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Waste Site Reclassification Form

Date Submitted: 5/08/06 **Originator:** R. A. Carlson **Phone:** 373-1440	**Operable Unit(s):** 100-DR-1 **Waste Site ID:** 132-D-3 **Type of Reclassification Action:** Rejected ☐ Closed Out ☐ Interim Closed Out ☒ No Action ☐	**Control Number:** 2005-033 **Lead Agency:** Ecology

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

Description of current waste site condition:

Decommissioning and demolition of the 132-D-3 site, 1608-D Effluent Pumping Station was performed in 1986. Decommissioning included removal of equipment, water, and sludge for disposal as radioactive waste. The at- and below- grade structure (floor slab, foundation walls, sump walls, and piping) was demolished to at least 1 m (3.3 ft) below grade and the resulting rubble buried in situ. The area was backfilled to grade with at least 1 m (3.3 ft) of clean fill and contoured to the surrounding terrain. Radiological characterization was performed prior to final decommissioning, including the collection of concrete, pipe scale, and soil samples to support dose assessment calculations prepared in accordance with allowable residual contamination levels (ARCL) methodology. The ARCL calculations indicated that the "worst case" potential dose to the maximally exposed individual in 1986 would be 3.68 mrem/yr. A RESidual RADioactivity (RESRAD) evaluation was performed in 2005 using the 1986 sampling results (after accounting for radioactive decay) to support an interim closure decision. This evaluation predicted a maximum dose rate of 2.55×10^{-3} mrem/yr above background over 1,000 years. The RESRAD evaluation also showed that, of the contaminants detected, only tritium is predicted to reach groundwater within 1,000 years. The maximum tritium concentration in groundwater is predicted to be less than the remedial action goal (20,000 pCi/L). Therefore, the dose limits for the rural residential (15 mrem/yr) and groundwater (4 mrem/yr) pathways will not be exceeded.

Basis for reclassification:

The site achieves 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-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, 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*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington. Residual concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario and pose no threat to groundwater or the Columbia River based on RESRAD modeling. However, the acceptability of unrestricted direct exposure to below-grade structure surfaces in the deep zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The basis for reclassification to interim closed out is described in detail in the attached *Remaining Site Verification Package for 132-D-3; 1608-D Effluent Pumping Station*, (attached). The data used for this evaluation was not obtained from environmental media and is not intended to be incorporated into the River Corridor Baseline Risk Assessment. Waste site-specific evaluations will be performed to determine which data are appropriate for ecological risk assessment and/or to assess the risk these sites present to ecological receptors.

K. Bazzell DOE-RL Project Manager	Signature	5/9/2006 Date
J. Price Ecology Project Manager	Signature	5/9/2006 Date
NA EPA Project Manager	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR 132-D-3, 1608-D EFFLUENT PUMPING STATION

Attachment to Waste Site Reclassification Form 2005-033

May 2006

REMAINING SITES VERIFICATION PACKAGE FOR 132-D-3, 1608-D EFFLUENT PUMPING STATION

EXECUTIVE SUMMARY

The 132-D-3, 1608-D Effluent Pumping Station collected water from 105-D Reactor Building drains and the 115-D Gas Recirculation Building and pumped it to the process effluent pipelines that discharged to the 107-D Retention Basin. The facility, located approximately 9 m (30 ft) south of the 105-DR Reactor Building was constructed predominantly below grade, to a maximum depth of 7 m (23 ft), with 1.2 m (4 ft) of structure above grade. This facility operated from 1944 until shutdown of the 105-D Reactor in 1965.

The 1608-D facility was decommissioned and demolished in 1986 in two phases. Initial decommissioning activities consisted of removing and disposing of all asbestos and equipment within the building and removing residual water and sludge from the sumps. Contaminated equipment was packaged and shipped to 200 Area burial grounds for disposal. Liquid/sludge within the sumps was placed in 208-L (55-gallon) drums, stabilized, and also shipped to 200 Area burial grounds for disposal. During the second phase of decommissioning, additional liquid was discovered in the sumps, presumably resulting from water used for dust suppression during demolition of the proximate 115-D/DR facility (132-D-1 site). This liquid was transferred to the 1608-DR sumps (132-DR-1 site) for later disposal.

Extensive radiological survey and sampling activities were performed to characterize residual radiological contamination on the accessible internal concrete of the 1608-D Effluent Pumping Station. Characterization results indicated that residual contamination was confined to the concrete floors and walls of the facility.

The 1608-D Effluent Pumping Station was released for unrestricted use based on the post-decontamination characterization results and the *Dose Assessment of In Situ Burial of the 1608-D Lift Station* (WHC 1988). Demolition and site grading were performed in 1986 using conventional heavy equipment. The structure was demolished to at least 1 m (3.3 ft) below grade and the rubble buried in situ under at least 1 m (3.3 ft) of clean fill.

Using the maximum radiological activities from the pre-demolition characterization data to represent residual contamination levels throughout all the residual concrete of the former building, RESidual RADioactivity (RESRAD) modeling was performed in 2005 to support the previous decision to demolish and bury the building in place. The RESRAD modeling accounts for radioactive decay from 1986 (year of sampling) to 2005 and predicts that the site achieves the dose limits and risk objectives for rural-residential land use with institutional controls, groundwater protection, and river protection. Results of the RESRAD evaluation are summarized in Table ES-1.

In accordance with this evaluation, the 1986 sampling results support a reclassification of the 132-D-3 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 2005) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 1999). These results show that the site and contaminant levels remaining in the soil will be protective of direct exposure, groundwater, and the Columbia River. However, the acceptability of unrestricted direct exposure to below-grade structure surfaces in the deep zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required.

Table ES-1. Summary of Remedial Action Goals for the 132-D-3 Site.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/yr dose rate above background over 1,000 years.	Maximum total radionuclide dose (occurring in 2005) is 2.55×10^{-3} mrem/yr above background.	Yes
Groundwater/River Protection – Radionuclides	Attain single-COC groundwater and river protection RAGs.	Tritium is the only radionuclide that is predicted to reach groundwater and its maximum concentration will not exceed the remedial action goal based on RESRAD modeling.	Yes
	Attain national primary drinking water standards:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5.[b]		

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and the Environment* (DOE Order 5400.5).
COC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose model)

Soil cleanup levels were established in the interim action ROD based on a limited ecological risk assessment. A baseline risk assessment for the river corridor portion of Hanford began in 2004, which includes a more complete quantitative ecological risk assessment. That baseline risk assessment will be used as part of the final ROD for this site.

REMAINING SITES VERIFICATION PACKAGE FOR 132-D-3, 1608-D EFFLUENT PUMPING STATION

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 132-D-3 site meets the objectives for interim closure as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 1999). These results show that the site and contaminant levels remaining in the soil will be protective of direct exposure, groundwater, and the Columbia River. However, the acceptability of unrestricted direct exposure to below-grade structure surfaces in the deep zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required.

GENERAL SITE INFORMATION AND BACKGROUND

The 1608-D Effluent Pumping Station, part of the 100-DR-1 Operable Unit and identified as the 132-D-3 site in WIDS, started operation in 1944 and was shut down in 1965. The facility was located approximately 9.1 m (30 ft) south of the 105-D Reactor Building and approximately 9.1 m (30 ft) east of the fan room wing of the 105-D Reactor Building, adjacent to the 105-D gas recirculation pipe tunnel (Figure 1). The facility walls and floors were constructed of reinforced concrete. The roof was constructed of a wood frame with composite surface. The Waste Information Data System (Appendix A) and the facility decommissioning report (WHC 1987) state the facility extended 9.8 m (32 ft) below grade. The dose assessment report (WHC 1988) lists a depth of 7m (23 ft) and includes a corresponding elevation view; this value was used for further calculations within this remaining sites verification package. The facility extended 1.2 m (4 ft) above grade and was 6.1 m (20 ft) in length and width.

