0.081	U
J15H33	9/4/2007	A2-7	0.015	U	0.015	U	0.043	U
J15H34	9/4/2007	A2-10	0.022	U	0.021	U	0.053	U
J15H35	9/4/2007	A2-14	0.028	U	0.023	U	0.065	U
J15H36	9/4/2007	A2-15	0.017	U	0.016	U	0.045	U
J15H37	9/10/2007	A3-1	0.061	U	0.069	U	0.135	U
J15H38	9/10/2007	A3-2	0.055	U	0.06	U	0.135	U
J15H39	9/10/2007	A3-4	0.054	U	0.043	U	0.118	U
J15H40	9/10/2007	A3-5	0.055	U	0.067	U	0.143	U
J15H41	9/10/2007	A3-9	0.043	U	0.089		0.118	U
J15H42	9/10/2007	A3-11	0.047	U	0.032	U	0.116	U
J15H43	9/10/2007	A4-3	0.067	U	0.062	U	0.149	U
J15H44	9/10/2007	A4-4	0.075	U	0.063	U	0.144	U
J15H45	9/10/2007	A4-7	0.05	U	0.045	U	0.126	U
J15H46	9/10/2007	A4-9	0.045	U	0.035	U	0.101	U
J15H47	9/10/2007	A4-12	0.039	U	0.037	U	0.1	U
J15H48	9/10/2007	A4-13	0.051	U	0.056	U	0.139	U
J15H49	9/10/2007	B5-1	0.051	U	0.049	U	0.127	U
J15H50	9/10/2007	B5-2	0.04	U	0.034	U	0.102	U
J15H51	9/10/2007	B5-5	0.04	U	0.038	U	0.107	U
J15H52	9/10/2007	B5-7	0.069	U	0.06	U	0.155	U
J15H53	9/10/2007	B5-13	0.047	U	0.046	U	0.113	U
J15H54	9/10/2007	B5-15	0.039	U	0.038	U	0.091	U
J15H55	9/10/2007	B6-1	0.036	U	0.029	U	0.09	U
J15H56	9/10/2007	B6-10	0.067	U	0.065	U	0.147	U
J15H57	9/10/2007	B6-12	0.048	U	0.039	U	0.109	U
J15H58	9/10/2007	B6-13	0.039	U	0.035	U	0.103	U
J15H59	9/10/2007	B6-15	0.052	U	0.05	U	0.13	U
J15H60	9/10/2007	B6-16	0.046	U	0.042	U	0.125	U

100-F-26_12 Pipe SZ

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD	Date 9-26-07 9/11/2007	Calc. No.	0100F-CA-V0299	Rev. No.	0
Project	100-F Remedial Action	Job No. 14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline Shallow Zone Variance Calculation				Sheet No.	2 of 2

1 Statistical Evaluation of Analytical Data
2
3 The required number of samples resulting from the calculation is highlighted at the bottom of the page.
4 Each value is reflective of the specific analyte evaluated.
5 The highest value of the three evaluations is used to determine the required number of samples as compared
6 against the default of four.
7 Sample locations are from Calculation 0100F-CA-V0308.
8 Mean, Standard Deviation, *t*, and Number of Samples formulas are from DOE/RL-96-22, Appendix A.
10
11 Decision Unit: 100-F-26:12 Pipeline Shallow Zone Variance Calculation
12 Samples values from GEA analysis
13 Sample Areas , A1 thru B8

			Constituent					
14 **Sample #**	**Sample Date**	**Location**	**Cobalt-60**	Q	**Cs-137**	Q	**Europium-152**	Q
15			pCi/g		pCi/g		pCi/g	
16 **Look-up Value (HT) ==========>**			**1.4**		**6.2**		**3.3**	
53 **J15H61**	9/10/2007	B7-1	0.043	U	0.097		0.114	U
54 **J15H62**	9/10/2007	B7-3	0.033	U	0.032	U	0.099	U
55 **J15H63**	9/10/2007	B7-4	0.041	U	0.043	U	0.103	U
56 **J15H64**	9/10/2007	B7-5	0.029	U	0.055		0.076	U
57 **J15H65**	9/10/2007	B7-8	0.025	U	0.024	U	0.061	U
58 **J15H66**	9/10/2007	B7-11	0.023	U	0.021	U	0.064	U
59 **J15H67**	9/10/2007	B8-2	0.075	U	0.695		0.878	
60 **J15H68**	9/10/2007	B8-3	0.043	U	0.043	U	0.123	U
61 **J15H69**	9/10/2007	B8-4	0.04	U	0.033	U	0.085	U
62 **J15H70**	9/10/2007	B8-8	0.03	U	0.032	U	0.098	U
63 **J15H71**	9/10/2007	B8-12	0.058	U	0.059	U	0.142	U
64 **J15H72**	9/10/2007	B8-13	0.049	U	0.046	U	0.115	U
65 Mean (LV) ==========>			0.04		0.06		0.12	
66 Standard Deviation (S) ==========>			0.02		0.10		0.12	
67 α (5%) ==========>			1.645		1.645		1.645	
68 β (20%) ==========>			0.842		0.842		0.842	
69 **Number of Samples ==========>**			**1**		**1**		**1**	
70								

100-F-26_12 Pipe SZ

CALCULATION COVER SHEET

Project Title 100 F Area Remedial Action **Job No.** 14655

Area 100 F

Discipline Environmental ***Calc. No.** 0100F-CA-V0300

Subject **100-F-26:12 Pipeline BCL Soil Variance Calculation**

Computer Program MS Excel **Program No.** Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These calculations 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	4	J. R. DeBuigne JRDeBuigne 9-25-07	R.T. Coffman RTCoffman 9/25/07	N/A	S.W. Callison SW Callison	9-25-07

SUMMARY OF REVISION

WCH-DE-018 (04/14/2006) *Obtain Calc. No. from R&DC and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD	Date 9-26-07	9/11/2007	Calc. No.	0100F-CA-V0300	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline BCL Soil Variance Calculation					Sheet No.	1 of 2

Conclusion:

The required number of samples calculated (1sample) for each decision sub-unit is less than the default number (4 samples) specified in the DOE/RL-96-22, Rev 4. Therefore, the default number of samples will be collected from each BCL Soil decision sub-unit.

Problem:

Calculate the number of close out samples required for 100-F-26:12 Pipeline BCL Soil Decision Unit verification sampling as required in "100 Area Remedial Action Sampling and Analysis Plan" (DOE/RL-96-22, Rev 4) and "Instruction Guide for the Remediation of 100 Areas Waste Sites" (0100X-IG-G0001, Rev 5).

Given:

1) Sample locations for the 100-F-26:12 Pipeline BCL Soil Decision Unit are identified on the 100-F-26:12 Shallow Zone and Stockpiling Soil, Soil Debris (BCL) Sampling Plan, Calculation number 0100F-CA-V0308, Rev. 0.
2) Lookup values from DOE/RL-96-22, Rev 4.
3) Sample Design requirements from DOE/RL-96-22, Rev 4 and 0100X-IG-G0001, Rev 5.
4) Field sampling information from sampling logbook EFL-1174-3.

Solution:

Calculation methodology is described in Appendix A of DOE/RL-96-22, Rev 4. Data from attached worksheets are used to calculate the required number of closeout samples. Variance calculation is based on the same three isotopes used to develop the statistical approach in DOE/RL-96-22, Rev 4. The statistical design is based on the premise that these isotopes are the predominant components of the contamination and are representative of the contamination distribution.

Sheet No.	Contents	Topic
1	Calc. Summary	Summary of Calc Brief
2	BCL Soil	Required Number of Samples Calculation

Calc. Summary

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD 9-26-07	Date	9/11/2007	Calc. No.	0100F-CA-V0300	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline BCL Soil Variance Calculation					Sheet No.	2 of 2

Statistical Evaluation of Analytical Data

The required number of samples resulting from the calculation is highlighted at the bottom of the page.
Each value is reflective of the specific analyte evaluated.
The highest value of the three evaluations is used to determine the required number of samples as compared against the default of four.
Sample locations are from Calculation 0100F-CA-V0308.
Mean, Standard Deviation, *t*, and Number of Samples formulas are from DOE/RL-96-22, Appendix A.

Decision Unit: 100-F-26:12 Pipeline BCL Soil Variance Calculation
Samples values from GEA analysis
Sample Areas . A1 thru C2

			Constituent					
Sample #	**Sample Date**	**Location**	**Cobalt-60**	Q	**Cs-137**	Q	**Europium-152**	Q
			pCi/g		pCi/g		pCi/g	
Look-up Value (HT) ==========>			**1.4**		**6.2**		**3.3**	
J15FL5	8/22/2007	O-A1-2	0.029	U	0.023	U	0.068	U
J15FL6	8/22/2007	O-A1-3	0.038	U	0.033	U	0.096	U
J15FL7	8/22/2007	O-A1-4	0.036	U	0.034	U	0.093	U
J15FL8	8/22/2007	O-A1-10	0.056	U	0.055	U	0.124	U
J15FL9	8/22/2007	O-A1-13	0.049	U	0.046	U	0.121	U
J15FM0	8/22/2007	O-A1-16	0.034	U	0.033	U	0.1	U
J15FM1	8/22/2007	O-A2-3	0.073	U	0.069	U	0.148	U
J15FM2	8/22/2007	O-A2-6	0.057	U	0.058	U	0.144	U
J15FM3	8/22/2007	O-A2-7	0.04	U	0.043	U	0.11	U
J15FM4	8/22/2007	O-A2-10	0.036	U	0.035	U	0.106	U
J15FM5	8/22/2007	O-A2-14	0.06	U	0.054	U	0.136	U
J15FM6	8/22/2007	O-A2-15	0.053	U	0.051	U	0.126	U
J15FM7	8/22/2007	O-A3-1	0.04	U	0.034	U	0.1	U
J15FM8	8/22/2007	O-A3-2	0.035	U	0.04	U	0.094	U
J15FM9	8/22/2007	O-A3-4	0.058	U	0.057	U	0.13	U
J15FN0	8/22/2007	O-A3-5	0.058	U	0.049	U	0.126	U
J15FN1	8/22/2007	O-A3-9	0.045	U	0.038	U	0.104	U
J15FN2	8/22/2007	O-A3-11	0.036	U	0.039	U	0.123	U
J15FN3	8/22/2007	O-A4-3	0.051	U	0.046	U	0.123	U
J15FN4	8/22/2007	O-A4-4	0.042	U	0.041	U	0.102	U
J15FN5	8/22/2007	O-A4-7	0.031	U	0.03	U	0.082	U
J15FN6	8/22/2007	O-A4-9	0.024	U	0.028	U	0.073	U
J15FN7	8/22/2007	O-A4-12	0.054	U	0.054	U	0.124	U
J15FN8	8/22/2007	O-A4-13	0.049	U	0.047	U	0.177	U
J15FN9	8/27/2007	O-B5-1	0.045	U	0.041	U	0.105	U
J15FP0	8/27/2007	O-B5-2	0.042	U	0.038	U	0.105	U
J15FP1	8/27/2007	O-B5-5	0.034	U	0.032	U	0.088	U
J15FP2	8/27/2007	O-B5-7	0.03	U	0.033	U	0.104	U
J15FP3	8/27/2007	O-B5-13	0.062	U	0.053	U	0.139	U
J15FP4	8/27/2007	O-B5-15	0.05	U	0.048	U	0.123	U
J15FP5	8/27/2007	O-B6-1	0.036	U	0.038	U	0.112	U
J15FP6	8/27/2007	O-B6-10	0.056	U	0.057	U	0.136	U
J15FP7	8/27/2007	O-B6-12	0.036	U	0.037	U	0.107	U
J15FP8	8/27/2007	O-B6-13	0.041	U	0.037	U	0.099	U
J15FP9	8/27/2007	O-B6-15	0.031	U	0.029	U	0.085	U
J15FR0	8/27/2007	O-B6-16	0.058	U	0.049	U	0.12	U
J15FR1	8/27/2007	O-B7-1	0.037	U	0.037	U	0.101	U
J15FR2	8/27/2007	O-B7-3	0.043	U	0.042	U	0.114	U
J15FR3	8/27/2007	O-B7-4	0.038	U	0.032	U	0.09	U
J15FR4	8/27/2007	O-B7-5	0.055	U	0.049	U	0.118	U
J15FR5	8/27/2007	O-B7-8	0.039	U	0.037	U	0.106	U
J15FR6	8/27/2007	O-B7-11	0.035	U	0.035	U	0.089	U

100-F-26_12 Pipe BCL Soil

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD 9-26-07	Date	9/11/2007	Calc. No.	0100F-CA-V0300	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline BCL Soil Variance Calculation					Sheet No.	2 of 2

Statistical Evaluation of Analytical Data

The required number of samples resulting from the calculation is highlighted at the bottom of the page.
Each value is reflective of the specific analyte evaluated.
The highest value of the three evaluations is used to determine the required number of samples as compared against the default of four.
Sample locations are from Calculation 0100F-CA-V0308.
Mean, Standard Deviation, *t*, and Number of Samples formulas are from DOE/RL-96-22, Appendix A.

Decision Unit: 100-F-26:12 Pipeline BCL Soil Variance Calculation
Samples values from GEA analysis
Sample Areas . A1 thru C2

			Constituent					
Sample #	**Sample Date**	**Location**	**Cobalt-60**	**Q**	**Cs-137**	**Q**	**Europium-152**	**Q**
			pCi/g		pCi/g		pCi/g	
Look-up Value (HT) ==========>			**1.4**		**6.2**		**3.3**	
J15FR7	8/27/2007	O-B8-2	0.03	U	0.031	U	0.083	U
J15FR8	8/27/2007	O-B8-3	0.068	U	0.058	U	0.145	U
J15FR9	8/27/2007	O-B8-4	0.058	U	0.053	U	0.138	U
J15FT0	8/27/2007	O-B8-8	0.042	U	0.043	U	0.11	U
J15FT1	8/27/2007	O-B8-12	0.042	U	0.037	U	0.109	U
J15FT2	8/27/2007	O-B8-13	0.082	U	0.046	U	0.164	U
J15FT3	8/28/2007	O-C9-3	0.047	U	0.041	U	0.12	U
J15FT4	8/28/2007	O-C9-4	0.038	U	0.04	U	0.122	U
J15FT5	8/28/2007	O-C9-5	0.043	U	0.049	U	0.129	U
J15FT6	8/28/2007	O-C9-10	0.043	U	0.045	U	0.113	U
J15FT7	8/28/2007	O-C9-14	0.037	U	0.062	U	0.111	U
J15FT8	8/28/2007	O-C9-16	0.063	U	0.056	U	0.155	U
J15FT9	8/28/2007	O-C10-3	0.066	U	0.058	U	0.168	U
J15FV0	8/28/2007	O-C10-4	0.056	U	0.111	U	0.208	U
J15FV1	8/28/2007	O-C10-8	0.037	U	0.038	U	0.105	U
J15FV2	8/28/2007	O-C10-10	0.038	U	0.036	U	0.105	U
J15FV3	8/28/2007	O-C10-14	0.064	U	0.059	U	0.173	U
J15FV4	8/28/2007	O-C10-16	0.047	U	0.05	U	0.125	U
J15FV5	8/28/2007	O-C1-2	0.041	U	0.042	U	0.101	U
J15FV6	8/28/2007	O-C1-3	0.036	U	0.072	U	0.122	U
J15FV7	8/28/2007	O-C1-4	0.06	U	0.065	U	0.176	U
J15FV8	8/28/2007	O-C1-10	0.049	U	0.115	U	0.126	U
J15FV9	8/28/2007	O-C1-13	0.045	U	0.042	U	0.097	U
J15FW0	8/28/2007	O-C1-16	0.03	U	0.034	U	0.089	U
J15FW1	8/28/2007	O-C2-3	0.066	U	0.048	U	0.157	U
J15FW2	8/28/2007	O-C2-6	0.08		0.436		1.75	
J15FW3	8/28/2007	O-C2-7	0.044	U	0.07		0.108	U
J15FW4	8/28/2007	O-C2-10	0.03	U	0.037	U	0.093	U
J15FW5	8/28/2007	O-C2-14	0.06	U	0.059	U	0.149	U
J15FW6	8/28/2007	O-C2-15	0.049	U	0.047	U	0.118	U
Mean (LV) ==========>			0.05		0.05		0.14	
Standard Deviation (S) ==========>			0.01		0.05		0.19	
α (5%) ==========>			1.645		1.645		1.645	
β (20%) ==========>			0.842		0.842		0.842	
Number of Samples ==========>			**1**		**1**		**1**	

100-F-26_12 Pipe BCL Soil

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-F-26:12 Pipeline Sample Design **Job No. 14655**

Area: 100-F

Discipline: Environmental Engineering *Calculation No: 0100F-CA-V0308

Subject: Shallow Zone and Stockpile (BCL) Soil, Soil/Debris Sampling Plan

Computer Program: Excel, Autodesk World, and Autodesk Land Map Program No: Excel 2003, World R2, and Land Map 2004

The attached calculations have been generated to document compliance with established cleanup levels. These calculations 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	Total = 8 Shts	G. Cruz 9-27-07	C.A. Bentz 9/27/07	N/A	S.W. Callison	10-2-07

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007) *Obtain Calc. No. from Document Control and Form from Intranet

Washington Closure Hanford **CALCULATION SHEET**

Originator	**G. Cruz**	**Date**	**9/27/2007**	**Calc. No.**	**0100F-CA-V0308**	**Rev. No.**	**0**
Project	**100-F-26:12 Pipeline Sample Design**			**Job No.**	**14655**	**Checked**	**Date 9/27/07**
Subject	**Shallow Zone and Stockpile (BCL) Soil, Soil/Debris Sampling Plan**					**Sheet No.**	**1 of 2**

Problem: Calculate and display required sampling nodes in concurrence with 100 Area SAP DOE/RL-96-22 Rev. 4 for verification and closure.

Given:
-SAP (DOE/RL-96-22 Rev. 4) and IG (0100X-IG-G0001 Rev. 5) requirements
-Shallow Sampling Area (Surface area of each zone determined from Autodesk Land Map program, Attachment 3, Sht 1 of 3, CAD file 1F:092807A, 100-F-26:12 Pipeline Shallow Zone Sampling Plan)
-Stockpile Sampling Area (Surface area of each zone determined from Autodesk Land Map program, Attachment 3, Sht 2 of 3, CAD file 1F:092807B, 100-F-26:12 Pipeline Stockpile (BCL) Soil Sampling Plan)
-Stockpile Sampling Area (Surface area of each zone determined from Autodesk Land Map program, Attachment 3, Sht 3 of 3, CAD file 1F:092607C, 118-F-8:4 Fuel Storage Basin Overburden Sampling Plan)

Sample Design Approach

Shallow Zone
-Develop a 16 node sampling grid for the sampling area
-Use appendix A of the IG to determine which six of the sixteen will be sampled to collect variance and clean up verification samples

Overburden:
-Develop a 16 node sampling grid for the sampling area
-Use appendix A of the IG to determine which six of the sixteen will be sampled to collect variance and clean up verification samples

Deep Zone:
-Develop a 16 node sampling grid for the sampling area
-Use appendix A of the IG to determine which four of the sixteen will be sampled to collect variance/verification samples

Determination of Shallow Zone Sampling Grid:

Shallow Zone Sampling Grid Area determined from Table 5-1, IG Attachment 2, Number of Decision Subunits Based on Area (Converted to Sq Meters)

Total Area:	9209.02	m^2
Area of Decision Subunits (total area 2 subunits)	4604.51	m^2
Decision Subunit divided into 4 Sampling Areas:	1151.13	m^2
Sampling Areas divided into a 16 node grid (node numbers 1-16):	71.95	m^2

Nodes to be Sampled (as determined from Attachment 1, Table A-1, Sample Grid Point Lookup Table)
See Attachment 3, Sht 1 of 3, 100-F-26:12 Pipeline Shallow Zone Sampling Plan, for Sample Location Table

Washington Closure Hanford **CALCULATION SHEET**

Originator	**G. Cruz**	**Date**	**9/27/2007**	**Calc. No.**	**0100F-CA-V0308**	**Rev. No.**	**0**
Project	**100-F-26:12 Pipeline Sample Design**			**Job No.**	**14655**	**Checked**	CAB **Date** 9/27/07
Subject	**Shallow Zone and Stockpile (BCL) Soil, Soil/Debris Sampling Plan**					**Sheet No.**	**2 of 2**

Determination of Stockpile Sampling Grid:

Stockpile Sampling Grid Area determined from Table 5-1, IG
Attachment 2, Number of Decision Subunits Based on Area (Converted to Sq Meters)

Total Area:	12868.40	m^2
Area of Decision Subunits (total area 3 subunits)	4289.47	m^2
Decision Subunits divided into 4 Sampling Areas:	1072.37	m^2
Sampling Areas divided into a 16 node grid (node numbers 1-16):	67.02	m^2

Nodes to be Sampled (as determined from Attachment 1, Table A-1, Sample Grid Point Lookup Table)
See Attachment 3, Sht 2 of 3, 100-F-26:12 Pipeline Stockpile (BCL) Soil Sampling Plan,
for Sample Location Table

Determination of Stockpile Sampling Grid:

Stockpile Sampling Grid Area determined from Table 5-1, IG
Attachment 2, Number of Decision Subunits Based on Area (Converted to Sq Meters)

Total Area:	2280.77	m^2
Area of Decision Subunits (total area 2 subunits)	1140.39	m^2
Decision Subunits divided into 4 Sampling Areas:	285.10	m^2
Sampling Areas divided into a 16 node grid (node numbers 1-16):	17.82	m^2

Nodes to be Sampled (as determined from Attachment 1, Table A-1, Sample Grid Point Lookup Table)
See Attachment 3, Sht 3 of 3, 100-F-26:12 Pipeline Stockpile (BCL) Soil/Debris Sampling Plan,
for Sample Location Table

Washington Closure Hanford

Originator	G. Cruz	**Date**	9/27/2007	**Calc. No.**	0100F-CA-V0308	**Rev. No.**	0
Project	100-F-26:12 Pipeline Sample Design			**Job No.**	14655	**Checked**	CAB **Date** 9/27/07
Subject	Shallow Zone and Stockpile (BCL) Soil, Soil/Debris Sampling Plan					**Sheet No**	1 of 1

ATTACHMENT 1

Sample Grid Point Lookup Table.

Default Plan	Sampling Area 1	Sampling Area 2	Sampling Area 3	Sampling Area 4	Sampling Area 5	Sampling Area 6	Sampling Area 7	Sampling Area 8	Sampling Area 9	Sampling Area 10
Variance/Verification	3	6	1	4	5	1	3	3	4	16
Variance/Verification	4	7	11	3	15	15	5	13	10	10
Variance/Verification	16	3	2	7	7	10	11	4	3	14
Variance/Verification	10	15	4	12	1	13	4	8	16	4
Variance	2	14	5	9	13	12	8	2	14	8
Variance	13	10	9	13	2	16	1	12	5	3
Not Sampling	6	1	10	8	14	4	16	5	8	6
Not Sampling	1	9	13	1	10	5	12	1	1	15
Not Sampling	9	12	7	5	6	2	6	7	15	9
Not Sampling	15	16	15	14	16	6	2	15	11	1
Not Sampling	8	13	8	10	12	11	13	14	2	12
Not Sampling	5	2	3	11	4	3	9	10	7	11
Not Sampling	7	11	14	15	11	14	14	6	13	2
Not Sampling	11	4	6	2	9	7	7	11	9	7
Not Sampling	12	8	16	16	3	6	15	9	6	13
Not Sampling	14	5	12	6	8	9	10	16	12	5

** **Note:** Grid nodes for each sampling area in each waste site should be numbered consistently, e.g., begin numbering the nodes in the northwestern-most node, then number consecutively left to right.

Washington Closure Hanford

Originator	**G. Cruz**	**Date**	**9/27/2007**	**Calc. No.**	**0100F-CA-V0308**	**Rev. No.**	**0**
Project	**100-F-26:12 Pipeline Sample Design**			**Job No.**	**14655**	**Checked**	QB **Date** 9/27/07
Subject	**Shallow Zone and Stockpile (BCL) Soil, Soil/Debris Sampling Plan**					**Sheet No.**	**1 of 1**

ATTACHMENT 2

Number of Decision Subunits Based on Area.

Area of Primary Decision Unit (m2)	Number of Subunits
<1,394	1
>1,394 to <2,326	2
>2,326 to <3,256	3
>3,256 to <4,186	4
>4,186 to <9,303	2
>9,303 to <13,024	3
>13,024 to <16,745	4
>16,745 to <20,466	5
>20,466	ROUNDa (Area/3,720)
a ROUND is an integer rounding function.	

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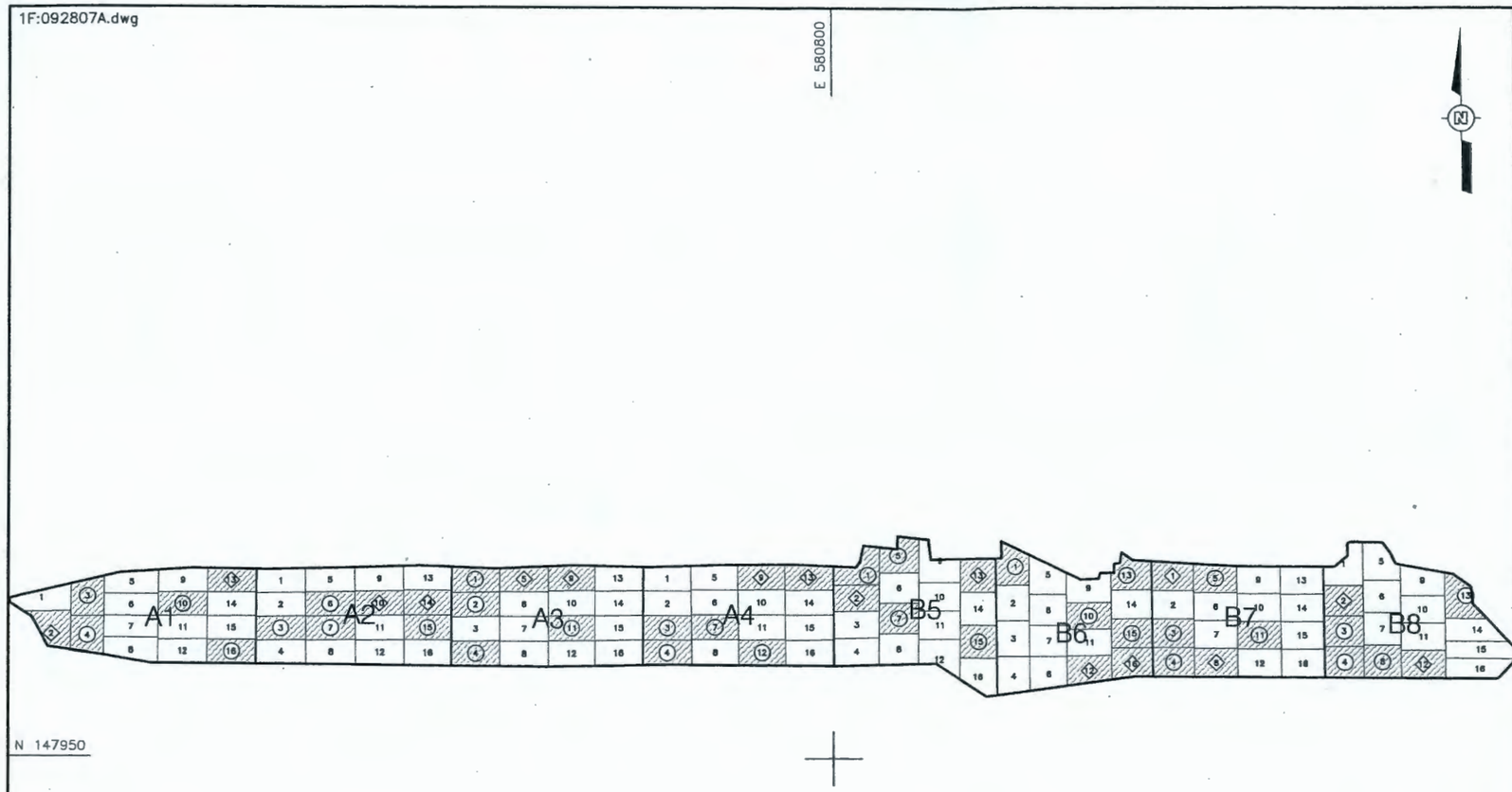

NOTES

1. SHALLOW ZONE NODE AREAS ARE APPROXIMATELY 71.95 SQUARE METERS.
2. SAMPLES ARE TAKEN FROM THE APPROXIMATE CENTER SQUARE METERS.
3. THE SHALLOW ZONE CONSISTS OF SAMPLING AREAS A1, A2, A3 AND A4 WITHIN DECISION SUBUNIT 1. SAMPLING AREAS B5, B6, B7, AND B8 WITHIN DECISION SUBUNIT 2.

LEGEND

VARIANCE AND VERIFICATION SAMPLING NODE

VARIANCE SAMPLING NODE

SAMPLE LOCATION TABLE

DECISION SUBUNIT	SAMPLING AREA	SAMPLE NODE	NORTHING	EASTING
1	A1	S-A1-2	147980.34	580608.90
		S-A1-3	147989.74	580617.64
		S-A1-4	147980.00	580617.58
		S-A1-10	147987.87	580641.01
		S-A1-13	147993.84	580653.19
		S-A1-16	147976.12	580653.20
	A2	S-A2-3	147981.87	580665.39
		S-A2-6	147988.00	580677.48
		S-A2-7	147982.01	580677.52
		S-A2-10	147988.23	580689.37
		S-A2-14	147988.44	580701.08
		S-A2-15	147982.25	580701.09
	A3	S-A3-1	147994.29	580712.70
		S-A3-2	147988.04	580712.81
		S-A3-4	147975.93	580712.85
		S-A3-5	147994.39	580724.56
		S-A3-9	147994.62	580736.08
		S-A3-11	147982.19	580736.17
	A4	S-A4-3	147982.32	580759.55
		S-A4-4	147976.22	580759.52
		S-A4-7	147982.54	580771.25
		S-A4-9	147994.98	580782.68
		S-A4-12	147976.31	580782.91
		S-A4-13	147995.01	580794.07
2	B5	S-B5-1	147995.60	580808.21
		S-B5-2	147989.86	580805.52
		S-B5-5	148000.44	580815.50
		S-B5-7	147984.80	580815.66
		S-B5-13	147995.53	580835.00
		S-B5-15	147979.03	580835.03
	B6	S-B6-1	147997.67	580844.01
		S-B6-10	147985.42	580862.27
		S-B6-12	147971.93	580862.34
		S-B6-13	147995.53	580871.58
		S-B6-15	147981.07	580872.75
		S-B6-16	147973.63	580872.80
	B7	S-B7-1	147995.38	580882.71
		S-B7-3	147981.10	580882.82
		S-B7-4	147973.99	580882.87
		S-B7-5	147994.81	580893.00
		S-B7-8	147973.87	580893.13
		S-B7-11	147980.62	580903.52
	B8	S-B8-2	147989.20	580923.93
		S-B8-3	147981.62	580923.99
		S-B8-4	147973.96	580924.09
		S-B8-8	147974.15	580933.24
		S-B8-12	147973.48	580943.01
		S-B8-13	147990.48	580953.27

Attachment 3 Sheet No. 1 of 3
Originator G. CRUZ Date 9-27-07
Chk'd By CAB Date 9/27/07
Calc. No. 0100F-CA-V0308 Rev No. 0

SCALE 1:1250
12.5 0 12.5 25 50 meters

U.S DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVIER CORRIDOR CLOSURE CONTRACT

ATTACHMENT 3

100-F AREA
100-F-26:12 PIPELINE
SHALLOW ZONE SAMPLING PLAN

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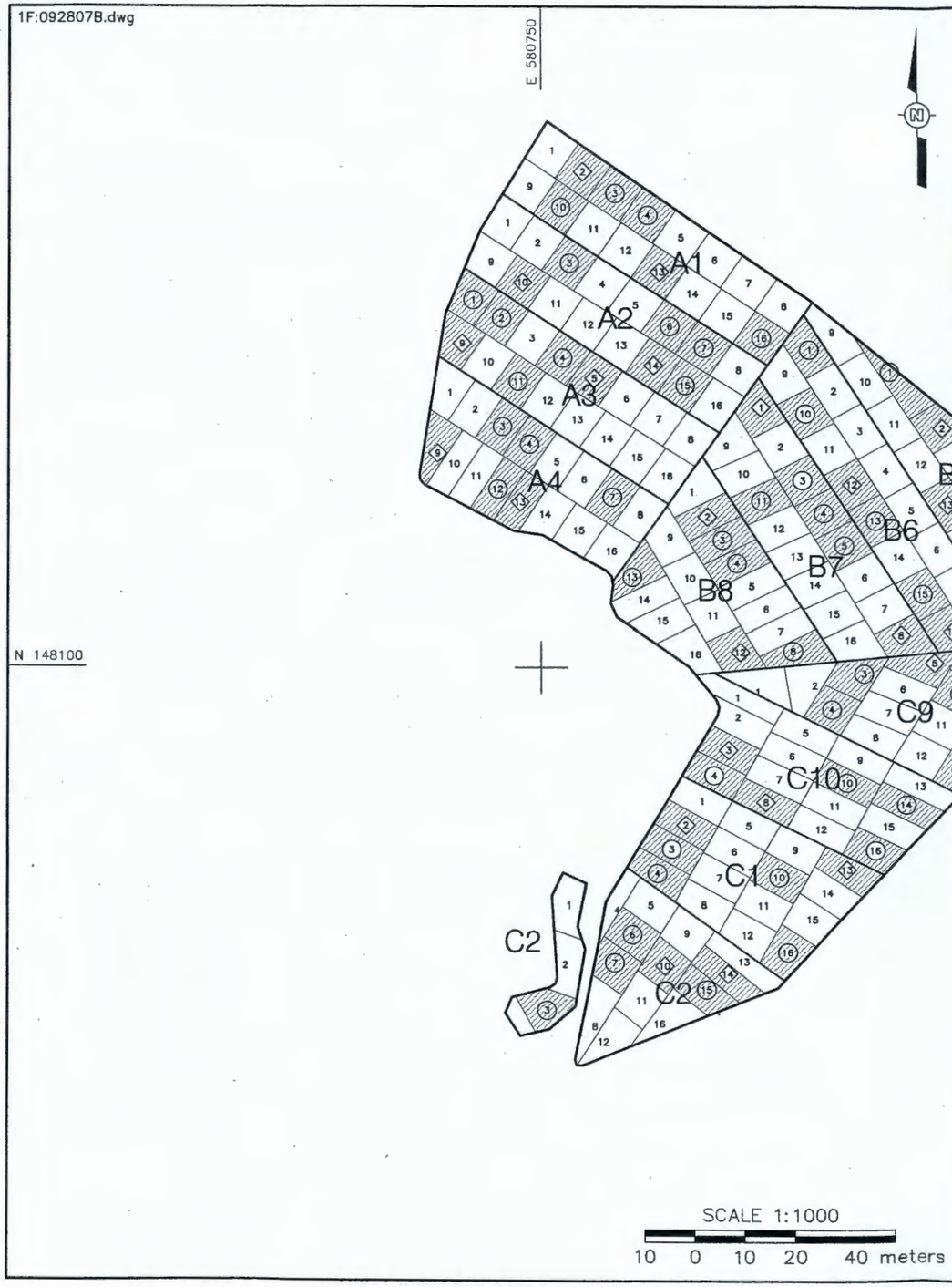

NOTES

1. STOCKPILE NODE AREAS ARE APPROXIMATELY 67.02 SQUARE METERS.
2. SAMPLES ARE TAKEN FROM THE APPROXIMATE CENTER SQUARE METERS.
3. THE STOCKPILE CONSISTS OF SAMPLING AREAS A1, A2, A3 AND A4 WITHIN DECISION SUBUNIT 1. SAMPLING AREAS B5, B6, B7, AND B8 WITHIN DECISION SUBUNIT 2. SAMPLING AREAS C9, C10, C1, AND C2 WITHIN DECISION SUBUNIT 3.

LEGEND

VARIANCE AND VERIFICATION SAMPLING NODE

VARIANCE SAMPLING NODE

SAMPLE LOCATION TABLE

DECISION SUBUNIT	SAMPLING AREA	SAMPLE NODE	NORTHING	EASTING
1	A1	O-A1-2	148202.15	580758.55
		O-A1-3	148197.73	580765.05
		O-A1-4	148193.26	580771.64
		O-A1-10	148194.83	580754.08
		O-A1-13	148181.69	580773.95
		O-A1-16	148168.12	580794.48
	A2	O-A2-3	148183.43	580755.85
		O-A2-6	148170.51	580775.98
		O-A2-7	148166.08	580782.88
		O-A2-10	148179.50	580746.22
		O-A2-14	148162.47	580772.72
		O-A2-15	148158.35	580779.12
	A3	O-A3-1	148175.87	580736.02
		O-A3-2	148172.10	580741.84
		O-A3-4	148163.94	580754.46
		O-A3-5	148159.81	580760.84
		O-A3-9	148166.92	580733.81
		O-A3-11	148159.11	580745.27
	A4	O-A4-3	148149.74	580742.02
		O-A4-4	148146.11	580747.60
		O-A4-7	148135.18	580764.42
		O-A4-9	148144.21	580728.85
		O-A4-12	148136.80	580741.11
		O-A4-13	148134.09	580745.72
2	B5	O-B5-1	148161.25	580820.12
		O-B5-2	148149.61	580830.77
		O-B5-5	148135.40	580843.05
		O-B5-7	148128.54	580847.76
		O-B5-13	148133.68	580831.94
		O-B5-15	148117.70	580842.32
	B6	O-B6-1	148165.74	580803.92
		O-B6-10	148152.56	580803.19
		O-B6-12	148137.81	580812.50
		O-B6-13	148130.34	580817.20
		O-B6-15	148115.23	580826.74
		O-B6-16	148107.55	580832.85
	B7	O-B7-1	148153.87	580794.30
		O-B7-3	148138.72	580802.57
		O-B7-4	148131.88	580806.80
		O-B7-5	148125.19	580810.94
		O-B7-8	148106.78	580822.35
		O-B7-11	148134.46	580794.35
	B8	O-B8-2	148131.16	580783.56
		O-B8-3	148126.31	580786.55
		O-B8-4	148121.52	580789.51
		O-B8-8	148103.50	580800.66
		O-B8-12	148103.27	580790.17
		O-B8-13	148118.61	580768.41
3	C9	O-C9-3	148098.86	580814.83
		O-C9-4	148091.46	580808.37
		O-C9-5	148101.09	580829.10
		O-C9-10	148094.76	580834.21
		O-C9-14	148091.86	580842.63
		O-C9-16	148079.08	580834.49
	C10	O-C10-3	148083.09	580787.71
		O-C10-4	148077.83	580784.78
		O-C10-8	148072.27	580795.16
		O-C10-10	148076.32	580811.32
		O-C10-14	148071.75	580823.29
		O-C10-16	148062.27	580817.00
	C1	O-C1-2	148067.54	580779.11
		O-C1-3	148062.51	580776.20
		O-C1-4	148057.47	580773.32
		O-C1-10	148056.73	580797.72
		O-C1-13	148058.27	580811.25
		O-C1-16	148041.22	580799.39
	C2	O-C2-3	148029.20	580751.04
		O-C2-6	148044.78	580768.27
		O-C2-7	148039.02	580764.72
		O-C2-10	148038.40	580774.76
		O-C2-14	148036.80	580787.45
		O-C2-15	148033.55	580783.18

Attachment 3 Sheet No. 2 of 3
Originator G. CRUZ Date 9-27-07
Chk'd By CAB Date 9/27/07
Calc. No. 0100F-CA-V0308 Rev No. 0

ATTACHMENT 3

U.S DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVIER CORRIDOR CLOSURE CONTRACT

100-F AREA
100-F-26:12 PIPELINE
STOCKPILE (BCL) SOIL SAMPLING PLAN

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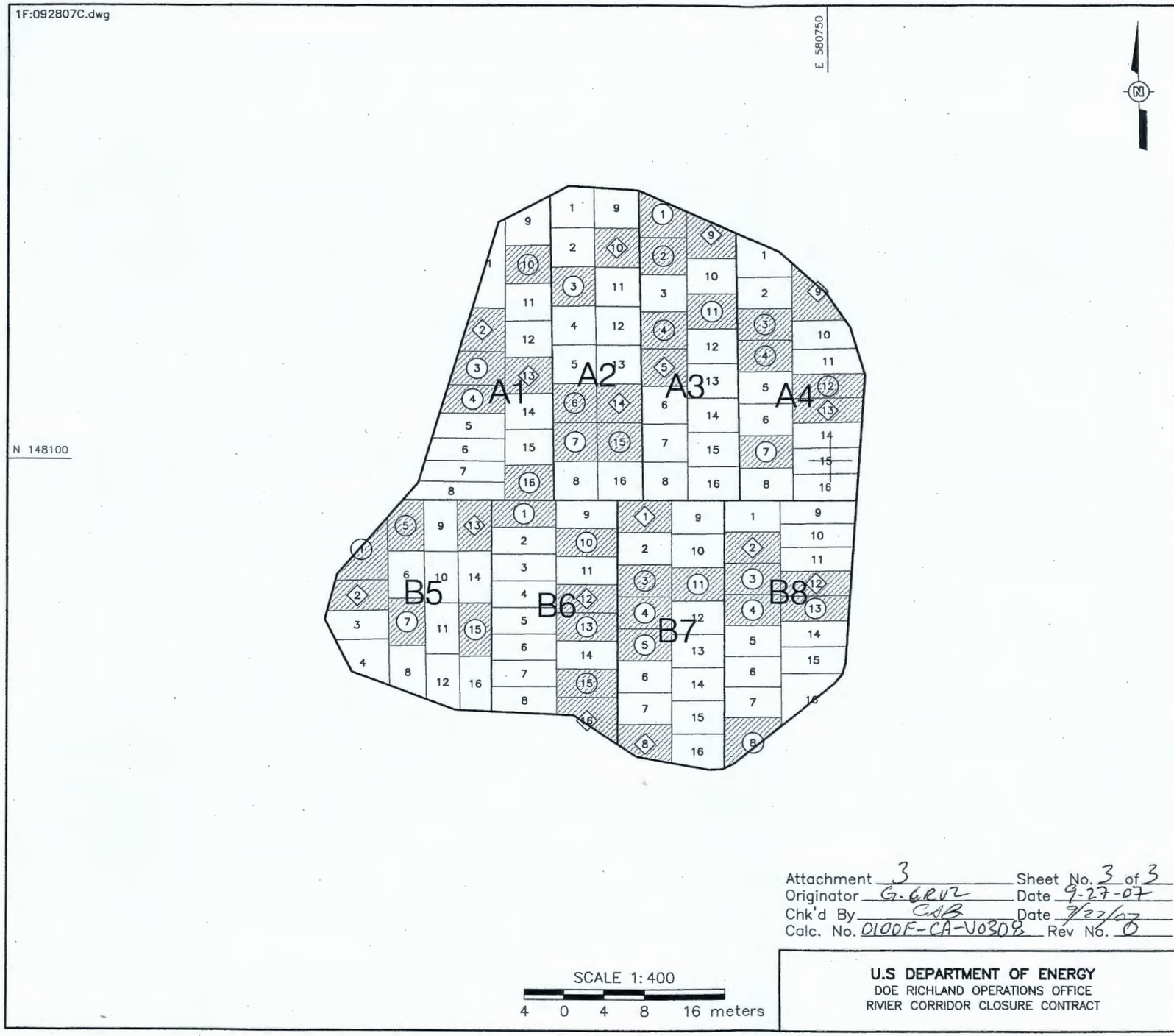

NOTES

1. STOCKPILE NODE AREAS ARE APPROXIMATELY 17.82 SQUARE METERS.
2. SAMPLES ARE TAKEN FROM THE APPROXIMATE CENTER SQUARE METERS.
3. THE STOCKPILE CONSISTS OF SAMPLING AREAS A1, A2, A3 AND A4 WITHIN DECISION SUBUNIT 1. SAMPLING AREAS B5, B6, B7, AND B8 WITHIN DECISION SUBUNIT 2.

