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Data Quality Objectives Workshop Results for 1301-N and 1325-N Characterization

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1.0 BACKGROUND

Background information includes the purpose of the DQO process, discussions from previous workshops on the same project, facility descriptions, and general existing data summaries.

1.1 PURPOSE OF DQO PROCESS

The Data Quality Objectives Process (DQO) is used to assess how much data is required, the uses of the data and how decisions will be made. Data collection supports the Limited Field Investigation (LFI) for 1301-N and 1325-N in the 100-NR-1 Operable Unit.

To support the LFI, a previous workshop using the Streamlined Approach to Environmental Restoration (SAFER) was held June 13 to 19, 1994. The agreements made were documented in the appendix of the Description of Work (DOW), Draft A dated August 1994. The DOW presented the number and type of samples with sampling strategies. The general sampling and analysis designs were discussed in the SAFER workshop. Cost and exposure rates were not evaluated in detail during the SAFER discussions. Past data was also not compiled for the SAFER workshop.

The U.S. Department of Energy (DOE) requested that the Environmental Restoration Contractor (ERC) use the DQO process to further evaluate the decisions and data needs. The goal was a more cost-effective sampling design that decreased personnel exposure, which met the initial SAFER objectives. The DOE met with the ERC technical staff. Many meetings and working sessions occurred between May 10 and June 21, 1995.

The SAFER decisions were consistent with those of the DQO Process and are presented in Section 5.0. Since the SAFER meetings, Ecology and EPA have provided a list of information and decisions that were a priority from their perspective before the new DQO meetings. Initial discussions with the regulators indicated that unless more information was available, Ecology and EPA would not be involved in the initial DQO meetings. After historical data was compiled and a technical team evaluated the conceptual model, DQO meetings were held with Ecology and EPA on June 21, 1995. These meetings are still in process.

1.2 PREVIOUS SAFER WORKSHOP

Two key decisions were identified in the SAFER workshop and remained the predominant drivers in the process. These are provided in Section 4.0. To better understand the SAFER output, discussions were held with the facilitator of the previous workshop. The SAFER facilitator indicated that a better compilation of the data was needed and that more detailed assessment of the sampling and analysis was needed. The SAFER workshop was allowed 3 days, which was insufficient for data compilation.

Both the SAFER workshop and this DQO process agreed that strontium-90, cesium-137, cobalt-60, and plutonium-239/240 were primary analyses and dangerous waste (lead, cadmium, chromium, and nickel) was a secondary issue.

1.3 OVERVIEW OF EXISTING DATA

There are many sources of environmental data relating to 1301-N/1325-N that were used in the DQO workshop. These sources include historical documents containing process information, monitoring data, and characterization studies and personal communication with operations and environmental personnel.

As a part of the DQO process, the environmental data to be used in the DQO workshop was compiled. To compile the existing data, monitoring and concentration data were entered into an electronic data base that was reviewed for entry errors and obvious data QA/QC problems. To comprehend and evaluate the large volume of data, summary tables and figures were prepared. These summaries included the following:

- Estimated amounts of hazardous waste discharged to 1301-N and 1325-N
- 1301-N/1325-N contaminant loading data
- 1301-N trench and 1325-N crib sediment concentrations
- Soil concentrations in cross section for cobalt-60, cesium-137, and strontium-90 from the cribs/trenches to the river.

Additional data, decay calculations, and details of the original data used to prepare summary tables are presented in Attachment 1.

Additional data is available relating to 1301-N/1325-N that was not used in the DQO workshop and is not presented in Attachment 1. This data will be compiled during the LFI report scheduled to begin after this characterization effort. This data includes surface soil samples, air monitoring data, dose rate measurements, TLD monitoring data, effluent monitoring data, laboratory experiments of chemical and physical properties, vegetation samples, bioassays, groundwater monitoring data, and monitoring data from N-Springs and the Columbia River.

1.4 PERSONNEL INTERVIEWS

A Westinghouse Hanford Company (WHC) operator that collected the sediment samples at 1325-N was present at a DQO meeting. The operator provided the following facts about 1325-N to the workshop:

- Sampling ceased in 1987 because of as low as reasonably achievable (ALARA) and dose rate concerns.
- The trench was added after 3 months of crib operation because the crib was flooding because of low percolation rates.
- Flow was diverted back to 1301-N crib when flooding occurred; only 20% of effluent volume was discharged in the crib from 1983 to 1985.
- Sediments were collected and analyzed for metals before protocols and are not good sources of data.
- The WHC/United Nuclear Corporation (UNC) effluent monitoring reports are good sources of data.
- Blue books contain details about 1301-N and 1325-N operations.
- Could not confirm any reports of sludge dumping, truck burials, or other unsubstantiated rumors.
- There were no more effluent releases to 1301-N after 1985.