The 1608-D Effluent Pumping Station functioned as a lift station to pump effluent collected from various drain systems to the 107-D Retention Basins. The main/equipment room floor contained three sumps measuring approximately 0.4 m^2 (4 ft^2) and 4.9 m (16 ft) deep. Effluent from the various 105-D Reactor Building and 115-D Gas Recirculation Building drain systems were routed to the facility either through an accumulation sump located in the 105-DR pipe tunnel or via a 0.6-m (2-ft) drain line that emptied into the north sump. Plan and elevation drawings of the former building are provided in Figures 2 and 3, respectively.

The 0.3-m (1-ft) distribution headers interconnecting the sumps and the accumulation sump were used for isolating individual sumps. Each sump contained its own independent pump. Two of the sumps used electric motor-driven pumps, and the third used a steam-driven pump. All three pumps discharged to the 107-D Retention Basins via a 0.6-m (2-ft) pipe (WHC 1988).

Figure 1. 132-D-3 Site Location Map.

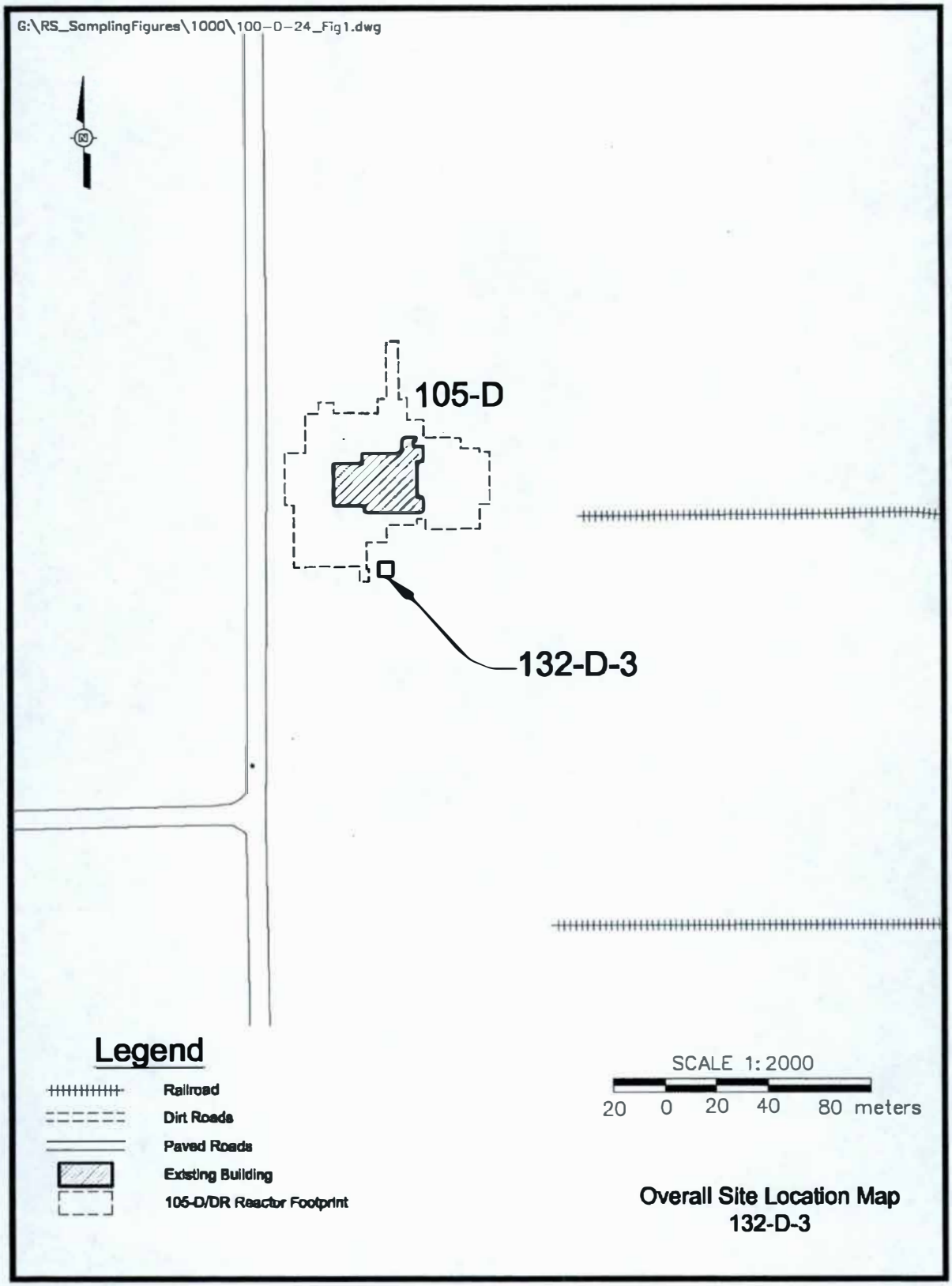


Figure 2. Plan View of the 1608-D Effluent Pumping Station.