LEGEND

VARIANCE AND VERIFICATION SAMPLING NODE

VARIANCE SAMPLING NODE

SAMPLE LOCATION TABLE

DECISION SUBUNIT	SAMPLING AREA	SAMPLE NODE	NORTHING	EASTING
1	A1	0-A1-2	148113.41	580715.14
		0-A1-3	148109.45	580714.61
		0-A1-4	148106.27	580714.16
		0-A1-10	148120.10	580719.78
		0-A1-13	148108.70	580719.80
		0-A1-16	148097.70	580719.83
	A2	0-A2-3	148117.88	580724.35
		0-A2-6	148105.88	580724.46
		0-A2-7	148101.89	580724.50
		0-A2-10	148121.83	580728.77
		0-A2-14	148105.87	580728.93
		0-A2-15	148101.88	580728.97
	A3	0-A3-1	148125.27	580733.33
		0-A3-2	148121.00	580733.39
		0-A3-4	148113.42	580733.42
		0-A3-5	148109.58	580733.44
		0-A3-9	148123.18	580738.17
		0-A3-11	148115.35	580738.21
	A4	0-A4-3	148114.05	580743.45
		0-A4-4	148110.79	580743.47
		0-A4-7	148100.90	580743.52
		0-A4-9	148117.42	580748.83
		0-A4-12	148107.67	580749.81
		0-A4-13	148105.18	580749.75
2	B5	0-B5-1	148090.81	580702.99
		0-B5-2	148086.10	580702.60
		0-B5-5	148093.24	580707.42
		0-B5-7	148083.39	580707.53
		0-B5-13	148093.29	580714.32
		0-B5-15	148082.60	580714.37
	B6	0-B6-1	148094.50	580719.28
		0-B6-10	148091.58	580725.61
		0-B6-12	148085.81	580725.60
		0-B6-13	148082.91	580725.59
		0-B6-15	148077.10	580725.58
		0-B6-16	148073.24	580725.57
	B7	0-B7-1	148094.23	580731.43
		0-B7-3	148087.65	580731.40
		0-B7-4	148084.36	580731.38
		0-B7-5	148081.07	580731.37
		0-B7-8	148070.86	580731.33
		0-B7-11	148087.31	580736.70
	B8	0-B8-2	148091.07	580742.10
		0-B8-3	148087.88	580742.09
		0-B8-4	148084.68	580742.09
		0-B8-8	148070.98	580742.05
		0-B8-12	148087.42	580748.47
		0-B8-13	148084.86	580748.38

Attachment 3 Sheet No. 3 of 3
Originator G. GRUZ Date 9-27-07
Chk'd By CAB Date 9/27/07
Calc. No. 0100F-CA-V0308 Rev No. 0

ATTACHMENT 3

U.S DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVIER CORRIDOR CLOSURE CONTRACT

100-F AREA
100-F-26:12 PIPELINE
STOCKPILE (BCL) SOIL/DEBRIS SAMPLING PLAN

CALCULATION COVER SHEET

Project Title 100 F Area Remedial Action **Job No.** 14655

Area 100 F

Discipline Environmental ***Calc. No.** 0100F-CA-V0310

Subject **100-F-26:12 Pipeline BCL Soil/Debris Variance Calculation**

Computer Program MS Excel **Program No.** Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These calculations 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	4	J. R. DeBuigne JRDeBuigne 9-25-07	R.T. Coffman RTCoffman 9/25/07	N/A	S.W. Callison SW Callison	9-25-07

SUMMARY OF REVISION

WCH-DE-018 (04/14/2006) *Obtain Calc. No. from R&DC and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD	Date	9/11/2007 1-26-08	Calc. No.	0100F-CA-V0310	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline BCL Soil/Debris Variance Calculation					Sheet No.	1 of 2

Conclusion:

The required number of samples calculated (1sample) for each decision sub-unit is less than the default number (4 samples) specified in the DOE/RL-96-22, Rev 4. Therefore, the default number of samples will be collected from each shallow zone decision sub-unit.

Problem:

Calculate the number of close out samples required for 100-F-26:12 Pipeline BCL Soil/Debris Decision Unit verification sampling as required in "100 Area Remedial Action Sampling and Analysis Plan" (DOE/RL-96-22, Rev 4) and "Instruction Guide for the Remediation of 100 Areas Waste Sites" (0100X-IG-G0001, Rev 5).

Given:

1) Sample locations for the 100-F-26:12 Pipeline BCL Soil/Debris Decision Unit are identified on the 100-F-26:12 Shallow Zone and Stockpiling Soil, Soil Debris (BCL) Sampling Plan, Calculation number 0100F-CA-V0308, Rev. 0.
2) Lookup values from DOE/RL-96-22, Rev 4.
3) Sample Design requirements from DOE/RL-96-22, Rev 4 and 0100X-IG-G0001, Rev 5.
4) Field sampling information from sampling logbook EFL-1174-3.

Solution:

Calculation methodology is described in Appendix A of DOE/RL-96-22, Rev 4. Data from attached worksheets are used to calculate the required number of closeout samples. Variance calculation is based on the same three isotopes used to develop the statistical approach in DOE/RL-96-22, Rev 4. The statistical design is based on the premise that these isotopes are the predominant components of the contamination and are representative of the contamination distribution.

Sheet No.	Contents	Topic
1	Calc. Summary	Summary of Calc Brief
2	BCL Soil Debris	Required Number of Samples Calculation

Calc. Summary

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD	Date 9-26-07 9/11/2007	Calc. No.	0100F-CA-V0310	Rev. No.	0
Project	100-F Remedial Action	Job No. 14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline BCL Soil/Debris Variance Calculation				Sheet No.	2 of 2

Statistical Evaluation of Analytical Data

The required number of samples resulting from the calculation is highlighted at the bottom of the page.
Each value is reflective of the specific analyte evaluated.
The highest value of the three evaluations is used to determine the required number of samples as compared against the default of four.
Sample locations are from Calculation 0100F-CA-V0308.
Mean, Standard Deviation, *t*, and Number of Samples formulas are from DOE/RL-96-22, Appendix A.

Decision Unit: 100-F-26:12 Pipeline BCL Soil/Debris Variance Calculation
Samples values from GEA analysis
Sample Areas , A1 thru B8

			Constituent					
Sample #	**Sample Date**	**Location**	**Cobalt-60**	Q	**Cs-137**	Q	**Europium-152**	Q
			pCi/g		pCi/g		pCi/g	
Look-up Value (HT) ==========>			**1.4**		**6.2**		**3.3**	
J15FW7	8/29/2007	A1-2	0.041	U	0.042	U	0.112	U
J15FW8	8/29/2007	A1-3	0.031	U	0.033	U	0.091	U
J15FW9	8/29/2007	A1-4	0.032	U	0.086		0.202	
J15FX0	8/29/2007	A1-10	0.042	U	0.038	U	0.102	U
J15FX1	8/29/2007	A1-13	0.035	U	0.033	U	0.084	U
J15FX2	8/29/2007	A1-16	0.031	U	0.033	U	0.091	U
J15FX3	8/29/2007	A2-3	0.042	U	0.043	U	0.113	U
J15FX4	8/29/2007	A2-6	0.038	U	0.092		0.114	U
J15FX5	8/29/2007	A2-7	0.031	U	0.033	U	0.084	U
J15FX6	8/29/2007	A2-10	0.067	U	0.06	U	0.162	U
J15FX7	8/29/2007	A2-14	0.052	U	0.051	U	0.126	U
J15FX8	8/29/2007	A2-15	0.051	U	0.248		0.294	
J15FX9	8/29/2007	A3-1	0.041	U	0.049		0.116	U
J15FY0	8/29/2007	A3-2	0.047	U	0.05	U	0.128	U
J15FY1	8/29/2007	A3-4	0.037	U	0.039	U	0.114	U
J15FY2	8/29/2007	A3-5	0.04	U	0.043	U	0.111	U
J15FY3	8/29/2007	A3-9	0.047	U	0.042	U	0.118	U
J15FY4	8/29/2007	A3-11	0.04	U	0.037	U	0.106	U
J15FY5	8/29/2007	A4-3	0.037	U	0.038	U	0.104	U
J15FY6	8/29/2007	A4-4	0.048	U	0.049	U	0.127	U
J15FY7	8/29/2007	A4-7	0.049	U	0.049		0.123	U
J15FY8	8/29/2007	A4-9	0.037	U	0.043	U	0.113	U
J15FY9	8/29/2007	A4-12	0.056	U	0.051	U	0.148	U
J15H00	8/29/2007	A4-13	0.046	U	0.044	U	0.119	U
J15H01	8/29/2007	B5-1	0.037	U	0.044	U	0.112	U
J15H02	8/29/2007	B5-2	0.072	U	0.058	U	0.175	U
J15H03	8/29/2007	B5-5	0.055	U	0.052	U	0.132	U
J15H04	8/29/2007	B5-7	0.042	U	0.044	U	0.115	U
J15H05	8/29/2007	B5-13	0.035	U	0.036	U	0.1	U
J15H06	8/29/2007	B5-15	0.064	U	0.059	U	0.157	U
J15H07	8/29/2007	B6-1	0.056	U	0.05	U	0.135	U
J15H08	8/29/2007	B6-10	0.042	U	0.043	U	0.117	U
J15H09	8/29/2007	B6-12	0.037	U	0.072	U	0.112	U
J15H10	8/29/2007	B6-13	0.065	U	0.058	U	0.158	U
J15H11	8/29/2007	B6-15	0.053	U	0.07	U	0.129	U
J15H12	8/29/2007	B6-16	0.045	U	0.047	U	0.108	U

100-F-26_12 BCL Soil Debris

CALCULATION SHEET

Washington Closure Hanford

Originator	J.R. DeBuigne JRD	Date 9/26-07 9/11/2007	Calc. No.	0100F-CA-V0310	Rev. No.	0
Project	100-F Remedial Action	Job No. 14655	Checked	R.T. Coffman RTC	Date	9/25/07
Subject	100-F-26:12 Pipeline BCL Soil/Debris Variance Calculation				Sheet No.	2 of 2

Statistical Evaluation of Analytical Data

The required number of samples resulting from the calculation is highlighted at the bottom of the page.
Each value is reflective of the specific analyte evaluated.
The highest value of the three evaluations is used to determine the required number of samples as compared against the default of four.
Sample locations are from Calculation 0100F-CA-V0308.
Mean, Standard Deviation, *t*, and Number of Samples formulas are from DOE/RL-96-22, Appendix A.

Decision Unit: 100-F-26:12 Pipeline BCL Soil/Debris Variance Calculation
Samples values from GEA analysis
Sample Areas , A1 thru B8

			Constituent					
Sample #	**Sample Date**	**Location**	**Cobalt-60**	Q	**Cs-137**	Q	**Europium-152**	Q
			pCi/g		pCi/g		pCi/g	
Look-up Value (HT) ==========>			**1.4**		**6.2**		**3.3**	
J15H13	8/29/2007	B7-1	0.033	U	0.034	U	0.092	U
J15H14	8/29/2007	B7-3	0.044	U	0.037	U	0.102	U
J15H15	8/29/2007	B7-4	0.029	U	0.089	U	0.109	U
J15H16	8/29/2007	B7-5	0.03	U	0.03	U	0.075	U
J15H17	8/29/2007	B7-8	0.021	U	0.023	U	0.063	U
J15H18	8/29/2007	B7-11	0.043	U	0.04	U	0.112	U
J15H19	8/29/2007	B8-2	0.032	U	0.034	U	0.092	U
J15H20	8/29/2007	B8-3	0.029	U	0.029	U	0.07	U
J15H21	8/29/2007	B8-4	0.019	U	0.023	U	0.058	U
J15H22	8/29/2007	B8-8	0.042	U	0.038	U	0.105	U
J15H23	8/29/2007	B8-12	0.032	U	0.033	U	0.086	U
J15H24	8/29/2007	B8-13	0.051	U	0.049	U	0.131	U
Mean (LV) ==========>			0.04		0.05		0.12	
Standard Deviation (S) ==========>			0.01		0.03		0.04	
α (5%) ==========>			1.645		1.645		1.645	
β (20%) ==========>			0.842		0.842		0.842	
Number of Samples ==========>			**1**		**1**		**1**	

100-F-26_12 BCL Soil Debris

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CALCULATION COVER SHEET

Project Title: 100-F Field Remediation **Job No. 14655**

Area: 100-F

Discipline: Environmental *Calculation No: 0100F-CA-V0317

Subject: 100-F-26:12 Pipelines Cleanup Verification 95% UCL Calculation

Computer Program: Excel Program No: Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These calculations 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	Total = 30	L. D. Habel	J. M. Capron	N/A	S. W. Callison	11-13-07

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007) *Obtain Calc. No. from Document Control and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel	**Date** 11/08/07	**Calc. No.** 0100F-CA-V0317	**Rev. No.** 0
Project 100-F Field Remediation	**Job No.** 14655	**Checked** J. M. Capron	**Date** 11/08/07
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation			**Sheet No.** 1 of 22

Summary

Purpose:

Calculate the 95% upper confidence limit (UCL) values to evaluate compliance with cleanup standards for the shallow zone excavation of the subject site. Also, perform the Washington Administrative Code (WAC) 173-340-740(7)(e) 3-part test for nonradionuclide contaminants of concern (COCs) and contaminants of potential concern (COPCs) and calculate the relative percent difference (RPD) for primary-duplicate sample pairs, as necessary.

Table of Contents:

Sheets 1 to 4 - Summary
Sheets 5 to 6 - Excavation Shallow Zone Statistical Calculations
Sheets 7 to 9 - Overburden Statistical Calculations
Sheets 10 to 12 - BCL Material Statistical Calculations
Sheet 13 to 16 - Ecology Software (MTCAStat) Results (Overburden/BCL Material)
Sheets 17 to 22 - Split/Duplicate Analysis
Attachment 1 - Verification Sampling Results (7 sheets)

Given/References:

1) Sample Results (Attachment 1).
2) Background values and remedial action goals (RAGs) are from DOE-RL (1996), DOE-RL (2001), DOE-RL (2005b) and Ecology (2005).
3) DOE-RL, 1996, Hanford Site Background: Part 2, Soil Background for Radionuclides DOE/RL-96-12, Rev 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) DOE-RL, 2001, Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes, DOE/RL-92-24, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
5) DOE-RL, 2005a, 100 Area Remedial Action Sampling and Analysis Plan (SAP), DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
6) DOE-RL, 2005b, Remedial Design Report/Remedial Action Work Plan for the 100 Area (RDR/RAWP), DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
7) Ecology, 1992, Statistical Guidance for Ecology Site Managers, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
8) Ecology, 1993, Statistical Guidance for Ecology Site Managers, Supplement S-6, Analyzing Site or Background Data with Below-detection Limit or Below-PQL Values (Censored Data Sets), Publication #92-54, Washington Department of Ecology, Olympia, Washington.
9) Ecology, 2005, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
10) EPA, 1994, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540/R-94/013. U.S. Environmental Protection Agency, Washington, D.C.
11) WAC 173-340, 1996, "Model Toxic Control Act - Cleanup," Washington Administrative Code.

Solution:

Calculation methodology is described in Ecology publication #92-54 (Ecology 1992, 1993), below, and in the RDR/RAWP (DOE-RL 2005b). Use data from attached worksheets to perform the 95% UCL calculation for each analyte, the WAC 173-340-740(7)(e) 3-part test for nonradionuclides, and the RPD calculations for primary-duplicate sample pairs, as required. The hazard quotient and carcinogenic risk calculations are located in a separate calculation brief as an appendix to the Remaining Sites Verification Package (RSVP).

Calculation Description:

The subject calculations were performed on data from soil verification samples from the subject waste site. The data were entered into an EXCEL 2003 spreadsheet and calculations performed by using the built-in spreadsheet functions and/or creating formulae within the cells. The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2005b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel	**Date** 11/08/07	**Calc. No.** 0100F-CA-V0317	**Rev. No.** 0
Project 100-F Field Remediation	**Job No.** 14655	**Checked** J. M. Capron	**Date** 11/08/07
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation			**Sheet No.** 2 of 22

Summary (continued)

UCL Methodology:

For nonradioactive analytes with ≤50% of the data below detection limits and all detected radionuclide analytes, the statistical value calculated to evaluate the effectiveness of cleanup is the 95% UCL. For nonradioactive analytes with >50% of the data below detection limits, the maximum detected value for the data set is used instead of the 95% UCL. The 95% UCL is not calculated for data sets with no reported detections. The evaluation of the portion of each analyte's data set below detection limits was performed by direct inspection of the attached sample results, and no further calculations were performed for those data sets where >50% of the data was below detection limits.

Calculated cleanup levels are not available in Ecology (2005) under WAC 173-340-740(3) for:

aluminum, calcium, iron, magnesium, potassium, silicon, and sodium;

therefore, these constituents are not considered site COPCs and are also not included in these tables.

The 95% UCL values were not calculated for radium-226, radium-228, thorium-228, thorium-232, and potassium-40, as these isotopes are excluded from consideration as COCs based on natural occurrence and analogous site information.

All nonradionuclide data reported as being undetected are set to ½ the detection limit value for calculation of the statistics (Ecology 1993). For radionuclide data, calculation of the statistics is done using the reported value. In cases where the laboratory does not report a value below the minimum detectable activity (MDA), half of the MDA is used in the calculation. For the statistical evaluation of duplicate sample pairs, the samples are averaged before being included in the data set, after adjustments for censored data as described above.

For nonradionuclides, the WAC 173-340 statistical guidance suggests that a test for distributional form be performed on the data and the 95% UCL calculated on the appropriate distribution using Ecology software. For nonradionuclide small data sets ($n < 10$) and all radionuclide data sets, the calculations are performed assuming nonparametric distribution, so no tests for distribution are performed. For nonradionuclide data sets of ten or greater, as for the subject site, distributional testing and calculation of the 95% UCL is done using Ecology's MTCAStat software (Ecology 1993). Due to differences in addressing censored data between the RDR/RAWP (DOE-RL 2005b) and MTCAStat coding and due to a limitation in the MTCAStat coding (no direct capability to address variable quantitation limits within a data set), substitutions for censored data are performed before software input and the resulting input set treated as uncensored.

The WAC 173-340-740(7)(e) 3-part test is performed for nonradionuclide analytes only and determines if:
1) the 95% UCL exceeds the most stringent cleanup limit for each COPC,
2) greater than 10% of the raw data exceed the most stringent cleanup limit for each COPC,
3) the maximum value of the raw data set exceeds two times the most stringent cleanup limit for each COPC.

The WAC 173-340-740(7)(e) 3-part test is not performed for COPCs where the statistical value defaults to the maximum value in the data set. Instead, direct comparison of the maximum value against site remedial action goals (RAGs) (within the RSVP) is used as the compliance basis.

The RPD values are evaluated for analytes detected in a primary-duplicate or primary-split sample pair for the purposes of data quality assessment within the CVP. The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The RPD calculations use the following formula:

$$RPD = [\,|M-S|/((M+S)/2)]*100$$

where, M = main sample value S = split (or duplicate) sample value

For quality assurance/quality control (QA/QC) split and duplicate RPD calculations, a value less than 30% indicates the data compare favorably. For regulatory splits, a threshold of 35% is used (EPA 1994b). If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. To assist in the identification of anomalous sample pairs, when an analyte is detected in the primary or duplicate/split sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate/split results exceed a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. Additional discussion is provided in the data quality assessment section of the applicable CVP, as necessary.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel	**Date** 11/12/07	**Calc. No.** 0100F-CA-V0317	**Rev. No.** 0
Project 100-F Field Remediation	**Job No.** 14655	**Checked** J. M. Capron	**Date** 11/08/07
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation			**Sheet No.** 3 of 22

Summary (continued)

Methodology (continued):

For quality assurance/quality control (QA/QC) split and duplicate RPD calculations, a value less than 30% indicates the data compare favorably. For regulatory splits, a threshold of 35% is used (EPA 1994). If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. No split samples were collected for cleanup verification of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP, as necessary.

Noteworthy details:

Initial sample results (September 5 and 6) indicated that four samples (J15H74, J15H84, J15HB1 and J15HB3 [duplicate of J15HB2]) in the overburden (OB) and below cleanup level (BCL) stockpiles had detections of Carbon-14 in excess of the remedial action goal. The elevated carbon-14 was removed by removing 0.3 m (1 ft) from each of the contaminated sample areas (OB-A2, OB-C1, BCL-B5 and BCL-B6). The four areas were resampled (J15PK1, J15PK2, J15PK3 and J15PK4) on October 4 for carbon-14. The analyses also returned results for tritium. At the request of EPA, the areas were resampled (J15VY5, J15VY6, J15VY7 and J15VY8) on October 16 for the complete set of analytes.

All of the results are presented in Attachment 1. The latest set of results (October 16) were used to replace the initial results (September 5 and 6) in statistical calculations since the contaminated soil was removed. The October 4 sample results were not used in the statistical calculations. However, to be conservative, the maximum results for tritium and all other radionuclides obtained from the October 4 and October 16 samples were used in the RESidual RADioactivity (RESRAD) dose assessment to show that backfilling the excavation with overburden and below cleanup level stockpiles will meet the 15 mrem/year above background limitation for all exposure pathways and be protective of groundwater and the Columbia River.

Results:

The results presented in the tables that follow include the summary of the results of the 95% UCL calculations or the maximum value, the WAC 173-340-740(7)(e) 3-part test evaluation, and the RPD calculations, and are for use in risk analysis and the RSVP for this site.

Results Summary[a] - Remediation Footprint

Analyte	Excavation Shallow Zone[b]	Overburden Stockpile[b]	BCL Stockpile[b]	Units
Carbon-14	--	--	1.43	pCi/g
Cesium-137	--	0 (< BG)	0.039	pCi/g
Europium-152	--	0.048	--	pCi/g
Strontium-90	--	0 (< BG)	0.260	pCi/g
Tritium	--	1.39	4.68	pCi/g
Antimony	1.0	1.2	0.10	mg/kg
Arsenic	3.5	2.5	3.6	mg/kg
Barium	52.9	52.5	72.3	mg/kg
Beryllium	0.18	0.26	0.26	mg/kg
Boron	1.5	1.5	3.4	mg/kg
Cadmium	--	0.18	0.17	mg/kg
Chromium	7.8	8.3	10.7	mg/kg
Hexavalent Chromium	0.31	1.40	0.33	mg/kg
Cobalt	5.0	4.9	5.9	mg/kg
Copper	13.7	11.9	13.4	mg/kg
Lead	7.1	5.8	7.1	mg/kg
Manganese	223	237	261	mg/kg
Mercury	0.04	--	0.05	mg/kg
Molybdenum	0.48	0.78	0.59	mg/kg
Nickel	9.2	9.6	10.8	mg/kg
Selenium	--	1.3	--	mg/kg
Vanadium	28.1	29.9	37.4	mg/kg
Zinc	31.9	30.4	42.5	mg/kg

[a]No detections were reported in any data set for COCs/COPCs not listed in this table.

[b]Maximum or 95% UCL result, depending on data censorship, as described in the calculation methodology.

CALCULATION SHEET

Washington Closure Hanford

Originator	L. D. Habel	**Date**	11/12/07	**Calc. No.** 0100F-CA-V0317	**Rev. No.** 0
Project	100-F Field Remediation	**Job No.**	14655	**Checked** J. M. Capron	**Date** 11/08/07
Subject	100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation				**Sheet No.** 4 of 22

Summary (continued)

Excavation Shallow Zone - WAC 173-340 3-Part Test for most stringent RAG:

95% UCL > Cleanup Limit? NO
> 10% above Cleanup Limit? YES
Any sample > 2x Cleanup Limit? NO

Because of the "yes" answers to the WAC 173-340 3-part test for lead, additional evaluation of the attainment of cleanup criteria will be performed.

Overburden - WAC 173-340 3-Part Test for most stringent RAG:

95% UCL > Cleanup Limit? NO
> 10% above Cleanup Limit? NO
Any sample > 2x Cleanup Limit? NO

All data sets evaluated meet the 3-part test criteria when compared to the most stringent cleanup limit.

BCL - WAC 173-340 3-Part Test for most stringent RAG:

95% UCL > Cleanup Limit? NO
> 10% above Cleanup Limit? NO
Any sample > 2x Cleanup Limit? NO

All data sets evaluated meet the 3-part test criteria when compared to the most stringent cleanup limit.

Relative Percent Difference Results[a,b] -						
	Excavation Shallow Zone		Overburden Stockpile		BCL Stockpile	
Analyte	Duplicate Analysis	Split Analysis	Duplicate Analysis	Split Analysis	Duplicate Analysis	Split Analysis
Potassium-40	11%	--	1%	--	12%	--
Radium-226	--	--	9%	--	--	--
Aluminum	6%	35%	15%	37%	2%	19%
Barium	8%	35%	22%	37%	6%	0%
Calcium	7%	12%	9%	24%	72%	70%
Chromium	0%	56%	17%	43%	5%	39%
Copper	5%	7%	2%	11%	8%	20%
Iron	2%	44%	21%	36%	1%	27%
Magnesium	2%	36%	14%	23%	12%	3%
Manganese	1%	32%	9%	25%	5%	8%
Silicon	25%	158%	4%	87%	10%	149%
Vanadium	7%	59%	20%	30%	1%	32%
Zinc	23%	23%	13%	48%	63%	52%

[a]Relative percent difference evaluation was not required for analytes not included in this table.
[b]The significance of relative percent difference values are discussed within the RSVP for the subject site.
-- = analysis not required

BCL = below cleanup levels
CALC = cleanup levels and risk calculations
COC = contaminant of concern
COPC = contaminant of potential concern
MDA = minimum detectable activity
OB = overburen
QA/QC = quality assurance/quality control
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity
RPD = relative percent difference
RSVP = Remaining Site Verification Package
SAP = sampling and analysis plan
TDL = target detection limit
UCL = upper confidence limit
WAC = Washington Administrative Code

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
Job No. 14655

Calc. No. 0100F-CA-V0317
Checked J. M. Capron JMC

Rev. No. 0
Date 11/08/07
Sheet No. 5 of 22

1 **100-F-26:12 Excavation Shallow Zone Statistical Calculations**
2 **Verification Data**

3	Sample	Sample	Sample	Arsenic			Barium			Beryllium			Boron			Chromium			Hexavalent Chromium		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SZ - A4	J15H90	9/11/07	1.2	U	1.2	29.4	C	0.06	0.11		0.03	1.0	U	1.0	5.2		0.29	0.27		0.20
6	SZ - A4 - dup	J15H91	9/11/07	2.3		1.2	31.9	C	0.06	0.12		0.03	1.0	U	1.0	5.2		0.28	0.20	U	0.20
7	SZ - A1	J15H87	9/11/07	2.2		1.2	63.8	C	0.06	0.20		0.03	1.6	C	1.1	6.9		0.30	0.28		0.20
8	SZ - A2	J15H88	9/11/07	2.8		1.2	38.8	C	0.06	0.16		0.03	1.0	U	1.0	6.5		0.29	0.36		0.20
9	SZ - A3	J15H89	9/11/07	6.2		1.2	68.0	C	0.06	0.23		0.03	2.1	C	1.1	8.8		0.29	0.32		0.20
10	SZ - B5	J15H92	9/12/07	2.8		1.2	50.5	C	0.06	0.12		0.03	2.0		1.0	8.5		0.29	0.27		0.20
11	SZ - B6	J15H93	9/12/07	1.6		1.2	36.1	C	0.06	0.15		0.03	1.1	U	1.1	8.2		0.29	0.34		0.20
12	SZ - B7	J15H94	9/12/07	1.5		1.2	37.5	C	0.06	0.15		0.03	1.2		1.0	6.7		0.28	0.20	U	0.20
13	SZ - B8	J15H95	9/12/07	1.9		1.2	29.0	C	0.06	0.16		0.03	1.1	U	1.1	5.8		0.29	0.22		0.20

14 **Statistical Computation Input Data**

15	Sample	Sample	Sample	Arsenic	Barium	Beryllium	Boron	Chromium	Hexavalent Chromium
16	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
17	SZ - A4	J15H90/J15H91	9/11/07	1.5	30.7	0.12	0.50	5.2	0.19
18	SZ - A1	J15H87	9/11/07	2.2	63.8	0.20	1.6	6.9	0.28
19	SZ - A2	J15H88	9/11/07	2.8	38.8	0.16	0.50	6.5	0.36
20	SZ - A3	J15H89	9/11/07	6.2	68.0	0.23	2.1	8.8	0.32
21	SZ - B5	J15H92	9/12/07	2.8	50.5	0.12	2.0	8.5	0.27
22	SZ - B6	J15H93	9/12/07	1.6	36.1	0.15	0.55	8.2	0.34
23	SZ - B7	J15H94	9/12/07	1.5	37.5	0.15	1.2	6.7	0.10
24	SZ - B8	J15H95	9/12/07	1.9	29.0	0.16	0.55	5.8	0.22

25 **Statistical Computations**

26		Arsenic	Barium	Beryllium	Boron	Chromium	Hexavalent Chromium
27	95% UCL based on	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.
28	N	8	8	8	8	8	8
29	% < Detection limit	0%	0%	0%	50%	0%	13%
30	Mean	2.6	44.3	0.16	1.1	7.1	0.26
31	Standard deviation	1.6	14.9	0.04	0.70	1.3	0.09
32	95% UCL on mean	3.5	52.9	0.18	1.5	7.8	0.31
33	Maximum detected value	6.2	68.0	0.23	2.1	8.8	0.36
34	Final Statistical Value	3.5	52.9	0.18	1.5	7.8	0.31
35	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE & GW & River Protection	132 GW Protection	1.51 GW & River Protection	320 GW Protection	18.5 GW & River Protection	2 River Protection
36	**WAC 173-340 3-PART TEST**						
37	95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO
38	> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO
39	Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO
40	**WAC 173-340 Compliance? Yes**	Yes	Yes	Yes	Yes	Yes	Yes

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
Job No. 14655

Calc. No. 0100F-CA-V0317
Checked J. M. Capron JMC

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100-F-26:12 Excavation Shallow Zone Statistical Calculations

Verification Data

Sample Area	Sample Number	Sample Date	Cobalt mg/kg	Cobalt Q	Cobalt PQL	Copper mg/kg	Copper Q	Copper PQL	Lead mg/kg	Lead Q	Lead PQL	Manganese mg/kg	Manganese Q	Manganese PQL	Nickel mg/kg	Nickel Q	Nickel PQL	Vanadium mg/kg	Vanadium Q	Vanadium PQL	Zinc mg/kg	Zinc Q	Zinc PQL
SZ - A4	J15H90	9/11/07	3.4		0.23	10.3	C	0.26	2.6		0.94	181		0.20	7.1		0.77	18.7		0.23	23.6	C	0.11
SZ - A4 - dup	J15H91	9/11/07	3.5		0.23	10.8	C	0.26	2.7		0.94	180		0.20	7.5		0.77	17.4		0.23	21.9	C	0.11
SZ - A1	J15H87	9/11/07	5.0		0.24	11.4	C	0.27	5.2		0.97	234		0.21	9.0		0.80	26.7		0.24	31.0	C	0.12
SZ - A2	J15H88	9/11/07	4.1		0.23	11.3	C	0.26	6.8		0.95	195		0.20	7.7		0.78	22.3		0.23	29.9	C	0.12
SZ - A3	J15H89	9/11/07	5.4		0.23	14.1	C	0.26	13.7		0.97	249		0.21	10.3		0.79	26.1		0.23	39.2	C	0.12
SZ - B5	J15H92	9/12/07	4.9	C	0.23	11.1		0.26	2.6		0.95	223		0.20	9.6		0.77	31.7		0.23	31.2	C	0.11
SZ - B6	J15H93	9/12/07	4.6	C	0.23	9.6		0.26	2.3		0.96	206		0.20	8.9		0.79	26.0		0.23	26.0	C	0.12
SZ - B7	J15H94	9/12/07	4.8	C	0.23	9.8		0.25	2.7		0.93	206		0.20	8.3		0.76	29.6		0.23	27.2	C	0.11
SZ - B8	J15H95	9/12/07	4.6	C	0.24	18.3		0.27	2.0		0.97	162		0.21	8.0		0.80	24.9		0.24	23.0	C	0.12

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Cobalt mg/kg	Copper mg/kg	Lead mg/kg	Manganese mg/kg	Nickel mg/kg	Vanadium mg/kg	Zinc mg/kg
SZ - A4	J15H90/J15H91	9/11/07	3.5	10.6	2.7	181	7.3	18.1	22.8
SZ - A1	J15H87	9/11/07	5.0	11.4	5.2	234	9.0	26.7	31.0
SZ - A2	J15H88	9/11/07	4.1	11.3	6.8	195	7.7	22.3	29.9
SZ - A3	J15H89	9/11/07	5.4	14.1	13.7	249	10.3	26.1	39.2
SZ - B5	J15H92	9/12/07	4.9	11.1	2.6	223	9.6	31.7	31.2
SZ - B6	J15H93	9/12/07	4.6	9.6	2.3	206	8.9	26.0	26.0
SZ - B7	J15H94	9/12/07	4.8	9.8	2.7	206	8.3	29.6	27.2
SZ - B8	J15H95	9/12/07	4.6	18.3	2.0	162	8.0	24.9	23.0

Statistical Computations

	Cobalt	Copper	Lead	Manganese	Nickel	Vanadium	Zinc
95% UCL based on	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.
N	8	8	8	8	8	8	8
% < Detection limit	0%	0%	0%	0%	0%	0%	0%
Mean	4.6	12.0	4.7	207	8.6	25.7	28.8
Standard deviation	0.60	2.9	4.0	28.3	1.0	4.2	5.4
95% UCL on mean	5.0	13.7	7.1	223	9.2	28.1	31.9
Maximum detected value	5.4	18.3	13.7	249	10.3	31.7	39.2
Final Statistical Value	5.0	13.7	7.1	223	9.2	28.1	31.9
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	32 GW Protection	22 River Protection	10.2 GW & River Protection	512 GW & River Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection
WAC 173-340 3-PART TEST							
95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	YES	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
WAC 173-340 Compliance? Further Assessment Required	Yes	Yes	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to direct exposure cleanup levels.	Yes	Yes	Yes	Yes

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel **Date** 11/12/07 **Calc. No.** 0100F-CA-V0317 **Rev. No.** 0
Project 100-F Field Remediation **Job No.** 14655 **Checked** J. M. Capron **Date** 11/08/07
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation **Sheet No.** 7 of 22

100-F-26:12 Overburden Statistical Calculations

Verification Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Q	PQL	Europium-152 pCi/g	Q	PQL	Strontium-90 pCi/g	Q	PQL	Tritium pCi/g	Q	PQL
OB - A4	J15H76	9/5/07	0.025	U	0.025	0.068	U	0.068	-0.058	U	0.259	-0.106	U	2.15
OB - A4 - dup	J15H77	9/5/07	0.032	U	0.032	0.111	U	0.111	0.009	U	0.324	-0.368	U	2.14
OB - A1	J15H73	9/5/07	0.023	U	0.023	0.065	U	0.065	0.125	U	0.268	1.05	U	2.11
OB - A2 (a)	J15VY5	10/16/07	0.037	U	0.037	0.100	U	0.100	0.017	U	0.273	4.67		3.89
OB - A3	J15H75	9/5/07	0.032	U	0.032	0.089	U	0.089	0.005	U	0.248	0.70	U	2.10
OB - B5	J15H78	9/5/07	0.027	U	0.027	0.070	U	0.070	0.046	U	0.258	1.11	U	3.57
OB - B6	J15H79	9/5/07	0.022	U	0.022	0.062	U	0.062	-0.073	U	0.283	0.423	U	3.64
OB - B7	J15H80	9/5/07	0.022	U	0.022	0.059	U	0.059	-0.002	U	0.253	-0.821	U	3.75
OB - B8	J15H81	9/5/07	0.027	U	0.027	0.075	U	0.075	-0.013	U	0.259	0.925	U	3.61
OB - C9	J15H82	9/5/07	0.032	U	0.032	0.078	U	0.078	-0.035	U	0.258	-0.241	U	3.70
OB - C10	J15H83	9/6/07	0.028	U	0.028	0.072	U	0.072	-0.039	U	0.286	-0.275	UJ	3.83
OB - C1 (b)	J15VY6	10/16/07	0.027	U	0.027	0.074	U	0.074	-0.078	U	0.248	1.27		3.79
OB - C2	J15H85	9/6/07	0.056		0.024	0.081		0.061	0.006		0.285	0.105	UJ	3.64

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Europium-152 pCi/g	Strontium-90 pCi/g	Tritium pCi/g
OB - A4	J15H76/J15H77	9/5/07	0.014	0.045	-0.025	-0.237
OB - A1	J15H73	9/5/07	0.012	0.033	0.125	1.05
OB - A2 (a)	J15VY5	10/16/07	0.019	0.050	0.017	4.7
OB - A3	J15H75	9/5/07	0.016	0.045	0.005	0.698
OB - B5	J15H78	9/5/07	0.014	0.035	0.046	1.110
OB - B6	J15H79	9/5/07	0.011	0.031	-0.073	0.423
OB - B7	J15H80	9/5/07	0.011	0.030	-0.002	-0.821
OB - B8	J15H81	9/5/07	0.014	0.038	-0.013	0.925
OB - C9	J15H82	9/5/07	0.016	0.039	-0.035	-0.24
OB - C10	J15H83	9/6/07	0.014	0.036	-0.039	-0.28
OB - C1 (b)	J15VY6	10/16/07	0.014	0.037	-0.078	1.3
OB - C2	J15H85	9/6/07	0.056	0.081	0.006	0.105

Statistical Computations

	Cesium-137	Europium-152	Strontium-90	Tritium
95% UCL based on	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.
N	12	12	12	12
% < Detection limit	92%	92%	92%	83%
Mean	0.017	0.041	-0.005	0.72
Standard deviation	0.012	0.014	0.054	1.41
95% UCL on mean	0.023	0.048	0.020	1.39
Maximum detected value	0.056	0.081	0.006	4.7
Final Statistical Value (nonRad)	NA	NA	NA	NA
Background	1.10	NA	0.180	NA
Statistical value above background	0 (< BG)	0.048	0 (< BG)	1.39

a) Initial results (J15H74) indicated that the overburden stockpiled soil in area A2 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken. The sample (J15VY5) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY5 radiological results were substituted for J15H74 in statistical calculations.

b) Initial results (J15H84) indicated that the overburden stockpiled soil in area C1 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken. The sample (J15VY6) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY6 radiological results were substituted for J15H84 in statistical calculations.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel **Date** 11/12/07 **Calc. No.** 0100F-CA-V0317 **Rev. No.** 0
Project 100-F Field Remediation **Job No.** 14655 **Checked** J. M. Capron **Date** 11/08/07
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation **Sheet No.** 8 of 22

1 **100-F-26:12 Overburden Statistical Calculations**

2 **Verification Data**

3	Sample	Sample	Sample	Beryllium			Boron			Chromium			Hexavalent chromium			Cobalt			Copper			Lead			Manganese		
4	Area	Number	Date	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	mg/kg	Q	PQL
5	OB - A4	J15H76	9/5/07	0.30		0.03	1.3		1.1	8.1		0.30	2.0	U	2.0	5.0		0.24	12.5		0.27	8.8		0.99	241		0.21
6	OB - A4 - dup	J15H77	9/5/07	0.33		0.03	2.3		1.1	9.6		0.30	20.3	U	20.3	5.4		0.24	12.7		0.27	10.2		0.98	264		0.21
7	OB - A1	J15H73	9/5/07	0.24		0.03	1.1	U	1.1	7.2		0.29	0.33		0.20	4.6		0.23	11.2		0.26	2.7		0.97	221		0.21
8	OB - A2 (a)	J15VY5	10/16/07	0.21		0.15	2.1		1.5	9.2		0.61	0.24		0.21	4.6		0.61	12.5		0.61	3.8		0.92	249		0.12
9	OB - A3	J15H75	9/5/07	0.17		0.03	1.1	U	1.1	4.9		0.30	0.31		0.20	3.1		0.24	8.6		0.27	1.8		0.99	164		0.21
10	OB - B5	J15H78	9/5/07	0.25		0.03	1.1	U	1.1	6.6		0.29	0.22		0.20	4.1		0.23	10.5		0.26	2.5		0.96	190		0.20
11	OB - B6	J15H79	9/5/07	0.29		0.03	1.0	U	1.0	7.8		0.29	0.29		0.20	4.7		0.23	12.5		0.26	3.0		0.95	226		0.20
12	OB - B7	J15H80	9/5/07	0.29		0.03	1.3		1.1	7.7		0.29	0.20	U	0.20	4.2		0.23	11.6		0.26	2.5		0.97	221		0.20
13	OB - B8	J15H81	9/5/07	0.23		0.03	1.1	U	1.1	5.1		0.30	0.31		0.20	3.4		0.24	9.6		0.27	3.6		0.98	172		0.21
14	OB - C9	J15H82	9/5/07	0.28		0.03	1.2		1.0	7.7		0.29	0.29		0.20	4.3		0.23	12.3		0.26	7.9		0.96	209		0.20
15	OB - C10	J15H83	9/6/07	0.04		0.03	1.3		1.1	8.3	C	0.30	0.20	U	0.20	5.6		0.24	12.1	C	0.27	5.8		0.98	244		0.21
16	OB - C1 (b)	J15VY6	10/16/07	0.24		0.14	2.0		1.4	9.4		0.58	0.20	U	0.20	4.9		0.58	12.0		0.58	3.3		0.87	255		0.12
17	OB - C2	J15H85	9/6/07	0.11		0.03	2.1		1.1	8.2		0.30	0.20	U	0.20	4.8		0.24	9.8		0.27	4.0		0.98	221		0.21

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Beryllium	Boron	Chromium	Hexavalent chromium	Cobalt	Copper	Lead	Manganese
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
21	OB - A4	J15H76/J15H77	9/5/07	0.32	1.8	8.9	5.6	5.2	12.6	9.5	253
22	OB - A1	J15H73	9/5/07	0.24	0.55	7.2	0.33	4.6	11.2	2.7	221
23	OB - A2 (a)	J15VY5	10/16/07	0.21	2.1	9.2	0.24	4.6	12.5	3.8	249
24	OB - A3	J15H75	9/5/07	0.17	0.55	4.9	0.31	3.1	8.6	1.8	164
25	OB - B5	J15H78	9/5/07	0.25	0.55	6.6	0.22	4.1	10.5	2.5	190
26	OB - B6	J15H79	9/5/07	0.29	0.50	7.8	0.29	4.7	12.5	3.0	226
27	OB - B7	J15H80	9/5/07	0.29	1.3	7.7	0.10	4.2	11.6	2.5	221
28	OB - B8	J15H81	9/5/07	0.23	0.55	5.1	0.31	3.4	9.6	3.6	172
29	OB - C9	J15H82	9/5/07	0.28	1.2	7.7	0.29	4.3	12.3	7.9	209
30	OB - C10	J15H83	9/6/07	0.04	1.3	8.3	0.10	5.6	12.1	5.8	244
31	OB - C1 (b)	J15VY6	10/16/07	0.24	2.0	9.4	0.10	4.9	12.0	3.3	255
32	OB - C2	J15H85	9/6/07	0.11	2.1	8.2	0.10	4.8	9.8	4.0	221

33 **Statistical Computations**

34		Beryllium	Boron	Chromium	Hexavalent chromium	Cobalt	Copper	Lead	Manganese
35	95% UCL based on	Large data set (n ≥10), lognormal and normal distribution rejected, use Z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use Z-statistic.	Large data set (n ≥10), use MTCAStat normal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use Z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use Z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
36	N	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	42%	0%	42%	0%	0%	0%	0%
38	Mean	0.22	1.2	7.6	0.66	4.5	11.3	4.2	219
39	Standard deviation	0.08	0.66	1.4	1.55	0.70	1.3	2.4	30.4
40	95% UCL on mean	0.26	1.5	8.3	1.40	4.9	11.9	5.8	237
41	Maximum detected value	0.33	2.3	9.6	0.33	5.6	12.7	10.2	264
42	Final Statistical Value	0.26	1.5	8.3	1.40	4.9	11.9	5.8	237
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	1.51 GW & River Protection	320 GW Protection	18.5 GW & River Protection	2 River Protection	32 GW Protection	22 River Protection	10.2 GW & River Protection	512 GW & River Protection
44	**WAC 173-340 3-PART TEST**								
45	95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
46	> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
47	Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
48	**WAC 173-340 Compliance? Yes**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