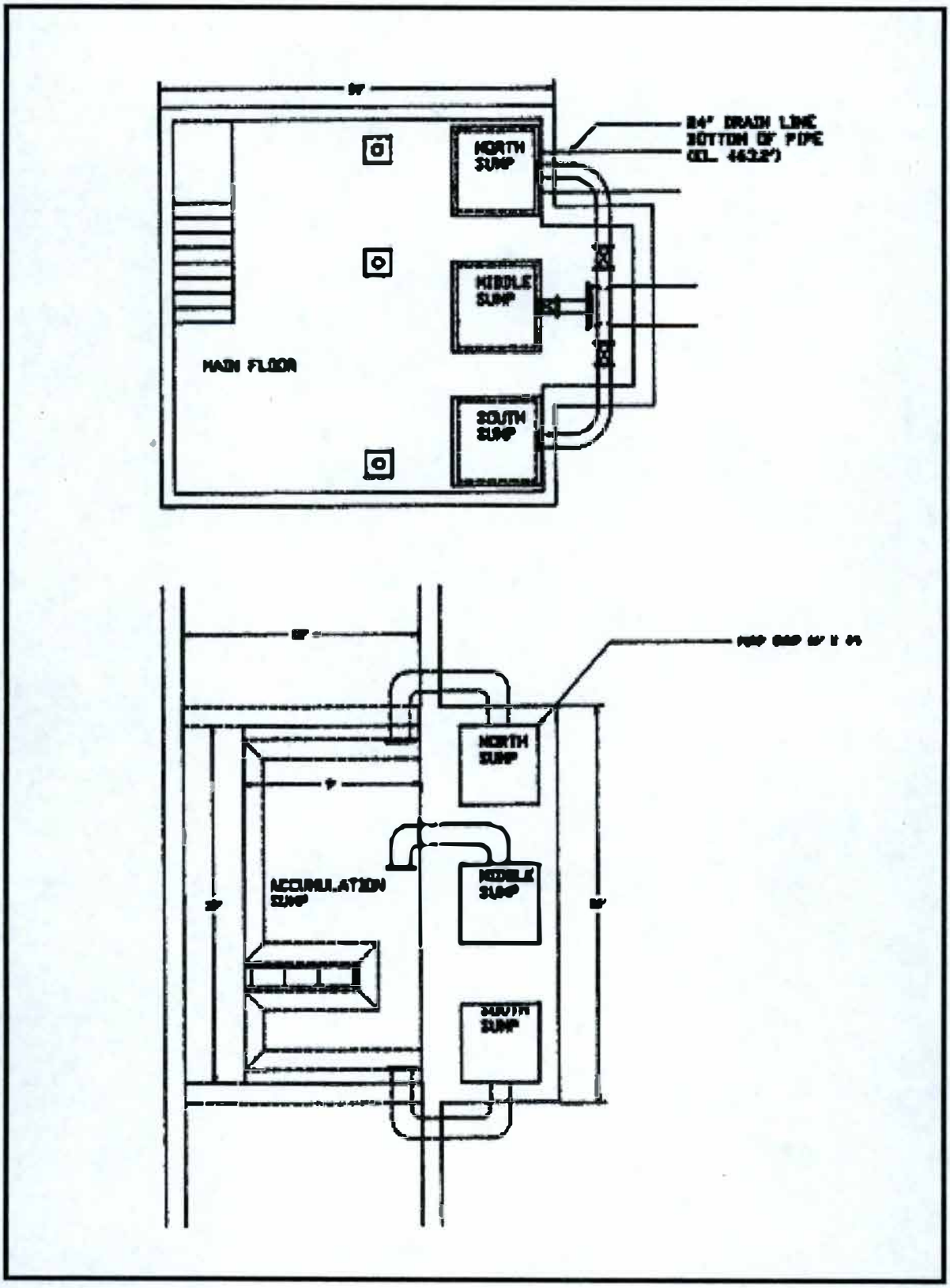
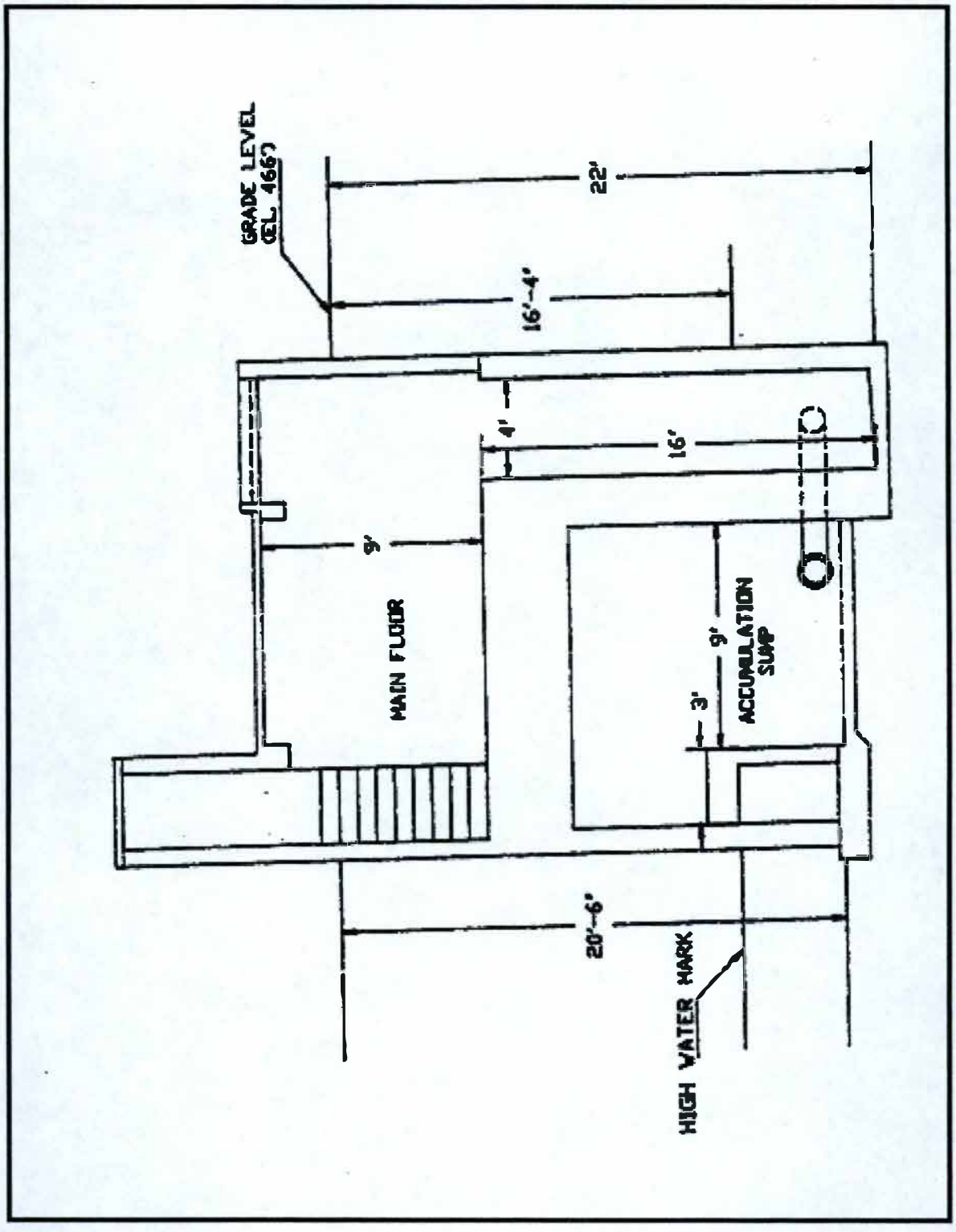


Figure 3. Elevation View of the 1608-D Effluent Pumping Station.



Decontamination and Decommissioning Background

The 1608-D Effluent Pumping Station was decommissioned in two phases in 1986. In situ decommissioning involved decontaminating the interior of the building as far as practicable, removing the major process equipment that could not be satisfactorily decontaminated, demolishing the building to below-grade level, then grading the site to match the surrounding terrain.

Initial decommissioning entailed the removal of 1.1 m^3 (40 ft^3) of asbestos for disposal at the 100-H Area. The sump cover plates, motors, pumps, and drive shafts were removed as a unit through the removable roof panels and contained in a specially made long plastic sleeve. The units were stored in the 105-D Transfer Bay until they were sectioned, packaged in three metal boxes, and shipped to the 200 Area burial grounds for disposal. The sumps were inspected and found to contain approximately 900 L (240 gal) of water. A barrel head air vacuum was used to vacuum the water directly into plastic-lined 208-L (55-gal) drums to be disposed at the 200 Area burial grounds. Approximately 15,100 L (4,000 gal) of additional water was discovered in the sumps and adjacent gas recirculation tunnel area during Phase II activities, presumably resulting from dust suppression water used during demolition of the 115-D/DR facility. Analysis of this water indicated low concentrations of beta-gamma emitters and approximately 5.0 x 10^5 pCi/L of tritium. This liquid was transferred to the 1608-DR sump for later disposal (WHC 1987).

After removal of equipment, water and sludge from the facility, extensive radiological surveys of the equipment room and sump areas and of the piping left in the facility were performed. Contamination levels in the equipment room were found to be less than 200 cpm direct contamination. Contamination levels found on the surfaces of the pump sumps and accumulation sump ranged from 5,000 to 20,000 cpm. Contamination levels of 3,000 to 5,000 cpm were observed within the distribution headers interconnecting the sumps. These survey results were then used to identify six strata corresponding to the different contamination levels found in the 1608-D Effluent Pumping Station. Samples of concrete, pipe scale, and/or soil were then collected from each of these strata. Maximum radiological activity levels detected in the concrete and pipe scale samples were similar. Only trace radiological activity was detected in soil core samples collected beneath each sump, and was concluded to be the result of contamination displaced from contaminated concrete during coring operations.

The sample results were used to support calculation of the residual dose contribution for the demolished 1608-D Effluent Pumping Station in accordance with DOE guidelines and *Allowable Residual Contamination Levels for Decommissioning Facilities on the Hanford Site* (Kennedy and Napier 1983). The ARCL calculation indicated that the demolished facility would contribute 3.68 mrem/yr dose to a hypothetical, maximally exposed site resident if the site was released for unrestricted use after the demolition and burial of the facility (WHC 1988).

Demolition activities began in December 1986 with the excavation of the periphery around the building to a depth of 1 m (3.3 ft) below grade. A 0.6-m (24-in.) pipe entering the north sump was plugged to prevent the potential for water draining into the facility after demolition. The structure was then demolished and the voids backfilled with soil, including a cover of at least 1 m (3.3 ft) thickness, graded to the surrounding terrain (WHC 1987).