49

50 a) Initial results (J15H74) indicated that the overburden stockpiled soil in area A2 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken.
51 The sample (J15VY5) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY5 radiological results were substituted for J15H74 in statistical calculations.
52
53 b) Initial results (J15H84) indicated that the overburden stockpiled soil in area C1 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken.
54 The sample (J15VY6) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY6 radiological results were substituted for J15H84 in statistical calculations.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/12/07
Job No. 14655

Calc. No. 0100F-CA-V0317
Checked J. M. Capron

Rev. No. 0
Date 11/08/07
Sheet No. 9 of 22

1 **100-F-26:12 Overburden Statistical Calculations**

2 **Verification Data**

3				Nickel			Vanadium			Zinc			Arsenic			Barium		
4	Sample Area	Sample Number	Sample Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	OB - A4	J15H76	9/5/07	9.2		0.81	27.7		0.24	28.9	C	0.12	2.4		1.20	54.3	C	0.06
6	OB - A4 - dup	J15H77	9/5/07	11.0		0.80	33.7		0.24	32.9	C	0.12	4.1		1.20	68.0	C	0.06
7	OB - A1	J15H73	9/5/07	9.3		0.79	24.4		0.23	26.6	C	0.12	1.5		1.20	47.6	C	0.06
8	OB - A2 (a)	J15VY5	10/16/07	10.4		0.61	32.6		0.43	33.3		1.80	2.7		1.50	51.2		0.31
9	OB - A3	J15H75	9/5/07	5.9		0.81	16.9		0.24	20.7	C	0.12	1.2	U	1.20	37.1	C	0.06
10	OB - B5	J15H78	9/5/07	7.4		0.79	24.7		0.23	24.7	C	0.12	1.2		1.20	41.2	C	0.06
11	OB - B6	J15H79	9/5/07	9.0		0.78	30.7		0.23	31.1	C	0.12	1.4		1.20	46.2	C	0.06
12	OB - B7	J15H80	9/5/07	8.2		0.79	27.7		0.23	27.9	C	0.12	1.3		1.20	45.6	C	0.06
13	OB - B8	J15H81	9/5/07	7.1		0.80	16.7		0.24	25.1	C	0.12	1.2	U	1.20	36.4	C	0.06
14	OB - C9	J15H82	9/5/07	8.7		0.78	27.1		0.23	26.3	C	0.12	3.0		1.20	56.3	C	0.06
15	OB - C10	J15H83	9/6/07	9.6		0.81	32.6	C	0.24	32.1	CJ	0.12	3.2		1.20	55.8	C	0.06
16	OB - C1 (b)	J15VY6	10/16/07	10.0		0.58	33.7		0.41	32.5		1.70	2.5		1.40	48.8		0.29
17	OB - C2	J15H85	9/6/07	8.7		0.81	28.8		0.24	25.5	J	0.12	2.7		1.20	49.6		0.06

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Nickel			Vanadium			Zinc			Arsenic			Barium		
20	Area	Number	Date	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
21	OB - A4	J15H76/J15H77	9/5/07	10.1			30.7			30.9			3.3			61.2		
22	OB - A1	J15H73	9/5/07	9.3			24.4			26.6			1.5			47.6		
23	OB - A2 (a)	J15VY5	10/16/07	10.4			32.6			33.3			2.7			51.2		
24	OB - A3	J15H75	9/5/07	5.9			16.9			20.7			0.6			37.1		
25	OB - B5	J15H78	9/5/07	7.4			24.7			24.7			1.2			41.2		
26	OB - B6	J15H79	9/5/07	9.0			30.7			31.1			1.4			46.2		
27	OB - B7	J15H80	9/5/07	8.2			27.7			27.9			1.3			45.6		
28	OB - B8	J15H81	9/5/07	7.1			16.7			25.1			0.6			36.4		
29	OB - C9	J15H82	9/5/07	8.7			27.1			26.3			3.0			56.3		
30	OB - C10	J15H83	9/6/07	9.6			32.6			32.1			3.2			55.8		
31	OB - C1 (b)	J15VY6	10/16/07	10.0			33.7			32.5			2.5			48.8		
32	OB - C2	J15H85	9/6/07	8.7			28.8			25.5			2.7			49.6		

33 **Statistical Computations**

34		Nickel			Vanadium			Zinc			Arsenic			Barium		
35	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.			Large data set (n ≥10), lognormal and normal distribution rejected, use Z-statistic.			Large data set (n ≥10), use MTCAStat lognormal distribution.			Large data set (n ≥10), use MTCAStat normal distribution.			Large data set (n ≥10), use MTCAStat lognormal distribution.		
36	N	12			12			12			12			12		
37	% < Detection limit	0%			0%			0%			17%			0%		
38	Mean	8.7			27.2			28.1			2.0			48.1		
39	Standard deviation	1.4			5.7			3.9			1.0			7.5		
40	95% UCL on mean	9.6			29.9			30.4			2.5			52.5		
41	Maximum detected value	11.0			33.7			33.3			4.1			68.0		
42	Final Statistical Value	9.6			29.9			30.4			2.5			52.5		
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	19.1	GW Protection		85.1	GW Protection		67.8	River Protection		20	DE & GW & River Protection		132	GW Protection	
44	**WAC 173-340 3-PART TEST**															
45	95% UCL > Cleanup Limit?	NO			NO			NO			NO			NO		
46	> 10% above Cleanup Limit?	NO			NO			NO			NO			NO		
47	Any sample > 2X Cleanup Limit?	NO			NO			NO			NO			NO		
48	**WAC 173-340 Compliance? Yes**	Yes			Yes			Yes			Yes			Yes		

49

50 a) Initial results (J15H74) indicated that the overburden stockpiled soil in area A2 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken.
51 The sample (J15VY5) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY5 radiological results were substituted for J15H74 in statistical calculations.
52
53 b) Initial results (J15H84) indicated that the overburden stockpiled soil in area C1 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken.
54 The sample (J15VY6) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY6 radiological results were substituted for J15H84 in statistical calculations.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
Job No. 14655

Calc. No. 0100F-CA-V0317
Checked J. M. Capron

Rev. No. 0
Date 11/08/07
Sheet No. 10 of 22

1 **100-F-26:12 BCL Material Statistical Calculations**
2 **Verification Data**

3				Cesium-137			Strontium-90			Carbon-14			Tritium		
4	Sample Area	Sample Number	Sample Date	pCi/g	Q	PQL	pCi/g	Q	PQL	pCi/g	Q	PQL	pCi/g	Q	PQL
5	BCL - B6 (b)	J15VY8	10/16/07	0.041	U	0.041	-0.040	U	0.260	0.152	U	3.22	4.0		3.62
6	BCL - A1	J15H97	9/6/07	0.030	U	0.030	0.390		0.232	1.09	UJ	3.44	0.6	UJ	3.72
7	BCL - A2	J15H98	9/6/07	0.079		0.039	0.563		0.218	-1.72	UJ	3.26	-0.9	UJ	3.57
8	BCL - A3	J15H99	9/6/07	0.024	U	0.024	0.124	U	0.290	5.10	J	3.09	-0.8	UJ	3.75
9	BCL - A4	J15HB0	9/6/07	0.025	U	0.025	0.042	U	0.283	-0.244	UJ	3.18	1.2	UJ	3.77
10	BCL - B5 (a)	J15VY7	10/16/07	0.026	U	0.026	-0.080	U	0.246	-0.727	U	3.66	12.6		3.89
11	BCL - B7	J15HB4	9/6/07	0.041		0.028	0.068	U	0.396	-1.67	UJ	3.34	-0.9	UJ	3.64
12	BCL - B8	J15HB5	9/11/07	0.020	U	0.020	-0.074	U	0.324	-0.848	U	3.04	0.4	U	4.20

13 **Statistical Computation Input Data**

14	Sample	Sample	Sample	Cesium-137	Strontium-90	Carbon-14	Tritium
15	Area	Number	Date	pCi/g	pCi/g	pCi/g	pCi/g
16	BCL - B6 (b)	J15VY8	10/16/07	0.021	-0.040	0.15	4.0
17	BCL - A1	J15H97	9/6/07	0.015	0.390	1.09	0.6
18	BCL - A2	J15H98	9/6/07	0.079	0.563	-1.72	-0.9
19	BCL - A3	J15H99	9/6/07	0.012	0.124	5.10	-0.8
20	BCL - A4	J15HB0	9/6/07	0.013	0.042	-0.244	1.2
21	BCL - B5 (a)	J15VY7	10/16/07	0.013	-0.080	-0.7	12.6
22	BCL - B7	J15HB4	9/6/07	0.041	0.068	-1.67	-0.9
23	BCL - B8	J15HB5	9/11/07	0.010	-0.074	-0.848	0.4

24 **Statistical Computations**

25		Cesium-137	Strontium-90	Carbon-14	Tritium
26	95% UCL based on	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.
27	N	8	8	8	8
28	% < Detection limit	75%	75%	88%	75%
29	Mean	0.025	0.124	0.142	2.0
30	Standard deviation	0.024	0.233	2.21	4.57
31	95% UCL on mean	0.039	0.260	1.43	4.7
32	Maximum detected value	0.079	0.563	5.10	12.6
33	Final Statistical Value (nonRad)	NA	NA	NA	NA
34	Background	NA	NA	NA	NA
35	Statistical value above background	0.039	0.260	1.43	4.7

36
37 a) Initial results (J15HB1) indicated that the BCL stockpiled soil in area B5 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken.
38 The sample (J15VY7) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY7 radiological results were substituted for J15HB1 in statistical calculations.
39
40 b) Initial results (J15HB3 [duplicate of J15HB2]) indicated that the BCL stockpiled soil in area B6 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken.
41 The sample (J15VY8) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY8 radiological results were substituted for J15HB2 in statistical calculations.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
Job No. 14655

Calc. No. 0100F-CA-V0317
Checked J. M. Capron JMC

Rev. No. 0
Date 11/08/07
Sheet No. 11 of 22

1 **100-F-26:12 BCL Material Statistical Calculations**

2 **Verification Data**

3	Sample	Sample	Sample	Cadmium			Cobalt			Copper			Lead			Manganese			Mercury			Nickel		
4	Area	Number	Date	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
5	BCL - B6 (b)	J15VY8	10/16/07	0.29	U	0.29	5.8		0.59	13.2		0.59	7.1		0.88	270		0.12	0.04		0.03	10.8		0.59
6	BCL - A1	J15H97	9/6/07	0.17		0.15	5.7		0.23	11.9	C	0.26	5.4		0.97	242		0.21	0.01	U	0.01	10.0		0.79
7	BCL - A2	J15H98	9/6/07	0.19		0.14	5.9		0.23	14.2	C	0.26	6.7		0.96	253		0.20	0.02	U	0.02	11.0		0.78
8	BCL - A3	J15H99	9/6/07	0.17		0.14	5.3		0.23	12.7	C	0.26	5.7		0.94	251		0.20	0.02	U	0.02	9.2		0.77
9	BCL - A4	J15HB0	9/6/07	0.19		0.14	6.5		0.22	12.7	C	0.25	9.1		0.92	274		0.20	0.02	U	0.02	11.4		0.75
10	BCL - B5 (a)	J15VY7	10/16/07	0.29	U	0.29	4.7		0.59	13.0		0.59	5.4		0.88	246		0.12	0.06		0.03	11.0		0.59
11	BCL - B7	J15HB4	9/6/07	0.15	U	0.15	5.9		0.24	13.6	C	0.27	6.5		0.98	247		0.21	0.08		0.01	10.1		0.80
12	BCL - B8	J15HB5	9/11/07	0.14	U	0.14	4.1		0.23	11.5	C	0.26	5.0		0.94	197		0.20	0.02		0.01	8.2		0.77

13 **Statistical Computation Input Data**

14	Sample	Sample	Sample	Cadmium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel
15	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
16	BCL - B6 (b)	J15VY8	10/16/07	0.15	5.8	13.2	7.1	270	0.04	10.8
17	BCL - A1	J15H97	9/6/07	0.17	5.7	11.9	5.4	242	0.01	10.0
18	BCL - A2	J15H98	9/6/07	0.19	5.9	14.2	6.7	253	0.01	11.0
19	BCL - A3	J15H99	9/6/07	0.17	5.3	12.7	5.7	251	0.01	9.2
20	BCL - A4	J15HB0	9/6/07	0.19	6.5	12.7	9.1	274	0.01	11.4
21	BCL - B5 (a)	J15VY7	10/16/07	0.15	4.7	13.0	5.4	246	0.06	11.0
22	BCL - B7	J15HB4	9/6/07	0.08	5.9	13.6	6.5	247	0.08	10.1
23	BCL - B8	J15HB5	9/11/07	0.07	4.1	11.5	5.0	197	0.02	8.2

24 **Statistical Computations**

25		Cadmium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel
26	95% UCL based on	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.
27	N	8	8	8	8	8	8	8
28	% < Detection limit	50%	0%	0%	0%	0%	50%	0%
29	Mean	0.14	5.5	12.9	6.4	248	0.03	10.2
30	Standard deviation	0.05	0.76	0.87	1.3	23.4	0.03	1.1
31	95% UCL on mean	0.17	5.9	13.4	7.1	261	0.05	10.8
32	Maximum detected value	0.19	6.5	14.2	9.1	274	0.08	11.4
33	Final Statistical Value	0.17	5.9	13.4	7.1	261	0.05	10.8
34	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	0.81 GW & River Protection	32 GW Protection	22 River Protection	10.2 GW & River Protection	512 GW & River Protection	0.33 GW & River Protection	19.1 GW Protection
35	**WAC 173-340 3-PART TEST**							
36	95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
37	> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
38	Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
39	**WAC 173-340 Compliance? Yes**	Yes	Yes	Yes	Yes	Yes	Yes	Yes

40

a) Initial results (J15HB1) indicated that the BCL stockpiled soil in area B5 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken. The sample (J15VY7) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY7 radiological results were substituted for J15HB1 in statistical calculations.

b) Initial results (J15HB3 [duplicate of J15HB2]) indicated that the BCL stockpiled soil in area B6 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken. The sample (J15VY8) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY8 radiological results were substituted for J15HB2 in statistical calculations.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
Job No. 14655

Calc. No. 0100F-CA-V0317
Checked J. M. Capron JMC

Rev. No. 0
Date 11/08/07
Sheet No. 12 of 22

1 **100-F-26:12 BCL Material Statistical Calculations**

2 **Verification Data**

3				Vanadium			Zinc			Chromium			Arsenic			Barium			Boron		
4	Sample Area	Sample Number	Sample Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	BCL - B6 (b)	J15VY8	10/16/07	38.2		0.41	40.5		1.80	10.1		0.59	3.7		1.50	69.1		0.29	3.6		1.50
6	BCL - A1	J15H97	9/6/07	34.9	C	0.23	33.6	CJ	0.12	10.1	C	0.29	2.7		1.20	46.7	C	0.06	1.3		1.10
7	BCL - A2	J15H98	9/6/07	37.3	C	0.23	50.5	CJ	0.12	10.8	C	0.29	4.4		1.20	60.7	C	0.06	2.2		1.00
8	BCL - A3	J15H99	9/6/07	33.4	C	0.23	40.3	CJ	0.11	9.6	C	0.28	2.6		1.20	61.7	C	0.06	2.1		1.00
9	BCL - A4	J15HB0	9/6/07	40.0	C	0.22	41.7	CJ	0.11	11.8	C	0.28	3.4		1.10	73.4	C	0.06	2.4		1.00
10	BCL - B5 (a)	J15VY7	10/16/07	32.5		0.41	35.1		1.80	9.8		0.59	3.6		1.50	74.8		0.29	4.6		1.50
11	BCL - B7	J15HB4	9/6/07	35.8	C	0.24	37.4	CJ	0.12	9.6	C	0.30	2.3		1.20	82.4	C	0.06	3.7		1.10
12	BCL - B8	J15HB5	9/11/07	22.9		0.23	36.8	C	0.11	6.2		0.28	2.4		1.20	56.4	C	0.06	2.3	C	1.00

13 **Statistical Computation Input Data**

14	Sample	Sample	Sample	Vanadium	Zinc	Chromium	Arsenic	Barium	Boron
15	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
16	BCL - B6 (b)	J15VY8	10/16/07	38.2	40.5	10.1	3.7	69.1	3.6
17	BCL - A1	J15H97	9/6/07	34.9	33.6	10.1	2.7	46.7	1.3
18	BCL - A2	J15H98	9/6/07	37.3	50.5	10.8	4.4	60.7	2.2
19	BCL - A3	J15H99	9/6/07	33.4	40.3	9.6	2.6	61.7	2.1
20	BCL - A4	J15HB0	9/6/07	40.0	41.7	11.8	3.4	73.4	2.4
21	BCL - B5 (a)	J15VY7	10/16/07	32.5	35.1	9.8	3.6	74.8	4.6
22	BCL - B7	J15HB4	9/6/07	35.8	37.4	9.6	2.3	82.4	3.7
23	BCL - B8	J15HB5	9/11/07	22.9	36.8	6.2	2.4	56.4	2.3

24 **Statistical Computations**

25		Vanadium	Zinc	Chromium	Arsenic	Barium	Boron
26	95% UCL based on	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.
27	N	8	8	8	8	8	8
28	% < Detection limit	0%	0%	0%	0%	0%	0%
29	Mean	34.4	39.5	9.8	3.1	65.7	2.8
30	Standard deviation	5.3	5.3	1.6	0.7	11.5	1.1
31	95% UCL on mean	37.4	42.5	10.7	3.6	72.3	3.4
32	Maximum detected value	40.0	50.5	11.8	4.4	82.4	4.6
33	Final Statistical Value	37.4	42.5	10.7	3.6	72.3	3.4
34	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	85.1 GW Protection	67.8 River Protection	18.5 GW & River Protection	20 DE & GW & River Protection	132 GW Protection	320 GW Protection
35	**WAC 173-340 3-PART TEST**						
36	95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO
37	> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO
38	Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO
39	**WAC 173-340 Compliance? Yes**	Yes	Yes	Yes	Yes	Yes	Yes

40

a) Initial results (J15HB1) indicated that the BCL stockpiled soil in area B5 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken. The sample (J15VY7) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY7 radiological results were substituted for J15HB1 in statistical calculations.

b) Initial results (J15HB3 [duplicate of J15HB2]) indicated that the BCL stockpiled soil in area B6 had detections of Carbon-14 in excess of the remedial action goal. The contaminated soil was removed and the sample was retaken. The sample (J15VY8) was analyzed for the entire suite of original analytes. Both sets of (initial and resample) results are presented in attachment 1. The J15VY8 radiological results were substituted for J15HB2 in statistical calculations.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
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Date 11/8/07
Sheet No. 13 of 22

Ecology Software (MTCAStat) - Overburden Results

95% UCL Calculation
Arsenic

DATA	ID				
3.25	J15H76/J15H77	Number of samples		Uncensored values	
1.5	J15H73	Uncensored	12	Mean	2.0
2.7	J15VY5	Censored		Lognormal mean	2.1
0.60	J15H75	Detection limit or PQL		Std. devn.	1.00
1.2	J15H78	Method detection limit		Median	2.0
1.4	J15H79	TOTAL	12	Min.	0.60
1.3	J15H80			Max.	3.3
0.60	J15H81				
3.0	J15H82				
3.2	J15H83				
2.5	J15VY6	Lognormal distribution?		Normal distribution?	
2.7	J15H85	r-squared is:	0.883	r-squared is:	0.914

Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 2.5

95% UCL Calculation
Barium

DATA	ID				
61.2	J15H76/J15H77	Number of samples		Uncensored values	
47.8	J15H73	Uncensored	12	Mean	48.1
51.2	J15VY5	Censored		Lognormal mean	48.1
37.1	J15H75	Detection limit or PQL		Std. devn.	7.5
41.2	J15H78	Method detection limit		Median	48.2
46.2	J15H79	TOTAL	12	Min.	36.4
45.6	J15H80			Max.	61.2
36.4	J15H81				
56.3	J15H82				
55.8	J15H83				
48.8	J15VY6	Lognormal distribution?		Normal distribution?	
49.6	J15H85	r-squared is:	0.968	r-squared is:	0.976

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 52.5

95% UCL Calculation
Beryllium

DATA	ID				
0.32	J15H76/J15H77	Number of samples		Uncensored values	
0.24	J15H73	Uncensored	12	Mean	0.22
0.21	J15VY5	Censored		Lognormal mean	0.24
0.17	J15H75	Detection limit or PQL		Std. devn.	0.08
0.25	J15H78	Method detection limit		Median	0.24
0.29	J15H79	TOTAL	12	Min.	0.04
0.29	J15H80			Max.	0.32
0.23	J15H81				
0.28	J15H82				
0.04	J15H83				
0.24	J15VY6	Lognormal distribution?		Normal distribution?	
0.11	J15H85	r-squared is:	0.699	r-squared is:	0.885

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.26

95% UCL Calculation
Boron

DATA	ID				
1.8	J15H76/J15H77	Number of samples		Uncensored values	
0.55	J15H73	Uncensored	12	Mean	1.2
2.1	J15VY5	Censored		Lognormal mean	1.2
0.55	J15H75	Detection limit or PQL		Std. devn.	0.66
0.55	J15H78	Method detection limit		Median	1.25
0.50	J15H79	TOTAL	12	Min.	0.50
1.3	J15H80			Max.	2.1
0.55	J15H81				
1.2	J15H82				
1.3	J15H83				
2.0	J15VY6	Lognormal distribution?		Normal distribution?	
2.1	J15H85	r-squared is:	0.845	r-squared is:	0.862

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 1.5

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

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Job No. 14655

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Ecology Software (MTCAStat) Results

95% UCL Calculation — Chromium

DATA	ID				
8.9	J15H76/J15H77	Number of samples		Uncensored values	
7.2	J15H73	Uncensored	12	Mean	7.6
9.2	J15VY5	Censored		Lognormal mean	7.6
4.9	J15H75	Detection limit or PQL		Std. devn.	1.4
6.6	J15H78	Method detection limit		Median	7.8
7.8	J15H79	TOTAL	12	Min.	4.9
7.7	J15H80			Max.	9.4
5.1	J15H81				
7.7	J15H82				
8.3	J15H83				
9.4	J15VY6	Lognormal distribution?		Normal distribution?	
8.2	J15H85	r-squared is:	0.873	r-squared is:	0.922

Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 8.3

95% UCL Calculation — Hexavalent chromium

DATA	ID				
5.6	J15H76/J15H77	Number of samples		Uncensored values	
0.33	J15H73	Uncensored	12	Mean	0.66
0.24	J15VY5	Censored		Lognormal mean	0.47
0.31	J15H75	Detection limit or PQL		Std. devn.	1.55
0.22	J15H78	Method detection limit		Median	0.27
0.29	J15H79	TOTAL	12	Min.	0.10
0.10	J15H80			Max.	5.58
0.31	J15H81				
0.29	J15H82				
0.10	J15H83				
0.10	J15VY6	Lognormal distribution?		Normal distribution?	
0.10	J15H85	r-squared is:	0.693	r-squared is:	0.347

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 1.4

95% UCL Calculation — Cobalt

DATA	ID				
5.2	J15H76/J15H77	Number of samples		Uncensored values	
4.6	J15H73	Uncensored	12	Mean	4.5
4.6	J15VY5	Censored		Lognormal mean	4.5
3.1	J15H75	Detection limit or PQL		Std. devn.	0.70
4.1	J15H78	Method detection limit		Median	4.6
4.7	J15H79	TOTAL	12	Min.	3.1
4.2	J15H80			Max.	5.6
3.4	J15H81				
4.3	J15H82				
5.6	J15H83				
4.9	J15VY6	Lognormal distribution?		Normal distribution?	
4.8	J15H85	r-squared is:	0.922	r-squared is:	0.956

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.9

95% UCL Calculation — Copper

DATA	ID				
12.6	J15H76/J15H77	Number of samples		Uncensored values	
11.2	J15H73	Uncensored	12	Mean	11.3
12.5	J15VY5	Censored		Lognormal mean	11.3
8.6	J15H75	Detection limit or PQL		Std. devn.	1.3
10.5	J15H78	Method detection limit		Median	11.8
12.5	J15H79	TOTAL	12	Min.	8.6
11.6	J15H80			Max.	12.6
9.6	J15H81				
12.3	J15H82				
12.1	J15H83				
12.0	J15VY6	Lognormal distribution?		Normal distribution?	
9.8	J15H85	r-squared is:	0.870	r-squared is:	0.888

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 11.9

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
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Calc. No. 0100F-CA-V0317
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Date 11/8/07
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Ecology Software (MTCAStat) Results

95% UCL Calculation — Lead

DATA	ID				
9.5	J15H76/J15H77	Number of samples		Uncensored values	
2.7	J15H73	Uncensored	12	Mean	4.2
3.8	J15VY5	Censored		Lognormal mean	4.2
1.8	J15H75	Detection limit or PQL		Std. devn.	2.4
2.5	J15H78	Method detection limit		Median	3.5
3.0	J15H79	TOTAL	12	Min.	1.8
2.5	J15H80			Max.	9.5
3.6	J15H81				
7.9	J15H82				
5.8	J15H83				
3.3	J15VY6	Lognormal distribution?		Normal distribution?	
4.0	J15H85	r-squared is:	0.939	r-squared is:	0.819

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 5.8

95% UCL Calculation — Manganese

DATA	ID				
253	J15H76/J15H77	Number of samples		Uncensored values	
221	J15H73	Uncensored	12	Mean	219
249	J15VY5	Censored		Lognormal mean	219
164	J15H75	Detection limit or PQL		Std. devn.	30.4
190	J15H78	Method detection limit		Median	221
226	J15H79	TOTAL	12	Min.	164
221	J15H80			Max.	255
172	J15H81				
209	J15H82				
244	J15H83				
255	J15VY6	Lognormal distribution?		Normal distribution?	
221	J15H85	r-squared is:	0.908	r-squared is:	0.929

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 237

95% UCL Calculation — Nickel

DATA	ID				
10.1	J15H76/J15H77	Number of samples		Uncensored values	
9.3	J15H73	Uncensored	12	Mean	8.7
10.4	J15VY5	Censored		Lognormal mean	8.7
5.9	J15H75	Detection limit or PQL		Std. devn.	1.4
7.4	J15H78	Method detection limit		Median	8.9
9.0	J15H79	TOTAL	12	Min.	5.9
8.2	J15H80			Max.	10.4
7.1	J15H81				
8.7	J15H82				
9.6	J15H83				
10.0	J15VY6	Lognormal distribution?		Normal distribution?	
8.7	J15H85	r-squared is:	0.911	r-squared is:	0.948

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 9.6

95% UCL Calculation — Vanadium

DATA	ID				
30.7	J15H76/J15H77	Number of samples		Uncensored values	
24.4	J15H73	Uncensored	12	Mean	27.2
32.6	J15VY5	Censored		Lognormal mean	27.3
16.9	J15H75	Detection limit or PQL		Std. devn.	5.7
24.7	J15H78	Method detection limit		Median	28.3
30.7	J15H79	TOTAL	12	Min.	16.7
27.7	J15H80			Max.	33.7
16.7	J15H81				
27.1	J15H82				
32.6	J15H83				
33.7	J15VY6	Lognormal distribution?		Normal distribution?	
28.8	J15H85	r-squared is:	0.836	r-squared is:	0.894

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 29.9

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

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Ecology Software (MTCAStat) Results

95% UCL Calculation

DATA	ID	Zinc			
30.9	J15H76/J15H77	Number of samples		Uncensored values	
26.6	J15H73	Uncensored	12	Mean	28.1
33.3	J15VY5	Censored		Lognormal mean	28.1
20.7	J15H75	Detection limit or IPQL		Std. devn.	3.9
24.7	J15H78	Method detection limit		Median	27.3
31.1	J15H79	TOTAL	12	Min.	20.7
27.9	J15H80			Max.	33.3
25.1	J15H81				
26.3	J15H82				
32.1	J15H83				
32.5	J15VY6	Lognormal distribution?		Normal distribution?	
25.5	J15H85	r-squared is:	0.931	r-squared is:	0.943

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 30.4

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
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Date 11/8/07
Sheet No. 17 of 22

Split/Duplicate Analysis, Excavation Shallow Zone

Sample Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Strontium-90			Gross alpha			Gross beta		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ - A4	J15H90	9/11/07	15.0		0.116	0.452		0.023	0.646		0.052	0.628		0.016	0.646		0.052	0.07	U	0.310.	15.8		6.22	15.5		9.26
SZ - A4 - dup	J15H91	9/11/07	13.4		0.098	0.373		0.017	0.563		0.039	0.597		0.012	0.563		0.039	-0.1	U	0.354	6.44	U	7.07	41.0		6.17
SZ - A4 - split	J15HY4	9/11/07	--		--	--		--	--		--	--		--	--		--	0.324		0.136	0.171	U	8.97	19.2		4.16

Analysis:

	TDL	0.5	0.1	0.2	1	1	1	10	15
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	No - evaluate difference	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference	No - evaluate difference	No - evaluate difference			No - evaluate difference
	RPD	11%							
	Difference >2xTDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable
Split Analysis	Both > PQL?						No - evaluate difference	No - evaluate difference	**Yes (continue)**
	Both >5xTDL?								No - evaluate difference
	RPD								
	Difference >2xTDL?						No - acceptable	No - acceptable	No - acceptable

Split/Duplicate Analysis, Excavation Shallow Zone (continued)

Sample Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Calcium			Chromium			Hexavalent chromium		
			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	mg/kg	Q	PQL
SZ - A4	J15H90	9/11/07	3510	C	4.7	1.2	U	1.2	29.4	C	0.06	0.11		0.03	1.0	U	1.0	5650	C	2	5.2		0.29	0.27		0.20
SZ - A4 - dup	J15H91	9/11/07	3290	C	4.7	2.3		1.2	31.9	C	0.06	0.12		0.03	1.0	U	1.0	6050	C	2	5.2		0.28	0.20	U	0.20
SZ - A4 - split	J15HY4	9/11/07	5010		40.1	1.6	B	2.0	42.0		10.0	0.14	B	1	7.1	B	20.1	6390		502	9.2		2.0	0.35	U	0.35

Analysis:

	TDL	5	10	2	0.5	2.0	100.0	1.0	0.5
Duplicate Analysis	Both > PQL?	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	No - evaluate difference
	Both >5xTDL?	**Yes (calc RPD)**		**Yes (calc RPD)**	No - evaluate difference		**Yes (calc RPD)**	**Yes (calc RPD)**	
	RPD	6%		8%			7%	***0%***	
	Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable
Split Analysis	Both > PQL?	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	No - evaluate difference	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	No - evaluate difference
	Both >5xTDL?	**Yes (calc RPD)**		**Yes (calc RPD)**			**Yes (calc RPD)**	**Yes (calc RPD)**	
	RPD	***35%***		***35%***			12%	***56%***	
	Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	***Yes - assess further***	Not applicable	Not applicable	No - acceptable

Split/Duplicate Analysis, Excavation Shallow Zone (continued)

Sample Area	Sample Number	Sample Date	Cobalt			Copper			Iron			Lead			Magnesium			Manganese			Nickel			Potassium		
			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	mg/kg	Q	PQL
SZ - A4	J15H90	9/11/07	3.4		0.23	10.3	C	0.26	8420		6.8	2.6		0.94	2720	C	2.3	181		0.2	7.1		0.77	630	C	9.1
SZ - A4 - dup	J15H91	9/11/07	3.5		0.23	10.8	C	0.26	8240		6.8	2.7		0.94	2670	C	2.3	180		0.2	7.5		0.77	574	C	9.1
SZ - A4 - split	J15HY4	9/11/07	5.8	B	10.0	11.1		5.0	13200		20.1	3.4		2.0	3900		201	249		2.0	8.7		8.0	1280		1000

Analysis:

	TDL	2	1	5	5	75	5	4	400
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference
	RPD		5%	2%		2%	1%		
	Difference >2xTDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable
Split Analysis	Both > PQL?	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?		**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference
	RPD		7%	***44%***		***36%***	***32%***		
	Difference >2xTDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel **Date** 11/08/07 **Calc. No.** 0100F-CA-V0317 **Rev. No.** 0
Project 100-F Field Remediation **Job No.** 14655 **Checked** J. M. Capron **Date** 11/8/07
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation **Sheet No.** 18 of 22

49 **Split/Duplicate Analysis, Excavation Shallow Zone (continued)**

50	Sample	Sample	Sample	Silicon			Sodium			Vanadium			Zinc		
51	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
52	SZ - A4	J15H90	9/11/07	2360	C	2.5	168	C	2.0	18.7		0.23	23.6	C	0.11
53	SZ - A4 - dup	J15H91	9/11/07	1830	C	2.4	138	C	2.0	17.4		0.23	21.9	C	0.11
54	SZ - A4 - split	J15HY4	9/11/07	277		80.3	99.8	B	201	34.4		2.0	29.8	C	10.0

55 **Analysis:**

56	TDL		2	50	3	1
57	Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
58		Both >5xTDL?	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**
59		RPD	25%		7%	7%
60		Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	Not applicable
61	Split Analysis	Both > PQL?	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**
62		Both >5xTDL?	**Yes (calc RPD)**		**Yes (calc RPD)**	**Yes (calc RPD)**
63		RPD	***158%***		***59%***	23%
64		Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

Date 11/08/07
Job No. 14655

Calc. No. 0100F-CA-V0317
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1 **Split/Duplicate Analysis, Overburden stockpile**

2	Sample	Sample	Sample	Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Gross alpha			Gross beta			Aluminum		
3	Area	Number	Date	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL
4	OB - A4	J15H76	9/5/07	14.4		0.220	0.542		0.043	0.794		0.104	0.752		0.035	0.794		0.104	6.06	U	8.86	23.7		5.66	5550		5.0
5	OB - A4 - dup	J15H77	9/5/07	14.5		0.396	0.592		0.062	0.744		0.149	0.714		0.049	0.744		0.149	15.4		6.76	18.0		6.15	6460		4.9
6	OB - A4 - split	J15HB8	9/5/07	--		--	--		--	--		--	--		--	--		--	4.35	U	7.78	22.5		4.52	8070		10.3

7 **Analysis:**

8		TDL	0.5	0.1	0.2	1	1	10	15	5
9	Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**
10		Both >5xTDL?	**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference	No - evaluate difference		No - evaluate difference	**Yes (calc RPD)**
11		RPD	1%	9%						15%
12		Difference >2xTDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable
13	Split Analysis	Both > PQL?						No - evaluate difference	**Yes (continue)**	**Yes (continue)**
14		Both >5xTDL?							No - evaluate difference	**Yes (calc RPD)**
15		RPD								*37%*
16		Difference >2xTDL?						No - acceptable	No - acceptable	Not applicable

17 **Split/Duplicate Analysis, Overburden stockpile (continued)**

18	Sample	Sample	Sample	Antimony			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium		
19	Area	Number	Date	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	mg/kg	Q	PQL
20	OB - A4	J15H76	9/5/07	0.66	U	0.66	2.4		1.2	54.3	C	0.06	0.3		0.03	1.3		1.1	0.15	U	0.15	4270	C	2.1	8.1		0.30
21	OB - A4 - dup	J15H77	9/5/07	0.66	U	0.66	4.1		1.2	68.0	C	0.06	0.33		0.03	2.3		1.1	0.15	U	0.15	4670	C	2.1	9.6		0.30
22	OB - A4 - split	J15HB8	9/5/07	1.2	B	1.0	4.7		0.49	79.2		0.47	0.32	B	0.14	13.1	B	3	0.30	B	0.12	5450		61	12.6	C	0.46

23 **Analysis:**

24		TDL	6	10	2	0.5	2	0.5	100	1
25	Duplicate Analysis	Both > PQL?	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**
26		Both >5xTDL?		No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference		**Yes (calc RPD)**	**Yes (calc RPD)**
27		RPD			22%				9%	17%
28		Difference >2xTDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable
29	Split Analysis	Both > PQL?	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**
30		Both >5xTDL?		No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference		**Yes (calc RPD)**	**Yes (calc RPD)**
31		RPD			***37%***				24%	***43%***
32		Difference >2xTDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	***Yes - assess further***	No - acceptable	Not applicable	Not applicable

33 **Split/Duplicate Analysis, Overburden stockpile (continued)**

34	Sample	Sample	Sample	Hexavalent chromium			Cobalt			Copper			Iron			Lead			Magnesium			Manganese			Molybdenum		
35	Area	Number	Date	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	mg/kg	Q	PQL
36	OB - A4	J15H76	9/5/07	2.0	U	2.0	5.0		0.24	12.5		0.27	12400	C	7.2	8.8		0.99	3440	C	2.4	241		0.21	0.48	U	0.48
37	OB - A4 - dup	J15H77	9/5/07	20.3	U	20.3	5.4		0.24	12.7		0.27	15300	C	7.1	10.2		0.98	3970	C	2.4	264		0.21	0.78		0.48
38	OB - A4 - split	J15HB8	9/5/07	0.83		0.35	8.1	B	0.47	14.0		0.81	17900		7.6	12.7		0.61	4340		18.2	309		0.81	1.8	U	1.8

39 **Analysis:**

40		TDL	0.5	2	1	5	5	75	5	5
41	Duplicate Analysis	Both > PQL?	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference
42		Both >5xTDL?		No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	
43		RPD			2%	21%		14%	9%	
44		Difference >2xTDL?	***Yes - assess further***	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable
45	Split Analysis	Both > PQL?	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference
46		Both >5xTDL?		No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	
47		RPD			11%	***36%***		23%	25%	
48		Difference >2xTDL?	***Yes - assess further***	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH **Date** 11/08/07 **Calc. No.** 0100F-CA-V0317 **Rev. No.** 0
Project 100-F Field Remediation **Job No.** 14655 **Checked** J. M. Capron JMC **Date** 11/8/07
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation **Sheet No.** 20 of 22

49 **Split/Duplicate Analysis, Overburden stockpile (continued)**

50	Sample	Sample	Sample	Nickel			Potassium			Silicon			Sodium			Vanadium			Zinc		
51	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
52	OB - A4	J15H76	9/5/07	9.2		0.81	866		9.6	1340	C	2.6	217	C	2.1	27.7		0.24	28.9	C	0.12
53	OB - A4 - dup	J15H77	9/5/07	11		0.80	1060		9.5	1390	C	2.6	242	C	2.1	33.7		0.24	32.9	C	0.12
54	OB - A4 - split	J15HB8	9/5/07	11.1		2.3	1540		305	529		18.3	261		24.4	37.6		1.1	47.2	C	3.0

55 **Analysis:**

56	TDL		4	400.0	2	50	3	1
57	Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
58		Both >5xTDL?	No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**
59		RPD			4%		20%	13%
60		Difference >2xTDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable
61	Split Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
62		Both >5xTDL?	No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**
63		RPD			***87%***		***30%***	***48%***
64		Difference >2xTDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LH
Project 100-F Field Remediation
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation

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Split/Duplicate Analysis, BCL stockpile

Sample Area	Sample Number	Sample Date	Cesium-137			Nickel-63			Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Carbon-14		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
BCL - B6	J15HB2	9/11/07	0.042	U	0.042	1.62	U	3.17	12.8		0.306	0.431		0.055	0.720		0.120	0.632		0.033	0.720		0.120	-0.63	U	3.12
BCL - B6 - dup	J15HB3	9/11/07	0.035	U	0.035	1.59	U	3.05	14.4		0.160	0.480		0.046	0.684		0.100	0.668		0.031	0.684		0.100	18.1		3.22
BCL - B6 - split	J15HB9	9/11/07	0.0262		0.016	12.7		5.93	--		--	--		--	--		--	--		--	--		--	0.048	U	0.327

Analysis:

TDL			0.1			30			0.5			0.1			0.2			1			1			50		
Duplicate Analysis	Both > PQL?		No - evaluate difference			No - evaluate difference			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			No - evaluate difference		
	Both >5xTDL?								**Yes (calc RPD)**			No - evaluate difference			No - evaluate difference			No - evaluate difference			No - evaluate difference					
	RPD								12%																	
	Difference >2xTDL?		No - acceptable			No - acceptable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable		
Split Analysis	Both > PQL?		No - evaluate difference			No - evaluate difference																		No - evaluate difference		
	Both >5xTDL?																									
	RPD																									
	Difference >2xTDL?		No - acceptable			No - acceptable																		No - acceptable		

Split/Duplicate Analysis, BCL stockpile (continued)

Sample Area	Sample Number	Sample Date	Gross alpha			Gross beta			Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
BCL - B6	J15HB2	9/11/07	8.54	U	8.700	17.9		5.63	5140	C	4.8	0.10	C	0.63	4.1		1.2	74.7	C	0.06	0.22		0.03	4.0	C	1.0
BCL - B6 - dup	J15HB3	9/11/07	13.2		6.78	13.2		6.78	5050	C	4.7	0.62	U	0.62	3.3		1.2	79.2	C	0.06	0.22		0.03	4.0	C	1.0
BCL - B6 - split	J15HB9	9/11/07	6.58	U	7.38	6.58	U	7.38	6200		40.2	2.0	U	2.0	2.3		2.0	74.7		10.1	0.21	B	1.0	9.2	B	20.1

Analysis:

TDL			10			15			5			6			10			2			0.5			2		
Duplicate Analysis	Both > PQL?		No - evaluate difference			**Yes (continue)**			**Yes (continue)**			No - evaluate difference			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**		
	Both >5xTDL?					No - evaluate difference			**Yes (calc RPD)**						No - evaluate difference			**Yes (calc RPD)**			No - evaluate difference			No - evaluate difference		
	RPD								2%									6%								
	Difference >2xTDL?		No - acceptable			No - acceptable			Not applicable			No - acceptable			No - acceptable			Not applicable			No - acceptable			No - acceptable		
Split Analysis	Both > PQL?		No - evaluate difference			No - evaluate difference			**Yes (continue)**			No - evaluate difference			**Yes (continue)**			**Yes (continue)**			No - evaluate difference			No - evaluate difference		
	Both >5xTDL?								**Yes (calc RPD)**						No - evaluate difference			**Yes (calc RPD)**								
	RPD								19%									***0%***								
	Difference >2xTDL?		No - acceptable			No - acceptable			Not applicable			No - acceptable			No - acceptable			Not applicable			No - acceptable			***Yes - assess further***		

Split/Duplicate Analysis, BCL stockpile (continued)

Sample Area	Sample Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Iron			Lead			Magnesium		
			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	mg/kg	Q	PQL
BCL - B6	J15HB2	9/11/07	0.14	U	0.14	11800	C	2.0	7.1		0.29	5.2		0.23	13.8	C	0.26	11600		6.8	5.0		0.94	3660	C	2.3
BCL - B6 - dup	J15HB3	9/11/07	0.14	U	0.14	5580	C	2.0	7.5		0.28	4.8		0.22	12.7	C	0.25	11500		6.7	5.7		0.93	3240	C	2.3
BCL - B6 - split	J15HB9	9/11/07	0.24	B	1.0	5690		503	10.5		2.0	7.3	B	10.1	11.3		5.0	15200		20.1	5.7		2.0	3780		201

Analysis:

TDL			0.5			100			1			2			1			5			5			75		
Duplicate Analysis	Both > PQL?		No - evaluate difference			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**		
	Both >5xTDL?					**Yes (calc RPD)**			**Yes (calc RPD)**			No - evaluate difference			**Yes (calc RPD)**			**Yes (calc RPD)**			No - evaluate difference			**Yes (calc RPD)**		
	RPD					***72%***			5%						8%			1%						12%		
	Difference >2xTDL?		No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable		
Split Analysis	Both > PQL?		No - evaluate difference			**Yes (continue)**			**Yes (continue)**			No - evaluate difference			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**		
	Both >5xTDL?					**Yes (calc RPD)**			**Yes (calc RPD)**						**Yes (calc RPD)**			**Yes (calc RPD)**			No - evaluate difference			**Yes (calc RPD)**		
	RPD					***70%***			***39%***						20%			27%						3%		
	Difference >2xTDL?		No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable		

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel **Date** 11/08/07 **Calc. No.** 0100F-CA-V0317 **Rev. No.** 0
Project 100-F Field Remediation **Job No.** 14655 **Checked** J. M. Capron **Date** 11/8/07
Subject 100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation **Sheet No.** 22 of 22

Split/Duplicate Analysis, BCL stockpile (continued)

Sample Area	Sample Number	Sample Date	Manganese mg/kg	Q	PQL	Mercury mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL
BCL - B6	J15HB2	9/11/07	232		0.2	0.02		0.01	0.46	U	0.46	8.9		0.77	877	C	9.2	2930	C	2.5	233	C	2.0	25.9		0.23
BCL - B6 - dup	J15HB3	9/11/07	220		0.2	0.02		0.02	0.45	U	0.45	8.9		0.76	848	C	9.0	2850	C	2.4	194	C	2.0	25.7		0.22
BCL - B6 - split	J15HB9	9/11/07	251		2.0	0.022	B, C	0.033	8.0		8.0	11.1		8.0	1240		1010	426		80.4	96.8	B	201	35.9		2.0

Analysis:

TDL		5	0.2	5	4	400	2	50	3
Duplicate Analysis	Both > PQL?	**Yes (continue)**	No - evaluate difference	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**			No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**
	RPD	5%					10%		1%
	Difference >2xTDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable
Split Analysis	Both > PQL?	**Yes (continue)**	No - evaluate difference	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**			No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**		**Yes (calc RPD)**
	RPD	8%					***149%***		***32%***
	Difference >2xTDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	***Yes - assess further***	Not applicable

Split/Duplicate Analysis, BCL stockpile (continued)

Sample Area	Sample Number	Sample Date	Zinc mg/kg	Q	PQL
BCL - B6	J15HB2	9/11/07	66.8	C	0.11
BCL - B6 - dup	J15HB3	9/11/07	34.8	C	0.11
BCL - B6 - split	J15HB9	9/11/07	39.4	C	10.1

Analysis:

TDL		1
Duplicate Analysis	Both > PQL?	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**
	RPD	***63%***
	Difference >2xTDL?	Not applicable
Split Analysis	Both > PQL?	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**
	RPD	***52%***
	Difference >2xTDL?	Not applicable

Attachment 1. 100-F-26:12 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Americium-241 (GEA)			Barium-133			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	pCi/g	Q	MDA
OB - A1	J15H73	9/5/07	0.042	U	0.042	0.024	U	0.024	0.023	U	0.023	0.025	U	0.025	0.065	U	0.065	0.083	U	0.083	0.058	U	0.058
OB - A2	J15H74	9/5/07	0.040	U	0.040	0.033	U	0.033	0.031	U	0.031	0.030	U	0.030	0.075	U	0.075	0.110	U	0.110	0.072	U	0.072
OB - A3	J15H75	9/5/07	0.298	U	0.298	0.035	U	0.035	0.032	U	0.032	0.036	U	0.036	0.089	U	0.089	0.132	U	0.132	0.099	U	0.099
OB - A4	J15H76	9/5/07	0.044	U	0.044	0.026	U	0.026	0.025	U	0.025	0.024	U	0.024	0.068	U	0.068	0.087	U	0.087	0.073	U	0.073
OB - A4 - dup	J15H77	9/5/07	0.322	U	0.322	0.040	U	0.040	0.032	U	0.032	0.034	U	0.034	0.111	U	0.111	0.127	U	0.127	0.111	U	0.111
OB - A4 - split	J15HB8	9/5/07				0.0077	U	0.016	0.00875	U	0.0171	-0.00177	U	0.017	-0.00793	U	0.0368	0.00654	U	0.0596	0.0481	U	0.0439
OB - B5	J15H78	9/5/07	0.037	U	0.037	0.030	U	0.030	0.027	U	0.027	0.029	U	0.029	0.070	U	0.070	0.102	U	0.102	0.067	U	0.067
OB - B6	J15H79	9/5/07	0.040	U	0.040	0.022	U	0.022	0.022	U	0.022	0.025	U	0.025	0.062	U	0.062	0.084	U	0.084	0.055	U	0.055
OB - B7	J15H80	9/5/07	0.144	U	0.144	0.025	U	0.025	0.022	U	0.022	0.021	U	0.021	0.059	U	0.059	0.073	U	0.073	0.077	U	0.077
OB - B8	J15H81	9/5/07	0.038	U	0.038	0.032	U	0.032	0.027	U	0.027	0.031	U	0.031	0.075	U	0.075	0.102	U	0.102	0.071	U	0.071
OB - C9	J15H82	9/5/07	0.041	U	0.041	0.034	U	0.034	0.032	U	0.032	0.034	U	0.034	0.078	U	0.078	0.112	U	0.112	0.073	U	0.073
OB - C10	J15H83	9/6/07	0.037	U	0.037	0.030	U	0.030	0.028	U	0.028	0.028	U	0.028	0.072	U	0.072	0.097	U	0.097	0.066	U	0.066
OB - C1	J15H84	9/6/07	0.144	U	0.144	0.023	U	0.023	0.026		0.022	0.021	U	0.021	0.060	U	0.060	0.070	U	0.070	0.076	U	0.076
OB - C2	J15H85	9/6/07	0.037	U	0.037	0.019	U	0.019	0.056		0.024	0.020	U	0.020	0.081		0.061	0.077	U	0.077	0.051	U	0.051
BCL - A1	J15H97	9/6/07	0.040	U	0.040	0.032	U	0.032	0.030	U	0.030	0.030	U	0.030	0.078	U	0.078	0.106	U	0.106	0.072	U	0.072
BCL - A2	J15H98	9/6/07	0.280	U	0.280	0.036	U	0.036	0.079		0.039	0.037	U	0.037	0.097	U	0.097	0.128	U	0.128	0.108	U	0.108
BCL - A3	J15H99	9/6/07	0.157	U	0.157	0.025	U	0.025	0.024	U	0.024	0.022	U	0.022	0.063	U	0.063	0.076	U	0.076	0.082	U	0.082
BCL - A4	J15HB0	9/6/07	0.044	U	0.044	0.023	U	0.023	0.025	U	0.025	0.025	U	0.025	0.068	U	0.068	0.086	U	0.086	0.060	U	0.060
BCL - B5	J15HB1	9/6/07	0.160	U	0.160	0.024	U	0.024	0.025		0.020	0.022	U	0.022	0.060	U	0.060	0.077	U	0.077	0.080	U	0.080
BCL - B7	J15HB4	9/6/07	0.038	U	0.038	0.031	U	0.031	0.041		0.028	0.029	U	0.029	0.075	U	0.075	0.105	U	0.105	0.069	U	0.069
BCL - B6	J15HB2	9/11/07	0.036	U	0.036	0.027	U	0.027	0.042	U	0.042	0.028	U	0.028	0.071	U	0.071	0.093	U	0.093	0.059	U	0.059
BCL - B6 - dup	J15HB3	9/11/07	0.037	U	0.037	0.023	U	0.023	0.035	U	0.035	0.022	U	0.022	0.057	U	0.057	0.083	U	0.083	0.061	U	0.061
BCL - B8	J15HB5	9/11/07	0.128	U	0.128	0.022	U	0.022	0.020	U	0.020	0.021	U	0.021	0.055	U	0.055	0.066	U	0.066	0.073	U	0.073
SZ - A1	J15H87	9/11/07	0.266	U	0.266	0.052	U	0.052	0.035	U	0.035	0.039	U	0.039	0.089	U	0.089	0.125	U	0.125	0.100	U	0.100
SZ - A2	J15H88	9/11/07	0.038	U	0.038	0.027	U	0.027	0.027	U	0.027	0.029	U	0.029	0.072	U	0.072	0.096	U	0.096	0.062	U	0.062
SZ - A3	J15H89	9/11/07	0.146	U	0.146	0.025	U	0.025	0.022	U	0.022	0.022	U	0.022	0.062	U	0.062	0.072	U	0.072	0.081	U	0.081
SZ - A4	J15H90	9/11/07	0.094	U	0.094	0.020	U	0.020	0.012	U	0.012	0.013	U	0.013	0.031	U	0.031	0.046	U	0.046	0.036	U	0.036
SZ - A4 - dup	J15H91	9/11/07	0.013	U	0.013	0.010	U	0.010	0.009	U	0.009	0.010	U	0.010	0.024	U	0.024	0.033	U	0.033	0.028	U	0.028
SZ - B5	J15H92	9/12/07	0.048	U	0.048	0.009	U	0.009	0.007	U	0.007	0.007	U	0.007	0.021	U	0.021	0.025	U	0.025	0.044	U	0.044
SZ - B6	J15H93	9/12/07	0.275	U	0.275	0.058	U	0.058	0.034	U	0.034	0.039	U	0.039	0.090	U	0.090	0.129	U	0.129	0.108	U	0.108
SZ - B7	J15H94	9/12/07	0.037	U	0.037	0.029	U	0.029	0.030	U	0.030	0.028	U	0.028	0.072	U	0.072	0.094	U	0.094	0.058	U	0.058
SZ - B8	J15H95	9/12/07	0.039	U	0.039	0.024	U	0.024	0.024	U	0.024	0.023	U	0.023	0.059	U	0.059	0.076	U	0.076	0.087	U	0.087
BCL - B6 - split	J15HB9	9/11/07				0.00763	U	0.0148	0.0262		0.016	0.000723	U	0.0165	0.00314	U	0.0335	-0.0218	U	0.0471	0.0387	U	0.0383
SZ - A4 - split	J15HY4	9/11/07				0.00515	U	0.0155	-0.0078	U	0.0146	0.00521	U	0.0159	-0.0142	U	0.0351	-0.000349	U	0.0508	0.0139	U	0.0403
OB - A2	J15PK1	10/4/07																					
BCL - B5	J15PK2	10/4/07																					
BCL - B6	J15PK3	10/4/07																					
OB - C1	J15PK4	10/4/07																					
OB - A2	J15VY5	10/16/07	0.299	U	0.299	0.046	U	0.046	0.037	U	0.037	0.041	U	0.041	0.100	U	0.100	0.137	U	0.137	0.113	U	0.113
OB - C1	J15VY6	10/16/07	0.040	U	0.040	0.034	U	0.034	0.027	U	0.027	0.030	U	0.030	0.074	U	0.074	0.105	U	0.105	0.062	U	0.062
BCL - B5	J15VY7	10/16/07	0.045	U	0.045	0.024	U	0.024	0.026	U	0.026	0.026	U	0.026	0.059	U	0.059	0.087	U	0.087	0.092	U	0.092
BCL - B6	J15VY8	10/16/07	0.180	U	0.180	0.025	U	0.025	0.041	U	0.041	0.022	U	0.022	0.065	U	0.065	0.075	U	0.075	0.084	U	0.084

Note: The following abbreviations apply to all Attachment 1 tables. Data qualified with C and/or J are considered acceptable values.

C = method blank contamination (inorganic constituents)
GEA = gamma energy analysis
J = estimated
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
U = undetected

Attachment	1	Sheet No.	1 of 7
Originator	L. D. Habel	Date	11/08/07
Checked	J. M. Capron	Date	11/8/07
Calc. No.	0100F-CA-V0317	Rev. No.	0

Attachment 1. 100-F-28:12 Verification Sampling Results.

Sample	HEIS	Sample	Nickel-63			Potassium-40			Radium-226			Radium-228			Silver-108			Thorium-228			Thorium-232		
Location	Number	Date	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB - A1	J15H73	9/5/07	0.201	U	3.10	14.8		0.218	0.505		0.048	0.697		0.127	0.017	U	0.017	0.682		0.030	0.697		0.127
OB - A2	J15H74	9/5/07	0.481	U	3.09	13.0		0.299	0.471		0.050	0.701		0.122	0.022	U	0.022	0.685		0.037	0.701		0.122
OB - A3	J15H75	9/5/07	-0.240	U	3.08	14.6		0.426	0.404		0.065	0.544		0.167	0.025	U	0.025	0.559		0.046	0.544		0.167
OB - A4	J15H76	9/5/07	-0.722	U	3.09	14.4		0.220	0.542		0.043	0.794		0.104	0.018	U	0.018	0.752		0.035	0.794		0.104
OB - A4 - dup	J15H77	9/5/07	-0.080	U	3.07	14.5		0.396	0.592		0.062	0.744		0.149	0.025	U	0.025	0.714		0.049	0.744		0.149
OB - A4 - split	J15HB8	9/5/07	0.136	U	6.03										-0.0053	U	0.0113						
OB - B5	J15H78	9/5/07	0.236	U	3.03	14.1		0.256	0.406		0.049	0.644		0.118	0.020	U	0.020	0.558		0.034	0.644		0.118
OB - B6	J15H79	9/5/07	0.447	U	3.14	15.2		0.217	0.476		0.045	0.716		0.104	0.017	U	0.017	0.675		0.028	0.716		0.104
OB - B7	J15H80	9/5/07	-0.318	U	3.07	13.9		0.218	0.433		0.042	0.630		0.089	0.015	U	0.015	0.591		0.027	0.630		0.089
OB - B8	J15H81	9/5/07	-0.041	U	3.20	13.1		0.312	0.432		0.052	0.710		0.120	0.021	U	0.021	0.607		0.035	0.710		0.120
OB - C9	J15H82	9/5/07	1.47	U	3.06	14.2		0.269	0.469		0.061	0.839		0.118	0.024	U	0.024	0.724		0.037	0.839		0.118
OB - C10	J15H83	9/6/07	2.13	U	3.05	12.9		0.254	0.438		0.043	0.644		0.124	0.021	U	0.021	0.671		0.035	0.644		0.124
OB - C1	J15H84	9/6/07	1.15	U	2.99	13.4		0.190	0.392		0.040	0.627		0.088	0.016	U	0.016	0.559		0.029	0.627		0.088
OB - C2	J15H85	9/6/07	1.80	U	3.00	13.4		0.116	0.470		0.044	0.642		0.088	0.015	U	0.015	0.674		0.027	0.642		0.088
BCL - A1	J15H97	9/6/07	1.64	U	2.99	13.2		0.283	0.469		0.053	0.593		0.123	0.022	U	0.022	0.637		0.039	0.593		0.123
BCL - A2	J15H98	9/6/07	2.97	U	3.02	14.2		0.344	0.484		0.070	0.776		0.174	0.028	U	0.028	0.700		0.070	0.776		0.174
BCL - A3	J15H99	9/6/07	0.349	U	2.80	14.1		0.266	0.420		0.043	0.656		0.104	0.017	U	0.017	0.623		0.034	0.656		0.104
BCL - A4	J15HB0	9/6/07	1.42	U	2.93	13.6		0.267	0.525		0.051	0.785		0.105	0.018	U	0.018	0.725		0.029	0.785		0.105
BCL - B5	J15HB1	9/6/07	1.57	U	2.80	13.9		0.245	0.440		0.044	0.712		0.089	0.017	U	0.017	0.627		0.032	0.712		0.089
BCL - B7	J15HB4	9/6/07	2.91	U	2.96	13.4		0.281	0.412		0.047	0.640		0.112	0.021	U	0.021	0.623		0.035	0.640		0.112
BCL - B6	J15HB2	9/11/07	1.62	U	3.17	12.8		0.306	0.431		0.055	0.720		0.120	0.019	U	0.019	0.632		0.033	0.720		0.120
BCL - B6 - dup	J15HB3	9/11/07	1.59	U	3.05	14.4		0.160	0.480		0.046	0.684		0.100	0.015	U	0.015	0.668		0.031	0.684		0.100
BCL - B8	J15HB5	9/11/07	1.45	U	3.06	13.4		0.224	0.397		0.041	0.549		0.087	0.014	U	0.014	0.585		0.029	0.549		0.087
SZ - A1	J15H87	9/11/07	0.732	U	3.09	13.9		0.304	0.513		0.061	0.696		0.128	0.024	U	0.024	0.712		0.043	0.696		0.128
SZ - A2	J15H88	9/11/07	0.738	U	3.28	13.7		0.271	0.432		0.052	0.616		0.100	0.019	U	0.019	0.563		0.034	0.616		0.100
SZ - A3	J15H89	9/11/07	-0.522	U	3.15	14.4		0.249	0.541		0.040	0.742		0.094	0.016	U	0.016	0.726		0.032	0.742		0.094
SZ - A4	J15H90	9/11/07	0.508	U	3.06	15.0		0.116	0.452		0.023	0.646		0.052	0.009	U	0.009	0.628		0.016	0.646		0.052
SZ - A4 - dup	J15H91	9/11/07	0.290	U	3.07	13.4		0.098	0.373		0.017	0.563		0.039	0.006	U	0.006	0.597		0.012	0.563		0.039
SZ - B5	J15H92	9/12/07	2.79	U	3.06	14.4		0.078	0.414		0.015	0.642		0.033	0.006	U	0.006	0.602		0.011	0.642		0.033
SZ - B6	J15H93	9/12/07	-0.036	U	3.02	15.2		0.352	0.436		0.066	0.655		0.141	0.025	U	0.025	0.583		0.047	0.655		0.141
SZ - B7	J15H94	9/12/07	0.234	U	3.30	13.4		0.294	0.362		0.048	0.456		0.106	0.019	U	0.019	0.563		0.036	0.456		0.106
SZ - B8	J15H95	9/12/07	1.09	U	3.42	14.9		0.220	0.444		0.048	0.681		0.089	0.016	U	0.016	0.626		0.033	0.681		0.089
BCL - B6 - split	J15HB9	9/11/07	12.7		5.93										0.000591	U	0.0101						
SZ - A4 - split	J15HY4	9/11/07	-2.11	U	6.09										0.0023	U	0.0113						
OB - A2	J15PK1	10/4/07																					
BCL - B5	J15PK2	10/4/07																					
BCL - B6	J15PK3	10/4/07																					
OB - C1	J15PK4	10/4/07																					
OB - A2	J15VY5	10/16/07	-0.734	U	3.17	14.0		0.505	0.506		0.075	0.670		0.164	0.026	U	0.026	0.677		0.046	0.670		0.164
OB - C1	J15VY6	10/16/07	-0.222	U	3.20	13.5		0.276	0.451		0.056	0.648		0.119	0.020	U	0.020	0.680		0.035	0.648		0.119
BCL - B5	J15VY7	10/16/07	-1.55	U	3.27	14.7		0.197	0.494		0.050	0.771		0.091	0.016	U	0.016	0.724		0.034	0.771		0.091
BCL - B6	J15VY8	10/16/07	-0.857	U	3.22	13.5		0.206	0.430		0.045	0.631		0.108	0.016	U	0.016	0.639		0.032	0.631		0.108

Attachment	1	Sheet No.	2 of 7
Originator	L. D. Habel	Date	11/08/07
Checked	J. M. Capron	Date	
Calc. No.	0100F-CA-V0317	Rev. No.	0

Attachment 1. 100-F-26:12 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Strontium-90			Uranium-235			Uranium-238			Carbon-14			Tritium			Gross alpha			Gross beta		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB - A1	J15H73	9/5/07	0.125	U	0.268	0.104	U	0.104	2.86	U	2.86	1.02	U	1.84	1.05	U	2.11	7.34	U	7.59	13.9		6.18
OB - A2	J15H74	9/5/07	-0.013	U	0.257	0.120	U	0.120	3.66	U	3.66	14.3		1.80	-0.864	U	2.04	18.7		6.79	17.0		5.70
OB - A3	J15H75	9/5/07	0.005	U	0.248	0.153	U	0.153	4.37	U	4.37	0.546	U	1.71	0.698	U	2.10	7.50		6.87	13.7		6.31
OB - A4	J15H76	9/5/07	-0.058	U	0.259	0.111	U	0.111	3.11	U	3.11	-0.151	U	1.84	-0.106	U	2.15	6.06	U	8.86	23.7		5.66
OB - A4 - dup	J15H77	9/5/07	0.009	U	0.324	0.168	U	0.168	4.60	U	4.60	-0.563	U	1.76	-0.368	U	2.14	15.4		6.76	18.0		6.15
OB - A4 - split	J15HB8	9/5/07	0.0224	U	0.151							0.025	U	0.845	0.00345	U	0.0209	4.35	U	7.78	22.5		4.52
OB - B5	J15H78	9/5/07	0.046	U	0.258	0.111	U	0.111	3.42	U	3.42	0.063	U	1.72	1.11	U	3.57	6.95		6.65	17.8		6.14
OB - B6	J15H79	9/5/07	-0.073	U	0.283	0.100	U	0.100	2.89	U	2.89	-0.155	U	1.89	0.423	U	3.64	9.14		6.81	17.4		5.54
OB - B7	J15H80	9/5/07	-0.002	U	0.253	0.103	U	0.103	2.46	U	2.46	0.091	U	1.66	-0.821	U	3.75	6.15	U	8.40	18.5		9.06
OB - B8	J15H81	9/5/07	-0.013	U	0.259	0.115	U	0.115	3.54	U	3.54	0.129	U	1.77	0.925	U	3.61	2.64	U	10.6	18.2		8.66
OB - C9	J15H82	9/5/07	-0.035	U	0.258	0.119	U	0.119	3.61	U	3.61	1.06	U	1.70	-0.241	U	3.70	5.13	U	7.52	16.8		5.44
OB - C10	J15H83	9/6/07	-0.039	U	0.286	0.109	U	0.109	3.31	U	3.31	-1.39	UJ	3.02	-0.275	UJ	3.83	6.75	U	10.1	18.4		8.63
OB - C1	J15H84	9/6/07	0.062	U	0.320	0.104	U	0.104	2.48	U	2.48	22.5	J	3.16	-0.520	UJ	3.62	11.3		7.01	20.8		5.42
OB - C2	J15H85	9/6/07	0.006		0.285	0.093	U	0.093	2.70	U	2.70	-0.184	UJ	3.20	0.105	UJ	3.64	10.1		6.43	20.3		5.67
BCL - A1	J15H97	9/6/07	0.390		0.232	0.121	U	0.121	3.60	U	3.60	1.09	UJ	3.44	0.641	UJ	3.72	7.54		6.53	18.4		6.30
BCL - A2	J15H98	9/6/07	0.563		0.218	0.161	U	0.161	4.43	U	4.43	-1.72	UJ	3.26	-0.924	UJ	3.57	0.644	U	8.53	18.3		5.65
BCL - A3	J15H99	9/6/07	0.124	U	0.290	0.112	U	0.112	2.71	U	2.71	5.10	J	3.09	-0.754	UJ	3.75	12.8		12.0	23.5		6.17
BCL - A4	J15HB0	9/6/07	0.042	U	0.283	0.106	U	0.106	2.97	U	2.97	-0.244	UJ	3.18	1.19	UJ	3.77	12.9		8.06	13.2		9.04
BCL - B5	J15HB1	9/6/07	-0.032	U	0.220	0.108	U	0.108	2.53	U	2.53	62.7	J	3.16	0.968	UJ	3.74	5.09	U	10.1	20.1		8.63
BCL - B7	J15HB4	9/6/07	0.068	U	0.396	0.113	U	0.113	3.51	U	3.51	-1.67	UJ	3.34	-0.941	UJ	3.64	9.25		7.32	17.3		5.42
BCL - B6	J15HB2	9/11/07	0.056	U	0.315	0.107	U	0.107	3.28	U	3.28	-0.630	U	3.12	0.200	U	4.36	8.54	U	8.70	17.9		5.63
BCL - B6 - dup	J15HB3	9/11/07	-0.115	U	0.359	0.100	U	0.100	2.85	U	2.85	18.1		3.22	-0.593	U	4.30	13.2		6.78	18.7		5.54
BCL - B8	J15HB5	9/11/07	-0.074	U	0.324	0.098	U	0.098	2.27	U	2.27	-0.848	U	3.04	0.386	U	4.20	13.3		8.33	12.8		9.05
SZ - A1	J15H87	9/11/07	0.115	U	0.331	0.147	U	0.147	4.13	U	4.13	0.325	U	3.07	0	U	4.36	8.13	U	10.5	16.9		8.65
SZ - A2	J15H88	9/11/07	0.085	U	0.264	0.112	U	0.112	3.40	U	3.40	-0.157	U	3.27	0.462	U	4.30	9.81		6.96	17.2		5.42
SZ - A3	J15H89	9/11/07	-0.001	U	0.316	0.108	U	0.108	2.51	U	2.51	-0.359	U	3.39	-1.51	U	4.68	13.1		7.06	18.5		6.13
SZ - A4	J15H90	9/11/07	0.070	U	0.310	0.052	U	0.052	1.49	U	1.49	1.14	U	3.10	0	U	4.23	15.8		6.22	15.5		9.26
SZ - A4 - dup	J15H91	9/11/07	-0.100	U	0.354	0.056	U	0.056	1.13	U	1.13	-0.031	U	3.21	-1.16	U	4.46	6.44	U	7.07	41.0		6.17
SZ - B5	J15H92	9/12/07	-0.048	U	0.362	0.037	U	0.037	1.14	U	1.14	0.121	U	3.14	-0.930	U	4.33	17.3		5.78	16.0		5.68
SZ - B6	J15H93	9/12/07	0.007	U	0.301	0.159	U	0.159	4.46	U	4.46	-1.01	U	3.28	-0.424	U	4.61	12.5		7.71	17.5		6.33
SZ - B7	J15H94	9/12/07	-0.060	U	0.335	0.108	U	0.108	3.28	U	3.28	0.030	U	3.15	0	U	4.39	4.28	U	8.80	16.1		5.67
SZ - B8	J15H95	9/12/07	0.046	U	0.301	0.104	U	0.104	3.00	U	3.00	-0.059	U	3.05	0.134	U	4.37	12.6		7.08	18.9		6.13
BCL - B6 - split	J15HB9	9/11/07	0.0761	U	0.148							0.0478	U	0.327	0.00832	U	0.0149	6.58	U	7.38	17.4		4.19
SZ - A4 - split	J15HY4	9/11/07	0.324		0.136							0.264	U	0.328	0.00558	U	0.0147	0.171	U	8.97	19.2		4.16
OB - A2	J15PK1	10/4/07										1.41		2.98	26.2		7.44						
BCL - B5	J15PK2	10/4/07										0.492		2.82	52.2		7.51						
BCL - B6	J15PK3	10/4/07										1.78		3.04	58.3		7.97						
OB - C1	J15PK4	10/4/07										1.77		3.02	3.84		7.73						
OB - A2	J15VY5	10/16/07	0.017	U	0.273	0.164	U	0.164	4.59	U	4.59	-1.18	U	3.78	4.67		3.89	6.50	U	8.88	9.54		8.94
OB - C1	J15VY6	10/16/07	-0.078	U	0.248	0.115	U	0.115	3.54	U	3.54	-0.542	U	3.58	1.27		3.79	4.85	U	9.14	14.8		8.63
BCL - B5	J15VY7	10/16/07	-0.080	U	0.246	0.112	U	0.112	2.80	U	2.80	-0.727	U	3.66	12.6		3.89	10.2		8.86	15.6		5.64
BCL - B6	J15VY8	10/16/07	-0.040	U	0.260	0.102	U	0.102	2.64	U	2.64	0.152	U	3.22	3.97		3.62	8.38		8.20	16.7		5.70

Attachment	1	Sheet No.	3 of 7
Originator	L. D. Habel	Date	11/08/07
Checked	J. M. Capron	Date	
Calc. No.	0100F-CA-V0317	Rev. No.	0

Attachment 1. 100-F-26:12 Verification Sampling Results.

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
OB - A1	J15H73	9/5/07	4640		4.9	0.65	U	0.65	1.5		1.2	47.6	C	0.06	0.24		0.03	1.1	U	1.1	0.15	U	0.15
OB - A2	J15H74	9/5/07	4850		4.8	0.64	U	0.64	2.1		1.2	46.9	C	0.06	0.26		0.03	1.5		1.0	0.14	U	0.14
OB - A3	J15H75	9/5/07	3100		5.0	0.66	U	0.66	1.2	U	1.2	37.1	C	0.06	0.17		0.03	1.1	U	1.1	0.15	U	0.15
OB - A4	J15H76	9/5/07	5550		5.0	0.66	U	0.66	2.4		1.2	54.3	C	0.06	0.30		0.03	1.3		1.1	0.15	U	0.15
OB - A4 - dup	J15H77	9/5/07	6460		4.9	0.66	U	0.66	4.1		1.2	68.0	C	0.06	0.33		0.03	2.3		1.1	0.15	U	0.15
OB - A4 - split	J15HB8	9/5/07	8070		10.3	1.20	B	1.0	4.7		0.5	79.2		0.47	0.32	B	0.14	13.1	B	3.0	0.30	B	0.12
OB - B5	J15H78	9/5/07	4300		4.9	0.64	U	0.64	1.2		1.2	41.2	C	0.06	0.25		0.03	1.1	U	1.1	0.15	U	0.15
OB - B6	J15H79	9/5/07	5060		4.8	0.64	U	0.64	1.4		1.2	46.2	C	0.06	0.29		0.03	1.0	U	1.0	0.14	U	0.14
OB - B7	J15H80	9/5/07	5040		4.9	0.64	U	0.64	1.3		1.2	45.6	C	0.06	0.29		0.03	1.3		1.1	0.15		0.15
OB - B8	J15H81	9/5/07	3680		4.9	0.65	U	0.65	1.2	U	1.2	36.4	C	0.06	0.23		0.03	1.1	U	1.1	0.15	U	0.15
OB - C9	J15H82	9/5/07	5360		4.8	0.64	U	0.64	3.0		1.2	56.3	C	0.06	0.28		0.03	1.2		1.0	0.18		0.15
OB - C10	J15H83	9/6/07	5600		5.0	0.66	UJ	0.66	3.2		1.2	55.8	C	0.06	0.04		0.03	1.3		1.1	0.15	U	0.15
OB - C1	J15H84	9/6/07	5350		4.8	0.63	UJ	0.63	1.8		1.2	50.5		0.06	0.03		0.03	1.9		1.0	0.14	U	0.14
OB - C2	J15H85	9/6/07	4610		5.0	0.66	UJ	0.66	2.7		1.2	49.6		0.06	0.11		0.03	2.1		1.1	0.15	U	0.15
BCL - A1	J15H97	9/6/07	6000		4.9	0.64	UJ	0.64	2.7		1.2	46.7	C	0.06	0.03		0.03	1.3		1.1	0.17		0.15
BCL - A2	J15H98	9/6/07	6270		4.8	0.64	UJ	0.64	4.4		1.2	60.7	C	0.06	0.03	U	0.03	2.2		1.0	0.19		0.14
BCL - A3	J15H99	9/6/07	5290		4.7	0.63	UJ	0.63	2.6		1.2	61.7	C	0.06	0.03	U	0.03	2.1		1.0	0.17		0.14
BCL - A4	J15HB0	9/6/07	7120		4.6	0.61	UJ	0.61	3.4		1.1	73.4	C	0.06	0.03	U	0.03	2.4		1.0	0.19		0.14
BCL - B5	J15HB1	9/6/07	5050		4.8	0.64	UJ	0.64	2.7		1.2	71.9	C	0.06	0.03	U	0.03	3.5		1.0	0.14	U	0.14
BCL - B7	J15HB4	9/6/07	5990		4.9	0.65	UJ	0.65	2.3		1.2	82.4	C	0.06	0.03	U	0.03	3.7		1.1	0.15	U	0.15
BCL - B6	J15HB2	9/11/07	5140	C	4.8	0.10	C	0.63	4.1		1.2	74.7	C	0.06	0.22		0.03	4.0	C	1.0	0.14	U	0.14
BCL - B6 - dup	J15HB3	9/11/07	5050	C	4.7	0.62	U	0.62	3.3		1.2	79.2	C	0.06	0.22		0.03	4.0	C	1.0	0.14	U	0.14
BCL - B8	J15HB5	9/11/07	4090	C	4.7	0.62	U	0.62	2.4		1.2	56.4	C	0.06	0.16		0.03	2.3	C	1.0	0.14	U	0.14
SZ - A1	J15H87	9/11/07	5000	C	4.9	0.65	U	0.65	2.2		1.2	63.8	C	0.06	0.20		0.03	1.6	C	1.1	0.15	U	0.15
SZ - A2	J15H88	9/11/07	4290	C	4.8	0.63	U	0.63	2.8		1.2	38.8	C	0.06	0.16		0.03	1.0	U	1.0	0.14	U	0.14
SZ - A3	J15H89	9/11/07	5720	C	4.9	1.0	C	0.64	6.2		1.2	68.0	C	0.06	0.23		0.03	2.1	C	1.1	0.15	U	0.15
SZ - A4	J15H90	9/11/07	3510	C	4.7	0.63	U	0.63	1.2	U	1.2	29.4	C	0.06	0.11		0.03	1.0	U	1.0	0.14	U	0.14
SZ - A4 - dup	J15H91	9/11/07	3290	C	4.7	0.62	U	0.62	2.3		1.2	31.9	C	0.06	0.12		0.03	1.0	U	1.0	0.14	U	0.14
SZ - B5	J15H92	9/12/07	5530		4.8	0.63	U	0.63	2.8		1.2	50.5	C	0.06	0.12		0.03	2.0		1.0	0.14	U	0.14
SZ - B6	J15H93	9/12/07	4430		4.8	0.64	U	0.64	1.6		1.2	36.1	C	0.06	0.15		0.03	1.1	U	1.1	0.15	U	0.15
SZ - B7	J15H94	9/12/07	4570		4.7	0.62	U	0.62	1.5		1.2	37.5	C	0.06	0.15		0.03	1.2		1.0	0.14	U	0.14
SZ - B8	J15H95	9/12/07	3780		4.9	0.65	U	0.65	1.9		1.2	29.0	C	0.06	0.16		0.03	1.1	U	1.1	0.15	U	0.15
BCL - B6 - split	J15HB9	9/11/07	6200		40.2	2.0	U	2.0	2.3		2.0	74.7		10.1	0.21	B	1.0	9.2	B	20.1	0.24	B	1.0
SZ - A4 - split	J15HY4	9/11/07	5010		40.1	2.0	U	2.0	1.6	B	2.0	42.0		10.0	0.14	B	1.0	7.1	B	20.1	1.0	U	1.0
OB - A2	J15VY5	10/16/07	5710		12.2	0.92	U	0.92	2.7		1.5	51.2		0.31	0.21		0.15	2.1		1.5	0.31	U	0.31
OB - C1	J15VY6	10/16/07	6010		11.6	0.87	U	0.87	2.5		1.4	48.8		0.29	0.24		0.14	2.0		1.4	0.29	U	0.29
BCL - B5	J15VY7	10/16/07	5910		11.7	0.88	U	0.88	3.6		1.5	74.8		0.29	0.22		0.15	4.6		1.5	0.29	U	0.29
BCL - B6	J15VY8	10/16/07	6440		11.7	0.88	U	0.88	3.7		1.5	69.1		0.29	0.26		0.15	3.6		1.5	0.29	U	0.29

Attachment	1	Sheet No.	4 of 7
Originator	L. D. Habel	Date	11/08/07
Checked	J. M. Capron	Date	
Calc. No.	0100F-CA-V0317	Rev. No.	0

Attachment 1. 100-F-26:12 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Calcium			Chromium			Hexavalent Chromium			Cobalt			Copper			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
OB - A1	J15H73	9/5/07	5870	C	2.1	7.2		0.29	0.33		0.20	4.6		0.23	11.2		0.26	11000	C	7.0	2.7		0.97
OB - A2	J15H74	9/5/07	4450	C	2.1	6.8		0.29	0.22		0.20	5.1		0.23	11.5		0.26	13600	C	6.9	2.6		0.95
OB - A3	J15H75	9/5/07	3860	C	2.1	4.9		0.30	0.31		0.20	3.1		0.24	8.6		0.27	7220	C	7.1	1.8		0.99
OB - A4	J15H76	9/5/07	4270	C	2.1	8.1		0.30	2.0	U	2.0	5.0		0.24	12.5		0.27	12400	C	7.2	8.8		0.99
OB - A4 - dup	J15H77	9/5/07	4670	C	2.1	9.6		0.30	20.3	U	20.3	5.4		0.24	12.7		0.27	15300	C	7.1	10.2		0.98
OB - A4 - split	J15HB8	9/5/07	5450		61.0	12.6	C	0.46	0.83		0.35	8.1	B	0.47	14.0		0.81	17900		7.6	12.7		0.61
OB - B5	J15H78	9/5/07	4340	C	2.1	6.6		0.29	0.22		0.20	4.1		0.23	10.5		0.26	10300	C	7.0	2.5		0.96
OB - B6	J15H79	9/5/07	4800	C	2.1	7.8		0.29	0.29		0.20	4.7		0.23	12.5		0.26	12400	C	6.9	3.0		0.95
OB - B7	J15H80	9/5/07	4880	C	2.1	7.7		0.29	0.20	U	0.20	4.2		0.23	11.6		0.26	11800	C	7.0	2.5		0.97
OB - B8	J15H81	9/5/07	3700	C	2.1	5.1		0.30	0.31		0.20	3.4		0.24	9.6		0.27	8080	C	7.1	3.6		0.98
OB - C9	J15H82	9/5/07	3630	C	2.1	7.7		0.29	0.29		0.20	4.3		0.23	12.3		0.26	11700	C	6.9	7.9		0.96
OB - C10	J15H83	9/6/07	4410	C	2.1	8.3	C	0.30	0.20	U	0.20	5.6		0.24	12.1	C	0.27	13900		7.1	5.8		0.98
OB - C1	J15H84	9/6/07	4540		2.0	9.3		0.29	0.20	U	0.20	5.7		0.23	12.5		0.26	13800		6.9	4.0		0.95
OB - C2	J15H85	9/6/07	4070		2.1	8.2		0.30	0.20	U	0.20	4.8		0.24	9.8		0.27	12200		7.1	4.0		0.98
BCL - A1	J15H97	9/6/07	4780	C	2.1	10.1	C	0.29	0.28		0.20	5.7		0.23	11.9	C	0.26	15000		7.0	5.4		0.97
BCL - A2	J15H98	9/6/07	7640	C	2.1	10.8	C	0.29	0.20	U	0.20	5.9		0.23	14.2	C	0.26	16000		6.9	6.7		0.96
BCL - A3	J15H99	9/6/07	4900	C	2.0	9.6	C	0.28	0.28		0.20	5.3		0.23	12.7	C	0.26	14300		6.8	5.7		0.94
BCL - A4	J15HB0	9/6/07	5200	C	2.0	11.8	C	0.28	0.33		0.20	6.5		0.22	12.7	C	0.25	17800		6.7	9.1		0.92
BCL - B5	J15HB1	9/6/07	5620	C	2.1	7.7	C	0.29	0.20	U	0.20	5.4		0.23	13.5	C	0.26	12600		6.9	4.6		0.95
BCL - B7	J15HB4	9/6/07	5970	C	2.1	9.6	C	0.30	0.20	U	0.20	5.9		0.24	13.6	C	0.27	15700		7.1	6.5		0.98
BCL - B6	J15HB2	9/11/07	11800	C	2.0	7.1		0.29	0.20	U	0.20	5.2		0.23	13.8	C	0.26	11600		6.8	5.0		0.94
BCL - B6 - dup	J15HB3	9/11/07	5580	C	2.0	7.5		0.28	0.20	U	0.20	4.8		0.22	12.7	C	0.25	11500		6.7	5.7		0.93
BCL - B8	J15HB5	9/11/07	6090	C	2.0	6.2		0.28	0.20	U	0.20	4.1		0.23	11.5	C	0.26	10100		6.8	5.0		0.94
SZ - A1	J15H87	9/11/07	4130	C	2.1	6.9		0.30	0.28		0.20	5.0		0.24	11.4	C	0.27	11900		7.1	5.2		0.97
SZ - A2	J15H88	9/11/07	4290	C	2.0	6.5		0.29	0.36		0.20	4.1		0.23	11.3	C	0.26	10200		6.9	6.8		0.95
SZ - A3	J15H89	9/11/07	7920	C	2.1	8.8		0.29	0.32		0.20	5.4		0.23	14.1	C	0.26	12400		7.0	13.7		0.97
SZ - A4	J15H90	9/11/07	5650	C	2.0	5.2		0.29	0.27		0.20	3.4		0.23	10.3	C	0.26	8420		6.8	2.6		0.94
SZ - A4 - dup	J15H91	9/11/07	6050	C	2.0	5.2		0.28	0.20	U	0.20	3.5		0.23	10.8	C	0.26	8240		6.8	2.7		0.94
SZ - B5	J15H92	9/12/07	12400	C	2.0	8.5		0.29	0.27		0.20	4.9	C	0.23	11.1		0.26	12300		6.9	2.6		0.95
SZ - B6	J15H93	9/12/07	4680	C	2.1	8.2		0.29	0.34		0.20	4.6	C	0.23	9.6		0.26	11100		7.0	2.3		0.96
SZ - B7	J15H94	9/12/07	4030	C	2.0	6.7		0.28	0.20	U	0.20	4.8	C	0.23	9.8		0.25	12100		6.8	2.7		0.93
SZ - B8	J15H95	9/12/07	3720	C	2.1	5.8		0.29	0.22		0.20	4.6	C	0.24	18.3		0.27	10100		7.0	2.0		0.97
BCL - B6 - split	J15HB9	9/11/07	5690		503	10.5		2.0	0.35	U	0.35	7.3	B	10.1	11.3		5.0	15200		20.1	5.7		2.0
SZ - A4 - split	J15HY4	9/11/07	6390		502	9.2		2.0	0.35	U	0.35	5.8	B	10.0	11.1		5.0	13200		20.1	3.4		2.0
OB - A2	J15VY5	10/16/07	4710		12.2	9.2		0.61	0.24		0.21	4.6		0.61	12.5		0.61	13600		13.8	3.8		0.92
OB - C1	J15VY6	10/16/07	4580		11.6	9.4		0.58	0.20	U	0.20	4.9		0.58	12.0		0.58	14100		13.0	3.3		0.87
BCL - B5	J15VY7	10/16/07	6090		11.7	9.8		0.59	0.24		0.20	4.7		0.59	13.0		0.59	13500		13.2	5.4		0.88
BCL - B6	J15VY8	10/16/07	5400		11.7	10.1		0.59	0.32		0.20	5.8		0.59	13.2		0.59	15900		13.2	7.1		0.88

Attachment	1	Sheet No.	5 of 7
Originator	L. D. Habel	Date	11/08/07
Checked	J. M. Capron	Date	
Calc. No.	0100F-CA-V0317	Rev. No.	0

Attachment 1. 100-F-26:12 Verification Sampling Results.