BASIS FOR INTERIM CLOSURE

Allowable Residual Contamination Level Methodology

The ARCL calculation methodology was used in 1987 to determine if further decontamination or remedial action was needed prior to demolition and in situ burial (WHC 1988). The calculation scenario was designed to represent unrestricted use conditions for a hypothetical, maximally exposed individual to receipt of a dose not exceeding 25 mrem/yr to the whole body or any organ. At the time of decommissioning of the 1608-D facility, the ARCL calculation determined that the site would contribute 3.68 mrem/yr under a residential home garden scenario and less than 5 mrem/yr to an overall hectare dose rate and therefore no further decontamination to reduce the source term was necessary and the facility could be buried in situ. Additional information is provided in the characterization and closeout reports (WHC 1987, 1988).

RESidual RADioactivity Modeling Methodology

In 2005, RESRAD modeling was performed in accordance with the RDR/RAWP (DOE-RL 2005) to support the interim closure decision. The waste site was modeled considering the entire thickness of contaminated material and all exposure pathways (direct exposure to gamma radiation; dust inhalation; soil ingestion; and ingestion of plants, meat, milk, aquatic foods, and drinking water) evaluated in RESRAD. Contaminated concrete was buried in a demolished facility that extended 7 m (23 ft) below grade and was covered with 1 m (3.3 ft) of soil. The RESRAD evaluation used the 1986 sampling data adjusted for decay from 1986 to 2005. The highest decayed value for each radionuclide was conservatively used in the RESRAD modeling. Table 1 provides a summary of the maximum radionuclide results from the samples collected in 1986 with the associated present-year value accounting for decay. The decayed results for the maximum activities were used to represent uniform residual radiological contaminant concentrations throughout the 6-m (19.6-ft) thick rubble layer. Although the contamination was present in concrete on the inner building surfaces, soil distribution coefficients (K_d values) were used in the modeling as conservative inputs to predict future potential groundwater impacts. The RESRAD input parameters are presented in Appendix B.

Table 1. 1986 Sample Results and Present-Year Decayed Values.

Radionuclides	1986 Activities (pCi/g)	2005 Activities (pCi/g)
Carbon-14	14.0	13.9
Cesium-137	10,100	6,527
Cobalt-60	1,630	134
Europium-152	4,520	1,701
Europium-154	599	129
Tritium (H-3)	19.0	6.5
Plutonium-239	98.5	98.3
Strontium-90	156	99.2

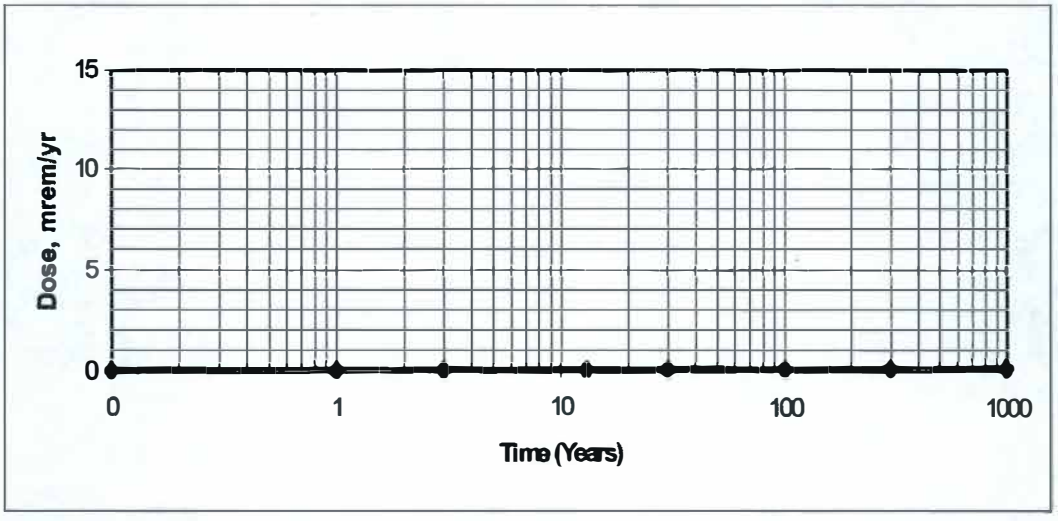
The evaluation predicts that the dose limits will not be exceeded for either the rural-residential scenario (15 mrem/yr) or the groundwater pathway (4 mrem/yr) (Appendix C). Maximum potential dose to a receptor in the rural-residential scenario is predicted to be 2.55×10^{-3} mrem/yr, which is less than the RAG of 15 mrem/yr above background. RESRAD showed that of the contaminants detected only tritium is predicted to reach groundwater within 1,000 years. The maximum tritium concentration in groundwater is predicted to be less than the RAG (20,000 pCi/L). Results are summarized in Table 2 and Figure 2.

Table 2. Summary of Attainment of Dose Limits for Radiological Contaminants of Concern for the 1608-D Effluent Pumping Station Using Soil Distribution Coefficient Values.

Scenario	Dose Limit (mrem/yr)	Maximum Dose Predicted by RESRAD (mrem/yr)	Is Dose > Dose Limit?
Rural residential	15	2.55×10^{-3}	No
Groundwater protection	4	1.41×10^{-24}	No
	MCL [a] (pCi/L)	**Maximum Concentration Predicted by RESRAD (pCi/L)**	**Is Concentration > Maximum Contaminant Level?**
Carbon-14 in groundwater	2,000	0	No
Cesium-137 in groundwater	60	0	No
Cobalt-60 in groundwater	100	0	No
Europium-152 in groundwater	200	0	No
Europium-154 in groundwater	60	0	No
Tritium (H-3) in groundwater	20,000	3.56×10^{-19}	No
Strontium-90 in groundwater	8	0	No

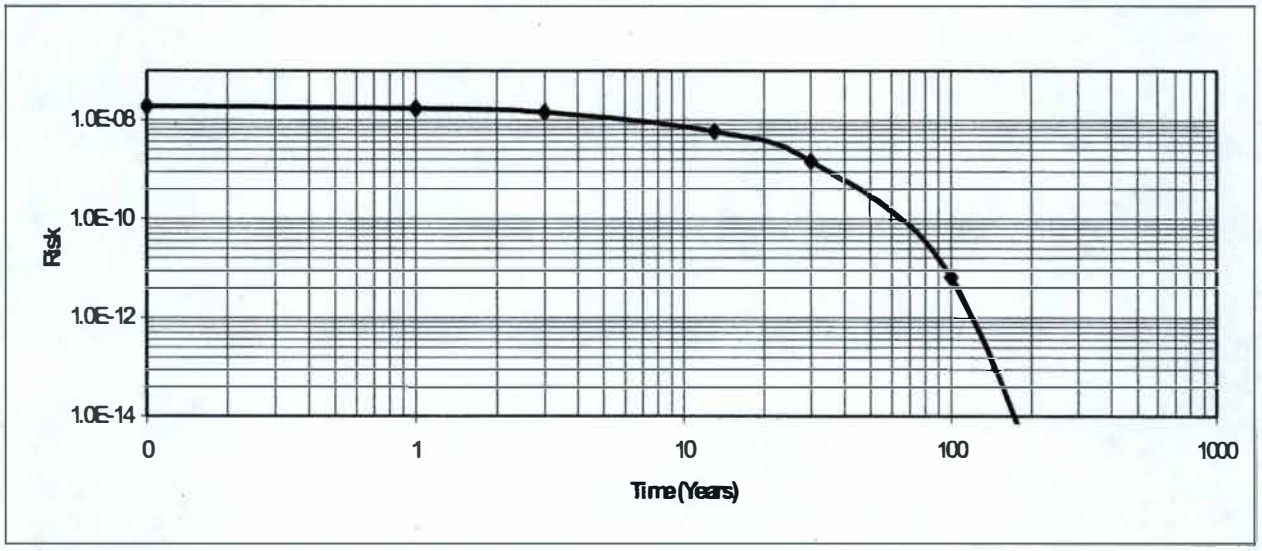
[a] Maximum contaminant levels from Table 2-3 of the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005).
MCL = maximum contaminant level
RESRAD = RESidual RADioactivity (dose model)

Figure 2. Radionuclide Dose Rate – All Pathways for the 132-D-3 Site



The RESRAD model also estimates the excess lifetime cancer risk associated with the radiation dose rates using the U.S. Environmental Protection Agency's Health Effects Assessment Summary Tables (HEAST). The "National Oil and Hazardous Substances Pollution Contingency Plan" (*40 Code of Federal Regulations 300*) presents a target range for residual risk of 10^{-4} to 10^{-6}. The radionuclide excess lifetime cancer risk results are shown in Figure 3. The maximum excess lifetime cancer risk is 1.89×10^{-8}, occurring at present year (2005). Summary information for the RESRAD modeling (BHI 2005) is presented in Appendix C.