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
OB - A1	J15H73	9/5/07	3250	C	2.4	221		0.21	0.02	U	0.02	0.74		0.47	9.3		0.79	849		9.4	1.3	U	1.3
OB - A2	J15H74	9/5/07	3290	C	2.3	230		0.20	0.01	U	0.01	0.46	U	0.46	8.0		0.78	806		9.3	1.2	U	1.2
OB - A3	J15H75	9/5/07	2230	C	2.4	164		0.21	0.01	U	0.01	0.50		0.48	5.9		0.81	442		9.6	1.3	U	1.3
OB - A4	J15H76	9/5/07	3440	C	2.4	241		0.21	0.01	U	0.01	0.48	U	0.48	9.2		0.81	866		9.6	1.3	U	1.3
OB - A4 - dup	J15H77	9/5/07	3970	C	2.4	264		0.21	0.01	U	0.01	0.78		0.48	11.0		0.80	1060		9.5	1.3	U	1.3
OB - A4 - split	J15HB8	9/5/07	4340		18.2	309		0.81	0.007	U	0.007	1.8	U	1.8	11.1		2.30	1540		305	0.9	U	0.9
OB - B5	J15H78	9/5/07	3020	C	2.4	190		0.20	0.01	U	0.01	0.50		0.47	7.4		0.79	677		9.4	1.3		1.3
OB - B6	J15H79	9/5/07	3380	C	2.3	226		0.20	0.02	U	0.02	0.46	U	0.46	9.0		0.78	843		9.3	1.2	U	1.2
OB - B7	J15H80	9/5/07	3330	C	2.4	221		0.20	0.01	U	0.01	0.59		0.47	8.2		0.79	850		9.4	1.3	U	1.3
OB - B8	J15H81	9/5/07	2440	C	2.4	172		0.21	0.02	U	0.02	0.48	U	0.48	7.1		0.80	638		9.5	1.3	U	1.3
OB - C9	J15H82	9/5/07	3160	C	2.4	209		0.20	0.02	U	0.02	0.47	U	0.47	8.7		0.78	898		9.3	1.3	U	1.3
OB - C10	J15H83	9/6/07	3550	C	2.4	244		0.21	0.02	U	0.02	0.48	U	0.48	9.6		0.81	954		9.5	1.3	U	1.3
OB - C1	J15H84	9/6/07	3570		2.3	238		0.20	0.01	U	0.01	0.46	U	0.46	9.8		0.77	874		9.2	1.2	U	1.2
OB - C2	J15H85	9/6/07	2880		2.4	221		0.21	0.02	U	0.02	0.48	U	0.48	8.7		0.81	750		9.5	1.3	U	1.3
BCL - A1	J15H97	9/6/07	3770	C	2.4	242		0.21	0.01	U	0.01	0.47	U	0.47	10.0		0.79	860		9.4	1.3	U	1.3
BCL - A2	J15H98	9/6/07	4160	C	2.3	253		0.20	0.02	U	0.02	0.46	U	0.46	11.0		0.78	938		9.3	1.2	U	1.2
BCL - A3	J15H99	9/6/07	3440	C	2.3	251		0.20	0.02	U	0.02	0.45	U	0.45	9.2		0.77	850		9.1	1.2	U	1.2
BCL - A4	J15HB0	9/6/07	4270	C	2.3	274		0.20	0.02	U	0.02	0.45	U	0.45	11.4		0.75	1140		8.9	1.2	U	1.2
BCL - B5	J15HB1	9/6/07	3350	C	2.3	222		0.20	0.04		0.02	0.58		0.46	8.6		0.78	768		9.3	1.2	U	1.2
BCL - B7	J15HB4	9/6/07	3830	C	2.4	247		0.21	0.08		0.01	0.59		0.47	10.1		0.80	944		9.5	1.3	U	1.3
BCL - B6	J15HB2	9/11/07	3660	C	2.3	232		0.20	0.02		0.01	0.46	U	0.46	8.9		0.77	877	C	9.2	1.2	U	1.2
BCL - B6 - dup	J15HB3	9/11/07	3240	C	2.3	220		0.20	0.02		0.02	0.45	U	0.45	8.9		0.76	848	C	9.0	1.2	U	1.2
BCL - B8	J15HB5	9/11/07	2940	C	2.3	197		0.20	0.02		0.01	0.45	U	0.45	8.2		0.77	622	C	9.1	1.2	U	1.2
SZ - A1	J15H87	9/11/07	3240	C	2.4	234		0.21	0.01	U	0.01	0.47	U	0.47	9.0		0.80	1030	C	9.4	1.3	U	1.3
SZ - A2	J15H88	9/11/07	3010	C	2.3	195		0.20	0.04		0.02	0.46		0.46	7.7		0.78	666	C	9.2	1.2	U	1.2
SZ - A3	J15H89	9/11/07	3600	C	2.4	249		0.21	0.02		0.01	0.48		0.47	10.3		0.79	1040	C	9.4	1.3	U	1.3
SZ - A4	J15H90	9/11/07	2720	C	2.3	181		0.20	0.02	U	0.02	0.46	U	0.46	7.1		0.77	630	C	9.1	1.2	U	1.2
SZ - A4 - dup	J15H91	9/11/07	2670	C	2.3	180		0.20	0.02	U	0.01	0.45	U	0.45	7.5		0.77	574	C	9.1	1.2	U	1.2
SZ - B5	J15H92	9/12/07	3760	C	2.3	223		0.20	0.02		0.01	0.46	U	0.46	9.6		0.77	710	C	9.2	1.2	U	1.2
SZ - B6	J15H93	9/12/07	3220	C	2.4	206		0.20	0.02	U	0.02	0.47	U	0.47	8.9		0.79	631	C	9.3	1.3	U	1.3
SZ - B7	J15H94	9/12/07	3140	C	2.3	206		0.20	0.01	U	0.01	0.45	U	0.45	8.3		0.76	639	C	9.1	1.2	U	1.2
SZ - B8	J15H95	9/12/07	2720	C	2.4	162		0.21	0.01	U	0.01	0.47	U	0.47	8.0		0.80	572	C	9.4	1.3	U	1.3
BCL - B6 - split	J15HB9	9/11/07	3780		201	251		2.00	0.022	B,C	0.033	8.0		8.0	11.1		8.0	1240		1010	3.0	U	3.0
SZ - A4 - split	J15HY4	9/11/07	3900		201	249		2.00	0.033	U	0.033	8.0	U	8.0	8.7		8.0	1280		1000	3.0	U	3.0
OB - A2	J15VY5	10/16/07	3650		7.6	249		0.12	0.005	U	0.005	0.92	U	0.92	10.4		0.61	915		12.2	1.8	U	1.8
OB - C1	J15VY6	10/16/07	3800		7.2	255		0.12	0.03	U	0.03	0.87	U	0.87	10.0		0.58	926		11.6	1.7	U	1.7
BCL - B5	J15VY7	10/16/07	3870		7.3	246		0.12	0.06		0.03	0.88	U	0.88	11.0		0.59	915		11.7	1.8	U	1.8
BCL - B6	J15VY8	10/16/07	3950		7.3	270		0.12	0.04		0.03	0.88	U	0.88	10.8		0.59	1040		11.7	1.8	U	1.8

Attachment	1	Sheet No.	6 of 7
Originator	L. D. Habel	Date	11/08/07
Checked	J. M. Capron	Date	
Calc. No.	0100F-CA-V0317	Rev. No.	0

Attachment 1. 100-F-26:12 Verification Sampling Results.

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
OB - A1	J15H73	9/5/07	2790	C	2.5	0.26	U	0.26	171	C	2.1	24.4		0.23	26.6	C	0.12
OB - A2	J15H74	9/5/07	1700	C	2.5	0.26	U	0.26	182	C	2.0	31.6		0.23	29.3	C	0.12
OB - A3	J15H75	9/5/07	1470	C	2.6	0.27	U	0.27	115	C	2.1	16.9		0.24	20.7	C	0.12
OB - A4	J15H76	9/5/07	1340	C	2.6	0.27	U	0.27	217	C	2.1	27.7		0.24	28.9	C	0.12
OB - A4 - dup	J15H77	9/5/07	1390	C	2.6	0.27	U	0.27	242	C	2.1	33.7		0.24	32.9	C	0.12
OB - A4 - split	J15HB8	9/5/07	529		18.3	0.74	U	0.74	261		24.4	37.6		1.10	47.2	C	3.0
OB - B5	J15H78	9/5/07	1840	C	2.5	0.26	U	0.26	144	C	2.0	24.7		0.23	24.7	C	0.12
OB - B6	J15H79	9/5/07	1670	C	2.5	0.26	U	0.26	156	C	2.0	30.7		0.23	31.1	C	0.12
OB - B7	J15H80	9/5/07	2080	C	2.5	0.26	U	0.26	172	C	2.0	27.7		0.23	27.9	C	0.12
OB - B8	J15H81	9/5/07	2060	C	2.6	0.27	U	0.27	132	C	2.1	16.7		0.24	25.1	C	0.12
OB - C9	J15H82	9/5/07	1910	C	2.5	0.26	U	0.26	187	C	2.0	27.1		0.23	26.3	C	0.12
OB - C10	J15H83	9/6/07	1820		2.6	0.27	U	0.27	216	C	2.1	32.6	C	0.24	32.1	CJ	0.12
OB - C1	J15H84	9/6/07	1050		2.5	0.26	U	0.26	162		2.0	33.7		0.23	30.9	J	0.11
OB - C2	J15H85	9/6/07	582		2.6	0.27	U	0.27	169		2.1	28.8		0.24	25.5	J	0.12
BCL - A1	J15H97	9/6/07	706		2.5	0.26	U	0.26	190	C	2.1	34.9	C	0.23	33.6	CJ	0.12
BCL - A2	J15H98	9/6/07	689		2.5	0.26	U	0.26	208	C	2.0	37.3	C	0.23	50.5	CJ	0.12
BCL - A3	J15H99	9/6/07	525		2.4	0.26	U	0.26	182	C	2.0	33.4	C	0.23	40.3	CJ	0.11
BCL - A4	J15HB0	9/6/07	819		2.4	0.25	U	0.25	252	C	2.0	40.0	C	0.22	41.7	CJ	0.11
BCL - B5	J15HB1	9/6/07	2980		2.5	0.26	U	0.26	207	C	2.0	29.9	C	0.23	33.2	CJ	0.12
BCL - B7	J15HB4	9/6/07	1090		2.5	0.27	U	0.27	237	C	2.1	35.8	C	0.24	37.4	CJ	0.12
BCL - B6	J15HB2	9/11/07	2930	C	2.5	0.26	U	0.26	233	C	2.0	25.9		0.23	66.8	C	0.11
BCL - B6 - dup	J15HB3	9/11/07	2650	C	2.4	0.25	U	0.25	194	C	2.0	25.7		0.22	34.8	C	0.11
BCL - B8	J15HB5	9/11/07	2180	C	2.4	0.26	U	0.26	192	C	2.0	22.9		0.23	36.8	C	0.11
SZ - A1	J15H87	9/11/07	3160	C	2.5	0.27	U	0.27	177	C	2.1	26.7		0.24	31.0	C	0.12
SZ - A2	J15H88	9/11/07	2340	C	2.5	0.26	U	0.26	189	C	2.0	22.3		0.23	29.9	C	0.12
SZ - A3	J15H89	9/11/07	3100	C	2.5	0.26	U	0.26	299	C	2.1	26.1		0.23	39.2	C	0.12
SZ - A4	J15H90	9/11/07	2360	C	2.5	0.26	U	0.26	168	C	2.0	18.7		0.23	23.6	C	0.11
SZ - A4 - dup	J15H91	9/11/07	1830	C	2.4	0.26	U	0.26	138	C	2.0	17.4		0.23	21.9	C	0.11
SZ - B5	J15H92	9/12/07	1700		2.5	0.26	U	0.26	266	C	2.0	31.7		0.23	31.2	C	0.11
SZ - B6	J15H93	9/12/07	2040		2.5	0.26	U	0.26	179	C	2.0	26.0		0.23	26.0	C	0.12
SZ - B7	J15H94	9/12/07	1970		2.4	0.25	U	0.25	195	C	2.0	29.6		0.23	27.2	C	0.11
SZ - B8	J15H95	9/12/07	1860		2.5	0.27	U	0.27	203	C	2.1	24.9		0.24	23.0	C	0.12
BCL - B6 - split	J15HB9	9/11/07	425		80.4	2.0	U	2.0	99.6	B	201	35.9		2.00	39.4	C	10.1
SZ - A4 - split	J15HY4	9/11/07	277		80.3	2.0	U	2.0	99.8	B	201	34.4		2.00	29.8	C	10.0
OB - A2	J15VY5	10/16/07	2680		12.2	0.31	U	0.31	212		6.1	32.6		0.43	33.3		1.8
OB - C1	J15VY6	10/16/07	2240		11.6	0.29	U	0.29	173		57.9	33.7		0.41	32.5		1.7
BCL - B5	J15VY7	10/16/07	3360		11.7	0.29	U	0.29	237		58.6	32.5		0.41	35.1		1.8
BCL - B6	J15VY8	10/16/07	2330		11.7	0.29	U	0.29	214		58.7	38.2		0.41	40.5		1.8

Attachment	1	Sheet No.	7 of 7
Originator	L. D. Habel	Date	11/08/07
Checked	J. M. Capron	Date	
Calc. No.	0100F-CA-V0317	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-F Field Remediation **Job No. 14655**

Area: 100-F

Discipline: Environmental *Calculation No: 0100F-CA-V0318

Subject: 100-F-26:12 Pipelines 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 calculations 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	Total = 4	L. D. Habel	J. M. Capron	N/A	S. W. Callison	11-13-07

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007) *Obtain Calc. No. from Document Control and Form from Intranet

Washington Closure Hanford CALCULATION SHEET

Originator:	L.D. Habel	Date:	11/12/07	Calc. No.:	0100F-CA-V0318	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	11/8/07
Subject:	100-F-26:12 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-F-26:12 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, 2007, *100-F-26:12 Pipelines Cleanup Verification 95% UCL Calculation*, 0100F-CA-V0317, 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:	L.D. Habel	Date:	11/8/07	Calc. No.:	0100F-CA-V0318	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	11/8/07
Subject:	100-F-26:12 Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 3	

METHODOLOGY:

HQ and carcinogenic risk calculations were conservatively calculated for the entire 100-F-26:12 waste site using the maximum of the statistically determined value for each analyte in all decision units (WCH 2007). Of the nonradionuclide contaminants of concern (COC) selenium was the only analyte that required the HQ and risk calculations because it was quantified above background. Additionally, boron, hexavalent chromium, and molybdenum required the HQ and risk calculations because these COCs were detected and a Washington State or Hanford Site background value is not available. All other site nonradionuclide COCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the maximum statistical result for molybdenum (0.78 mg/kg), divided by the noncarcinogenic RAG value of 400 mg/kg (calculated in accordance with the noncarcinogenic toxic effects WAC 173-340-740[3]), is 2.0×10^{-3}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion 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 1.1×10^{-2} Comparing this values to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum statistical value is divided by the carcinogenic RAG value, then multiplied by 1×10^{-6}. For example, the maximum value for hexavalent chromium is 1.40 mg/kg; divided by 2.1 mg/kg, and multiplied as indicated, is 6.7×10^{-7}. Comparing this value 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 6.7×10^{-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:	L.D. Habel	Date:	11/8/07	Calc. No.:	0100F-CA-V0318	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	11/8/07
Subject:	100-F-26:12 Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 3	

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-F-26:12 Waste Site.

Contaminants of Potential Concern	Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	3.4	16,000	2.1E-04	--	--
Chromium, hexavalent[c]	1.40	240	5.8E-03	2.1	6.7E-07
Molybdenum	0.78	400	2.0E-03	--	--
Selenium	1.30	400	3.3E-03	--	--
Totals					
Cumulative Hazard Quotient:			**1.1E-02**		
Cumulative Excess Cancer Risk:					**6.7E-07**

Notes:
RAG = remedial action goal
-- = not applicable
[a] = From Calculation No. 0100F-CA-V0317 (WCH 2007).
[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-F-26:12 waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2005).

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CALCULATION COVER SHEET

Project Title: Field Remediation **Job No. 14655**

Area: 100-F

Discipline: Environmental *Calculation No: 0100F-CA-V0326

Subject: 100-F-26:12 Main Process Sewer Pipelines Cleanup Verification RESRAD Calc Brief

Computer Program: RESRAD Program No: Version 6.3

The attached calculations have been generated to document compliance with established cleanup levels. These calculations 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 pg Summary – 5 pg Attm. 1 - 1 pg Attm. 2 - 20 pg Attm. 3 - 21 pg Attm. 4 - 10 pg Total – 57 pages	S. W. Clark	H. M. Sulloway	N/A	S. W. Callison	11-13-07
	58					

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007) *Obtain Calc. No. from Document Control and Form from Intranet

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	11/12/07	Calc. No.:	0100F-CA-V0326	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	11/12/07
Subject:	100-F-26:12 Main Process Sewer Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No.	1 of 5

PURPOSE:

Calculate the soil and groundwater concentrations, dose, and risk contributions over a period of 1,000 years from the maximum activities of radionuclides in the overburden/below cleanup level soil to be used to backfill the 100-F-26:12 Main Process Sewer Pipeline excavation areas.

GIVEN/REFERENCES:

1) Cleanup verification data from *100-F-26:12 Pipeline Cleanup Verification 95% UCL Calculation*, Calculation No. 0100F-CA-V0317, Rev. 0, Washington Closure Hanford, Richland, Washington (100-F-26:12 95% UCL Calculation).
2) *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
3) For the purpose of these RESRAD calculations, the radioactive contaminants of concern (COCs) established in the 100-F-26:12 95% UCL Calculation are carbon-14, cesium-137, europium-152, strontium-90, and tritium.
4) The nonradionuclide COCs include barium, hexavalent chromium, lead, and mercury. The full suite of nonradionuclide contaminants of potential concern (COPCs) and attainment of their remediation goals are discussed in the 100-F-26:12 95% UCL Calculation. All nonradionuclide direct exposure RAGs are met and protection of groundwater and the river can be demonstrated by the results of vertical migration modeling in the *100 Area Analogous Sites RESRAD Calculations*, 0100X-CA-V0050, Rev. 0, Bechtel Hanford, Inc., Richland, Washington, which predicts that the nonradionuclides will not migrate to groundwater (and thus the Columbia River) within 1,000 years.
5) RESidual RADioactivity (RESRAD) computer code, version 6.3, to calculate compliance with residual radioactivity guidelines, developed for the U.S. Department of Energy by the Environmental Assessment Division of Argonne National Laboratory, Argonne, Illinois.
6) Sample design data from the *100-F-26:12 Shallow Zone and Overburden Sampling Plan*, Calculation No. 0100F-CA-V0308, Rev. 0, Washington Closure Hanford, Richland, Washington.
7) Groundwater elevation from *Hanford Groundwater Monitoring for Fiscal Year 2006*, PNNL-16346, Pacific Northwest National Laboratory, Richland, Washington.

SOLUTION:

1) A single RESRAD run was performed for the 100-F-26:12 Main Process Sewer Pipeline Overburden/Below Cleanup Level soils that are to be used to backfill the 100-F-26:12 excavation. Table 1 shows the elevations (NAVD88) and thickness of each soil horizon. Attachment 1 shows representative dimensions of soil horizons and contaminant pathways considered for dose, risk, and groundwater protection. Input factors for each run are shown in the "Summary" section of the RESRAD "Mixture Sums and Single Radionuclide Guidelines" printouts in the Attachments to this Calculation Summary.

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	11/12/07	Calc. No.:	0100F-CA-V0326	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	11/12/07
Subject:	100-F-26:12 Main Process Sewer Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No. 2 of 5	

Table 1. Waste Site Dimensions for RESRAD Modeling

Parameter	Units	OB/BCL
Contaminated Zone Dimensions		
Cover Depth	m	0
Area of Contaminated Zone (CZ)	m^2	9,600
Length Parallel to Aquifer Flow	m	30
Elevations of Vadose Zone Horizons		
Elevation: Surface	m	125.5
Elevation: Groundwater	m	113.9
Thickness: Contaminated Zone	m	6.1
Thickness: Unsaturated Zone	m	5.5

OB/BCL = Overburden/Below Cleanup Levels Stockpile

2) The year where the peak dose (or concentration) occurs from each individual radionuclide COC and layer is determined by a preliminary run. This year is then added for all horizons for the final RESRAD runs. For the direct exposure pathway (i.e. soil ingestion and inhalation and external radiation), the peak year occurred at year zero (year 2007) for all COCs. For the water pathways (i.e. drinking water and food ingestion) only tritium is predicted to reach groundwater within 1,000 years at a peak year of 9.4. The 9.4-year time periods was added to all RESRAD runs.

METHODOLOGY:

1) Runs of RESRAD version 6.3 were completed for the 100-F-26:12 Main Process Sewer Pipeline Overburden/Below Cleanup Level soils using the maximum radionuclide activities from the 100-F-26:12 95% UCL Calculation shown in Table 2. RESRAD numerical output reports for dose, risk, and concentration are presented in the Attachments to this calculation summary.

Table 2. Maximum Radionuclide Activities of the 100-F-26:12 Main Process Sewer Pipeline Overburden/Below Cleanup Level Soils (from the 100-F-26:12 95% UCL Calculation)

COCs	Overburden/Below Cleanup Levels Soils
Radionuclide Activity (pCi/g)	
Carbon-14	5.1
Cesium-137	0.079
Europium-152	0.048
Strontium-90	0.563
Tritium (H-3)	58.3

COCs = Contaminants of Concern

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark SWC	Date:	11/12/07	Calc. No.:	0100F-CA-V0326	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	11/12/07
Subject:	100-F-26:12 Main Process Sewer Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No. 3 of 5	

RESULTS:

1) Radionuclide "All Pathways" Dose Rate

The "all pathways" (maximum) dose rates are shown in Table 3. The maximum all pathways dose rate from the maximum activities of radionuclides in the overburden/below cleanup level soil to be used to backfill the 100-F-26:12 Main Process Sewer Pipeline excavation areas is 9.14 mrem/yr at year zero (2007).

Table 3. All Pathways Dose Rate (mrem/yr)

RESRAD Run	Vadose Zone Horizons	"All Pathways" Dose Contributions in mrem/yr at Each Time Slice (yr)								
		0	1	3	9.4	11	30	100	300	1000
OB/BCL	Shallow Zone	9.14E+00	4.67E+00	2.40E+00	2.41E+00	1.86E+00	1.03E+00	1.84E-01	1.49E-03	7.57E-11

OB/BCL = Overburden/Below Cleanup Levels Stockpile

2) Radionuclide Excess Lifetime Cancer Risk

The radionuclide excess lifetime cancer risk (ELCR) results are shown in Table 4. The maximum ELCR for the maximum activities of radionuclides in the overburden/below cleanup level soil to be used to backfill the 100-F-26:12 Main Process Sewer Pipeline excavation areas is 4.99×10^{-5} at year zero (2007).

Table 4. Radionuclide Excess Lifetime Cancer Risk

RESRAD Run	Vadose Zone Horizons	Excess Cancer Risk at Each Time Slice (yr)								
		0	1	3	9.4	11	30	100	300	1000
OB/BCL	Shallow Zone	4.99E-05	3.83E-05	3.12E-05	2.64E-05	2.36E-05	1.41E-05	2.54E-06	2.07E-08	1.06E-15

OB/BCL = Overburden/Below Cleanup Levels Stockpile

3) Radionuclide Groundwater Protection

The radionuclide concentrations in groundwater calculated by the RESRAD model are summarized in Table 5. Of the radionuclide contaminants of concern only tritium is predicted to reach groundwater in the 1,000 years of the RESRAD model evaluation (at a concentration of 14,400 pCi/L, which is below the MCL of 20,000 pCi/L). Therefore calculation of cumulative organ specific dose via the groundwater (and river) pathway was not necessary to determine that the 4 mrem/yr drinking water dose limitation is met and the comparison to drinking water standards (MCL) calculation brief was not performed.

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	11/12/07	Calc. No.:	0100F-CA-V0326	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	11/12/07
Subject:	100-F-26:12 Main Process Sewer Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No.	4 of 5

Table 5. Predicted Groundwater (Well Water/Drinking Water) Concentrations

Radio-nuclides	RESRAD Run	Groundwater Concentrations in pCi/L at Each Time Slice (yr)									RAGs, pCi/L
		0	1	3	9.4	11	30	100	300	1000	
C-14	OB/BCL	0	0	0	0	0	0	0	0	0	2,000
Cs-137	OB/BCL	0	0	0	0	0	0	0	0	0	60
Eu-152	OB/BCL	0	0	0	0	0	0	0	0	0	200
Sr-90	OB/BCL	0	0	0	0	0	0	0	0	0	8
Tritium	OB/BCL	0	0	0	1.44E+04	4.10E+03	8.40E-04	9.41E-29	0	0	20,000

OB/BCL = Overburden/Below Cleanup Levels Stockpile
RAGs = Remedial action goals from the 100 Area RDR/RAWP

CONCLUSIONS:

- The "all pathways" (maximum) dose rates are shown in Table 3. The maximum all pathways dose rate from the maximum activities of radionuclides in the overburden/below cleanup level soil to be used to backfill the 100-F-26:12 Main Process Sewer Pipeline excavation areas is 9.14 mrem/yr at year zero (2007).

- The radionuclide excess lifetime cancer risk (ELCR) results are shown in Table 4. The maximum ELCR for the maximum activities of radionuclides in the overburden/below cleanup level soil to be used to backfill the 100-F-26:12 Main Process Sewer Pipeline excavation areas is 4.99×10^{-5} at year zero (2007).

- The dominant pathway for the RESRAD evaluations dose rate for the 100-F-26:12 Main Process Sewer Pipeline excavation areas backfilled with the maximum activities of radionuclides in the overburden/below cleanup level soil is plant ingestion due to carbon-14.

- None of the site COCs are projected to exceed remedial action goals (RAGs).

- Of the radionuclide contaminants of concern, only tritium is predicted to reach groundwater in the 1,000 years of the RESRAD model evaluation at a concentration of 14,400 pCi/L which is below the MCL of 20,000 pCi/L. Because only one radionuclide is predicted to reach groundwater it was not necessary to perform the calculation of cumulative organ specific dose via the groundwater (and river) pathway to determine that the 4 mrem/yr drinking water dose limitation is met.

Washington Closure Hanford CALCULATION SHEET

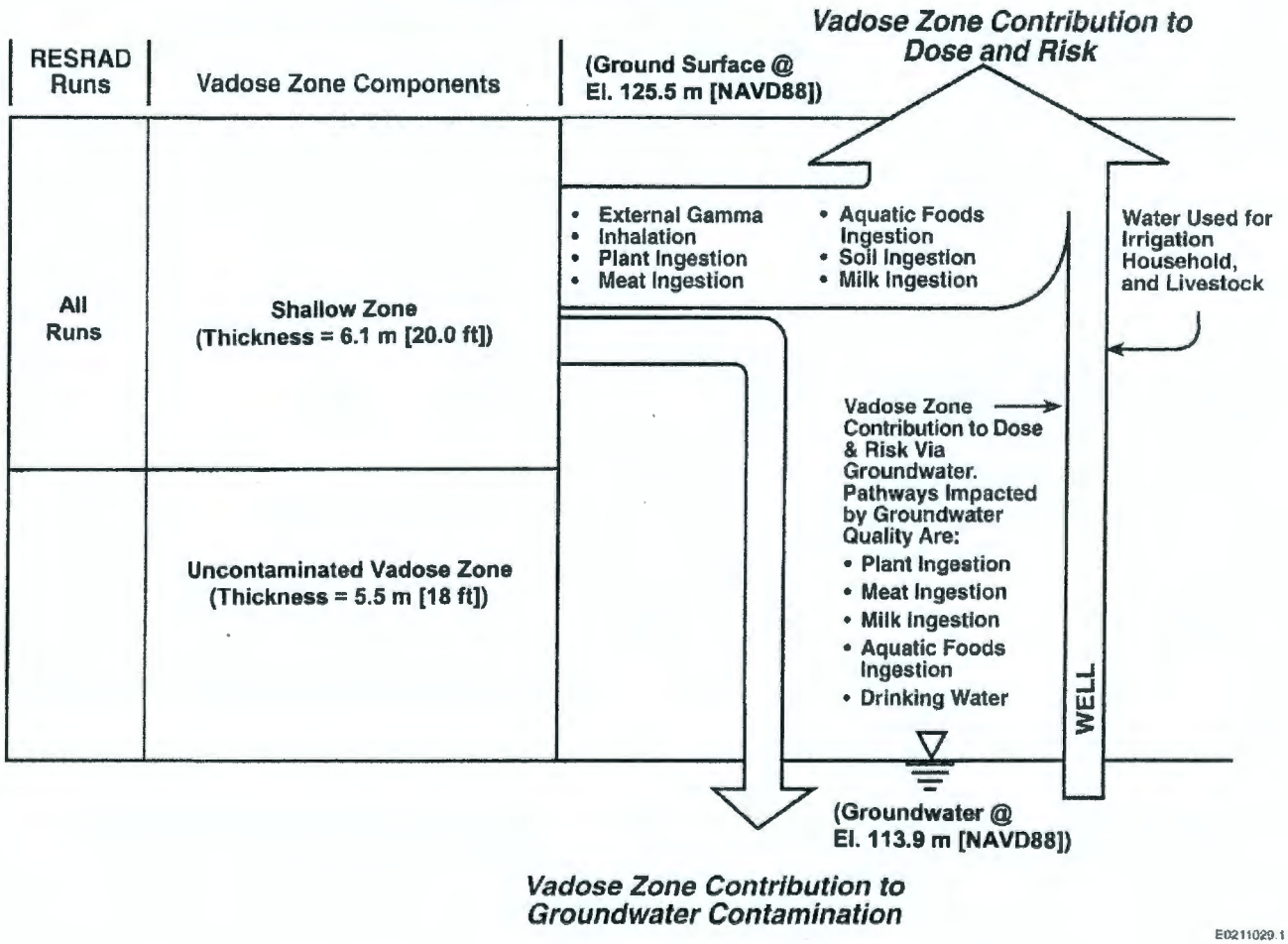
Originator:	S. W. Clark SWC	Date:	11/12/07	Calc. No.:	0100F-CA-V0326	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	11/12/07
Subject:	100-F-26:12 Main Process Sewer Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No. 5 of 5	

ATTACHMENTS:

1. Graphic showing 100-F-26:12 Cleanup Verification Model (1 page)
2. RESRAD Output: 100-F-26:12 Overburden/Below Cleanup Level Maximum Radionuclide Activities – Mixture Sums and Single Radionuclide Guidelines (20 pages)
3. RESRAD Output: 100-F-26:12 Overburden/Below Cleanup Level Maximum Radionuclide Activities – Intake Quantities and Health Risk Factors (21 pages)
4. RESRAD Output: 100-F-26:12 Overburden/Below Cleanup Level Maximum Radionuclide Activities – Concentration of Radionuclides, (10 pages)

ATTACHMENT 1

100-F-26:12 Main Process Sewer Pipelines Cleanup Verification Model



Attachment 1 Sheet No. 1 of 1
Originator: S. W. Clark Date 11/12/07
Chk'd By H. M. Sulloway Date 11/12/07
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

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1RESRAD, Version 6.3      T« Limit = 180 days       11/12/2007  08:15  Page   1
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ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 2
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Dose Conversion Factor (and Related) Parameter Summary
File: HEAST 2001 MORBIDITY

0 Menu	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	C-14	2.090E-06	2.090E-06	DCF2(1)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(2)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(3)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(5)
B-1	H-3	6.400E-08	6.400E-08	DCF2(6)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(7)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	C-14	2.090E-06	2.090E-06	DCF3(1)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(2)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(3)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(5)
D-1	H-3	6.400E-08	6.400E-08	DCF3(6)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(7)
D-34	Food transfer factors:			
D-34	C-14 , plant/soil concentration ratio, dimensionless	5.500E+00	5.500E+00	RTF(1,1)
D-34	C-14 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.100E-02	3.100E-02	RTF(1,2)
D-34	C-14 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.200E-02	1.200E-02	RTF(1,3)
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(2,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(2,3)
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(3,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(3,3)
D-34	Gd-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Gd-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Gd-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(5,3)
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(6,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(6,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(6,3)
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(7,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(7,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	C-14 , fish	5.000E+04	5.000E+04	BIOFAC(1,1)
D-5	C-14 , crustacea and mollusks	9.100E+03	9.100E+03	BIOFAC(1,2)
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(2,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(3,2)

Attachment 2 Sheet No. 2 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

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 File    : 100-F-26-12_OB_BCL.RAD
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Dose Conversion Factor (and Related) Parameter Summary (continued)
File: HEAST 2001 MORBIDITY

0 Menu	Parameter	Current Value	Base Case*	Parameter Name
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(5,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(6,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(6,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(7,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Attachment 2 Sheet No. 3 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 4
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	9.600E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.100E+00	2.000E+00	---	THICKO
R011	Length parallel to aquifer flow (m)	3.000E+01	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	9.400E+00	1.000E+01	---	T(4)
R011	Times for calculations (yr)	1.100E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	3.000E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): C-14	5.100E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Cs-137	7.900E-02	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Eu-152	4.800E-02	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): H-3	5.830E+01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Sr-90	5.630E-01	0.000E+00	---	S1(7)
R012	Concentration in groundwater (pCi/L): C-14	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(7)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVERO
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	1.500E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.050E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	3.400E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.100E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	7.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.500E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	1.500E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	5.530E+03	1.000E+02	---	HCSZ

Attachment 2 Sheet No. 4 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

```
1RESRAD, Version 6.3      T« Limit = 180 days        11/12/2007  08:15  Page   5
 Summary : 100-F-26:12 OB & BCL Using Maximum Activities
 File    : 100-F-26-12_OB_BCL.RAD
```

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone hydraulic gradient	1.250E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.050E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	4.600E+00	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	5.500E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.600E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.500E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	1.500E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.050E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for C-14				
R016	Contaminated zone (cm**3/g)	2.000E+02	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+02	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.092E-05	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.634E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.092E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.763E-02	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.260E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)

Attachment 2 Sheet No. 5 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

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1RESRAD, Version 6.3      T« Limit = 180 days        11/12/2007  08:15  Page   6
 Summary : 100-F-26:12 OB & BCL Using Maximum Activities
 File    : 100-F-26-12_OB_BCL.RAD
```

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.926E-06	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R017	Inhalation rate (m**3/yr)	7.300E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.000E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.100E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	2.700E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	1.000E+02	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	3.600E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	1.970E+01	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	7.300E+01	3.650E+01	---	SOIL

Attachment 2 Sheet No. 6 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0022 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 7
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Drinking water intake (L/yr)	7.300E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.480E+00	FMEAT
R018	Contamination fraction of milk	-1	-1	0.480E+00	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	2.000E-05	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	3.000E-02	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	2.000E-02	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	9.800E-01	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	3.000E-01	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	7.000E-07	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	1.000E-10	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	8.000E-01	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	2.000E-01	2.000E-01	---	AVFG5
C14	DCF correction factor for gaseous forms of C14	8.894E+01	0.000E+00	---	CO2F

Attachment 2 Sheet No. 7 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 8
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	128	---	---	NPTS
TITL	Maximum number of integration points for dose	5	---	---	LYMAX
TITL	Maximum number of integration points for risk	9	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Attachment 2 Sheet No. 8 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

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1RESRAD, Version 6.3      T« Limit = 180 days       11/12/2007  08:15  Page   9
 Summary : 100-F-26:12 OB & BCL Using Maximum Activities
 File    : 100-F-26-12_OB_BCL.RAD

      Contaminated Zone Dimensions           Initial Soil Concentrations, pCi/g
      ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ           ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
        Area:   9600.00 square meters               C-14        5.100E+00
   Thickness:      6.10 meters                      Cs-137      7.900E-02
 Cover Depth:      0.00 meters                      Eu-152      4.800E-02
                                                    H-3         5.830E+01
                                                    Sr-90       5.630E-01
0
                                          Total Dose TDOSE(t), mrem/yr
                                    Basic Radiation Dose Limit = 1.500E+01 mrem/yr
                     Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)
                     ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
    t (years):  0.000E+00  1.000E+00  3.000E+00  9.400E+00  1.100E+01  3.000E+01  1.000E+02  3.000E+02  1.000E+03
     TDOSE(t):  9.136E+00  4.668E+00  2.396E+00  2.414E+00  1.857E+00  1.028E+00  1.839E-01  1.494E-03  7.571E-11
         M(t):  6.091E-01  3.112E-01  1.597E-01  1.610E-01  1.238E-01  6.852E-02  1.226E-02  9.958E-05  5.047E-12
0Maximum TDOSE(t):  9.136E+00 mrem/yr    at t = 0.000E+00 years
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Attachment 2	Sheet No. 9 of 20
Originator: S. W. Clark	Date
Chk'd By H. M. Sulloway	Date
Calc. No. 0100F-CA-V0326	Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 10
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	2.786E-05	0.0000	1.033E-03	0.0001	0.000E+00	0.0000	4.026E+00	0.4407	8.624E-01	0.0944	6.645E-01	0.0727	3.794E-04	0.0000
Cs-137	1.694E-01	0.0185	1.002E-07	0.0000	0.000E+00	0.0000	8.801E-03	0.0010	6.518E-03	0.0007	4.048E-03	0.0004	2.280E-04	0.0000
Eu-152	2.098E-01	0.0230	4.156E-07	0.0000	0.000E+00	0.0000	4.271E-05	0.0000	7.021E-06	0.0000	4.639E-07	0.0000	1.770E-05	0.0000
H-3	0.000E+00	0.0000	3.416E-02	0.0037	0.000E+00	0.0000	9.757E-01	0.1068	1.285E-01	0.0141	2.093E-01	0.0229	1.494E-04	0.0000
Sr-90	8.738E-03	0.0010	2.927E-05	0.0000	0.000E+00	0.0000	1.437E+00	0.1573	2.456E-01	0.0269	1.387E-01	0.0152	4.964E-03	0.0005
Total	3.879E-01	0.0425	3.523E-02	0.0039	0.000E+00	0.0000	6.448E+00	0.7057	1.243E+00	0.1361	1.017E+00	0.1113	5.738E-03	0.0006

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.555E+00	0.6080
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.890E-01	0.0207
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.098E-01	0.0230
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.348E+00	0.1475
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.835E+00	0.2008
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.136E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	2	Sheet No.	10 of 20
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 11
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	9.382E-06	0.0000	3.478E-04	0.0001	0.000E+00	0.0000	1.364E+00	0.2921	2.976E-01	0.0638	2.278E-01	0.0488	1.278E-04	0.0000
Cs-137	1.655E-01	0.0354	9.786E-08	0.0000	0.000E+00	0.0000	8.598E-03	0.0018	6.368E-03	0.0014	3.955E-03	0.0008	2.228E-04	0.0000
Eu-152	1.991E-01	0.0427	3.946E-07	0.0000	0.000E+00	0.0000	4.054E-05	0.0000	6.665E-06	0.0000	4.403E-07	0.0000	1.680E-05	0.0000
H-3	0.000E+00	0.0000	1.521E-02	0.0033	0.000E+00	0.0000	4.360E-01	0.0934	5.810E-02	0.0124	9.426E-02	0.0202	6.654E-05	0.0000
Sr-90	8.530E-03	0.0018	2.857E-05	0.0000	0.000E+00	0.0000	1.403E+00	0.3005	2.397E-01	0.0514	1.354E-01	0.0290	4.845E-03	0.0010
Total	3.731E-01	0.0799	1.559E-02	0.0033	0.000E+00	0.0000	3.211E+00	0.6878	6.018E-01	0.1289	4.614E-01	0.0988	5.279E-03	0.0011

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
0 Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.889E+00	0.4048
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.846E-01	0.0395
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.992E-01	0.0427
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.036E-01	0.1293
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.791E+00	0.3837
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.668E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	2	Sheet No.	11 of 20
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 12
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	1.063E-06	0.0000	3.941E-05	0.0000	0.000E+00	0.0000	1.545E-01	0.0645	3.372E-02	0.0141	2.581E-02	0.0108	1.447E-05	0.0000
Cs-137	1.579E-01	0.0659	9.341E-08	0.0000	0.000E+00	0.0000	8.207E-03	0.0034	6.079E-03	0.0025	3.775E-03	0.0016	2.126E-04	0.0001
Eu-152	1.794E-01	0.0749	3.556E-07	0.0000	0.000E+00	0.0000	3.654E-05	0.0000	6.006E-06	0.0000	3.968E-07	0.0000	1.514E-05	0.0000
H-3	0.000E+00	0.0000	3.015E-03	0.0013	0.000E+00	0.0000	8.639E-02	0.0361	1.151E-02	0.0048	1.868E-02	0.0078	1.319E-05	0.0000
Sr-90	8.128E-03	0.0034	2.722E-05	0.0000	0.000E+00	0.0000	1.337E+00	0.5578	2.284E-01	0.0953	1.290E-01	0.0538	4.617E-03	0.0019
Total	3.455E-01	0.1442	3.082E-03	0.0013	0.000E+00	0.0000	1.586E+00	0.6617	2.798E-01	0.1168	1.773E-01	0.0740	4.873E-03	0.0020

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.141E-01	0.0893
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.762E-01	0.0735
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.795E-01	0.0749
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.196E-01	0.0499
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.707E+00	0.7123
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.396E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 12 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 13
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 9.400E+00 years
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	9.903E-10	0.0000	3.671E-08	0.0000	0.000E+00	0.0000	1.439E-04	0.0001	3.143E-05	0.0000	2.405E-05	0.0000	1.349E-08	0.0000
Cs-137	1.361E-01	0.0564	8.049E-08	0.0000	0.000E+00	0.0000	7.072E-03	0.0029	5.238E-03	0.0022	3.253E-03	0.0013	1.832E-04	0.0001
Eu-152	1.286E-01	0.0533	2.548E-07	0.0000	0.000E+00	0.0000	2.619E-05	0.0000	4.305E-06	0.0000	2.844E-07	0.0000	1.085E-05	0.0000
H-3	0.000E+00	0.0000	1.687E-05	0.0000	0.000E+00	0.0000	4.835E-04	0.0002	6.445E-05	0.0000	1.045E-04	0.0000	7.379E-08	0.0000
Sr-90	6.965E-03	0.0029	2.333E-05	0.0000	0.000E+00	0.0000	1.145E+00	0.4744	1.958E-01	0.0811	1.106E-01	0.0458	3.957E-03	0.0016
Total	2.717E-01	0.1125	4.057E-05	0.0000	0.000E+00	0.0000	1.153E+00	0.4776	2.011E-01	0.0833	1.140E-01	0.0472	4.151E-03	0.0017

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 9.400E+00 years
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.995E-04	0.0001
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.518E-01	0.0629
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.287E-01	0.0533
H-3	4.778E-01	0.1979	8.668E-04	0.0004	0.000E+00	0.0000	1.437E-01	0.0595	1.210E-02	0.0050	3.600E-02	0.0149	6.711E-01	0.2780
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.463E+00	0.6058
Total	4.778E-01	0.1979	8.668E-04	0.0004	0.000E+00	0.0000	1.437E-01	0.0595	1.210E-02	0.0050	3.600E-02	0.0149	2.414E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	2	Sheet No.	13 of 20
Originator	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 14
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.100E+01 years
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	1.726E-10	0.0000	6.400E-09	0.0000	0.000E+00	0.0000	2.509E-05	0.0000	5.479E-06	0.0000	4.193E-06	0.0000	2.351E-09	0.0000
Cs-137	1.311E-01	0.0706	7.754E-08	0.0000	0.000E+00	0.0000	6.813E-03	0.0037	5.046E-03	0.0027	3.134E-03	0.0017	1.765E-04	0.0001
Eu-152	1.183E-01	0.0637	2.345E-07	0.0000	0.000E+00	0.0000	2.409E-05	0.0000	3.961E-06	0.0000	2.617E-07	0.0000	9.986E-06	0.0000
H-3	0.000E+00	0.0000	4.607E-06	0.0000	0.000E+00	0.0000	1.320E-04	0.0001	1.760E-05	0.0000	2.856E-05	0.0000	2.015E-08	0.0000
Sr-90	6.701E-03	0.0036	2.244E-05	0.0000	0.000E+00	0.0000	1.102E+00	0.5933	1.883E-01	0.1014	1.064E-01	0.0573	3.807E-03	0.0020
Total	2.562E-01	0.1379	2.737E-05	0.0000	0.000E+00	0.0000	1.109E+00	0.5971	1.934E-01	0.1041	1.096E-01	0.0590	3.993E-03	0.0021

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.100E+01 years
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.477E-05	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.463E-01	0.0788
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.184E-01	0.0637
H-3	1.317E-01	0.0709	2.396E-04	0.0001	0.000E+00	0.0000	3.985E-02	0.0215	3.411E-03	0.0018	1.001E-02	0.0054	1.854E-01	0.0998
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.407E+00	0.7576
Total	1.317E-01	0.0709	2.396E-04	0.0001	0.000E+00	0.0000	3.985E-02	0.0215	3.411E-03	0.0018	1.001E-02	0.0054	1.857E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	2	Sheet No.	14 of 20
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 15
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	1.575E-19	0.0000	5.838E-18	0.0000	0.000E+00	0.0000	2.290E-14	0.0000	5.005E-15	0.0000	3.828E-15	0.0000	2.145E-18	0.0000
Cs-137	8.427E-02	0.0820	4.984E-08	0.0000	0.000E+00	0.0000	4.379E-03	0.0043	3.243E-03	0.0032	2.014E-03	0.0020	1.135E-04	0.0001
Eu-152	4.403E-02	0.0428	8.724E-08	0.0000	0.000E+00	0.0000	8.964E-06	0.0000	1.474E-06	0.0000	9.736E-08	0.0000	3.715E-06	0.0000
H-3	0.000E+00	0.0000	8.928E-13	0.0000	0.000E+00	0.0000	2.559E-11	0.0000	3.414E-12	0.0000	5.536E-12	0.0000	3.905E-15	0.0000
Sr-90	4.237E-03	0.0041	1.419E-05	0.0000	0.000E+00	0.0000	6.967E-01	0.6779	1.191E-01	0.1159	6.726E-02	0.0654	2.407E-03	0.0023
Total	1.325E-01	0.1289	1.433E-05	0.0000	0.000E+00	0.0000	7.011E-01	0.6822	1.223E-01	0.1190	6.928E-02	0.0674	2.524E-03	0.0025

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.174E-14	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.402E-02	0.0915
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.404E-02	0.0429
H-3	2.694E-08	0.0000	4.900E-11	0.0000	0.000E+00	0.0000	8.149E-09	0.0000	6.976E-10	0.0000	2.047E-09	0.0000	3.792E-08	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.897E-01	0.8657
Total	2.694E-08	0.0000	4.900E-11	0.0000	0.000E+00	0.0000	8.149E-09	0.0000	6.976E-10	0.0000	2.047E-09	0.0000	1.028E+00	1.0000

*Sum of all water independent and dependent pathways.

Attachment	2	Sheet No.	15 of 20
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 16
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
0 Water Independent Pathways (Inhalation excludes radon)

0 Radio- Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	1.653E-02	0.0899	9.776E-09	0.0000	0.000E+00	0.0000	8.590E-04	0.0047	6.362E-04	0.0035	3.951E-04	0.0021	2.226E-05	0.0001
Eu-152	1.153E-03	0.0063	2.284E-09	0.0000	0.000E+00	0.0000	2.347E-07	0.0000	3.858E-08	0.0000	2.549E-09	0.0000	9.725E-08	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	7.825E-04	0.0043	2.621E-06	0.0000	0.000E+00	0.0000	1.287E-01	0.6996	2.199E-02	0.1196	1.242E-02	0.0675	4.445E-04	0.0024
Total	1.847E-02	0.1004	2.633E-06	0.0000	0.000E+00	0.0000	1.295E-01	0.7043	2.263E-02	0.1230	1.282E-02	0.0697	4.669E-04	0.0025

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
0 Water Dependent Pathways

0 Radio- Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.844E-02	0.1003
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.153E-03	0.0063
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.643E-01	0.8935
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.839E-01	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	2	Sheet No.	16 of 20
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.3 T½ Limit = 180 days 11/12/2007 08:15 Page 17
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	1.575E-04	0.1054	9.314E-11	0.0000	0.000E+00	0.0000	8.183E-06	0.0055	6.061E-06	0.0041	3.764E-06	0.0025	2.120E-07	0.0001
Eu-152	3.480E-08	0.0000	6.896E-14	0.0000	0.000E+00	0.0000	7.085E-12	0.0000	1.165E-12	0.0000	7.695E-14	0.0000	2.936E-12	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	6.276E-06	0.0042	2.102E-08	0.0000	0.000E+00	0.0000	1.032E-03	0.6909	1.764E-04	0.1181	9.963E-05	0.0667	3.565E-06	0.0024
Total	1.638E-04	0.1097	2.111E-08	0.0000	0.000E+00	0.0000	1.040E-03	0.6964	1.825E-04	0.1222	1.034E-04	0.0692	3.777E-06	0.0025

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.757E-04	0.1176
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.481E-08	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.318E-03	0.8823
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.494E-03	1.0000

*Sum of all water independent and dependent pathways.

Attachment	2	Sheet No.	17 of 20
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 18
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	1.329E-11	0.1755	7.860E-18	0.0000	0.000E+00	0.0000	6.906E-13	0.0091	5.115E-13	0.0068	3.177E-13	0.0042	1.789E-14	0.0002
Eu-152	5.261E-24	0.0000	1.599E-17	0.0000	0.000E+00	0.0000	3.713E-17	0.0000	6.104E-18	0.0000	1.613E-19	0.0000	1.539E-17	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	2.899E-13	0.0038	9.710E-16	0.0000	0.000E+00	0.0000	4.768E-11	0.6297	8.149E-12	0.1076	4.603E-12	0.0608	1.647E-13	0.0022
Total	1.358E-11	0.1794	9.949E-16	0.0000	0.000E+00	0.0000	4.837E-11	0.6388	8.660E-12	0.1144	4.920E-12	0.0650	1.826E-13	0.0024

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.483E-11	0.1959
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.478E-17	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.088E-11	0.8041
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.571E-11	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	2	Sheet No.	18 of 20
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 19
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	9.400E+00	1.100E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	1.089E+00	3.705E-01	4.197E-02	3.911E-05	6.818E-06	6.223E-15	0.000E+00	0.000E+00	0.000E+00
0Cs-137+D	Cs-137+D	1.000E+00	2.392E+00	2.337E+00	2.231E+00	1.922E+00	1.852E+00	1.190E+00	2.335E-01	2.224E-03	1.877E-10
0Eu-152	Eu-152	7.208E-01	3.151E+00	2.991E+00	2.696E+00	1.932E+00	1.778E+00	6.613E-01	1.731E-02	5.227E-07	7.903E-23
0Eu-152	Eu-152	2.792E-01	1.221E+00	1.159E+00	1.044E+00	7.483E-01	6.886E-01	2.562E-01	6.706E-03	2.025E-07	3.061E-23
Eu-152	Gd-152	2.792E-01	4.023E-17	1.180E-16	2.618E-16	6.333E-16	7.083E-16	1.251E-15	1.564E-15	1.569E-15	1.558E-15
Eu-152	äDSR(j)		1.221E+00	1.159E+00	1.044E+00	7.483E-01	6.886E-01	2.562E-01	6.706E-03	2.025E-07	1.558E-15
0H-3	H-3	1.000E+00	2.312E-02	1.035E-02	2.052E-03	1.151E-02	3.181E-03	6.503E-10	7.231E-35	0.000E+00	0.000E+00
0Sr-90+D	Sr-90+D	1.000E+00	3.259E+00	3.182E+00	3.032E+00	2.598E+00	2.499E+00	1.580E+00	2.919E-01	2.341E-03	1.081E-10

The DSR includes contributions from associated (half-life ó 180 days) daughters.
0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.500E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	9.400E+00	1.100E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	1.377E+01	4.049E+01	3.574E+02	3.835E+05	2.200E+06	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12
Cs-137	6.271E+00	6.419E+00	6.725E+00	7.804E+00	8.101E+00	1.260E+01	6.425E+01	6.744E+03	7.992E+10
Eu-152	3.431E+00	3.615E+00	4.011E+00	5.596E+00	6.082E+00	1.635E+01	6.245E+02	2.069E+07	*1.765E+14
H-3	6.488E+02	1.449E+03	7.311E+03	1.303E+03	4.716E+03	2.306E+10	*9.597E+15	*9.597E+15	*9.597E+15
Sr-90	4.602E+00	4.715E+00	4.948E+00	5.774E+00	6.001E+00	9.492E+00	5.139E+01	6.408E+03	1.387E+11

*At specific activity limit
0

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
C-14	5.100E+00	0.000E+00	1.089E+00	1.377E+01	1.089E+00	1.377E+01
Cs-137	7.900E-02	0.000E+00	2.392E+00	6.271E+00	2.392E+00	6.271E+00
Eu-152	4.800E-02	0.000E+00	4.371E+00	3.431E+00	4.371E+00	3.431E+00
H-3	5.830E+01	0.000E+00	2.312E-02	6.488E+02	2.312E-02	6.488E+02
Sr-90	5.630E-01	0.000E+00	3.259E+00	4.602E+00	3.259E+00	4.602E+00

Attachment 2 Sheet No. 19 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 20
Summary : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

ONuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	9.400E+00	1.100E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
C-14	C-14	1.000E+00	5.555E+00	1.889E+00	2.141E-01	1.995E-04	3.477E-05	3.174E-14	0.000E+00	0.000E+00	0.000E+00
OCs-137	Cs-137	1.000E+00	1.890E-01	1.846E-01	1.762E-01	1.518E-01	1.463E-01	9.402E-02	1.844E-02	1.757E-04	1.483E-11
OEu-152	Eu-152	7.208E-01	1.512E-01	1.436E-01	1.294E-01	9.273E-02	8.533E-02	3.174E-02	8.310E-04	2.509E-08	3.793E-24
Eu-152	Eu-152	2.792E-01	5.858E-02	5.561E-02	5.012E-02	3.592E-02	3.305E-02	1.230E-02	3.219E-04	9.718E-09	1.469E-24
Eu-152	äDOSE(j)		2.098E-01	1.992E-01	1.795E-01	1.287E-01	1.184E-01	4.404E-02	1.153E-03	3.481E-08	5.263E-24
OGd-152	Eu-152	2.792E-01	1.931E-18	5.663E-18	1.257E-17	3.040E-17	3.400E-17	6.006E-17	7.505E-17	7.530E-17	7.478E-17
OH-3	H-3	1.000E+00	1.348E+00	6.036E-01	1.196E-01	6.711E-01	1.854E-01	3.792E-08	0.000E+00	0.000E+00	0.000E+00
OSr-90	Sr-90	1.000E+00	1.835E+00	1.791E+00	1.707E+00	1.463E+00	1.407E+00	8.897E-01	1.643E-01	1.318E-03	6.088E-11
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

ONuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	9.400E+00	1.100E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
C-14	C-14	1.000E+00	5.100E+00	1.718E+00	1.947E-01	1.815E-04	3.165E-05	2.896E-14	0.000E+00	0.000E+00	0.000E+00
OCs-137	Cs-137	1.000E+00	7.900E-02	7.718E-02	7.367E-02	6.348E-02	6.116E-02	3.931E-02	7.711E-03	7.346E-05	6.199E-12
OEu-152	Eu-152	7.208E-01	3.460E-02	3.284E-02	2.960E-02	2.121E-02	1.952E-02	7.262E-03	1.901E-04	5.739E-09	8.677E-25
Eu-152	Eu-152	2.792E-01	1.340E-02	1.272E-02	1.146E-02	8.217E-03	7.560E-03	2.813E-03	7.364E-05	2.223E-09	3.361E-25
Eu-152	äS(j):		4.800E-02	4.557E-02	4.106E-02	2.943E-02	2.708E-02	1.007E-02	2.637E-04	7.962E-09	1.204E-24
OGd-152	Eu-152	2.792E-01	0.000E+00	8.381E-17	2.389E-16	6.394E-16	7.203E-16	1.306E-15	1.642E-15	1.648E-15	1.637E-15
OH-3	H-3	1.000E+00	5.830E+01	2.596E+01	5.146E+00	2.882E-02	7.871E-03	1.528E-09	1.397E-34	0.000E+00	0.000E+00
OSr-90	Sr-90	1.000E+00	5.630E-01	5.496E-01	5.237E-01	4.488E-01	4.318E-01	2.730E-01	5.042E-02	4.044E-04	1.868E-11
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ

THF(i) is the thread fraction of the parent nuclide.
ORESCALC.EXE execution time = 6.85 seconds

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Chk'd By	H. M. Sulloway	Date	
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Amount of Intake Quantities and Excess Cancer Risks
Time= 0.000E+00 4
Time= 1.000E+00 6
Time= 3.000E+00 8
Time= 9.400E+00 10
Time= 1.100E+01 12
Time= 3.000E+01 14
Time= 1.000E+02 16
Time= 3.000E+02 18
Time= 1.000E+03 20

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Chk'd By	H. M. Sulloway	Date	11/12/07
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Cancer Risk Slope Factors Summary Table
Risk Library: HEAST 2001 Morbidity

0 Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	C-14	7.83E-12	7.83E-12	SLPF(1,1)
Sf-1	Cs-137+D	2.55E-06	5.32E-10	SLPF(2,1)
Sf-1	Eu-152	5.30E-06	5.30E-06	SLPF(3,1)
Sf-1	Gd-152	0.00E+00	0.00E+00	SLPF(5,1)
Sf-1	H-3	0.00E+00	0.00E+00	SLPF(6,1)
Sf-1	Sr-90+D	1.96E-08	4.82E-10	SLPF(7,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	C-14	7.07E-12	7.07E-12	SLPF(1,2)
Sf-2	Cs-137+D	1.19E-11	1.19E-11	SLPF(2,2)
Sf-2	Eu-152	9.10E-11	9.10E-11	SLPF(3,2)
Sf-2	Gd-152	9.10E-09	9.10E-09	SLPF(5,2)
Sf-2	H-3	1.99E-13	1.99E-13	SLPF(6,2)
Sf-2	Sr-90+D	1.13E-10	1.05E-10	SLPF(7,2)
Sf-3	Food ingestion, slope factors, 1/(pCi):			
Sf-3	C-14	2.00E-12	2.00E-12	SLPF(1,3)
Sf-3	Cs-137+D	3.74E-11	3.74E-11	SLPF(2,3)
Sf-3	Eu-152	8.70E-12	8.70E-12	SLPF(3,3)
Sf-3	Gd-152	3.85E-11	3.85E-11	SLPF(5,3)
Sf-3	H-3	1.44E-13	1.44E-13	SLPF(6,3)
Sf-3	Sr-90+D	9.53E-11	6.88E-11	SLPF(7,3)
Sf-3	Water ingestion, slope factors, 1/(pCi):			
Sf-3	C-14	1.55E-12	1.55E-12	SLPF(1,4)
Sf-3	Cs-137+D	3.04E-11	3.04E-11	SLPF(2,4)
Sf-3	Eu-152	6.07E-12	6.07E-12	SLPF(3,4)
Sf-3	Gd-152	2.97E-11	2.97E-11	SLPF(5,4)
Sf-3	H-3	1.12E-13	1.12E-13	SLPF(6,4)
Sf-3	Sr-90+D	7.40E-11	5.59E-11	SLPF(7,4)
Sf-3	Soil ingestion, slope factors, 1/(pCi):			
Sf-3	C-14	2.79E-12	2.79E-12	SLPF(1,5)
Sf-3	Cs-137+D	4.33E-11	4.33E-11	SLPF(2,5)
Sf-3	Eu-152	1.62E-11	1.62E-11	SLPF(3,5)
Sf-3	Gd-152	6.29E-11	6.29E-11	SLPF(5,5)
Sf-3	H-3	2.20E-13	2.20E-13	SLPF(6,5)
Sf-3	Sr-90+D	1.44E-10	9.18E-11	SLPF(7,5)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

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Risk Slope and Environmental Transport Factors for the Ground Pathway

ONuclide (i)	Slope(i)*	ETFG(i,t) At Time in Years (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	9.400E+00	1.100E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
Ba-137m	2.690E-06	6.358E-01	6.358E-01	6.358E-01	6.358E-01	6.358E-01	6.358E-01	6.358E-01	6.358E-01	6.358E-01
C-14	7.830E-12	6.664E-01	6.664E-01	6.664E-01	6.664E-01	6.664E-01	6.664E-01	6.664E-01	6.664E-01	6.664E-01
Cs-137	5.320E-10	6.456E-01	6.456E-01	6.456E-01	6.456E-01	6.456E-01	6.456E-01	6.456E-01	6.456E-01	6.456E-01
Eu-152	5.300E-06	6.402E-01	6.402E-01	6.402E-01	6.402E-01	6.402E-01	6.402E-01	6.402E-01	6.402E-01	6.402E-01
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	0.000E+00	6.800E-01	6.800E-01	6.800E-01	6.800E-01	6.800E-01	6.800E-01	6.800E-01	6.800E-01	6.800E-01
Sr-90	4.820E-10	6.468E-01	6.468E-01	6.468E-01	6.468E-01	6.468E-01	6.468E-01	6.468E-01	6.468E-01	6.468E-01
Y-90	1.910E-08	6.379E-01	6.379E-01	6.379E-01	6.379E-01	6.379E-01	6.379E-01	6.379E-01	6.379E-01	6.379E-01
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* - Units are 1/yr per (pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

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File : 100-F-26-12_OB_BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
C-14	8.108E+02	3.049E+06	5.717E+05	4.631E+05	2.978E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.084E+06
Cs-137	3.177E-03	1.781E+02	1.319E+02	8.191E+01	4.614E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.965E+02
Eu-152	1.930E-03	6.764E+00	1.112E+00	7.346E-02	2.803E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.075E+01
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	7.785E+05	2.169E+07	2.600E+06	4.387E+06	3.405E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.868E+07
Sr-90	2.264E-02	9.518E+03	1.627E+03	9.188E+02	3.288E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.210E+04

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	3.553E-11	0.0000	7.653E-09	0.0002	8.163E-06	0.1635	1.547E-06	0.0310	1.248E-06	0.0250	1.109E-09	0.0000
Cs-137	2.761E-06	0.0553	8.163E-13	0.0000	1.438E-07	0.0029	1.065E-07	0.0021	6.615E-08	0.0013	4.314E-09	0.0001
Eu-152	2.473E-06	0.0495	2.667E-12	0.0000	8.935E-10	0.0000	1.469E-10	0.0000	9.704E-12	0.0000	6.895E-10	0.0000
Gd-152	0.000E+00	0.0000	8.960E-24	0.0000	1.328E-22	0.0000	2.184E-23	0.0000	5.773E-25	0.0000	8.995E-23	0.0000
H-3	0.000E+00	0.0000	2.319E-07	0.0046	4.696E-06	0.0941	5.737E-07	0.0115	9.612E-07	0.0193	1.121E-09	0.0000
Sr-90	1.502E-07	0.0030	5.481E-11	0.0000	1.936E-05	0.3878	3.310E-06	0.0663	1.869E-06	0.0374	1.013E-07	0.0020
Total	5.384E-06	0.1078	2.396E-07	0.0048	3.237E-05	0.6483	5.537E-06	0.1109	4.145E-06	0.0830	1.085E-07	0.0022

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Chk'd By	H. M. Sulloway	Date	
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Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.097E-05	0.2197
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.081E-06	0.0617
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.475E-06	0.0496
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.542E-22	0.0000
H-3	1.410E-06	0.0282	3.296E-09	0.0001	5.482E-07	0.0110	4.692E-08	0.0009	1.377E-07	0.0028	8.610E-06	0.1724
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.479E-05	0.4966
Total	1.410E-06	0.0282	3.296E-09	0.0001	5.482E-07	0.0110	4.692E-08	0.0009	1.377E-07	0.0028	4.993E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	3.553E-11	0.0000	7.653E-09	0.0002	0.000E+00	0.0000	8.163E-06	0.1635	1.547E-06	0.0310	1.248E-06	0.0250	1.109E-09	0.0000
Cs-137	2.761E-06	0.0553	8.163E-13	0.0000	0.000E+00	0.0000	1.438E-07	0.0029	1.065E-07	0.0021	6.615E-08	0.0013	4.314E-09	0.0001
Eu-152	2.473E-06	0.0495	2.667E-12	0.0000	0.000E+00	0.0000	8.935E-10	0.0000	1.469E-10	0.0000	9.704E-12	0.0000	6.895E-10	0.0000
H-3	0.000E+00	0.0000	2.319E-07	0.0046	0.000E+00	0.0000	4.696E-06	0.0941	5.737E-07	0.0115	9.612E-07	0.0193	1.121E-09	0.0000
Sr-90	1.502E-07	0.0030	5.481E-11	0.0000	0.000E+00	0.0000	1.936E-05	0.3878	3.310E-06	0.0663	1.869E-06	0.0374	1.013E-07	0.0020
Total	5.384E-06	0.1078	2.396E-07	0.0048	0.000E+00	0.0000	3.237E-05	0.6483	5.537E-06	0.1109	4.145E-06	0.0830	1.085E-07	0.0022

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.097E-05	0.2197
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.081E-06	0.0617
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.475E-06	0.0496
H-3	1.410E-06	0.0282	3.296E-09	0.0001	0.000E+00	0.0000	5.482E-07	0.0110	4.692E-08	0.0009	1.377E-07	0.0028	8.610E-06	0.1724
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.479E-05	0.4966
Total	1.410E-06	0.0282	3.296E-09	0.0001	0.000E+00	0.0000	5.482E-07	0.0110	4.692E-08	0.0009	1.377E-07	0.0028	4.993E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment	3	Sheet No.	5 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 6
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
C-14	2.731E+02	1.071E+06	2.337E+05	1.789E+05	1.003E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.483E+06
Cs-137	3.104E-03	1.740E+02	1.289E+02	8.003E+01	4.507E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.874E+02
Eu-152	1.832E-03	6.421E+00	1.055E+00	6.974E-02	2.661E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.021E+01
Gd-152	3.370E-18	1.181E-14	1.941E-15	5.151E-17	4.895E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.870E-14
H-3	3.467E+05	9.935E+06	1.324E+06	2.148E+06	1.516E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.341E+07
Sr-90	2.210E-02	9.291E+03	1.588E+03	8.970E+02	3.210E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.181E+04

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	1.196E-11	0.0000	2.578E-09	0.0001	2.858E-06	0.0746	6.239E-07	0.0163	4.775E-07	0.0125	3.736E-10	0.0000
Cs-137	2.697E-06	0.0704	7.975E-13	0.0000	1.405E-07	0.0037	1.041E-07	0.0027	6.463E-08	0.0017	4.215E-09	0.0001
Eu-152	2.347E-06	0.0613	2.531E-12	0.0000	8.482E-10	0.0000	1.394E-10	0.0000	9.212E-12	0.0000	6.545E-10	0.0000
Gd-152	0.000E+00	0.0000	9.426E-24	0.0000	1.398E-22	0.0000	2.297E-23	0.0000	6.072E-25	0.0000	9.462E-23	0.0000
H-3	0.000E+00	0.0000	1.033E-07	0.0027	2.141E-06	0.0559	2.853E-07	0.0074	4.629E-07	0.0121	4.993E-10	0.0000
Sr-90	1.466E-07	0.0038	5.350E-11	0.0000	1.890E-05	0.4932	3.231E-06	0.0843	1.825E-06	0.0476	9.887E-08	0.0026
Total	5.191E-06	0.1355	1.059E-07	0.0028	2.404E-05	0.6274	4.244E-06	0.1107	2.830E-06	0.0738	1.046E-07	0.0027

Attachment	3	Sheet No. 6 of 21	
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 7
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.963E-06	0.1034
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.010E-06	0.0786
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.349E-06	0.0613
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.674E-22	0.0000
H-3	1.250E-06	0.0326	2.763E-09	0.0001	4.263E-07	0.0111	2.449E-08	0.0006	1.015E-07	0.0026	4.798E-06	0.1252
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.420E-05	0.6316
Total	1.250E-06	0.0326	2.763E-09	0.0001	4.263E-07	0.0111	2.449E-08	0.0006	1.015E-07	0.0026	3.832E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	1.196E-11	0.0000	2.578E-09	0.0001	0.000E+00	0.0000	2.858E-06	0.0746	6.239E-07	0.0163	4.775E-07	0.0125	3.736E-10	0.0000
Cs-137	2.697E-06	0.0704	7.975E-13	0.0000	0.000E+00	0.0000	1.405E-07	0.0037	1.041E-07	0.0027	6.463E-08	0.0017	4.215E-09	0.0001
Eu-152	2.347E-06	0.0613	2.531E-12	0.0000	0.000E+00	0.0000	8.482E-10	0.0000	1.394E-10	0.0000	9.212E-12	0.0000	6.545E-10	0.0000
H-3	0.000E+00	0.0000	1.033E-07	0.0027	0.000E+00	0.0000	2.141E-06	0.0559	2.853E-07	0.0074	4.629E-07	0.0121	4.993E-10	0.0000
Sr-90	1.466E-07	0.0038	5.350E-11	0.0000	0.000E+00	0.0000	1.890E-05	0.4932	3.231E-06	0.0843	1.825E-06	0.0476	9.887E-08	0.0026
Total	5.191E-06	0.1355	1.059E-07	0.0028	0.000E+00	0.0000	2.404E-05	0.6274	4.244E-06	0.1107	2.830E-06	0.0738	1.046E-07	0.0027

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.963E-06	0.1034
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.010E-06	0.0786
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.349E-06	0.0613
H-3	1.250E-06	0.0326	2.763E-09	0.0001	0.000E+00	0.0000	4.263E-07	0.0111	2.449E-08	0.0006	1.015E-07	0.0026	4.798E-06	0.1252
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.420E-05	0.6316
Total	1.250E-06	0.0326	2.763E-09	0.0001	0.000E+00	0.0000	4.263E-07	0.0111	2.449E-08	0.0006	1.015E-07	0.0026	3.832E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment	3	Sheet No.	7 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 8
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
C-14	3.095E+01	1.213E+05	2.649E+04	2.027E+04	1.137E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.681E+05
Cs-137	2.962E-03	1.661E+02	1.230E+02	7.639E+01	4.303E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.698E+02
Eu-152	1.651E-03	5.786E+00	9.511E-01	6.284E-02	2.398E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.198E+00
Gd-152	9.606E-18	3.366E-14	5.534E-15	1.464E-16	1.395E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.330E-14
H-3	6.872E+04	1.969E+06	2.624E+05	4.258E+05	3.005E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.658E+06
Sr-90	2.106E-02	8.853E+03	1.513E+03	8.547E+02	3.058E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.125E+04

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	1.356E-12	0.0000	2.921E-10	0.0000	3.239E-07	0.0104	7.070E-08	0.0023	5.411E-08	0.0017	4.233E-11	0.0000
Cs-137	2.574E-06	0.0825	7.612E-13	0.0000	1.341E-07	0.0043	9.933E-08	0.0032	6.169E-08	0.0020	4.023E-09	0.0001
Eu-152	2.115E-06	0.0678	2.281E-12	0.0000	7.643E-10	0.0000	1.256E-10	0.0000	8.301E-12	0.0000	5.898E-10	0.0000
Gd-152	0.000E+00	0.0000	1.029E-23	0.0000	1.525E-22	0.0000	2.507E-23	0.0000	6.627E-25	0.0000	1.033E-22	0.0000
H-3	0.000E+00	0.0000	2.046E-08	0.0007	4.243E-07	0.0136	5.654E-08	0.0018	9.173E-08	0.0029	9.893E-11	0.0000
Sr-90	1.397E-07	0.0045	5.098E-11	0.0000	1.801E-05	0.5773	3.079E-06	0.0987	1.739E-06	0.0557	9.422E-08	0.0030
Total	4.830E-06	0.1548	2.081E-08	0.0007	1.889E-05	0.6056	3.305E-06	0.1059	1.946E-06	0.0624	9.897E-08	0.0032

Attachment 3 Sheet No. 8 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 9
Intrisk : 100-F-26:12 OB & BCL Using Maximum.Activities
File : 100-F-26-12_OB_BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.490E-07	0.0144
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.874E-06	0.0921
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.117E-06	0.0678
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.918E-22	0.0000
H-3	1.384E-06	0.0443	3.235E-09	0.0001	5.381E-07	0.0172	4.605E-08	0.0015	1.351E-07	0.0043	2.699E-06	0.0865
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.306E-05	0.7392
Total	1.384E-06	0.0443	3.235E-09	0.0001	5.381E-07	0.0172	4.605E-08	0.0015	1.351E-07	0.0043	3.120E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	1.356E-12	0.0000	2.921E-10	0.0000	0.000E+00	0.0000	3.239E-07	0.0104	7.070E-08	0.0023	5.411E-08	0.0017	4.233E-11	0.0000
Cs-137	2.574E-06	0.0825	7.612E-13	0.0000	0.000E+00	0.0000	1.341E-07	0.0043	9.933E-08	0.0032	6.169E-08	0.0020	4.023E-09	0.0001
Eu-152	2.115E-06	0.0678	2.281E-12	0.0000	0.000E+00	0.0000	7.643E-10	0.0000	1.256E-10	0.0000	8.301E-12	0.0000	5.898E-10	0.0000
H-3	0.000E+00	0.0000	2.046E-08	0.0007	0.000E+00	0.0000	4.243E-07	0.0136	5.654E-08	0.0018	9.173E-08	0.0029	9.893E-11	0.0000
Sr-90	1.397E-07	0.0045	5.098E-11	0.0000	0.000E+00	0.0000	1.801E-05	0.5773	3.079E-06	0.0987	1.739E-06	0.0557	9.422E-08	0.0030
Total	4.830E-06	0.1548	2.081E-08	0.0007	0.000E+00	0.0000	1.889E-05	0.6056	3.305E-06	0.1059	1.946E-06	0.0624	9.897E-08	0.0032

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.490E-07	0.0144
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.874E-06	0.0921
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.117E-06	0.0678
H-3	1.384E-06	0.0443	3.235E-09	0.0001	0.000E+00	0.0000	5.381E-07	0.0172	4.605E-08	0.0015	1.351E-07	0.0043	2.699E-06	0.0865
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.306E-05	0.7392
Total	1.384E-06	0.0443	3.235E-09	0.0001	0.000E+00	0.0000	5.381E-07	0.0172	4.605E-08	0.0015	1.351E-07	0.0043	3.120E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment	3	Sheet No.	9 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 10
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 9.400E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
C-14	2.886E-02	1.132E+02	2.471E+01	1.891E+01	1.060E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.568E+02
Cs-137	2.553E-03	1.431E+02	1.060E+02	6.582E+01	3.707E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.186E+02
Eu-152	1.183E-03	4.147E+00	6.817E-01	4.504E-02	1.719E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.593E+00
Gd-152	2.571E-17	9.010E-14	1.481E-14	3.916E-16	3.734E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.426E-13
H-3	3.848E+02	1.103E+04	1.470E+03	2.384E+03	1.683E+00	1.049E+07	1.864E+04	3.013E+06	2.209E+05	7.421E+05	1.450E+07
Sr-90	1.804E-02	7.586E+03	1.297E+03	7.324E+02	2.621E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.641E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 9.400E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	1.264E-15	0.0000	2.722E-13	0.0000	3.019E-10	0.0000	6.592E-11	0.0000	5.045E-11	0.0000	3.946E-14	0.0000
Cs-137	2.218E-06	0.0840	6.559E-13	0.0000	1.156E-07	0.0044	8.559E-08	0.0032	5.316E-08	0.0020	3.466E-09	0.0001
Eu-152	1.516E-06	0.0574	1.635E-12	0.0000	5.478E-10	0.0000	9.005E-11	0.0000	5.950E-12	0.0000	4.227E-10	0.0000
Gd-152	0.000E+00	0.0000	1.251E-23	0.0000	1.855E-22	0.0000	3.049E-23	0.0000	8.060E-25	0.0000	1.256E-22	0.0000
H-3	0.000E+00	0.0000	1.145E-10	0.0000	2.374E-09	0.0001	3.164E-10	0.0000	5.133E-10	0.0000	5.534E-13	0.0000
Sr-90	1.197E-07	0.0045	4.368E-11	0.0000	1.543E-05	0.5844	2.638E-06	0.0999	1.490E-06	0.0564	8.073E-08	0.0031
Total	3.854E-06	0.1459	1.607E-10	0.0000	1.555E-05	0.5889	2.724E-06	0.1032	1.544E-06	0.0585	8.462E-08	0.0032

Attachment 3 Sheet No. 10 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 11
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 9.400E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.186E-10	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.476E-06	0.0938
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.517E-06	0.0575
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.549E-22	0.0000
H-3	1.771E-06	0.0671	4.065E-09	0.0002	6.602E-07	0.0250	4.985E-08	0.0019	1.632E-07	0.0062	2.652E-06	0.1004
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.976E-05	0.7484
Total	1.771E-06	0.0671	4.065E-09	0.0002	6.602E-07	0.0250	4.985E-08	0.0019	1.632E-07	0.0062	2.641E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 9.400E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	1.264E-15	0.0000	2.722E-13	0.0000	0.000E+00	0.0000	3.019E-10	0.0000	6.592E-11	0.0000	5.045E-11	0.0000	3.946E-14	0.0000
Cs-137	2.218E-06	0.0840	6.559E-13	0.0000	0.000E+00	0.0000	1.156E-07	0.0044	8.559E-08	0.0032	5.316E-08	0.0020	3.466E-09	0.0001
Eu-152	1.516E-06	0.0574	1.635E-12	0.0000	0.000E+00	0.0000	5.478E-10	0.0000	9.005E-11	0.0000	5.950E-12	0.0000	4.227E-10	0.0000
H-3	0.000E+00	0.0000	1.145E-10	0.0000	0.000E+00	0.0000	2.374E-09	0.0001	3.164E-10	0.0000	5.133E-10	0.0000	5.534E-13	0.0000
Sr-90	1.197E-07	0.0045	4.368E-11	0.0000	0.000E+00	0.0000	1.543E-05	0.5844	2.638E-06	0.0999	1.490E-06	0.0564	8.073E-08	0.0031
Total	3.854E-06	0.1459	1.607E-10	0.0000	0.000E+00	0.0000	1.555E-05	0.5889	2.724E-06	0.1032	1.544E-06	0.0585	8.462E-08	0.0032

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 9.400E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.186E-10	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.476E-06	0.0938
Eu-152	0:000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.517E-06	0.0575
H-3	1.771E-06	0.0671	4.065E-09	0.0002	0.000E+00	0.0000	6.602E-07	0.0250	4.985E-08	0.0019	1.632E-07	0.0062	2.652E-06	0.1004
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.976E-05	0.7484
Total	1.771E-06	0.0671	4.065E-09	0.0002	0.000E+00	0.0000	6.602E-07	0.0250	4.985E-08	0.0019	1.632E-07	0.0062	2.641E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment	3	Sheet No.	11 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 12
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.100E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
C-14	5.032E-03	1.973E+01	4.309E+00	3.297E+00	1.848E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.734E+01
Cs-137	2.459E-03	1.379E+02	1.021E+02	6.342E+01	3.572E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.069E+02
Eu-152	1.089E-03	3.816E+00	6.273E-01	4.144E-02	1.581E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.066E+00
Gd-152	2.896E-17	1.015E-13	1.669E-14	4.411E-16	4.207E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.607E-13