Figure 3. Estimated Radionuclide Cancer Risk for the 132-D-3 Site.



Nonradionuclides

No detailed analyses were performed for nonradionuclides at the 1608-D Effluent Pumping Station. Analogous facilities at the 190-DR Process Water Pump House (WIDS site 100-D-68) were sampled for a series of nonradionuclide COCs (hexavalent chromium, lead, and mercury, plus other metals, semivolatile organic compounds, pesticides, and polychlorinated biphenyls) and closed as a "No Action" site with remaining concrete structures reduced to 1 m (3.3 ft) below grade. The 190-DR and 1608-D facilities pumped liquids containing approximately the same concentrations of nonradionuclides, but liquids from the 1608-D facility also contained radionuclides. All residual contaminant levels from sampling at worst case locations at the 190-DR facility were found to be below remedial action goals for direct exposure and groundwater/river protection. By analogy, residual nonradionuclide contamination at the 1608-D site is also believed to meet remedial action goals for direct exposure and groundwater/river protection.

SUMMARY FOR INTERIM CLOSURE

The 132-D-3 site residual contaminant levels are protective of direct exposure, groundwater, and the Columbia River. However, the acceptability of unrestricted direct exposure to below-grade structure surfaces in the deep zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. This decision is supported based on reviews of the facility information, historical data, and RESRAD modeling results as summarized below.

1. During decommissioning activities, contaminated material and equipment were removed from the building and transported to the Hanford Site 200 Area for disposal.

2. The residual contamination exists in concrete on the walls and floor of the 1608-D Effluent Pumping Station.

3. Using conservative inputs (e.g., maximum activity sample results, and assuming uniform contamination levels throughout the entire mass of residual concrete, and modeling of all exposure pathways), the ARCL and RESRAD outputs indicate that residual contamination levels do not present unacceptable risk to the maximally exposed individual.

4. Excavation of the site to collect more information (i.e., samples) is not likely to result in a change of the interim decision for the 132-D-3 site because the residual contamination occurred as a thin surface layer on the interior surfaces of the building sumps and would be impossible to detect in the rubble resulting from demolition of the facility.

REFERENCES

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.

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

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

DOE-RL, 2005, *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.

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.

Kennedy, W. E., Jr. and B. A. Napier, 1983, *Allowable Residual Contamination Levels for Decommissioning Facilities on the Hanford Site*, PNL-4722/UNI-2522, Pacific Northwest Laboratory, Richland, Washington.

WCH, 2005, *132-D-3 / 1608-D Lift Station RESRAD Evaluation*, Calculation No. 0100D-CA-V0263, Rev. 1, Washington Closure Hanford, Richland, Washington.

WHC, 1987, *1608-D Effluent Water Pumping Station Facility Decommissioning Report*, WHC-SD-DD-TI-013, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988, *Dose Assessment of In Situ Burial of the 1608-D Lift Station*, WHC-SD-DD-TI-015, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

WASTE INFORMATION DATA SYSTEM GENERAL SUMMARY REPORT

Waste Information Data System
General Summary Report

05/31/2005

Site Code: 132-D-3 **Site Classification: Accepted** **Page 1**

Site Names: 132-D-3, 1608-D Waste Water Pumping Station, 1608-D Effluent Pumping Station
Site Type: Pump Station
Status: Inactive
Operable Unit: 100-DR-1
Start Date: 1944
End Date: 1965
Coordinates:
(E) 573766.68
(N) 151552.500
Washington State Plane

Site Description: Prior to decommissioning, the structure extended 1.2 meters (4 feet) above grade and 9.8 meters (32 feet) below grade. The walls and floor were constructed of reinforced concrete and the roof was constructed of a wood frame with composition surface. The facility included an accumulation sump, which supplied three separate sumps.

Location Description: The unit is located adjacent to the south side of 105-D within the 105-D/DR Exclusion Fence.

Process Description: This unit received water from reactor building drains containing trace amounts of low-level radionuclides and decontamination chemicals. Water was pumped from the reactor collection pits into the reactor effluent lines near the reactor building and became part of the 107-D effluent that was discharged to the Columbia River.

Site Comment: Decommissioning was performed in two phases. Phase 1 consisted of water removal (910 liters [240 gallons]), asbestos removal/disposal (1.1 cubic meters [40 cubic feet]), and pump and piping removal, and was completed April 4, 1986. Phase 2 consisted of in situ demolition and site grading and was completed January 6, 1987. The facility was covered with 1 meter (3.3 feet) of soil.

Release Potential: There is no potential for release.

Environmental Monitoring Description: The site is radiologically surveyed monthly.

References:
1. K. H. Cramer, Hanford Site Waste Management Units Report, May 1987.
2. 2/89 Preliminary Operable Units Designation Project, WHC-EP-0216.
3. Scott Kitts to Nancy Homan, 4/17/90 100N updates for WIDS, DSI.

Waste Information:

Type: Process Effluent
Category: Radioactive
Physical State: Liquid
Description: This unit received water from reactor building drains containing trace amounts of low-level radionuclides and decontamination chemicals. Radionuclides were primarily miscellaneous fission and activation products. The decontamination chemicals consisted of sodium fluoride, oxalic acid, and citric acid.

Waste Information Data System
General Summary Report

05/31/2005

Site Code: 132-D-3 **Site Classification: Accepted** **Page 2**

Dimensions:

Length:	6.10	Meters	20.00	Feet
Width:	6.10	Meters	20.00	Feet
Depth/Height:	9.75	Meters	32.00	Feet
Sq. Area:	37.16	sqMeters	400.00	sqFeet

References: 1. Scott Kitts to Nancy Homan, 4/17/90 100N updates for WIDS, DSI.

Field Work:

Type GPS Surveys
BeginDate: 04/15/1998 **FieldCrew:** K.A. Prosser, C. Webb, W. Hayward
EndDate: 04/15/1998 **Data Repository:** HGIS
Purpose: Mapping
Comment: GPS-ed a building marker labeled "132-D-3."
Job Number: 158
Type: Real-Time Kinematic

Type: Surveillance Walkdowns
BeginDate: 04/15/1998
EndDate: 04/15/1998
Purpose: Surveillance

Regulatory Information:

Programmatic Responsibility:

DOE Program: EM-40 **Confirmed By Program:** Yes
DOE Division: ERD - Environmental Restoration Division

Responsible Contractor/Subcontractor: BHI. Bechtel Hanford, Inc.

ResponsibleProject:

Site Evaluation:

Solid Waste Management Unit: Yes
TPA Waste Management Unit Type: Waste Disposal Unit
This site was consolidated with:

Reason:

Permitting:

RCRA Part B Permit:	No	**TSD Number:**	
RCRA Part A Permit:	No	**Closure Plan:**	No
RCRA PermitStatus:			
Septic Permit:	No	**216/218 Permit:**	No
Inert LandFill:	No	**NPDES:**	No
Air Operating Permit:	No	**State Waste Discharge Permit:**	No

Waste Information Data System
General Summary Report

05/31/2005

Site Code: 132-D-3 **Site Classification: Accepted** **Page 3**

Tri-Party Agreement:

Lead Regulatory Agency: Ecology
Unit Category: CERCLA Past Practice (CPP)
TPA Appendix: C

Remediation and Closure:

Decision Document: Interim Action Record of Decision, 100 Area Remaining Sites (1999)
Decision Document Status: Final
Remediation Design Group: Group 5
Closure Document:
Closure Type:
Post Closure Requirements:

Residual Waste:

Images:

Pathname: \\apwids01\widsimg\100D\0233\0233_01.JPG DateTaken: 04/16/1998
Description: Photo shows the vicinity of the demolished 1608-D Effluent Pumping Station.