H-3	1.051E+02	3.012E+03	4.015E+02	6.514E+02	4.597E-01	3.001E+06	5.459E+03	9.080E+05	7.770E+04	2.280E+05	4.225E+06
Sr-90	1.736E-02	7.299E+03	1.248E+03	7.047E+02	2.521E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.276E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	2.203E-16	0.0000	4.745E-14	0.0000	5.263E-11	0.0000	1.149E-11	0.0000	8.795E-12	0.0000	6.879E-15	0.0000
Cs-137	2.137E-06	0.0907	6.319E-13	0.0000	1.113E-07	0.0047	8.246E-08	0.0035	5.122E-08	0.0022	3.340E-09	0.0001
Eu-152	1.395E-06	0.0592	1.504E-12	0.0000	5.041E-10	0.0000	8.285E-11	0.0000	5.474E-12	0.0000	3.890E-10	0.0000
Gd-152	0.000E+00	0.0000	1.296E-23	0.0000	1.922E-22	0.0000	3.159E-23	0.0000	8.349E-25	0.0000	1.301E-22	0.0000
H-3	0.000E+00	0.0000	3.126E-11	0.0000	6.482E-10	0.0000	8.641E-11	0.0000	1.402E-10	0.0000	1.511E-13	0.0000
Sr-90	1.152E-07	0.0049	4.203E-11	0.0000	1.485E-05	0.6302	2.538E-06	0.1077	1.434E-06	0.0608	7.768E-08	0.0033
Total	3.647E-06	0.1548	7.547E-11	0.0000	1.496E-05	0.6350	2.621E-06	0.1112	1.485E-06	0.0630	8.141E-08	0.0035

Attachment	3	Sheet No.	12 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 13
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.297E-11	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.386E-06	0.1012
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.396E-06	0.0592
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.677E-22	0.0000
H-3	5.033E-07	0.0214	1.177E-09	0.0000	1.957E-07	0.0083	1.675E-08	0.0007	4.916E-08	0.0021	7.670E-07	0.0326
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.901E-05	0.8070
Total	5.033E-07	0.0214	1.177E-09	0.0000	1.957E-07	0.0083	1.675E-08	0.0007	4.916E-08	0.0021	2.356E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	2.203E-16	0.0000	4.745E-14	0.0000	0.000E+00	0.0000	5.263E-11	0.0000	1.149E-11	0.0000	8.795E-12	0.0000	6.879E-15	0.0000
Cs-137	2.137E-06	0.0907	6.319E-13	0.0000	0.000E+00	0.0000	1.113E-07	0.0047	8.246E-08	0.0035	5.122E-08	0.0022	3.340E-09	0.0001
Eu-152	1.395E-06	0.0592	1.504E-12	0.0000	0.000E+00	0.0000	5.041E-10	0.0000	8.285E-11	0.0000	5.474E-12	0.0000	3.890E-10	0.0000
H-3	0.000E+00	0.0000	3.126E-11	0.0000	0.000E+00	0.0000	6.482E-10	0.0000	8.641E-11	0.0000	1.402E-10	0.0000	1.511E-13	0.0000
Sr-90	1.152E-07	0.0049	4.203E-11	0.0000	0.000E+00	0.0000	1.485E-05	0.6302	2.538E-06	0.1077	1.434E-06	0.0608	7.768E-08	0.0033
Total	3.647E-06	0.1548	7.547E-11	0.0000	0.000E+00	0.0000	1.496E-05	0.6350	2.621E-06	0.1112	1.485E-06	0.0630	8.141E-08	0.0035

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.297E-11	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.386E-06	0.1012
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.396E-06	0.0592
H-3	5.033E-07	0.0214	1.177E-09	0.0000	0.000E+00	0.0000	1.957E-07	0.0083	1.675E-08	0.0007	4.916E-08	0.0021	7.670E-07	0.0326
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.901E-05	0.8070
Total	5.033E-07	0.0214	1.177E-09	0.0000	0.000E+00	0.0000	1.957E-07	0.0083	1.675E-08	0.0007	4.916E-08	0.0021	2.356E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 13 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 14
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
C-14	4.604E-12	1.805E-08	3.946E-09	3.019E-09	1.691E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.502E-08
Cs-137	1.581E-03	8.860E+01	6.562E+01	4.076E+01	2.296E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.973E+02
Eu-152	4.051E-04	1.420E+00	2.334E-01	1.542E-02	5.883E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.257E+00
Gd-152	5.250E-17	1.840E-13	3.024E-14	7.994E-16	7.625E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.913E-13
H-3	2.040E-05	5.849E-04	7.801E-05	1.265E-04	8.924E-08	6.149E-01	1.118E-03	1.860E-01	1.592E-02	4.671E-02	8.654E-01
Sr-90	1.098E-02	4.615E+03	7.888E+02	4.455E+02	1.594E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.865E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	2.012E-25	0.0000	4.334E-23	0.0000	4.809E-20	0.0000	1.051E-20	0.0000	8.040E-21	0.0000	6.283E-24	0.0000
Cs-137	1.374E-06	0.0976	4.061E-13	0.0000	7.155E-08	0.0051	5.299E-08	0.0038	3.292E-08	0.0023	2.146E-09	0.0002
Eu-152	5.190E-07	0.0369	5.597E-13	0.0000	1.875E-10	0.0000	3.083E-11	0.0000	2.037E-12	0.0000	1.447E-10	0.0000
Gd-152	0.000E+00	0.0000	1.621E-23	0.0000	2.404E-22	0.0000	3.951E-23	0.0000	1.044E-24	0.0000	1.627E-22	0.0000
H-3	0.000E+00	0.0000	6.052E-18	0.0000	1.255E-16	0.0000	1.674E-17	0.0000	2.716E-17	0.0000	2.926E-20	0.0000
Sr-90	7.282E-08	0.0052	2.657E-11	0.0000	9.389E-06	0.6671	1.605E-06	0.1140	9.065E-07	0.0644	4.911E-08	0.0035
Total	1.965E-06	0.1396	2.754E-11	0.0000	9.461E-06	0.6722	1.658E-06	0.1178	9.394E-07	0.0667	5.140E-08	0.0037

Attachment	3	Sheet No.	14 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	ûîûûF-CA-V0326	Rev. No.	0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 15
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.669E-20	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.533E-06	0.1089
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.194E-07	0.0369
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.599E-22	0.0000
H-3	1.028E-13	0.0000	2.405E-16	0.0000	3.999E-14	0.0000	3.424E-15	0.0000	1.004E-14	0.0000	1.567E-13	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.202E-05	0.8542
Total	1.028E-13	0.0000	2.405E-16	0.0000	3.999E-14	0.0000	3.424E-15	0.0000	1.004E-14	0.0000	1.407E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	2.012E-25	0.0000	4.334E-23	0.0000	0.000E+00	0.0000	4.809E-20	0.0000	1.051E-20	0.0000	8.040E-21	0.0000	6.283E-24	0.0000
Cs-137	1.374E-06	0.0976	4.061E-13	0.0000	0.000E+00	0.0000	7.155E-08	0.0051	5.299E-08	0.0038	3.292E-08	0.0023	2.146E-09	0.0002
Eu-152	5.190E-07	0.0369	5.597E-13	0.0000	0.000E+00	0.0000	1.875E-10	0.0000	3.083E-11	0.0000	2.037E-12	0.0000	1.447E-10	0.0000
H-3	0.000E+00	0.0000	6.052E-18	0.0000	0.000E+00	0.0000	1.255E-16	0.0000	1.674E-17	0.0000	2.716E-17	0.0000	2.926E-20	0.0000
Sr-90	7.282E-08	0.0052	2.657E-11	0.0000	0.000E+00	0.0000	9.389E-06	0.6671	1.605E-06	0.1140	9.065E-07	0.0644	4.911E-08	0.0035
Total	1.965E-06	0.1396	2.754E-11	0.0000	0.000E+00	0.0000	9.461E-06	0.6722	1.658E-06	0.1178	9.394E-07	0.0667	5.140E-08	0.0037

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.669E-20	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.533E-06	0.1089
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.194E-07	0.0369
H-3	1.028E-13	0.0000	2.405E-16	0.0000	0.000E+00	0.0000	3.999E-14	0.0000	3.424E-15	0.0000	1.004E-14	0.0000	1.567E-13	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.202E-05	0.8542
Total	1.028E-13	0.0000	2.405E-16	0.0000	0.000E+00	0.0000	3.999E-14	0.0000	3.424E-15	0.0000	1.004E-14	0.0000	1.407E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment	3	Sheet No.	15 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 16
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	3.101E-04	1.738E+01	1.287E+01	7.995E+00	4.503E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.870E+01
Eu-152	1.060E-05	3.717E-02	6.109E-03	4.036E-04	1.540E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.908E-02
Gd-152	6.604E-17	2.314E-13	3.804E-14	1.005E-15	9.592E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.664E-13
H-3	1.865E-30	5.350E-29	7.145E-30	1.158E-29	0.000E+00	6.884E-26	1.252E-28	2.083E-26	1.785E-27	5.233E-27	9.689E-26
Sr-90	2.027E-03	8.523E+02	1.457E+02	8.229E+01	2.944E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.083E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	2.694E-07	0.1063	7.967E-14	0.0000	1.404E-08	0.0055	1.040E-08	0.0041	6.457E-09	0.0025	4.210E-10	0.0002
Eu-152	1.359E-08	0.0054	1.465E-14	0.0000	4.910E-12	0.0000	8.071E-13	0.0000	5.332E-14	0.0000	3.789E-12	0.0000
Gd-152	0.000E+00	0.0000	1.808E-23	0.0000	2.680E-22	0.0000	4.405E-23	0.0000	1.164E-24	0.0000	1.815E-22	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	1.345E-08	0.0053	4.908E-12	0.0000	1.734E-06	0.6841	2.964E-07	0.1169	1.674E-07	0.0660	9.071E-09	0.0036
Total	2.965E-07	0.1170	5.003E-12	0.0000	1.748E-06	0.6897	3.068E-07	0.1210	1.739E-07	0.0686	9.496E-09	0.0037

Attachment 3 Sheet No. 16 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 17
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.008E-07	0.1186
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.360E-08	0.0054
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.128E-22	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.220E-06	0.8760
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.535E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	2.694E-07	0.1063	7.967E-14	0.0000	0.000E+00	0.0000	1.404E-08	0.0055	1.040E-08	0.0041	6.457E-09	0.0025	4.210E-10	0.0002
Eu-152	1.359E-08	0.0054	1.465E-14	0.0000	0.000E+00	0.0000	4.910E-12	0.0000	8.071E-13	0.0000	5.332E-14	0.0000	3.789E-12	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	1.345E-08	0.0053	4.908E-12	0.0000	0.000E+00	0.0000	1.734E-06	0.6841	2.964E-07	0.1169	1.674E-07	0.0660	9.071E-09	0.0036
Total	2.965E-07	0.1170	5.003E-12	0.0000	0.000E+00	0.0000	1.748E-06	0.6897	3.068E-07	0.1210	1.739E-07	0.0686	9.496E-09	0.0037

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.008E-07	0.1186
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.360E-08	0.0054
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.220E-06	0.8760
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.535E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment	3	Sheet No.	17 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 3

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1RESRAD, Version 6.3      T« Limit = 180 days        11/12/2007  08:15  Page  18
 Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
 File    : 100-F-26-12_OB_BCL.RAD
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Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	2.954E-06	1.656E-01	1.226E-01	7.617E-02	4.290E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.687E-01
Eu-152	3.202E-10	1.122E-06	1.844E-07	1.219E-08	4.650E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.784E-06
Gd-152	6.627E-17	2.323E-13	3.818E-14	1.009E-15	9.626E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.677E-13
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	1.626E-05	6.836E+00	1.168E+00	6.600E-01	2.361E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.688E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	2.567E-09	0.1242	7.590E-16	0.0000	1.337E-10	0.0065	9.904E-11	0.0048	6.151E-11	0.0030	4.011E-12	0.0002
Eu-152	4.103E-13	0.0000	4.424E-19	0.0000	1.482E-16	0.0000	2.437E-17	0.0000	1.610E-18	0.0000	1.144E-16	0.0000
Gd-152	0.000E+00	0.0000	1.809E-23	0.0000	2.682E-22	0.0000	4.409E-23	0.0000	1.165E-24	0.0000	1.816E-22	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	1.079E-10	0.0052	3.936E-14	0.0000	1.391E-08	0.6727	2.377E-09	0.1150	1.343E-09	0.0649	7.275E-11	0.0035
Total	2.675E-09	0.1294	4.012E-14	0.0000	1.404E-08	0.6792	2.476E-09	0.1198	1.404E-09	0.0679	7.676E-11	0.0037

Attachment 3 Sheet No. 18 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 19
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.865E-09	0.1386
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.105E-13	0.0000
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.132E-22	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.781E-08	0.8614
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.067E-08	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	2.567E-09	0.1242	7.590E-16	0.0000	0.000E+00	0.0000	1.337E-10	0.0065	9.904E-11	0.0048	6.151E-11	0.0030	4.011E-12	0.0002
Eu-152	4.103E-13	0.0000	4.424E-19	0.0000	0.000E+00	0.0000	1.482E-16	0.0000	2.437E-17	0.0000	1.610E-18	0.0000	1.144E-16	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	1.079E-10	0.0052	3.936E-14	0.0000	0.000E+00	0.0000	1.391E-08	0.6727	2.377E-09	0.1150	1.343E-09	0.0649	7.275E-11	0.0035
Total	2.675E-09	0.1294	4.012E-14	0.0000	0.000E+00	0.0000	1.404E-08	0.6792	2.476E-09	0.1198	1.404E-09	0.0679	7.676E-11	0.0037

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.865E-09	0.1386
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.105E-13	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.781E-08	0.8614
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.067E-08	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 19 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 20
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+03 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	2.493E-13	1.397E-08	1.035E-08	6.428E-09	3.620E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.111E-08
Eu-152	4.841E-26	1.696E-22	2.789E-23	1.842E-24	7.031E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.697E-22
Gd-152	6.582E-17	2.307E-13	3.791E-14	1.002E-15	9.559E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.652E-13
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	7.511E-13	3.158E-07	5.397E-08	3.049E-08	1.091E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.013E-07

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	2.166E-16	0.2035	6.405E-23	0.0000	1.128E-17	0.0106	8.358E-18	0.0079	5.191E-18	0.0049	3.385E-19	0.0003
Eu-152	3.932E-29	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Gd-152	0.000E+00	0.0000	1.796E-23	0.0000	2.664E-22	0.0000	4.378E-23	0.0000	1.157E-24	0.0000	1.803E-22	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	4.983E-18	0.0047	1.818E-21	0.0000	6.425E-16	0.6036	1.098E-16	0.1032	6.203E-17	0.0583	3.361E-18	0.0032
Total	2.216E-16	0.2082	1.900E-21	0.0000	6.538E-16	0.6142	1.182E-16	0.1110	6.722E-17	0.0631	3.699E-18	0.0035

Attachment 3 Sheet No. 20 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 21
Intrisk : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.418E-16	0.2272
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.932E-29	0.0000
Gd-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.096E-22	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.227E-16	0.7728
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.064E-15	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	2.166E-16	0.2035	6.405E-23	0.0000	0.000E+00	0.0000	1.128E-17	0.0106	8.358E-18	0.0079	5.191E-18	0.0049	3.385E-19	0.0003
Eu-152	3.932E-29	0.0000	1.796E-23	0.0000	0.000E+00	0.0000	2.664E-22	0.0000	4.378E-23	0.0000	1.157E-24	0.0000	1.803E-22	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	4.983E-18	0.0047	1.818E-21	0.0000	0.000E+00	0.0000	6.425E-16	0.6036	1.098E-16	0.1032	6.203E-17	0.0583	3.361E-18	0.0032
Total	2.216E-16	0.2082	1.900E-21	0.0000	0.000E+00	0.0000	6.538E-16	0.6142	1.182E-16	0.1110	6.722E-17	0.0631	3.699E-18	0.0035

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.418E-16	0.2272
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.096E-22	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.227E-16	0.7728
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.064E-15	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment	3	Sheet No.	21 of 21
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 4

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1RESRAD, Version 6.3      T« Limit = 180 days       11/12/2007  08:15  Page    1
 Concent : 100-F-26:12 OB & BCL Using Maximum Activities
 File    : 100-F-26-12_OB_BCL.RAD

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           Part IV: Concentration of Radionuclides
           ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ
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Concentration of radionuclides in different media

Time= 0.000E+00 2
Time= 1.000E+00 3
Time= 3.000E+00 4
Time= 9.400E+00 5
Time= 1.100E+01 6
Time= 3.000E+01 7
Time= 1.000E+02 8
Time= 3.000E+02 9
Time= 1.000E+03 10

Attachment 4 Sheet No. 1 of 10
Originator: S. W. Clark SWC Date 11/12/07
Chk'd By H. M. Sulloway HMS Date 11/12/07
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 2
Concent : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Concentration of radionuclides in environmental media
at t = 0.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	5.100E+00	5.100E+00	6.385E-05	0.000E+00	0.000E+00
Cs-137	7.900E-02	7.900E-02	9.890E-07	0.000E+00	0.000E+00
Eu-152	4.800E-02	4.800E-02	6.009E-07	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	5.830E+01	5.830E+01	7.298E-04	0.000E+00	0.000E+00
Sr-90	5.630E-01	5.630E-01	7.048E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 4.815E+02 pCi/ml
Concentration of gaseous H-3 in air = 8.886E+01 pCi/m**3
Concentration of gaseous C-14 in air = 2.469E+01 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 0.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	5.513E+04	1.240E+04	4.659E+04	2.095E+04	3.308E+04	9.648E+03	0.000E+00	0.000E+00
Cs-137	0.000E+00	3.160E+00	3.160E+00	3.160E+00	3.160E+00	7.632E+00	1.707E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.200E-01	1.202E-01	1.202E-01	1.202E-01	6.434E-02	1.530E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	0.000E+00	3.848E+05	3.848E+05	3.848E+05	3.848E+05	1.505E+05	9.140E+04	0.000E+00	0.000E+00
Sr-90	0.000E+00	1.689E+02	1.689E+02	1.689E+02	1.689E+02	9.413E+01	1.914E+01	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 4 Sheet No. 2 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 3
Concent : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Concentration of radionuclides in environmental media
at t = 1.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	1.718E+00	1.718E+00	2.150E-05	0.000E+00	0.000E+00
Cs-137	7.718E-02	7.718E-02	9.662E-07	0.000E+00	0.000E+00
Eu-152	4.557E-02	4.557E-02	5.704E-07	0.000E+00	0.000E+00
Gd-152	8.381E-17	8.381E-17	1.049E-21	0.000E+00	0.000E+00
H-3	2.596E+01	2.596E+01	3.250E-04	0.000E+00	0.000E+00
Sr-90	5.496E-01	5.496E-01	6.880E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 2.144E+02 pCi/ml
Concentration of gaseous H-3 in air = 3.958E+01 pCi/m**3
Concentration of gaseous C-14 in air = 8.316E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 1.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	1.936E+04	4.191E+03	1.905E+04	8.093E+03	1.352E+04	3.726E+03	0.000E+00	0.000E+00
Cs-137	0.000E+00	3.087E+00	3.088E+00	3.092E+00	3.088E+00	7.457E+00	1.667E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.139E-01	1.141E-01	1.144E-01	1.141E-01	6.108E-02	1.453E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	2.096E-16	2.098E-16	1.986E-16	2.093E-16	1.123E-16	1.073E-18	0.000E+00	0.000E+00
H-3	0.000E+00	1.764E+05	1.717E+05	1.966E+05	1.885E+05	7.662E+04	4.475E+04	0.000E+00	0.000E+00
Sr-90	0.000E+00	1.649E+02	1.649E+02	1.651E+02	1.649E+02	9.190E+01	1.869E+01	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 4 Sheet No. 3 of 10
Originator: S. W. Clark Date
Chk'd By H.M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 4

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1RESRAD, Version 6.3      T« Limit = 180 days        11/12/2007  08:15  Page   4
 Concent : 100-F-26:12 OB & BCL Using Maximum Activities
 File    : 100-F-26-12_OB_BCL.RAD
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Concentration of radionuclides in environmental media
at t = 3.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	1.947E-01	1.947E-01	2.437E-06	0.000E+00	0.000E+00
Cs-137	7.367E-02	7.367E-02	9.223E-07	0.000E+00	0.000E+00
Eu-152	4.106E-02	4.106E-02	5.140E-07	0.000E+00	0.000E+00
Gd-152	2.389E-16	2.389E-16	2.991E-21	0.000E+00	0.000E+00
H-3	5.146E+00	5.146E+00	6.442E-05	0.000E+00	0.000E+00
Sr-90	5.237E-01	5.237E-01	6.556E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of H-3 in soil moisture = 4.251E+01 pCi/ml
Concentration of gaseous H-3 in air = 7.844E+00 pCi/m**3
Concentration of gaseous C-14 in air = 9.425E-01 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 3.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	2.194E+03	4.749E+02	2.159E+03	9.172E+02	1.533E+03	4.223E+02	0.000E+00	0.000E+00
Cs-137	0.000E+00	2.947E+00	2.947E+00	2.951E+00	2.947E+00	7.118E+00	1.591E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.027E-01	1.028E-01	1.031E-01	1.028E-01	5.504E-02	1.309E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	5.974E-16	5.980E-16	5.880E-16	5.976E-16	3.202E-16	3.051E-18	0.000E+00	0.000E+00
H-3	0.000E+00	3.497E+04	3.404E+04	3.896E+04	3.736E+04	1.519E+04	8.870E+03	0.000E+00	0.000E+00
Sr-90	0.000E+00	1.571E+02	1.571E+02	1.573E+02	1.571E+02	8.757E+01	1.781E+01	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 4 Sheet No. 4 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 5
Concent : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Concentration of radionuclides in environmental media
at t = 9.400E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	1.815E-04	1.815E-04	2.273E-09	0.000E+00	0.000E+00
Cs-137	6.348E-02	6.348E-02	7.947E-07	0.000E+00	0.000E+00
Eu-152	2.943E-02	2.943E-02	3.684E-07	0.000E+00	0.000E+00
Gd-152	6.394E-16	6.394E-16	8.004E-21	0.000E+00	0.000E+00
H-3	2.882E-02	2.882E-02	3.607E-07	1.439E+04	1.832E+03
Sr-90	4.488E-01	4.488E-01	5.618E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 2.380E-01 pCi/ml
Concentration of gaseous H-3 in air = 4.392E-02 pCi/m**3
Concentration of gaseous C-14 in air = 8.789E-04 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 9.400E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	2.047E+00	4.429E-01	2.014E+00	8.556E-01	1.430E+00	3.939E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	2.539E+00	2.539E+00	2.543E+00	2.540E+00	6.133E+00	1.371E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	7.360E-02	7.367E-02	7.389E-02	7.369E-02	3.945E-02	9.384E-04	0.000E+00	0.000E+00
Gd-152	0.000E+00	1.599E-15	1.601E-15	1.594E-15	1.600E-15	8.571E-16	8.157E-18	0.000E+00	0.000E+00
H-3	1.437E+04	5.303E+04	7.946E+04	2.282E+04	2.367E+04	1.287E+04	1.551E+04	1.810E+03	1.810E+03
Sr-90	0.000E+00	1.346E+02	1.346E+02	1.348E+02	1.346E+02	7.504E+01	1.526E+01	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 4 Sheet No. 5 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 6
Concent : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Concentration of radionuclides in environmental media
at t = 1.100E+01 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	3.165E-05	3.165E-05	3.962E-10	0.000E+00	0.000E+00
Cs-137	6.116E-02	6.116E-02	7.656E-07	0.000E+00	0.000E+00
Eu-152	2.708E-02	2.708E-02	3.390E-07	0.000E+00	0.000E+00
Gd-152	7.203E-16	7.203E-16	9.018E-21	0.000E+00	0.000E+00
H-3	7.871E-03	7.871E-03	9.854E-08	4.103E+03	5.224E+02
Sr-90	4.318E-01	4.318E-01	5.405E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 6.501E-02 pCi/ml
Concentration of gaseous H-3 in air = 1.200E-02 pCi/m**3
Concentration of gaseous C-14 in air = 1.532E-04 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 1.100E+01 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	3.568E-01	7.722E-02	3.511E-01	1.492E-01	2.493E-01	6.869E-02	0.000E+00	0.000E+00
Cs-137	0.000E+00	2.446E+00	2.447E+00	2.450E+00	2.447E+00	5.909E+00	1.321E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	6.772E-02	6.779E-02	6.799E-02	6.780E-02	3.630E-02	8.634E-04	0.000E+00	0.000E+00
Gd-152	0.000E+00	1.801E-15	1.803E-15	1.797E-15	1.803E-15	9.656E-16	9.190E-18	0.000E+00	0.000E+00
H-3	4.112E+03	1.600E+04	2.283E+04	8.448E+03	8.100E+03	4.520E+03	4.764E+03	5.300E+02	5.300E+02
Sr-90	0.000E+00	1.295E+02	1.295E+02	1.297E+02	1.295E+02	7.219E+01	1.468E+01	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 4 Sheet No. 6 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sullowway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 7
Concent : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Concentration of radionuclides in environmental media
at t = 3.000E+01 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	2.896E-14	2.896E-14	3.625E-19	0.000E+00	0.000E+00
Cs-137	3.931E-02	3.931E-02	4.921E-07	0.000E+00	0.000E+00
Eu-152	1.007E-02	1.007E-02	1.261E-07	0.000E+00	0.000E+00
Gd-152	1.306E-15	1.306E-15	1.635E-20	0.000E+00	0.000E+00
H-3	1.528E-09	1.528E-09	1.913E-14	8.405E-04	1.070E-04
Sr-90	2.730E-01	2.730E-01	3.417E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 1.262E-08 pCi/ml
Concentration of gaseous H-3 in air = 2.329E-09 pCi/m**3
Concentration of gaseous C-14 in air = 1.402E-13 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 3.000E+01 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	3.265E-10	7.065E-11	3.216E-10	1.366E-10	2.284E-10	6.289E-11	0.000E+00	0.000E+00
Cs-137	0.000E+00	1.572E+00	1.572E+00	1.574E+00	1.573E+00	3.797E+00	8.491E-01	0.000E+00	0.000E+00
Eu-152	0.000E+00	2.519E-02	2.522E-02	2.529E-02	2.523E-02	1.350E-02	3.212E-04	0.000E+00	0.000E+00
Gd-152	0.000E+00	3.265E-15	3.268E-15	3.266E-15	3.269E-15	1.750E-15	1.665E-17	0.000E+00	0.000E+00
H-3	8.423E-04	3.278E-03	4.675E-03	1.731E-03	1.659E-03	9.260E-04	9.758E-04	1.086E-04	1.086E-04
Sr-90	0.000E+00	8.190E+01	8.190E+01	8.201E+01	8.190E+01	4.565E+01	9.282E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	4	Sheet No.	7 of 10
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 8
Concent : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Concentration of radionuclides in environmental media
at t = 1.000E+02 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	7.711E-03	7.711E-03	9.653E-08	0.000E+00	0.000E+00
Eu-152	2.637E-04	2.637E-04	3.302E-09	0.000E+00	0.000E+00
Gd-152	1.642E-15	1.642E-15	2.056E-20	0.000E+00	0.000E+00
H-3	1.397E-34	1.397E-34	1.749E-39	9.411E-29	1.198E-29
Sr-90	5.042E-02	5.042E-02	6.312E-07	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 1.154E-33 pCi/ml
Concentration of gaseous H-3 in air = 2.129E-34 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 1.000E+02 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	3.084E-01	3.085E-01	3.089E-01	3.085E-01	7.449E-01	1.666E-01	0.000E+00	0.000E+00
Eu-152	0.000E+00	6.595E-04	6.602E-04	6.622E-04	6.604E-04	3.535E-04	8.409E-06	0.000E+00	0.000E+00
Gd-152	0.000E+00	4.107E-15	4.111E-15	4.112E-15	4.112E-15	2.202E-15	2.095E-17	0.000E+00	0.000E+00
H-3	9.431E-29	3.669E-28	5.233E-28	1.938E-28	1.857E-28	1.037E-28	1.093E-28	1.216E-29	1.216E-29
Sr-90	0.000E+00	1.513E+01	1.513E+01	1.515E+01	1.513E+01	8.431E+00	1.714E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	4	Sheet No.	8 of 10
Originator:	S. W. Clark	Date	
Chk'd By	H. M. Sulloway	Date	
Calc. No.	0100F-CA-V0326	Rev. No.	0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 9
Concent : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Concentration of radionuclides in environmental media
at t = 3.000E+02 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	7.346E-05	7.346E-05	9.196E-10	0.000E+00	0.000E+00
Eu-152	7.962E-09	7.962E-09	9.968E-14	0.000E+00	0.000E+00
Gd-152	1.648E-15	1.648E-15	2.063E-20	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	4.044E-04	4.044E-04	5.062E-09	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 3.000E+02 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	2.938E-03	2.939E-03	2.942E-03	2.939E-03	7.097E-03	1.587E-03	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.991E-08	1.993E-08	1.999E-08	1.994E-08	1.067E-08	2.539E-10	0.000E+00	0.000E+00
Gd-152	0.000E+00	4.122E-15	4.126E-15	4.126E-15	4.126E-15	2.209E-15	2.102E-17	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	1.213E-01	1.213E-01	1.215E-01	1.213E-01	6.761E-02	1.375E-02	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 4 Sheet No. 9 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 11/12/2007 08:15 Page 10
Concent : 100-F-26:12 OB & BCL Using Maximum Activities
File : 100-F-26-12_OB_BCL.RAD

Concentration of radionuclides in environmental media
at t = 1.000E+03 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	6.199E-12	6.199E-12	7.761E-17	0.000E+00	0.000E+00
Eu-152	1.204E-24	1.204E-24	1.507E-29	0.000E+00	0.000E+00
Gd-152	1.637E-15	1.637E-15	2.049E-20	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	1.868E-11	1.868E-11	2.338E-16	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 1.000E+03 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	2.480E-10	2.480E-10	2.483E-10	2.480E-10	5.989E-10	1.339E-10	0.000E+00	0.000E+00
Eu-152	0.000E+00	3.010E-24	3.014E-24	3.023E-24	3.014E-24	1.614E-24	3.838E-26	0.000E+00	0.000E+00
Gd-152	0.000E+00	4.093E-15	4.097E-15	4.098E-15	4.098E-15	2.194E-15	2.088E-17	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	5.604E-09	5.604E-09	5.612E-09	5.605E-09	3.124E-09	6.352E-10	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 4 Sheet No. 10 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0326 Rev. No. 0

APPENDIX D

100-F-26:12 PIPELINE SUBSITE VERIFICATION DATA SUMMARY TABLES

Table D-1. 100-F-26:12 Radionuclide Data Results. (3 Pages)

Sample Location	HEIS Number	Sample Date	Americium-241 (GEA)			Barium-133			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	pCi/g	Q	MDA
OB - A1	J15H73	9/5/07	0.042	U	0.042	0.024	U	0.024	0.023	U	0.023	0.025	U	0.025	0.065	U	0.065	0.083	U	0.083	0.058	U	0.058
OB - A2	J15H74	9/5/07	0.040	U	0.040	0.033	U	0.033	0.031	U	0.031	0.030	U	0.030	0.075	U	0.075	0.110	U	0.110	0.072	U	0.072
OB - A3	J15H75	9/5/07	0.298	U	0.298	0.035	U	0.035	0.032	U	0.032	0.036	U	0.036	0.089	U	0.089	0.132	U	0.132	0.099	U	0.099
OB - A4	J15H76	9/5/07	0.044	U	0.044	0.026	U	0.026	0.025	U	0.025	0.024	U	0.024	0.068	U	0.068	0.087	U	0.087	0.073	U	0.073
OB - A4 - dup	J15H77	9/5/07	0.322	U	0.322	0.040	U	0.040	0.032	U	0.032	0.034	U	0.034	0.111	U	0.111	0.127	U	0.127	0.111	U	0.111
OB - A4 - split	J15HB8	9/5/07				0.0077	U	0.016	0.00875	U	0.0171	-0.00177	U	0.017	-0.00793	U	0.0368	0.00654	U	0.0596	0.0481	U	0.0439
OB - B5	J15H78	9/5/07	0.037	U	0.037	0.030	U	0.030	0.027	U	0.027	0.029	U	0.029	0.070	U	0.070	0.102	U	0.102	0.067	U	0.067
OB - B6	J15H79	9/5/07	0.040	U	0.040	0.022	U	0.022	0.022	U	0.022	0.025	U	0.025	0.062	U	0.062	0.084	U	0.084	0.055	U	0.055
OB - B7	J15H80	9/5/07	0.144	U	0.144	0.025	U	0.025	0.022	U	0.022	0.021	U	0.021	0.059	U	0.059	0.073	U	0.073	0.077	U	0.077
OB - B8	J15H81	9/5/07	0.038	U	0.038	0.032	U	0.032	0.027	U	0.027	0.031	U	0.031	0.075	U	0.075	0.102	U	0.102	0.071	U	0.071
OB - C9	J15H82	9/5/07	0.041	U	0.041	0.034	U	0.034	0.032	U	0.032	0.034	U	0.034	0.078	U	0.078	0.112	U	0.112	0.073	U	0.073
OB - C10	J15H83	9/6/07	0.037	U	0.037	0.030	U	0.030	0.028	U	0.028	0.028	U	0.028	0.072	U	0.072	0.097	U	0.097	0.066	U	0.066
OB - C1	J15H84	9/6/07	0.144	U	0.144	0.023	U	0.023	0.026		0.022	0.021	U	0.021	0.060	U	0.060	0.070	U	0.070	0.076	U	0.076
OB - C2	J15H85	9/6/07	0.037	U	0.037	0.019	U	0.019	0.056		0.024	0.020	U	0.020	0.081		0.061	0.077	U	0.077	0.051	U	0.051
BCL - A1	J15H97	9/6/07	0.040	U	0.040	0.032	U	0.032	0.030	U	0.030	0.030	U	0.030	0.078	U	0.078	0.106	U	0.106	0.072	U	0.072
BCL - A2	J15H98	9/6/07	0.280	U	0.280	0.036	U	0.036	0.079		0.039	0.037	U	0.037	0.097	U	0.097	0.128	U	0.128	0.108	U	0.108
BCL - A3	J15H99	9/6/07	0.157	U	0.157	0.025	U	0.025	0.024	U	0.024	0.022	U	0.022	0.063	U	0.063	0.076	U	0.076	0.082	U	0.082
BCL - A4	J15HB0	9/6/07	0.044	U	0.044	0.023	U	0.023	0.025	U	0.025	0.025	U	0.025	0.068	U	0.068	0.086	U	0.086	0.060	U	0.060
BCL - B5	J15HB1	9/6/07	0.160	U	0.160	0.024	U	0.024	0.025		0.020	0.022	U	0.022	0.060	U	0.060	0.077	U	0.077	0.080	U	0.080
BCL - B7	J15HB4	9/6/07	0.038	U	0.038	0.031	U	0.031	0.041		0.028	0.029	U	0.029	0.075	U	0.075	0.105	U	0.105	0.069	U	0.069
BCL - B6	J15HB2	9/11/07	0.036	U	0.036	0.027	U	0.027	0.042	U	0.042	0.028	U	0.028	0.071	U	0.071	0.093	U	0.093	0.059	U	0.059
BCL - B6 - dup	J15HB3	9/11/07	0.037	U	0.037	0.023	U	0.023	0.035	U	0.035	0.022	U	0.022	0.057	U	0.057	0.083	U	0.083	0.061	U	0.061
BCL - B8	J15HB5	9/11/07	0.128	U	0.128	0.022	U	0.022	0.020	U	0.020	0.021	U	0.021	0.055	U	0.055	0.066	U	0.066	0.073	U	0.073
SZ - A1	J15H87	9/11/07	0.266	U	0.266	0.052	U	0.052	0.035	U	0.035	0.039	U	0.039	0.089	U	0.089	0.125	U	0.125	0.100	U	0.100
SZ - A2	J15H88	9/11/07	0.038	U	0.038	0.027	U	0.027	0.027	U	0.027	0.029	U	0.029	0.072	U	0.072	0.096	U	0.096	0.062	U	0.062
SZ - A3	J15H89	9/11/07	0.146	U	0.146	0.025	U	0.025	0.022	U	0.022	0.022	U	0.022	0.062	U	0.062	0.072	U	0.072	0.081	U	0.081
SZ - A4	J15H90	9/11/07	0.094	U	0.094	0.020	U	0.020	0.012	U	0.012	0.013	U	0.013	0.031	U	0.031	0.046	U	0.046	0.036	U	0.036
SZ - A4 - dup	J15H91	9/11/07	0.013	U	0.013	0.010	U	0.010	0.009	U	0.009	0.010	U	0.010	0.024	U	0.024	0.033	U	0.033	0.028	U	0.028
SZ - B5	J15H92	9/12/07	0.048	U	0.048	0.009	U	0.009	0.007	U	0.007	0.007	U	0.007	0.021	U	0.021	0.025	U	0.025	0.044	U	0.044
SZ - B6	J15H93	9/12/07	0.275	U	0.275	0.058	U	0.058	0.034	U	0.034	0.039	U	0.039	0.090	U	0.090	0.129	U	0.129	0.108	U	0.108
SZ - B7	J15H94	9/12/07	0.037	U	0.037	0.029	U	0.029	0.030	U	0.030	0.028	U	0.028	0.072	U	0.072	0.094	U	0.094	0.058	U	0.058
SZ - B8	J15H95	9/12/07	0.039	U	0.039	0.024	U	0.024	0.024	U	0.024	0.023	U	0.023	0.059	U	0.059	0.076	U	0.076	0.087	U	0.087
BCL - B6 - split	J15HB9	9/11/07				0.00763	U	0.0148	0.0262		0.016	0.000723	U	0.0165	0.00314	U	0.0335	-0.0218	U	0.0471	0.0387	U	0.0383
SZ - A4 - split	J15HY4	9/11/07				0.00515	U	0.0155	-0.0078	U	0.0146	0.00521	U	0.0159	-0.0142	U	0.0351	-0.000349	U	0.0508	0.0139	U	0.0403
OB - A2	J15PK1	10/4/07																					
BCL - B5	J15PK2	10/4/07																					
BCL - B6	J15PK3	10/4/07																					
OB - C1	J15PK4	10/4/07																					
OB - A2	J15VY5	10/16/07	0.299	U	0.299	0.046	U	0.046	0.037	U	0.037	0.041	U	0.041	0.100	U	0.100	0.137	U	0.137	0.113	U	0.113
OB - C1	J15VY6	10/16/07	0.040	U	0.040	0.034	U	0.034	0.027	U	0.027	0.030	U	0.030	0.074	U	0.074	0.105	U	0.105	0.062	U	0.062
BCL - B5	J15VY7	10/16/07	0.045	U	0.045	0.024	U	0.024	0.026	U	0.026	0.026	U	0.026	0.059	U	0.059	0.087	U	0.087	0.092	U	0.092
BCL - B6	J15VY8	10/16/07	0.180	U	0.180	0.025	U	0.025	0.041	U	0.041	0.022	U	0.022	0.065	U	0.065	0.075	U	0.075	0.084	U	0.084

Table D-1. 100-F-26:12 Radionuclide Data Results. (3 Pages)

Sample Location	HEIS Number	Sample Date	Nickel-63			Potassium-40			Radium-226			Radium-228			Silver-108			Thorium-228			Thorium-232		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB - A1	J15H73	9/5/07	0.201	U	3.10	14.8		0.218	0.505		0.048	0.697		0.127	0.017	U	0.017	0.682		0.030	0.697		0.127
OB - A2	J15H74	9/5/07	0.481	U	3.09	13.0		0.299	0.471		0.050	0.701		0.122	0.022	U	0.022	0.685		0.037	0.701		0.122
OB - A3	J15H75	9/5/07	-0.240	U	3.08	14.6		0.426	0.404		0.065	0.544		0.167	0.025	U	0.025	0.559		0.046	0.544		0.167
OB - A4	J15H76	9/5/07	-0.722	U	3.09	14.4		0.220	0.542		0.043	0.794		0.104	0.018	U	0.018	0.752		0.035	0.794		0.104
OB - A4 - dup	J15H77	9/5/07	-0.080	U	3.07	14.5		0.396	0.592		0.062	0.744		0.149	0.025	U	0.025	0.714		0.049	0.744		0.149
OB - A4 - split	J15HB8	9/5/07	0.136	U	6.03										-0.0053	U	0.0113						
OB - B5	J15H78	9/5/07	0.236	U	3.03	14.1		0.256	0.406		0.049	0.644		0.118	0.020	U	0.020	0.558		0.034	0.644		0.118
OB - B6	J15H79	9/5/07	0.447	U	3.14	15.2		0.217	0.476		0.045	0.716		0.104	0.017	U	0.017	0.675		0.028	0.716		0.104
OB - B7	J15H80	9/5/07	-0.318	U	3.07	13.9		0.218	0.433		0.042	0.630		0.089	0.015	U	0.015	0.591		0.027	0.630		0.089
OB - B8	J15H81	9/5/07	-0.041	U	3.20	13.1		0.312	0.432		0.052	0.710		0.120	0.021	U	0.021	0.607		0.035	0.710		0.120
OB - C9	J15H82	9/5/07	1.47	U	3.06	14.2		0.269	0.469		0.061	0.839		0.118	0.024	U	0.024	0.724		0.037	0.839		0.118
OB - C10	J15H83	9/6/07	2.13	U	3.05	12.9		0.254	0.438		0.043	0.644		0.124	0.021	U	0.021	0.671		0.035	0.644		0.124
OB - C1	J15H84	9/6/07	1.15	U	2.99	13.4		0.190	0.392		0.040	0.627		0.088	0.016	U	0.016	0.559		0.029	0.627		0.088
OB - C2	J15H85	9/6/07	1.80	U	3.00	13.4		0.116	0.470		0.044	0.642		0.088	0.015	U	0.015	0.674		0.027	0.642		0.088
BCL - A1	J15H97	9/6/07	1.64	U	2.99	13.2		0.283	0.469		0.053	0.593		0.123	0.022	U	0.022	0.637		0.039	0.593		0.123
BCL - A2	J15H98	9/6/07	2.97	U	3.02	14.2		0.344	0.484		0.070	0.776		0.174	0.028	U	0.028	0.700		0.070	0.776		0.174
BCL - A3	J15H99	9/6/07	0.349	U	2.80	14.1		0.266	0.420		0.043	0.656		0.104	0.017	U	0.017	0.623		0.034	0.656		0.104
BCL - A4	J15HB0	9/6/07	1.42	U	2.93	13.6		0.267	0.525		0.051	0.785		0.105	0.018	U	0.018	0.725		0.029	0.785		0.105
BCL - B5	J15HB1	9/6/07	1.57	U	2.80	13.9		0.245	0.440		0.044	0.712		0.089	0.017	U	0.017	0.627		0.032	0.712		0.089
BCL - B7	J15HB4	9/6/07	2.91	U	2.96	13.4		0.281	0.412		0.047	0.640		0.112	0.021	U	0.021	0.623		0.035	0.640		0.112
BCL - B6	J15HB2	9/11/07	1.62	U	3.17	12.8		0.306	0.431		0.055	0.720		0.120	0.019	U	0.019	0.632		0.033	0.720		0.120
BCL - B6 - dup	J15HB3	9/11/07	1.59	U	3.05	14.4		0.160	0.480		0.046	0.684		0.100	0.015	U	0.015	0.668		0.031	0.684		0.100
BCL - B8	J15HB5	9/11/07	1.45	U	3.06	13.4		0.224	0.397		0.041	0.549		0.087	0.014	U	0.014	0.585		0.029	0.549		0.087
SZ - A1	J15H87	9/11/07	0.732	U	3.09	13.9		0.304	0.513		0.061	0.696		0.128	0.024	U	0.024	0.712		0.043	0.696		0.128
SZ - A2	J15H88	9/11/07	0.738	U	3.28	13.7		0.271	0.432		0.052	0.616		0.100	0.019	U	0.019	0.563		0.034	0.616		0.100
SZ - A3	J15H89	9/11/07	-0.522	U	3.15	14.4		0.249	0.541		0.040	0.742		0.094	0.016	U	0.016	0.726		0.032	0.742		0.094
SZ - A4	J15H90	9/11/07	0.508	U	3.06	15.0		0.116	0.452		0.023	0.646		0.052	0.009	U	0.009	0.628		0.016	0.646		0.052
SZ - A4 - dup	J15H91	9/11/07	0.290	U	3.07	13.4		0.098	0.373		0.017	0.563		0.039	0.006	U	0.006	0.597		0.012	0.563		0.039
SZ - B5	J15H92	9/12/07	2.79	U	3.06	14.4		0.078	0.414		0.015	0.642		0.033	0.006	U	0.006	0.602		0.011	0.642		0.033
SZ - B6	J15H93	9/12/07	-0.036	U	3.02	15.2		0.352	0.436		0.066	0.655		0.141	0.025	U	0.025	0.583		0.047	0.655		0.141
SZ - B7	J15H94	9/12/07	0.234	U	3.30	13.4		0.294	0.362		0.048	0.456		0.106	0.019	U	0.019	0.563		0.036	0.456		0.106
SZ - B8	J15H95	9/12/07	1.09	U	3.42	14.9		0.220	0.444		0.048	0.681		0.089	0.016	U	0.016	0.626		0.033	0.681		0.089
BCL - B6 - split	J15HB9	9/11/07	12.7		5.93										0.000591	U	0.0101						
SZ - A4 - split	J15HY4	9/11/07	-2.11	U	6.09										0.0023	U	0.0113						
OB - A2	J15PK1	10/4/07																					
BCL - B5	J15PK2	10/4/07																					
BCL - B6	J15PK3	10/4/07																					
OB - C1	J15PK4	10/4/07																					
OB - A2	J15VY5	10/16/07	-0.734	U	3.17	14.0		0.505	0.506		0.075	0.670		0.164	0.026	U	-0.026	0.677		0.046	0.670		0.164
OB - C1	J15VY6	10/16/07	-0.222	U	3.20	13.5		0.276	0.451		0.056	0.648		0.119	0.020	U	0.020	0.680		0.035	0.648		0.119
BCL - B5	J15VY7	10/16/07	-1.55	U	3.27	14.7		0.197	0.494		0.050	0.771		0.091	0.016	U	0.016	0.724		0.034	0.771		0.091
BCL - B6	J15VY8	10/16/07	-0.857	U	3.22	13.5		0.206	0.430		0.045	0.631		0.108	0.016	U	0.016	0.639		0.032	0.631		0.108

Table D-1. 100-F-26:12 Radionuclide Data Results. (3 Pages)

Sample Location	HEIS Number	Sample Date	Strontium-90			Uranium-235			Uranium-238			Carbon-14			Tritium			Gross alpha			Gross beta		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB - A1	J15H73	9/5/07	0.125	U	0.268	0.104	U	0.104	2.86	U	2.86	1.02	U	1.84	1.05	U	2.11	7.34	U	7.59	13.9		6.18
OB - A2	J15H74	9/5/07	-0.013	U	0.257	0.120	U	0.120	3.66	U	3.66	14.3		1.80	-0.864	U	2.04	18.7		6.79	17.0		5.70
OB - A3	J15H75	9/5/07	0.005	U	0.248	0.153	U	0.153	4.37	U	4.37	0.546	U	1.71	0.698	U	2.10	7.50		6.87	13.7		6.31
OB - A4	J15H76	9/5/07	-0.058	U	0.259	0.111	U	0.111	3.11	U	3.11	-0.151	U	1.84	-0.106	U	2.15	6.06	U	8.86	23.7		5.66
OB - A4 - dup	J15H77	9/5/07	0.009	U	0.324	0.168	U	0.168	4.60	U	4.60	-0.563	U	1.76	-0.368	U	2.14	15.4		6.76	18.0		6.15
OB - A4 - split	J15HB8	9/5/07	0.0224	U	0.151							0.025	U	0.845	0.00345	U	0.0209	4.35	U	7.78	22.5		4.52
OB - B5	J15H78	9/5/07	0.046	U	0.258	0.111	U	0.111	3.42	U	3.42	0.063	U	1.72	1.11	U	3.57	6.95		6.65	17.8		6.14
OB - B6	J15H79	9/5/07	-0.073	U	0.283	0.100	U	0.100	2.89	U	2.89	-0.155	U	1.89	0.423	U	3.64	9.14		6.81	17.4		5.54
OB - B7	J15H80	9/5/07	-0.002	U	0.253	0.103	U	0.103	2.46	U	2.46	0.091	U	1.66	-0.821	U	3.75	6.15	U	8.40	18.5		9.06
OB - B8	J15H81	9/5/07	-0.013	U	0.259	0.115	U	0.115	3.54	U	3.54	0.129	U	1.77	0.925	U	3.61	2.64	U	10.6	18.2		8.66
OB - C9	J15H82	9/5/07	-0.035	U	0.258	0.119	U	0.119	3.61	U	3.61	1.06	U	1.70	-0.241	U	3.70	5.13	U	7.52	16.8		5.44
OB - C10	J15H83	9/6/07	-0.039	U	0.286	0.109	U	0.109	3.31	U	3.31	-1.39	UJ	3.02	-0.275	UJ	3.83	6.75	U	10.1	18.4		8.63
OB - C1	J15H84	9/6/07	0.062	U	0.320	0.104	U	0.104	2.48	U	2.48	22.5	J	3.16	-0.520	UJ	3.62	11.3		7.01	20.8		5.42
OB - C2	J15H85	9/6/07	0.006		0.285	0.093	U	0.093	2.70	U	2.70	-0.184	UJ	3.20	0.105	UJ	3.64	10.1		6.43	20.3		5.67
BCL - A1	J15H97	9/6/07	0.390		0.232	0.121	U	0.121	3.60	U	3.60	1.09	UJ	3.44	0.641	UJ	3.72	7.54		6.53	18.4		6.30
BCL - A2	J15H98	9/6/07	0.563		0.218	0.161	U	0.161	4.43	U	4.43	-1.72	UJ	3.26	-0.924	UJ	3.57	0.644	U	8.53	18.3		5.65
BCL - A3	J15H99	9/6/07	0.124	U	0.290	0.112	U	0.112	2.71	U	2.71	5.10	J	3.09	-0.754	UJ	3.75	12.8		12.0	23.5		6.17
BCL - A4	J15HB0	9/6/07	0.042	U	0.283	0.106	U	0.106	2.97	U	2.97	-0.244	UJ	3.18	1.19	UJ	3.77	12.9		8.06	13.2		9.04
BCL - B5	J15HB1	9/6/07	-0.032	U	0.220	0.108	U	0.108	2.53	U	2.53	62.7	J	3.16	0.968	UJ	3.74	5.09	U	10.1	20.1		8.63
BCL - B7	J15HB4	9/6/07	0.068	U	0.396	0.113	U	0.113	3.51	U	3.51	-1.67	UJ	3.34	-0.941	UJ	3.64	9.25		7.32	17.3		5.42
BCL - B6	J15HB2	9/11/07	0.056	U	0.315	0.107	U	0.107	3.28	U	3.28	-0.630	U	3.12	0.200	U	4.36	8.54	U	8.70	17.9		5.63
BCL - B6 - dup	J15HB3	9/11/07	-0.115	U	0.359	0.100	U	0.100	2.85	U	2.85	18.1		3.22	-0.593	U	4.30	13.2		6.78	18.7		5.54
BCL - B8	J15HB5	9/11/07	-0.074	U	0.324	0.098	U	0.098	2.27	U	2.27	-0.848	U	3.04	0.386	U	4.20	13.3		8.33	12.8		9.05
SZ - A1	J15H87	9/11/07	0.115	U	0.331	0.147	U	0.147	4.13	U	4.13	0.325	U	3.07	0	U	4.36	8.13	U	10.5	16.9		8.65
SZ - A2	J15H88	9/11/07	0.085	U	0.264	0.112	U	0.112	3.40	U	3.40	-0.157	U	3.27	0.462	U	4.30	9.81		6.96	17.2		5.42
SZ - A3	J15H89	9/11/07	-0.001	U	0.316	0.108	U	0.108	2.51	U	2.51	-0.359	U	3.39	-1.51	U	4.68	13.1		7.06	18.5		6.13
SZ - A4	J15H90	9/11/07	0.070	U	0.310	0.052	U	0.052	1.49	U	1.49	1.14	U	3.10	0	U	4.23	15.8		6.22	15.5		9.26
SZ - A4 - dup	J15H91	9/11/07	-0.100	U	0.354	0.056	U	0.056	1.13	U	1.13	-0.031	U	3.21	-1.16	U	4.46	6.44	U	7.07	41.0		6.17
SZ - B5	J15H92	9/12/07	-0.048	U	0.362	0.037	U	0.037	1.14	U	1.14	0.121	U	3.14	-0.930	U	4.33	17.3		5.78	16.0		5.68
SZ - B6	J15H93	9/12/07	0.007	U	0.301	0.159	U	0.159	4.46	U	4.46	-1.01	U	3.28	-0.424	U	4.61	12.5		7.71	17.5		6.33
SZ - B7	J15H94	9/12/07	-0.060	U	0.335	0.108	U	0.108	3.28	U	3.28	0.030	U	3.15	0	U	4.39	4.28	U	8.80	16.1		5.67
SZ - B8	J15H95	9/12/07	0.046	U	0.301	0.104	U	0.104	3.00	U	3.00	-0.059	U	3.05	0.134	U	4.37	12.6		7.08	18.9		6.13
BCL - B6 - split	J15HB9	9/11/07	0.0761	U	0.148							0.0478	U	0.327	0.00832	U	0.0149	6.58	U	7.38	17.4		4.19
SZ - A4 - split	J15HY4	9/11/07	0.324		0.136							0.264	U	0.328	0.00558	U	0.0147	0.171	U	8.97	19.2		4.16
OB - A2	J15PK1	10/4/07										1.41		2.98	26.2		7.44						
BCL - B5	J15PK2	10/4/07										0.492		2.82	52.2		7.51						
BCL - B6	J15PK3	10/4/07										1.78		3.04	58.3		7.97						
OB - C1	J15PK4	10/4/07										1.77		3.02	3.84		7.73						
OB - A2	J15VY5	10/16/07	0.017	U	0.273	0.164	U	0.164	4.59	U	4.59	-1.18	U	3.78	4.67		3.89	6.50	U	8.88	9.54		8.94
OB - C1	J15VY6	10/16/07	-0.078	U	0.248	0.115	U	0.115	3.54	U	3.54	-0.542	U	3.58	1.27		3.79	4.85	U	9.14	14.8		8.63
BCL - B5	J15VY7	10/16/07	-0.080	U	0.246	0.112	U	0.112	2.80	U	2.80	-0.727	U	3.66	12.6		3.89	10.2		8.86	15.6		5.64
BCL - B6	J15VY8	10/16/07	-0.040	U	0.260	0.102	U	0.102	2.64	U	2.64	0.152	U	3.22	3.97		3.62	8.38		8.20	16.7		5.70

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

B = blank contamination (organics)
J = estimated
BCL = below cleanup level
MDA = minimum detectable activity
C = blank contamination (inorganics)
OB = overburden
D = diluted
Q = qualifier
GEA = gamma energy analysis
SZ = shallow zone
HEIS = Hanford Environmental Information System

Table D-2. 100-F-26:12 Inorganic Data 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
OB - A1	J15H73	9/5/07	4640		4.9	0.65	U	0.65	1.5		1.2	47.6	C	0.06	0.24		0.03	1.1	U	1.1	0.15	U	0.15
OB - A2	J15H74	9/5/07	4850		4.8	0.64	U	0.64	2.1		1.2	46.9	C	0.06	0.26		0.03	1.5		1.0	0.14	U	0.14
OB - A3	J15H75	9/5/07	3100		5.0	0.66	U	0.66	1.2	U	1.2	37.1	C	0.06	0.17		0.03	1.1	U	1.1	0.15	U	0.15
OB - A4	J15H76	9/5/07	5550		5.0	0.66	U	0.66	2.4		1.2	54.3	C	0.06	0.30		0.03	1.3		1.1	0.15	U	0.15
OB - A4 - dup	J15H77	9/5/07	6460		4.9	0.66	U	0.66	4.1		1.2	68.0	C	0.06	0.33		0.03	2.3		1.1	0.15	U	0.15
OB - A4 - split	J15HB8	9/5/07	8070		10.3	1.20	B	1.0	4.7		0.5	79.2		0.47	0.32	B	0.14	13.1	B	3.0	0.30	B	0.12
OB - B5	J15H78	9/5/07	4300		4.9	0.64	U	0.64	1.2		1.2	41.2	C	0.06	0.25		0.03	1.1	U	1.1	0.15	U	0.15
OB - B6	J15H79	9/5/07	5060		4.8	0.64	U	0.64	1.4		1.2	46.2	C	0.06	0.29		0.03	1.0	U	1.0	0.14	U	0.14
OB - B7	J15H80	9/5/07	5040		4.9	0.64	U	0.64	1.3		1.2	45.6	C	0.06	0.29		0.03	1.3		1.1	0.15		0.15
OB - B8	J15H81	9/5/07	3680		4.9	0.65	U	0.65	1.2	U	1.2	36.4	C	0.06	0.23		0.03	1.1	U	1.1	0.15	U	0.15
OB - C9	J15H82	9/5/07	5360		4.8	0.64	U	0.64	3.0		1.2	56.3	C	0.06	0.28		0.03	1.2		1.0	0.18		0.15
OB - C10	J15H83	9/6/07	5600		5.0	0.66	UJ	0.66	3.2		1.2	55.8	C	0.06	0.04		0.03	1.3		1.1	0.15	U	0.15
OB - C1	J15H84	9/6/07	5350		4.8	0.63	UJ	0.63	1.8		1.2	50.5		0.06	0.03		0.03	1.9		1.0	0.14	U	0.14
OB - C2	J15H85	9/6/07	4610		5.0	0.66	UJ	0.66	2.7		1.2	49.6		0.06	0.11		0.03	2.1		1.1	0.15	U	0.15
BCL - A1	J15H97	9/6/07	6000		4.9	0.64	UJ	0.64	2.7		1.2	46.7	C	0.06	0.03		0.03	1.3		1.1	0.17		0.15
BCL - A2	J15H98	9/6/07	6270		4.8	0.64	UJ	0.64	4.4		1.2	60.7	C	0.06	0.03	U	0.03	2.2		1.0	0.19		0.14
BCL - A3	J15H99	9/6/07	5290		4.7	0.63	UJ	0.63	2.6		1.2	61.7	C	0.06	0.03	U	0.03	2.1		1.0	0.17		0.14
BCL - A4	J15HB0	9/6/07	7120		4.6	0.61	UJ	0.61	3.4		1.1	73.4	C	0.06	0.03	U	0.03	2.4		1.0	0.19		0.14
BCL - B5	J15HB1	9/6/07	5050		4.8	0.64	UJ	0.64	2.7		1.2	71.9	C	0.06	0.03	U	0.03	3.5		1.0	0.14	U	0.14
BCL - B7	J15HB4	9/6/07	5990		4.9	0.65	UJ	0.65	2.3		1.2	82.4	C	0.06	0.03	U	0.03	3.7		1.1	0.15	U	0.15
BCL - B6	J15HB2	9/11/07	5140	C	4.8	0.10	C	0.63	4.1		1.2	74.7	C	0.06	0.22		0.03	4.0	C	1.0	0.14	U	0.14
BCL - B6 - dup	J15HB3	9/11/07	5050	C	4.7	0.62	U	0.62	3.3		1.2	79.2	C	0.06	0.22		0.03	4.0	C	1.0	0.14	U	0.14
BCL - B8	J15HB5	9/11/07	4090	C	4.7	0.62	U	0.62	2.4		1.2	56.4	C	0.06	0.16		0.03	2.3	C	1.0	0.14	U	0.14
SZ - A1	J15H87	9/11/07	5000	C	4.9	0.65	U	0.65	2.2		1.2	63.8	C	0.06	0.20		0.03	1.6	C	1.1	0.15	U	0.15
SZ - A2	J15H88	9/11/07	4290	C	4.8	0.63	U	0.63	2.8		1.2	38.8	C	0.06	0.16		0.03	1.0	U	1.0	0.14	U	0.14
SZ - A3	J15H89	9/11/07	5720	C	4.9	1.0	C	0.64	6.2		1.2	68.0	C	0.06	0.23		0.03	2.1	C	1.1	0.15	U	0.15
SZ - A4	J15H90	9/11/07	3510	C	4.7	0.63	U	0.63	1.2	U	1.2	29.4	C	0.06	0.11		0.03	1.0	U	1.0	0.14	U	0.14
SZ - A4 - dup	J15H91	9/11/07	3290	C	4.7	0.62	U	0.62	2.3		1.2	31.9	C	0.06	0.12		0.03	1.0	U	1.0	0.14	U	0.14
SZ - B5	J15H92	9/12/07	5530		4.8	0.63	U	0.63	2.8		1.2	50.5	C	0.06	0.12		0.03	2.0		1.0	0.14	U	0.14
SZ - B6	J15H93	9/12/07	4430		4.8	0.64	U	0.64	1.6		1.2	36.1	C	0.06	0.15		0.03	1.1	U	1.1	0.15	U	0.15
SZ - B7	J15H94	9/12/07	4570		4.7	0.62	U	0.62	1.5		1.2	37.5	C	0.06	0.15		0.03	1.2		1.0	0.14	U	0.14
SZ - B8	J15H95	9/12/07	3780		4.9	0.65	U	0.65	1.9		1.2	29.0	C	0.06	0.16		0.03	1.1	U	1.1	0.15	U	0.15
BCL - B6 - split	J15HB9	9/11/07	6200		40.2	2.0	U	2.0	2.3		2.0	74.7		10.1	0.21	B	1.0	9.2	B	20.1	0.24	B	1.0
SZ - A4 - split	J15HY4	9/11/07	5010		40.1	2.0	U	2.0	1.6	B	2.0	42.0		10.0	0.14	B	1.0	7.1	B	20.1	1.0	U	1.0
OB - A2	J15VY5	10/16/07	5710		12.2	0.92	U	0.92	2.7		1.5	51.2		0.31	0.21		0.15	2.1		1.5	0.31	U	0.31
OB - C1	J15VY6	10/16/07	6010		11.6	0.87	U	0.87	2.5		1.4	48.8		0.29	0.24		0.14	2.0		1.4	0.29	U	0.29
BCL - B5	J15VY7	10/16/07	5910		11.7	0.88	U	0.88	3.6		1.5	74.8		0.29	0.22		0.15	4.6		1.5	0.29	U	0.29
BCL - B6	J15VY8	10/16/07	6440		11.7	0.88	U	0.88	3.7		1.5	69.1		0.29	0.26		0.15	3.6		1.5	0.29	U	0.29

Table D-2. 100-F-26:12 Inorganic Data Results. (4 Pages)

Sample Location	HEIS Number	Sample Date	Calcium			Chromium			Hexavalent Chromium			Cobalt			Copper			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
OB - A1	J15H73	9/5/07	5870	C	2.1	7.2		0.29	0.33		0.20	4.6		0.23	11.2		0.26	11000	C	7.0	2.7		0.97
OB - A2	J15H74	9/5/07	4450	C	2.1	6.8		0.29	0.22		0.20	5.1		0.23	11.5		0.26	13600	C	6.9	2.6		0.95
OB - A3	J15H75	9/5/07	3860	C	2.1	4.9		0.30	0.31		0.20	3.1		0.24	8.6		0.27	7220	C	7.1	1.8		0.99
OB - A4	J15H76	9/5/07	4270	C	2.1	8.1		0.30	2.0	U	2.0	5.0		0.24	12.5		0.27	12400	C	7.2	8.8		0.99
OB - A4 - dup	J15H77	9/5/07	4670	C	2.1	9.6		0.30	20.3	U	20.3	5.4		0.24	12.7		0.27	15300	C	7.1	10.2		0.98
OB - A4 - split	J15HB8	9/5/07	5450		61.0	12.6	C	0.46	0.83		0.35	8.1	B	0.47	14.0		0.81	17900		7.6	12.7		0.61
OB - B5	J15H78	9/5/07	4340	C	2.1	6.6		0.29	0.22		0.20	4.1		0.23	10.5		0.26	10300	C	7.0	2.5		0.96
OB - B6	J15H79	9/5/07	4800	C	2.1	7.8		0.29	0.29		0.20	4.7		0.23	12.5		0.26	12400	C	6.9	3.0		0.95
OB - B7	J15H80	9/5/07	4880	C	2.1	7.7		0.29	0.20	U	0.20	4.2		0.23	11.6		0.26	11800	C	7.0	2.5		0.97
OB - B8	J15H81	9/5/07	3700	C	2.1	5.1		0.30	0.31		0.20	3.4		0.24	9.6		0.27	8080	C	7.1	3.6		0.98
OB - C9	J15H82	9/5/07	3630	C	2.1	7.7		0.29	0.29		0.20	4.3		0.23	12.3		0.26	11700	C	6.9	7.9		0.96
OB - C10	J15H83	9/6/07	4410	C	2.1	8.3	C	0.30	0.20	U	0.20	5.6		0.24	12.1	C	0.27	13900		7.1	5.8		0.98
OB - C1	J15H84	9/6/07	4540		2.0	9.3		0.29	0.20	U	0.20	5.7		0.23	12.5		0.26	13800		6.9	4.0		0.95
OB - C2	J15H85	9/6/07	4070		2.1	8.2		0.30	0.20	U	0.20	4.8		0.24	9.8		0.27	12200		7.1	4.0		0.98
BCL - A1	J15H97	9/6/07	4780	C	2.1	10.1	C	0.29	0.28		0.20	5.7		0.23	11.9	C	0.26	15000		7.0	5.4		0.97
BCL - A2	J15H98	9/6/07	7640	C	2.1	10.8	C	0.29	0.20	U	0.20	5.9		0.23	14.2	C	0.26	16000		6.9	6.7		0.96
BCL - A3	J15H99	9/6/07	4900	C	2.0	9.6	C	0.28	0.28		0.20	5.3		0.23	12.7	C	0.26	14300		6.8	5.7		0.94
BCL - A4	J15HB0	9/6/07	5200	C	2.0	11.8	C	0.28	0.33		0.20	6.5		0.22	12.7	C	0.25	17800		6.7	9.1		0.92
BCL - B5	J15HB1	9/6/07	5620	C	2.1	7.7	C	0.29	0.20	U	0.20	5.4		0.23	13.5	C	0.26	12600		6.9	4.6		0.95
BCL - B7	J15HB4	9/6/07	5970	C	2.1	9.6	C	0.30	0.20	U	0.20	5.9		0.24	13.6	C	0.27	15700		7.1	6.5		0.98
BCL - B6	J15HB2	9/11/07	11800	C	2.0	7.1		0.29	0.20	U	0.20	5.2		0.23	13.8	C	0.26	11600		6.8	5.0		0.94
BCL - B6 - dup	J15HB3	9/11/07	5580	C	2.0	7.5		0.28	0.20	U	0.20	4.8		0.22	12.7	C	0.25	11500		6.7	5.7		0.93
BCL - B8	J15HB5	9/11/07	6090	C	2.0	6.2		0.28	0.20	U	0.20	4.1		0.23	11.5	C	0.26	10100		6.8	5.0		0.94
SZ - A1	J15H87	9/11/07	4130	C	2.1	6.9		0.30	0.28		0.20	5.0		0.24	11.4	C	0.27	11900		7.1	5.2		0.97
SZ - A2	J15H88	9/11/07	4290	C	2.0	6.5		0.29	0.36		0.20	4.1		0.23	11.3	C	0.26	10200		6.9	6.8		0.95
SZ - A3	J15H89	9/11/07	7920	C	2.1	8.8		0.29	0.32		0.20	5.4		0.23	14.1	C	0.26	12400		7.0	13.7		0.97
SZ - A4	J15H90	9/11/07	5650	C	2.0	5.2		0.29	0.27		0.20	3.4		0.23	10.3	C	0.26	8420		6.8	2.6		0.94
SZ - A4 - dup	J15H91	9/11/07	6050	C	2.0	5.2		0.28	0.20	U	0.20	3.5		0.23	10.8	C	0.26	8240		6.8	2.7		0.94
SZ - B5	J15H92	9/12/07	12400	C	2.0	8.5		0.29	0.27		0.20	4.9	C	0.23	11.1		0.26	12300		6.9	2.6		0.95
SZ - B6	J15H93	9/12/07	4680	C	2.1	8.2		0.29	0.34		0.20	4.6	C	0.23	9.6		0.26	11100		7.0	2.3		0.96
SZ - B7	J15H94	9/12/07	4030	C	2.0	6.7		0.28	0.20	U	0.20	4.8	C	0.23	9.8		0.25	12100		6.8	2.7		0.93
SZ - B8	J15H95	9/12/07	3720	C	2.1	5.8		0.29	0.22		0.20	4.6	C	0.24	18.3		0.27	10100		7.0	2.0		0.97
BCL - B6 - split	J15HB9	9/11/07	5690		503	10.5		2.0	0.35	U	0.35	7.3	B	10.1	11.3		5.0	15200		20.1	5.7		2.0
SZ - A4 - split	J15HY4	9/11/07	6390		502	9.2		2.0	0.35	U	0.35	5.8	B	10.0	11.1		5.0	13200		20.1	3.4		2.0
OB - A2	J15VY5	10/16/07	4710		12.2	9.2		0.61	0.24		0.21	4.6		0.61	12.5		0.61	13600		13.8	3.8		0.92
OB - C1	J15VY6	10/16/07	4580		11.6	9.4		0.58	0.20	U	0.20	4.9		0.58	12.0		0.58	14100		13.0	3.3		0.87
BCL - B5	J15VY7	10/16/07	6090		11.7	9.8		0.59	0.24		0.20	4.7		0.59	13.0		0.59	13500		13.2	5.4		0.88
BCL - B6	J15VY8	10/16/07	5400		11.7	10.1		0.59	0.32		0.20	5.8		0.59	13.2		0.59	15900		13.2	7.1		0.88

Table D-2. 100-F-26:12 Inorganic Data Results. (4 Pages)

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
OB - A1	J15H73	9/5/07	3250	C	2.4	221		0.21	0.02	U	0.02	0.74		0.47	9.3		0.79	849		9.4	1.3	U	1.3
OB - A2	J15H74	9/5/07	3290	C	2.3	230		0.20	0.01	U	0.01	0.46	U	0.46	8.0		0.78	806		9.3	1.2	U	1.2
OB - A3	J15H75	9/5/07	2230	C	2.4	164		0.21	0.01	U	0.01	0.50		0.48	5.9		0.81	442		9.6	1.3	U	1.3
OB - A4	J15H76	9/5/07	3440	C	2.4	241		0.21	0.01	U	0.01	0.48	U	0.48	9.2		0.81	866		9.6	1.3	U	1.3
OB - A4 - dup	J15H77	9/5/07	3970	C	2.4	264		0.21	0.01	U	0.01	0.78		0.48	11.0		0.80	1060		9.5	1.3	U	1.3
OB - A4 - split	J15HB8	9/5/07	4340		18.2	309		0.81	0.007	U	0.007	1.8	U	1.8	11.1		2.30	1540		305	0.9	U	0.9
OB - B5	J15H78	9/5/07	3020	C	2.4	190		0.20	0.01	U	0.01	0.50		0.47	7.4		0.79	677		9.4	1.3		1.3
OB - B6	J15H79	9/5/07	3380	C	2.3	226		0.20	0.02	U	0.02	0.46	U	0.46	9.0		0.78	843		9.3	1.2	U	1.2
OB - B7	J15H80	9/5/07	3330	C	2.4	221		0.20	0.01	U	0.01	0.59		0.47	8.2		0.79	850		9.4	1.3	U	1.3
OB - B8	J15H81	9/5/07	2440	C	2.4	172		0.21	0.02	U	0.02	0.48	U	0.48	7.1		0.80	638		9.5	1.3	U	1.3
OB - C9	J15H82	9/5/07	3160	C	2.4	209		0.20	0.02	U	0.02	0.47	U	0.47	8.7		0.78	898		9.3	1.3	U	1.3
OB - C10	J15H83	9/6/07	3550	C	2.4	244		0.21	0.02	U	0.02	0.48	U	0.48	9.6		0.81	954		9.5	1.3	U	1.3
OB - C1	J15H84	9/6/07	3570		2.3	238		0.20	0.01	U	0.01	0.46	U	0.46	9.8		0.77	874		9.2	1.2	U	1.2
OB - C2	J15H85	9/6/07	2880		2.4	221		0.21	0.02	U	0.02	0.48	U	0.48	8.7		0.81	750		9.5	1.3	U	1.3
BCL - A1	J15H97	9/6/07	3770	C	2.4	242		0.21	0.01	U	0.01	0.47	U	0.47	10.0		0.79	860		9.4	1.3	U	1.3
BCL - A2	J15H98	9/6/07	4160	C	2.3	253		0.20	0.02	U	0.02	0.46	U	0.46	11.0		0.78	938		9.3	1.2	U	1.2
BCL - A3	J15H99	9/6/07	3440	C	2.3	251		0.20	0.02	U	0.02	0.45	U	0.45	9.2		0.77	850		9.1	1.2	U	1.2
BCL - A4	J15HB0	9/6/07	4270	C	2.3	274		0.20	0.02	U	0.02	0.45	U	0.45	11.4		0.75	1140		8.9	1.2	U	1.2
BCL - B5	J15HB1	9/6/07	3350	C	2.3	222		0.20	0.04		0.02	0.58		0.46	8.6		0.78	768		9.3	1.2	U	1.2
BCL - B7	J15HB4	9/6/07	3830	C	2.4	247		0.21	0.08		0.01	0.59		0.47	10.1		0.80	944		9.5	1.3	U	1.3
BCL - B6	J15HB2	9/11/07	3660	C	2.3	232		0.20	0.02		0.01	0.46	U	0.46	8.9		0.77	877	C	9.2	1.2	U	1.2
BCL - B6 - dup	J15HB3	9/11/07	3240	C	2.3	220		0.20	0.02		0.02	0.45	U	0.45	8.9		0.76	848	C	9.0	1.2	U	1.2
BCL - B8	J15HB5	9/11/07	2940	C	2.3	197		0.20	0.02		0.01	0.45	U	0.45	8.2		0.77	622	C	9.1	1.2	U	1.2
SZ - A1	J15H87	9/11/07	3240	C	2.4	234		0.21	0.01	U	0.01	0.47	U	0.47	9.0		0.80	1030	C	9.4	1.3	U	1.3
SZ - A2	J15H88	9/11/07	3010	C	2.3	195		0.20	0.04		0.02	0.46		0.46	7.7		0.78	666	C	9.2	1.2	U	1.2
SZ - A3	J15H89	9/11/07	3600	C	2.4	249		0.21	0.02		0.01	0.48		0.47	10.3		0.79	1040	C	9.4	1.3	U	1.3
SZ - A4	J15H90	9/11/07	2720	C	2.3	181		0.20	0.02	U	0.02	0.46	U	0.46	7.1		0.77	630	C	9.1	1.2	U	1.2
SZ - A4 - dup	J15H91	9/11/07	2670	C	2.3	180		0.20	0.02	U	0.01	0.45	U	0.45	7.5		0.77	574	C	9.1	1.2	U	1.2
SZ - B5	J15H92	9/12/07	3760	C	2.3	223		0.20	0.02		0.01	0.46	U	0.46	9.6		0.77	710	C	9.2	1.2	U	1.2
SZ - B6	J15H93	9/12/07	3220	C	2.4	206		0.20	0.02	U	0.02	0.47	U	0.47	8.9		0.79	631	C	9.3	1.3	U	1.3
SZ - B7	J15H94	9/12/07	3140	C	2.3	206		0.20	0.01	U	0.01	0.45	U	0.45	8.3		0.76	639	C	9.1	1.2	U	1.2
SZ - B8	J15H95	9/12/07	2720	C	2.4	162		0.21	0.01	U	0.01	0.47	U	0.47	8.0		0.80	572	C	9.4	1.3	U	1.3
BCL - B6 - split	J15HB9	9/11/07	3780		201	251		2.00	0.022	B,C	0.033	8.0		8.0	11.1		8.0	1240		1010	3.0	U	3.0
SZ - A4 - split	J15HY4	9/11/07	3900		201	249		2.00	0.033	U	0.033	8.0	U	8.0	8.7		8.0	1280		1000	3.0	U	3.0
OB - A2	J15VY5	10/16/07	3650		7.6	249		0.12	0.005	U	0.005	0.92	U	0.92	10.4		0.61	915		12.2	1.8	U	1.8
OB - C1	J15VY6	10/16/07	3800		7.2	255		0.12	0.03	U	0.03	0.87	U	0.87	10.0		0.58	926		11.6	1.7	U	1.7
BCL - B5	J15VY7	10/16/07	3870		7.3	246		0.12	0.06		0.03	0.88	U	0.88	11.0		0.59	915		11.7	1.8	U	1.8
BCL - B6	J15VY8	10/16/07	3950		7.3	270		0.12	0.04		0.03	0.88	U	0.88	10.8		0.59	1040		11.7	1.8	U	1.8

Table D-2. 100-F-26:12 Inorganic Data Results. (4 Pages)

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
OB - A1	J15H73	9/5/07	2790	C	2.5	0.26	U	0.26	171	C	2.1	24.4		0.23	26.6	C	0.12
OB - A2	J15H74	9/5/07	1700	C	2.5	0.26	U	0.26	182	C	2.0	31.6		0.23	29.3	C	0.12
OB - A3	J15H75	9/5/07	1470	C	2.6	0.27	U	0.27	115	C	2.1	16.9		0.24	20.7	C	0.12
OB - A4	J15H76	9/5/07	1340	C	2.6	0.27	U	0.27	217	C	2.1	27.7		0.24	28.9	C	0.12
OB - A4 - dup	J15H77	9/5/07	1390	C	2.6	0.27	U	0.27	242	C	2.1	33.7		0.24	32.9	C	0.12
OB - A4 - split	J15HB8	9/5/07	529		18.3	0.74	U	0.74	261		24.4	37.6		1.10	47.2	C	3.0
OB - B5	J15H78	9/5/07	1840	C	2.5	0.26	U	0.26	144	C	2.0	24.7		0.23	24.7	C	0.12
OB - B6	J15H79	9/5/07	1670	C	2.5	0.26	U	0.26	156	C	2.0	30.7		0.23	31.1	C	0.12
OB - B7	J15H80	9/5/07	2080	C	2.5	0.26	U	0.26	172	C	2.0	27.7		0.23	27.9	C	0.12
OB - B8	J15H81	9/5/07	2060	C	2.6	0.27	U	0.27	132	C	2.1	16.7		0.24	25.1	C	0.12
OB - C9	J15H82	9/5/07	1910	C	2.5	0.26	U	0.26	187	C	2.0	27.1		0.23	26.3	C	0.12
OB - C10	J15H83	9/6/07	1820		2.6	0.27	U	0.27	216	C	2.1	32.6	C	0.24	32.1	CJ	0.12
OB - C1	J15H84	9/6/07	1050		2.5	0.26	U	0.26	162		2.0	33.7		0.23	30.9	J	0.11
OB - C2	J15H85	9/6/07	582		2.6	0.27	U	0.27	169		2.1	28.8		0.24	25.5	J	0.12
BCL - A1	J15H97	9/6/07	706		2.5	0.26	U	0.26	190	C	2.1	34.9	C	0.23	33.6	CJ	0.12
BCL - A2	J15H98	9/6/07	689		2.5	0.26	U	0.26	208	C	2.0	37.3	C	0.23	50.5	CJ	0.12
BCL - A3	J15H99	9/6/07	525		2.4	0.26	U	0.26	182	C	2.0	33.4	C	0.23	40.3	CJ	0.11
BCL - A4	J15HB0	9/6/07	819		2.4	0.25	U	0.25	252	C	2.0	40.0	C	0.22	41.7	CJ	0.11
BCL - B5	J15HB1	9/6/07	2980		2.5	0.26	U	0.26	207	C	2.0	29.9	C	0.23	33.2	CJ	0.12
BCL - B7	J15HB4	9/6/07	1090		2.5	0.27	U	0.27	237	C	2.1	35.8	C	0.24	37.4	CJ	0.12
BCL - B6	J15HB2	9/11/07	2930	C	2.5	0.26	U	0.26	233	C	2.0	25.9		0.23	66.8	C	0.11
BCL - B6 - dup	J15HB3	9/11/07	2650	C	2.4	0.25	U	0.25	194	C	2.0	25.7		0.22	34.8	C	0.11
BCL - B8	J15HB5	9/11/07	2180	C	2.4	0.26	U	0.26	192	C	2.0	22.9		0.23	36.8	C	0.11
SZ - A1	J15H87	9/11/07	3160	C	2.5	0.27	U	0.27	177	C	2.1	26.7		0.24	31.0	C	0.12
SZ - A2	J15H88	9/11/07	2340	C	2.5	0.26	U	0.26	189	C	2.0	22.3		0.23	29.9	C	0.12
SZ - A3	J15H89	9/11/07	3100	C	2.5	0.26	U	0.26	299	C	2.1	26.1		0.23	39.2	C	0.12
SZ - A4	J15H90	9/11/07	2360	C	2.5	0.26	U	0.26	168	C	2.0	18.7		0.23	23.6	C	0.11
SZ - A4 - dup	J15H91	9/11/07	1830	C	2.4	0.26	U	0.26	138	C	2.0	17.4		0.23	21.9	C	0.11
SZ - B5	J15H92	9/12/07	1700		2.5	0.26	U	0.26	266	C	2.0	31.7		0.23	31.2	C	0.11
SZ - B6	J15H93	9/12/07	2040		2.5	0.26	U	0.26	179	C	2.0	26.0		0.23	26.0	C	0.12
SZ - B7	J15H94	9/12/07	1970		2.4	0.25	U	0.25	195	C	2.0	29.6		0.23	27.2	C	0.11
SZ - B8	J15H95	9/12/07	1860		2.5	0.27	U	0.27	203	C	2.1	24.9		0.24	23.0	C	0.12
BCL - B6 - split	J15HB9	9/11/07	425		80.4	2.0	U	2.0	99.6	B	201	35.9		2.00	39.4	C	10.1
SZ - A4 - split	J15HY4	9/11/07	277		80.3	2.0	U	2.0	99.8	B	201	34.4		2.00	29.8	C	10.0
OB - A2	J15VY5	10/16/07	2680		12.2	0.31	U	0.31	212		6.1	32.6		0.43	33.3		1.8
OB - C1	J15VY6	10/16/07	2240		11.6	0.29	U	0.29	173		57.9	33.7		0.41	32.5		1.7
BCL - B5	J15VY7	10/16/07	3360		11.7	0.29	U	0.29	237		58.6	32.5		0.41	35.1		1.8
BCL - B6	J15VY8	10/16/07	2330		11.7	0.29	U	0.29	214		58.7	38.2		0.41	40.5		1.8

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

B = blank contamination (organics) J = estimated
BCL = below cleanup level OB = overburden
C = blank contamination (inorganics) PQL= practical quantitation limit
D = diluted Q = qualifier
HEIS = Hanford Environmental Information System SZ = shallow zone

APPENDIX E

DATA QUALITY ASSESSMENT

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (DOE-RL 2005). A review of the sample designs (DOE-RL 2005 and WCH 2007a), the field logbooks (WCH 2007b, WCH 2007c), and applicable analytical data packages has been performed as part of this DQA. This DQA was performed in accordance with site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2005).

To ensure quality data, the SAP data assurance requirements and the data validation procedures for chemical and radiochemical analysis (BHI 2000a, 2000b) are used as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., closeout decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2000).

The closeout sampling approach for the 100-F-26:12, 1.8-m (72-in.) main process sewer line waste site included a sample design with multiple decision units. All samples were collected per the sample design. Verification sample data collected at the 100-F-26:12 waste site(s) were provided by the laboratories in seven sample delivery groups (SDGs). For the overburden, verification sample data was provided in four SDGs: SDG K0947, SDG J00128, SDG K0951, and SDG K0998. For the BCL stockpiles, verification sample data was provided in four SDGs: SDG K0951, SDG K0956, SDG J00130, and SDG K0998. For the shallow-zone excavation, verification sample data was provided in two SDGs: SDG K0956, and SDG J00130. SDG K0951 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed below.

SDG K0947

This SDG comprises ten field samples (J15H73-J15H82) collected from the 100-F-26:12 excavation overburden. One field duplicate pair is included in this SDG (J15H76/ J15H77). These samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, gross alpha, gross beta, nickel-63 by liquid scintillation counting (LSC), total strontium by beta counting, carbon-14, tritium, and by gamma spectroscopy. No major deficiencies were found in SDG K0947. Minor deficiencies are as follows:

The laboratory control sample (LCS) initial analysis for carbon-14 was unacceptable. The samples were realiquoted with new quality control (QC) samples and reanalyzed. No problems were encountered during the course of the reanalysis, all QC results are acceptable. The data are useable for decision-making purposes.

In the ICP metals analysis, the matrix spike (MS) recoveries for six ICP metals (aluminum, calcium, iron, manganese, antimony, and silicon) are out of project acceptance criteria. For most of these analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. To confirm quantitation, post-digestion spikes and serial dilutions were prepared for each analyte with results ranging between 87.2-103.4%. Calcium and antimony did not have mismatched spike and native

concentrations in the original MS. The original MS recoveries for calcium and antimony were 48.8% and 68.7%, respectively. The calcium and antimony data for SDG K0947 may be considered estimated. Estimated data are useable for decision-making purposes.

SDG J00128

This SDG comprises one field sample (J15HB8), a split of sample J15H76 from SDG K0947. This sample was analyzed at Severn Trent Laboratories, Inc. The analyses include ICP metals, mercury, hexavalent chromium, gross alpha, gross beta, nickel-63 by LSC, total strontium by beta counting, carbon-14, tritium, and by gamma spectroscopy. No major deficiencies were found in SDG J00128. Minor deficiencies are as follows:

Elevated relative percent differences (RPDs) were reported for many radionuclide laboratory duplicates for sample J15HB8. For the isotopes with RPDs exceeding the acceptance criteria (30%), the results were all below the detection limits or near the detection limits. When the duplicate pair is near the detection limit, analysis of RPDs is not considered useful in the precision determination. The data are useable for decision-making purposes.

In the hexavalent chromium analyses, the data package holding time requirement of 24 hours was exceeded by greater than twice the limit. The sample was collected on Sept. 5, 2007 and stored at 4° C until the analysis date of Sept. 12, 2007. Also, the MS recovery for hexavalent chromium is out of acceptance criteria, with a result of 35%. The method blank and LCS results for hexavalent chromium were within acceptance criteria. The hexavalent chromium data for sample J15HB8 may be considered estimated. Estimated data are considered acceptable for decision-making purposes.

In the ICP metals analysis, the MS and/or matrix spike duplicate (MSD) recoveries for eight ICP metals (aluminum, chromium, iron, manganese, potassium, antimony, silicon, and zinc) are out of project acceptance criteria. For aluminum, iron, and manganese, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS and/or MSD is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony, chromium, potassium, silicon, and zinc did not have mismatched spike and native concentrations in the original MS. The original MS and MSD recoveries for antimony were 40% and 34%, respectively. The original MS recovery for chromium was 133%. The original MSD recovery for potassium was 64%. The original MS recovery for silicon was 16%, and the MSD was 7.1%. The original MS and MSD recoveries for zinc were 126% and 133%, respectively. The data for these analytes in SDG J00128 may be considered estimated. Estimated data are useable for decision-making purposes.

SDG K0951

This SDG comprises three field samples (J15H83 – J15H85) collected from the 100-F-26:12 excavation overburden, and six field samples (J15H97 – J15H99, J15HB0, J15HB1, and J15HB4) collected from the BCL stockpiles. These samples were analyzed for ICP metals, mercury, hexavalent chromium, gross alpha, gross beta, nickel-63 by LSC, total strontium by beta counting, carbon-14, tritium, and by gamma spectroscopy. SDG K0951 was submitted for third-party validation. No major deficiencies were found in SDG K0951. Minor deficiencies are as follows:

No matrix spike analysis was performed for tritium or for carbon-14. Third-party validation qualified all tritium and carbon-14 results as estimated and flagged "J". The data are useable for decision-making purposes.

In the ICP metals analysis, the laboratory duplicate RPD for zinc is 30.4%, exceeding the acceptance criteria (30%). Third-party validation qualified all zinc results as estimated and flagged "J". The data are useable for decision-making purposes.

In addition, the MS recoveries for four ICP metals (aluminum, iron, antimony, and silicon) are out of project acceptance criteria. For most of these analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. To confirm quantitation, post-digestion spikes and serial dilutions were prepared for each analyte with results ranging between 91.4-117.4%. Antimony did not have mismatched spike and native concentrations in the original MS. The original MS recovery for antimony was 67.6%. The antimony data for SDG K0951 was qualified as estimated with a "J" flag by third-party validation. Estimated data are useable for decision-making purposes.

SDG K0956

This SDG comprises three field samples (J15HB2, J15HB3, and J15HB5) from the BCL stockpiles, and nine field samples from the 100-F-26:12 shallow-zone excavation (J15H87 – J15H95). One field duplicate pair for the BCL stockpiles (J15HB2/J15HB3) and one field duplicate pair from the shallow-zone excavation (J15H90/J15H91) is included in this SDG. This SDG also contains five field samples from the 118-F-5A shallow-zone excavation, however, this SDG limits the data review for this SDG to the 100-F-26:12 data. These samples were analyzed for ICP metals, mercury, hexavalent chromium, gross alpha, gross beta, nickel-63 by LSC, total strontium by beta counting, carbon-14, tritium, and by gamma spectroscopy. No major deficiencies were found in SDG K0956. Minor deficiencies are as follows:

The minimum detectable activity (MDA) exceeded the limit for all samples in the gamma spectroscopy analyses. A preparation error was noted in the data package, and the interference correction report included in the data package stated that the error was a probable misidentification of the Ra-226 line. The gamma spectroscopy data for SDG K0956 may be considered estimated. Estimated data are useable for decision-making purposes.

The metals, mercury, and hexavalent chromium data were analyzed in two batches; the samples J15H92-J15H95 were analyzed one day later than the other samples reported in SDG K0956, and have separate quality assurance (QA)/QC data.

In the ICP metals analysis, the MS recoveries for four analytes (aluminum, calcium, iron, and silicon) are out of acceptance criteria. In addition, the MS recovery for manganese for samples J15H92-J15H95 are out of acceptance criteria. For aluminum, calcium, iron, and silicon, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. For these analytes, the deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. To confirm quantitation, post digestion spikes (PDSs) and serial dilutions were prepared for all five analytes with results in the range

of 84.6% to 106.8%. Manganese did not have mismatched spike and native concentrations in the original MS for samples J15H92-J15H95. The original MS recovery for manganese in these samples is 56.3%. The manganese data for samples J15H92-J15H95 may be considered estimated. Estimated data are useable for decision-making purposes.

The RPD calculated for arsenic (48.5%), calcium (62.3%), silicon (33.3%), and zinc (53.0%) in the laboratory duplicate pair (sample J15HB2, and J15HB2 duplicate), are above the acceptance criteria of 30%. The RPD calculated for arsenic (38.3%), calcium (59.6%), chromium (31.3%), mercury (69.4%), and sodium (39.2%) in the laboratory duplicate pair (sample J15H92, and J15H92 duplicate), are above the acceptance criteria of 30%. Elevated RPDs in environmental soil samples are generally attributed to heterogeneities in the sample matrix and not to deficiencies in the laboratory procedures. The data are useable for decision-making purposes.

The laboratory duplicate RPD for hexavalent chromium is 155.5% for the laboratory duplicate pair (J15H92, and J15H92 duplicate); and is 127.0% for laboratory duplicate pair (J15HB2, and J15HB2 duplicate). Both laboratory duplicate RPDs exceed the acceptance criteria (30%). One result for each laboratory duplicate set was below the detection limit, and one result was just above the detection limit. When the duplicate pair is near the detection limit, analysis of RPDs is not considered useful in the precision determination. The data are useable for decision-making purposes.

SDG J00130

This SDG comprises two field samples, sample J15HY4, a split of sample J15H90 from SDG K0956, and sample J15HB9, a split of sample J15HB2 from SDG K0956. These samples were analyzed at Severn Trent Laboratories, Inc. The analyses include ICP metals, mercury, hexavalent chromium, gross alpha, gross beta, nickel-63 by LSC, total strontium by beta counting, carbon-14, tritium, and by gamma spectroscopy. No major deficiencies were found in SDG J00130. Minor deficiencies are as follows:

For the gamma spectroscopy, insufficient sample material was available to prepare a laboratory duplicate of sample J15HY4. The duplicate result was obtained by recounting sample J15HY4 on a different detector.

Elevated RPDs were reported for many radionuclide laboratory duplicates for sample J15591. For the isotopes with RPDs exceeding the acceptance criteria (30%), the results were all below the detection limits or near the detection limits. When the duplicate pair is near the detection limit, analysis of RPDs is not considered useful in the precision determination. The data are useable for decision-making purposes.

The MS recovery for hexavalent chromium is out of acceptance criteria, with a result of 74%. The method blank and LCS results for hexavalent chromium were within acceptance criteria. The hexavalent chromium data for SDG J00130 may be considered estimated. The data are useable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for six ICP metals (aluminum, iron, manganese, antimony, silicon, and silver) are out of acceptance criteria. For aluminum, iron, and manganese, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. For these analytes, the deficiency in the MS is a reflection of the analytical variability of

the native concentration rather than a measure of the recovery from the sample. Antimony, silicon, and silver did not have mismatched spike and native concentrations in the original MS. The original MS and MSD recoveries for antimony were 71% and 61%, respectively. The original MS and MSD recoveries for silicon were 38% and 33%, respectively. The MS recovery for silver is 127%. The antimony, silicon, and silver data for SDG J00130 may be considered estimated. The data are useable for decision-making purposes.

SDG K0998

This SDG comprises four field samples (J15VY5 – J15VY8) from the 100-F-26:12 overburden and BCL stockpiles. These samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, gross alpha, gross beta, nickel-63 by LSC, total strontium by beta counting, carbon-14, tritium, and by gamma spectroscopy. The sample J15HB1 result reported in SDG K0951 indicated that the stockpile soil in area B5 of the BCL decision unit had detections of carbon-14 in excess of the remedial action goal. The sample J15H74 result reported in SDG K0947 indicated that the stockpile soil in area A2 of the overburden decision unit had detections of carbon-14 in excess of the remedial action goal. The sample J15H84 result reported in SDG K0951 indicated that the stockpile soil in area C1 of the overburden decision unit had detections of carbon-14 in excess of the remedial action goal. The sample J15HB3 (duplicate of J15HB2) result reported in SDG K0956 indicated that the stockpile soil in area B6 of the BCL decision unit had detections of carbon-14 in excess of the remedial action goal. The contaminated soil was removed, and samples were taken to replace the radiological results in statistical calculations for verification sampling of the 100-F-26:12 site. No major deficiencies were found in SDG K0998. Minor deficiencies are as follows:

In the radionuclide analysis, the QC LCS recovery for the initial carbon-14 analysis was below the acceptance criteria. The samples were realiquoted and reanalyzed. The data are acceptable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for four ICP metals (aluminum, iron, antimony, and silicon) are out of acceptance criteria. For aluminum, iron, and silicon, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. For these analytes, the deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony did not have mismatched spike and native concentrations in the original MS. The original MS recovery for antimony was 71.4%. The antimony data for SDG K0998 may be considered estimated. The data are useable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

RPD evaluations of main sample(s) versus the laboratory duplicate(s) are routinely performed and reported by the laboratory. Any deficiencies in those calculations are reported by SDG in the previous sections.

Field QA/QC measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples, listed in the field logbooks (WCH 2007b, WCH 2007c), are summarized in Table E-1. The main and QA/QC sample results are presented in Appendix C.

Table E-1. Field Quality Assurance/Quality Control Samples.

Sample Area	Main Sample	Duplicate Sample	Split Sample
Shallow Zone Excavation	J15H90	J15H91	J15HY4
Overburden Stockpile	J15H76	J15H77	J15HB8
BCL Stockpile	J15HB2	J15HB3	J15HB9

Field duplicate samples are collected to provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates that are used to evaluate precision in the analytical process. The field duplicates are evaluated by computing the RPD of the duplicate samples for each contaminant of concern. Only analytes with values above five times the detection limits for both the main and duplicate samples are compared. The 95% upper confidence limit (UCL) calculation brief in Appendix C provides details on duplicate pair evaluation and RPD calculation. The data are suitable for the intended purpose of cleanup verification.

Radionuclides

None of the RPDs calculated for the field QA/QC samples' radionuclide results exceeded the acceptance criteria of 30%. The data is useable for decision-making purposes.

Nonradionuclides

The RPDs calculated for the field QA/QC samples' nonradionuclide results exceeded the acceptance criteria of 30% for the excavation shallow zone split (J15HY4), the overburden split (J15HB8), and the BCL stockpile duplicate (J15HB3) and split (J15HB9) samples for some analytes, as shown in Table E-2. Elevated RPDs, such as these, in the analysis of environmental soil samples, are largely attributed to heterogeneities in the soil matrix and only in small part attributed to precision and accuracy issues at the laboratory. The data are useable for decision-making purposes.

Table E-2. Field QA/QC Sample RPD Results Exceeding Acceptance Criteria (30%).

Analyte	Sample Number			
	J15HY4	J15HB8	J15HB3	J15HB9
Aluminum	35%	37%	-	-
Barium	35%	37%	-	-
Calcium	-	-	72%	70%
Chromium	56%	43%	-	39%
Iron	44%	36%	-	-
Magnesium	36%	-	-	-

Table E-2. Field QA/QC Sample RPD Results Exceeding Acceptance Criteria (30%).

Analyte	Sample Number			
	J15HY4	J15HB8	J15HB3	J15HB9
Manganese	32%	-	-	-
Silicon	158%	87%	-	149%
Vanadium	59%	30%	-	32%
Zinc	-	48%	63%	32%
- = RPD value did not exceed acceptance criteria				

RPDs for the remaining radionuclides and nonradionuclide analytes are not calculated because an evaluation of the data shows the analytes are not detected in both the main and duplicate sample at more than 5 times the target detection limit. RPDs of analytes detected at low concentrations (less than 5 times the detection limit) are not considered to be indicative of the analytical system performance. The data are useable for decision-making purposes.

A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than 5 times the target detection limit (TDL), including undetected analytes. In these cases, a control limit of ± 2 times the TDL is used (Appendix C) to indicate that a visual check of the data is required by the reviewer. For the excavation shallow zone split sample, boron required this check. For the overburden stockpile, the boron split sample and hexavalent chromium duplicate and split sample results required this check. For the BCL stockpile split sample, boron and sodium required this check. These results are attributed to heterogeneities in the sample matrix from which the samples were collected. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are useable for decision-making purposes.

SUMMARY

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above, are a potential challenge for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 100-F-26:12 verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for 100-F-26:12 waste site concludes that the reviewed 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 QA and QC deficiencies. The analytical data were found acceptable for decision-making purposes. The verification sample analytical data are stored in the ENRE project-specific database prior to being submitted for inclusion in the HEIS database. The verification sample analytical data are also summarized in Appendix D.

REFERENCES

BHI, 2000a, *Data Validation Procedure for Chemical Analysis*, BHI-01435, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2000b, *Data Validation Procedure for Radiochemical Analysis*, BHI-01433, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

DOE-RL, 2005, *100 Area Remedial Action Sampling and Analysis Plan*, DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 2000, *Guidance for Data Quality Assessment*, EPA QA/G-9, QA00 Update, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C.

WCH, 2007a, *100-F-26:12 Pipeline Shallow Zone and Stockpile (BCL) Soil, Soil/Debris Sampling Plan*, 0100F-CV-V0308, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2007b, *100F Remedial Sampling*, Logbook EFL-1174-3 pp. 76-81, 86-89, and 93-94, Washington Closure Hanford, Richland, Washington.

WCH, 2007c, *100F Remedial Sampling*, Logbook EFL-1174-4 pp. 12, Washington Closure Hanford, Richland, Washington.