Pathname: \\apwids01\widsimg\100D\0233\0233_02.JPG DateTaken: 04/16/1998
Description: Photo shows a medallion marker in the ground with 132-D-3 inscribed on it.

APPENDIX B

1608-D EFFLUENT PUMPING STATION RESRAD INPUT PARAMETERS

Table 1. RESRAD Input Parameters for 132-D-3 / 1608-D Lift Station. (3 pages)

Parameter	Units	Rural Residential Scenario Input Parameter Values[a]
Exposure pathways		
External gamma		Yes
Inhalation of dust		Yes
Plant ingestion		Yes
Meat ingestion		Yes
Milk ingestion		Yes
Aquatic foods		Yes
Drinking water		Yes
Soil ingestion		Yes
Radon		No
Cover		Soil
Cover depth	m	1
Density of cover material	g/cm^3	1.6
Cover erosion rate	m/yr	0
Contaminated zone		
Area of contaminated zone	m^2	36
Thickness of contaminated zone	m	6
Length parallel to aquifer flow	m	6
Density	g/cm^3	2.4 (concrete[b])
Erosion rate	m/yr	0
Total porosity	--	0.3 (concrete)
Field capacity	--	0.16 (concrete)
Hydraulic conductivity	m/yr	41 (concrete)
Soil-specific b parameter	--	11.4 (concrete)
Hydrogeologic data		
Evapotranspiration coefficient	--	0.91
Wind Speed	m/sec	3.4
Precipitation	m/yr	0.161
Irrigation	m/yr	0.76
Irrigation mode	--	Overhead
Runoff coefficient	--	0.2
Watershed area (nearby)	cm^2	1E+06
Accuracy for soil/water computations	--	0.001
Saturated zone		Soil
Density	g/cm^3	1.6
Total porosity	--	0.4
Effective porosity	--	0.25
Field capacity	--	0.15
Hydraulic conductivity	m/yr	5530
Hydraulic gradient	--	0.00125
Soil-specific b parameter	--	4.05
Water table drop rate	m/yr	0.001
Well pump intake depth (below water table)	m	4.6
Nondispersion (ND) or mass balance (MB)	--	ND
Well pumping rate	m^3/yr	250
Unsaturated zone		
Unsaturated zone strata		Soil
Thickness	m	19
Density	g/cm^3	1.6

Table 1. RESRAD Input Parameters for 132-D-3 / 1608-D Lift Station. (3 pages)

Parameter	Units	Rural Residential Scenario Input Parameter Values[a]
Total porosity	--	0.4
Effective porosity	--	0.25
Field capacity	--	0.15
Hydraulic conductivity	m/yr	250
Soil-specific b parameter	--	4.05
Distribution coefficients[c]		Soil
Carbon-14	cm^3/g	200
Cobalt-60	cm^3/g	50
Cesium-137	cm^3/g	50
Europium-152	cm^3/g	200
Europium-154	cm^3/g	200
Tritium (H-3)	cm^3/g	0
Plutonium-239	cm^3/g	200
Strontium-90	cm^3/g	25
Time since material placement	yrs	0
Radionuclide Concentrations (Decayed to July 2005)		
Carbon-14	pCi/g	13.9
Cesium-137	pCi/g	6527
Cobalt-60	pCi/g	134
Europium-152	pCi/g	1701
Europium-154	pCi/g	129
Tritium (H-3)	pCi/g	6.5
Plutonium-239	pCi/g	98.3
Strontium-90	pCi/g	99.2
Occupancy and Inhalation Data		
Inhalation rate	m^3/yr	7300
Mass loading for inhalation	g/cm^3	0.0001
Exposure duration	yr	30
Shielding factor, inhalation	--	0.4
Shielding factor, external gamma	--	0.8
Fraction of time indoors	--	0.6
Fraction of time outdoors	--	0.2
Food consumption		
Fruits, vegetables, and grain	Kg/yr	110
Leafy vegetables	Kg/yr	2.7
Milk	L/yr	100
Meat	Kg/yr	36
Fish	Kg/yr	19.7
Other aquatic food	Kg/yr	0.9
Soil ingestion	g/yr	73
Drinking water intake	L/yr	730
Contaminated fraction of food and water		
Drinking water	--	1
Household water	--	1
Livestock water	--	1
Irrigation water	--	1
Aquatic food	--	1
Plant food	--	1
Meat	--	1
Milk	--	1

Table 1. RESRAD Input Parameters for 132-D-3 / 1608-D Lift Station. (3 pages)

Parameter	Units	Rural Residential Scenario Input Parameter Values[a]
Ingestion parameters, nondietary		
Livestock fodder intake for meat	Kg/d	68
Livestock fodder intake for milk	Kg/d	55
Livestock water intake for meat	L/d	50
Livestock water intake for milk	L/d	160
Livestock soil intake	Kg/d	0.5
Mass loading for foliar deposition	g/cm^3	0.0001
Depth of soil mixing layer	M	0
Depth of roots	M	0.9
Groundwater fractional usage		
Drinking water	--	1
Household water	--	1
Livestock water	--	1
Irrigation	--	1
Storage times of contaminated foodstuffs		Not used
Radon emanation data		Not used

[a] All general 100 Area input parameters (non-site specific) are from Appendix B of the *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, WA.

[b] Input parameters for concrete are from Appendix B of the *Guidance for Radiological Release of DOE Real Property at Hanford*, DOE/RL-97-93, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, WA.

[c] Distribution coefficients for soil are from Appendix E of the *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, WA.

APPENDIX C

SUMMARY OF 1608-D EFFLUENT PUMPING STATION RESRAD EVALUATION

CALCULATION COVER SHEET

Project Title 100-D/DR Remedial Action **Job No.** 14655
Area 100-D Area
Discipline Environmental ***Calc. No.** 0100D-CA-V0263
Subject 132-D-3 / 1608-D Lift Station RESRAD Evaluation
Computer Program RESRAD **Program No.** Version 6.22

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

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

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover – 1 pg Summary – 5 pg Attm. 1 - 1 pg Attm. 2 - 21 pg Attm. 3 - 27 pg Attm. 4 - 17 pg Total – 72 pages	S. W. Clark *Approved* *7/25/05*	T. M. Blakley *Approved* *7/26/05*	K. E. Cook *Approved* *7/27/05*	R. A. Carlson *Approved* *7/28/05*	*Approved* *7/28/05*
1	Cover – 1 pg Summary – 5 pg Attm. 1 - 1 pg Attm. 2 - 23 pg Attm. 3 - 28 pg Attm. 4 - 17 pg Total – 75 pages	S. W. Clark 9/19/05	T. M. Blakley 9/20/05	K. E. Cook 9/20/05	R. A. Carlson	9/20/05

SUMMARY OF REVISION	
1	It was necessary to revise this calculation brief to correct input values for several radionuclides that were stated in the wrong order and to include plutonium-239 using the gross alpha activity as the plutonium-239 activity. For convenience, the calculation brief has been replaced in its entirety.

*Obtain Calc. No. from DIS

DE01-437.03 (12/09/2004)

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark SWC	Date:	9/19/05	Calc. No.:	0100D-CA-V0263	Rev.:	1
Project:	100-D/DR Remedial Action	Job No:	14655	Checked:	T. M. Blakley TMB	Date:	9/20/05
Subject:	132-D-3 / 1608-D Lift Station RESRAD Evaluation					Sheet No.	1 of 5

PURPOSE:

Evaluate the potential dose and risk to a receptor in a rural residential scenario from contaminants in concrete rubble at 132-D-3, the former 1608-D Lift Station site, and determine if contamination is predicted to reach groundwater within 1,000 years. Use data available from samples taken in June of 1986 for an Allowable Residual Contamination Level (ARCL) method evaluation of the decommissioned building site.

GIVEN/REFERENCES:

1) Decommissioning information, sample data, and dates from *Dose Assessment of In Situ Burial of the 1608-D Lift Station*, WHC-SD-DD-TI-015, Rev. 0, Westinghouse Hanford Company, Richland, Washington.
2) Facility description from *D Area Technical Baseline Report*, WHC-SD-EN-TI-181, Rev. 0, 1993, Westinghouse Hanford Company, Richland, Washington.
3) *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.
4) For the purpose of these RESRAD calculations, there are no nonradionuclide contaminants of concern.
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.

BACKGROUND:

The 132-D-3 / 1608-D Lift Station operated from 1944 until the 105-D Reactor was shut down in 1965 to collect water from reactor building drains and the 115-D gas recirculation building and pump it into the process effluent pipelines that discharged into the 116-D-7 (107-D) Retention Basin for discharge to the river. Most of the reinforced concrete structure (7 m [23 ft]) was below grade and only 1.22 m (4 ft) was above grade. The facility was decommissioned in 1986 and 1987. Residual sump water was disposed in the 1325-N Liquid Waste Disposal Facility. All equipment and sludge from the facility sumps was disposed in the 200 Area and the remaining structure was decontaminated and sampled (in 1986).

A total of 43 samples were taken from the decontaminated concrete surfaces to determine if ARCL criteria for decommissioning were met. Residual contamination was confined to the concrete on the surface of the walls and the floor of the facility sumps. Sampling showed the contamination was confined to a 0.013 m (0.5 inch) surface layer of the concrete. However, the RESRAD evaluation used the maximum concentrations of radionuclides from the surface concrete to conservatively model the residual concrete as if the entire mass of the concrete was contaminated. This was the conceptual model for evaluations of dose, risk, and groundwater protection. Holes were punched in the floor to

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark SWC	Date:	9/19/05	Calc. No.:	0100D-CA-V0263	Rev.:	1
Project:	100-D/DR Remedial Action	Job No:	14655	Checked:	T. M. Blakley TMB	Date:	9/20/05
Subject:	132-D-3 / 1608-D Lift Station RESRAD Evaluation					Sheet No.	2 of 5

allow precipitation to drain and the facility was demolished to 1 m (3.3 ft) below grade and covered with at least 1 m (3.3 ft) of clean fill.

SOLUTION:

1) Table 1 shows the waste site parameters used for RESRAD modeling. The model for the RESRAD runs assumes that the residual contamination levels from the data set are confined to the paint layer on the concrete from decommissioning of the building as described in *Dose Assessment of In Situ Burial of the 1608-D Lift Station,* WHC-SD-DD-TI-015, Rev. 0.

2) Table 2 shows the maximum radionuclide activities from WHC-SD-DD-TI-015, Rev. 0. A statistical sample design was not implemented so maximum activities for each radionuclide were used for RESRAD evaluations. Radionuclide activities were decayed from 1986 to the present date (19 years) to be used as shown in Table 2. Input factors for each RESRAD run are shown in the "Summary" section of the RESRAD "Mixture Sums and Single Radionuclide Guidelines," which are included as printouts in the Attachments to this Calculation Summary.

3) The year where the peak dose (or groundwater concentration) occurs from each individual radionuclide was determined by a preliminary run. This year was then included in all 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 2005) for all radionuclides. None of the radionuclides were predicted to reach groundwater within 1,000 years.

Table 1. Waste Site Dimensions for RESRAD Modeling

Parameter	Units	Value	Comments
Cover Depth	m	1	Minimum cover for conservative evaluation
Area of Contaminated Zone	m^2	36	Based on site area including building and tunnels [a]
Length Parallel to Aquifer Flow	m	6	Based on groundwater flow direction
Elevation: Surface	m	142.0	NAVD88
Elevation: Bottom of waste	m	135.0	NAVD88
Elevation: Groundwater	m	116.0	NAVD88
Thickness: Contaminated Zone	m	6.0	Based on 1 m cover [a]
Thickness: Unsaturated Zone	m	19	From foundation bottom to groundwater

[a] *Dose Assessment of In Situ Burial of the 1608-D Lift Station,* WHC-SD-DD-TI-015, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Washington Closure Hanford		CALCULATION SHEET					
Originator:	S. W. Clark	Date:	9/19/05	Calc. No.:	0100D-CA-V0263	Rev.:	1
Project:	100-D/DR Remedial Action	Job No:	14655	Checked:	T. M. Blakley	Date:	9/20/05
Subject:	132-D-3 / 1608-D Lift Station RESRAD Evaluation					Sheet No.	3 of 5

METHODOLOGY:

1). Runs of RESRAD version 6.22 were completed for the shallow zone using the radionuclide concentrations shown in Table 2. RESRAD numerical output reports for dose, risk, and concentration for the shallow zone are presented in the Attachments to this calculation summary.

Table 2. Radionuclide Activity.

Radionuclides	1986 Activities (pCi/g)	Activities Decayed to 2005 (pCi/g)
Carbon-14	14.0	13.9
Cesium-137	10,100	6,527
Cobalt-60	1,630	134
Europium-152	4,520	1,701
Europium-154	599	129
Tritium (H-3)	19.0	6.5
Plutonium-239	98.5	98.3
Strontium-90	156	99.2

RESULTS:

1) Radionuclide "All Pathways" Dose Rate: The "all pathways" dose rates are shown in Table 3. The maximum all-pathways dose rate for the shallow zone is 2.55×10^{-3} mrem/yr occurring at year zero (2005).

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

Vadose Zone Horizon	"All Pathways" Dose Contributions in mrem/yr at each time slice (yr)							
	0	1	3	13	30	100	300	1000
Shallow Zone Total Dose	2.55E-03	2.27E-03	1.81E-03	6.77E-04	1.61E-04	7.03E-07	1.82E-13	5.93E-23

2) Radionuclide Excess Cancer Risk: The radionuclide excess lifetime cancer risk results are shown in Table 4. The maximum excess lifetime cancer risk (1.89×10^{-8}) occurs at year zero (2005).

Table 4. Radionuclide Excess Lifetime Cancer Risk

Vadose Zone Horizon	Excess Cancer Risk at Each Time Slice (yr)							
	0	1	3	13	30	100	300	1000
Shallow Zone Total Excess Cancer Risk	1.89E-08	1.71E-08	1.41E-08	5.77E-09	1.44E-09	6.52E-12	1.70E-18	8.71E-28

Washington Closure Hanford		CALCULATION SHEET					
Originator:	S. W. Clark	Date:	9/19/05	Calc. No.:	0100D-CA-V0263	Rev.:	1
Project:	100-D/DR Remedial Action	Job No:	14655	Checked:	T. M. Blakley	Date:	9/20/05
Subject:	132-D-3 / 1608-D Lift Station RESRAD Evaluation					Sheet No.	4 of 5

3) Figures 1 and 2 show the all pathways dose rate and radionuclide excess cancer risk for the rural residential scenario.

Figure 1. RESRAD Analysis – Dose Rate, All Pathways.

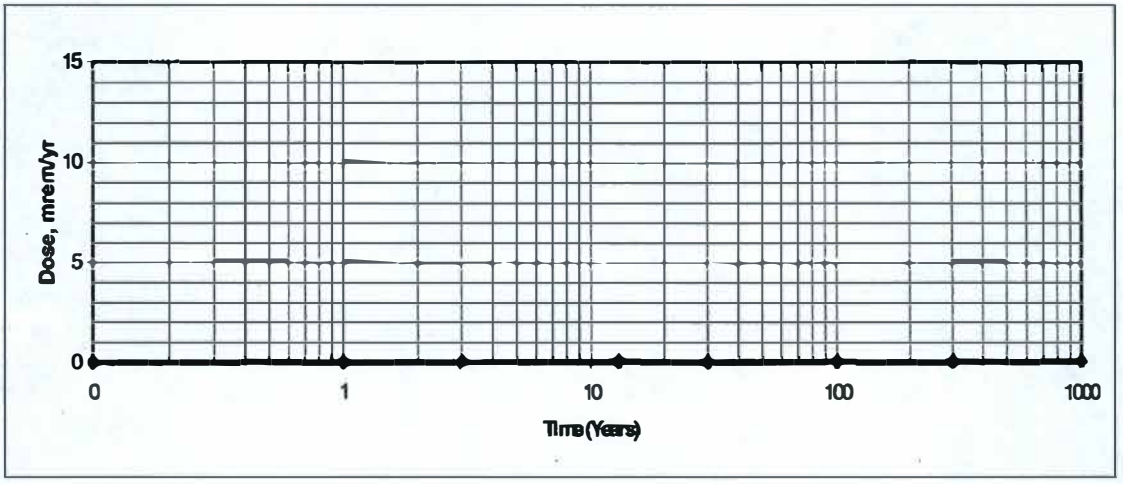
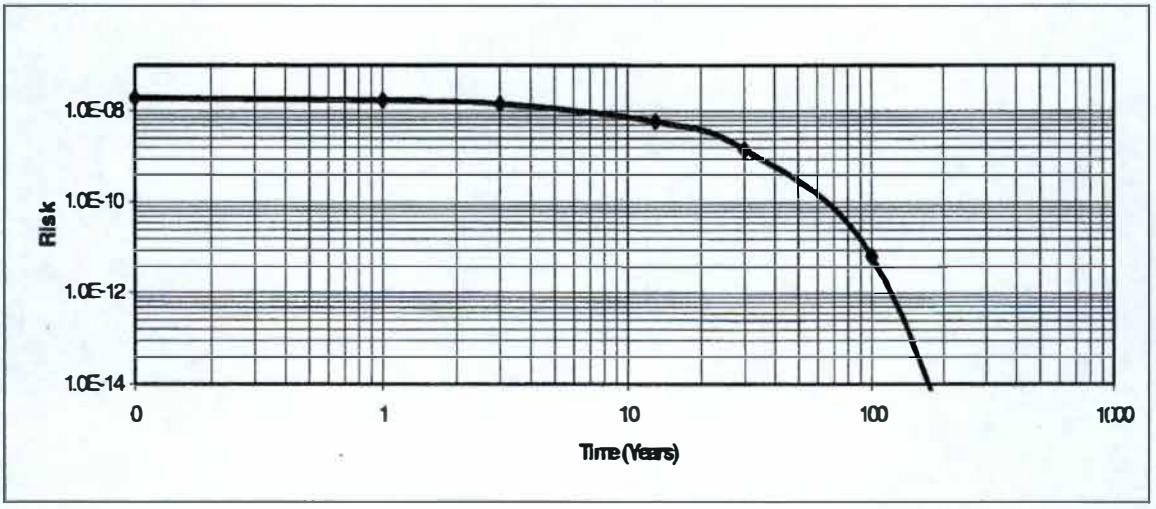


Figure 2. RESRAD Analysis – Radionuclide Risk, All Pathways.



Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	9/19/05	Calc. No.:	0100D-CA-V0263	Rev.:	1
Project:	100-D/DR Remedial Action	Job No:	14655	Checked:	T. M. Blakley	Date:	9/20/05
Subject:	132-D-3 / 1608-D Lift Station RESRAD Evaluation					Sheet No.	5 of 5

4) Radionuclide Groundwater Protection: The radionuclide concentrations in groundwater calculated by the RESRAD model are summarized in Table 5. Of the radionuclides only tritium (H-3) was predicted to reach groundwater within 1,000 years.

Table 5. RESRAD Predicted Radionuclide Groundwater (Well Water) Concentrations

Radio-nuclides	Vadose Zone Horizon	Groundwater Concentrations in pCi/L at Each Time Slice (yr)								RAGs From RDR, (pCi/L)
		0	1	3	13	30	107	300	1000	
C-14	Total	0	0	0	0	0	0	0	0	2,000
Cs-137	Total	0	0	0	0	0	0	0	0	60
Co-60	Total	0	0	0	0	0	0	0	0	100
Eu-152	Total	0	0	0	0	0	0	0	0	200
Eu-154	Total	0	0	0	0	0	0	0	0	60
H-3	Total	0	0	0	0	3.56E-19	0	0	0	20,000
Pu-239	Total	0	0	0	0	0	0	0	0	15
Sr-90	Total	0	0	0	0	0	0	0	0	8

CONCLUSIONS:

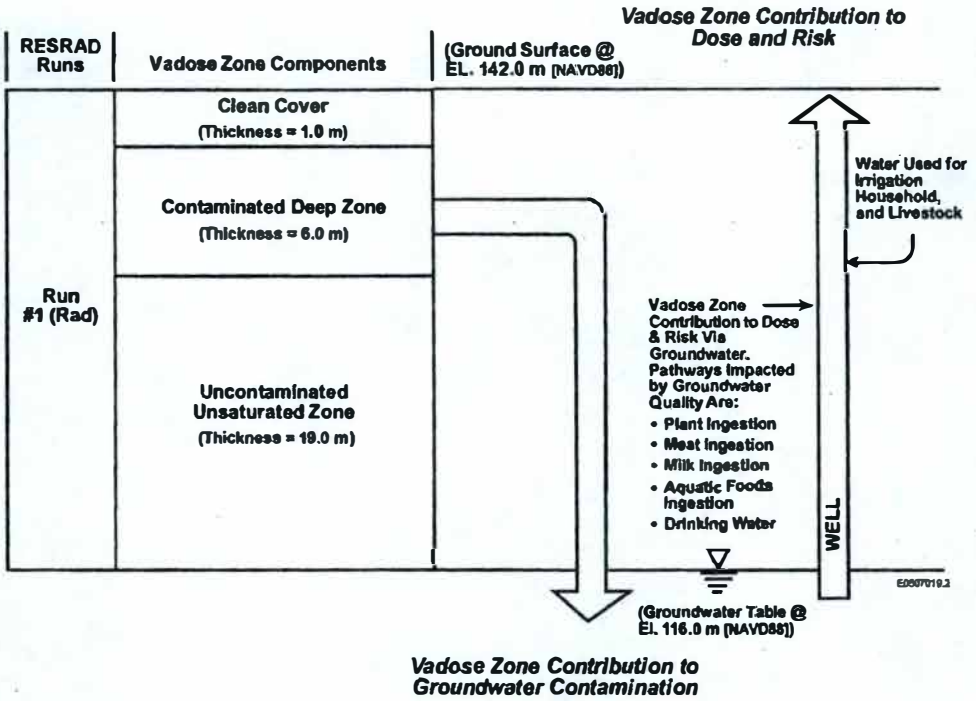
- The maximum all-pathways dose rate for the shallow zone is 2.55×10^{-3} mrem/yr which occurs at year zero (2005).
- The dominant pathway for the dose rate is direct external exposure.
- The primary radionuclide contributing to the plant ingestion pathway is europium-154.
- None of the site radionuclides are projected to exceed remedial action goals (RAGs).
- The maximum excess lifetime cancer risk (1.89×10^{-8}) occurs at year zero (2005).
- Of the radionuclides, only tritium (H-3) was predicted to reach groundwater within 1,000 years, at a concentration much below the applicable RAG.

ATTACHMENTS:

1. Graphic showing 132-D-3 RESRAD Evaluation Model (1 page)
2. RESRAD Output: 132-D-3 Shallow Zone Radionuclides, Mixture Sums and Single Radionuclide Guidelines (23 pages)
3. RESRAD Output: 132-D-3 Shallow Zone Radionuclides, Intake Quantities and Health Risk Factors (28 pages)
4. RESRAD Output: 132-D-3 Deep Zone Radionuclides, Concentration of Radionuclides, (17 pages)

ATTACHMENT 1

132-D-3 RESRAD Calculation Conceptual Model



Attachment 1 Sheet No. 1 of 1
Originator S. W. Clark Date 9/19/05
Chk'd By T. M. Blakley Date 9/19/05
Calc. No. 0100D-CA-V0263 Rev. No 1