Another WHC employee was interviewed outside of the DQO workshop and provided information on the 1301-N crib design. The employee explained that the 1301-N crib was excavated to an elevation of 137.2 m (450 ft) with a berm rising to 138.8 m (455 ft). Then boulders were added, nearly filling the rectangular basin. A 1.2-m (4-ft) depth is the best estimate for the 1301-N crib rock depth, with much more rock immediately surrounding the horse trough. An additional layer of boulders was added over the boulders in the early 1980s to cover surface contamination on the rocks caused by periodic flooding with water from N Reactor decontamination flushes. That added about 0.61 to 1 m (2 to 3 ft) of rock from the head end of the crib near the horse trough to about 30.5 m (100 ft) of the length of the crib. About 1987, the entire crib was covered with smaller rock to add an additional depth of 1.2 to 1.5 m (4 to 5 ft). An original drawing that shows some of this detail is H-1-3-589.

During N Reactor operations, sodium dichromate was used in the primary coolant system to inhibit corrosion of aluminum until the early 1970s. Therefore, sodium dichromate was discharged to 1301-N only, since 1325-N was not built until the 1980s.

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2.0 DETAILED REVIEW OF EXISTING DATA

To formulate a conceptual model for the DQO and to understand which data is available to make decisions, the cumulative of critical radioisotopes, dangerous waste permit contaminants, sediment sampling in the cribs and trenches, soil boring and ground water data was reviewed. Each data type are briefly discussed. Detailed data tables are provided in Attachment 1.

2.1 CUMULATIVE INVENTORY

Summaries of annual and cumulative releases of cobalt-60, cesium-137, strontium-90, and plutonium-239/240 discharged to 1301-N and 1325-N are presented in Attachment 1 in Table A1-9. This table shows that significant quantities of cobalt-60, cesium-137, and strontium-90, and lesser amounts of plutonium-239/240 were discharged to the facilities. The cumulative releases for strontium-90, cobalt-60, cesium-137, and plutonium-239/240 are taken from Tables 2 and 3 from Diediker and Hall (1985). No other document for the 100-N Area summarizes the cumulative releases to the liquid waste disposal facilities (LWDF). All other documents report the annual release. For 1985 to the present, each year's release has been taken from the annual reports and a new cumulative release table for each radionuclide has been calculated using the same formula given in UNI-3533. All releases in this table have been decayed to 1995 using the following formula:

$$C_{1995} = C_{Year\ of\ Release} * e^{\left\{\frac{-0.693}{Half\text{-}Life(y)} \cdot (1995 - (Year\ of\ Release))\right\}}$$

The UNI-3533 does not explain how the data from 1964 to 1966 were extrapolated. However, it appears these numbers were extrapolated from the 1967 and 1968 release. There is a great deal of uncertainty in the release report from 1964 to 1966 since no records were kept at that time.

2.2 CONTAMINANT INVENTORY FROM RCRA PART A PERMIT

The RCRA Part A permit, revision 5, lists the estimated total pounds per year of discharge by waste classification when the facility was operational. Table A1-10 in Attachment 1 provides estimated amounts of acetone, corrosive, cadmium, lead, mercury, hydrazine, carcinogens, and toxins discharged to 1301-N and 1325-N. In addition to these discharges, sodium dichromate was discharged to 1301-N. This information can be used to examine the cribs and trenches for dangerous waste and to establish the potential contaminants of concern.

2.3 SEDIMENT SAMPLING

During operation of the facilities, sediment samples were collected through the manholes. Figure A1-1 in Attachment 1 provides drawings of the sediment sampling locations in the 1301-N trench and the 1325-N crib. Sediment samples were not collected in the 1301-N crib because it is covered with boulders or the 1325-N trench because only one-third of the trench was used.

For each sediment sample at each location, cesium-137, cobalt-60, strontium-90, and plutonium-239/240 was averaged and graphed by location (Figures A1-2 and A1-3). All data was decayed to May 30, 1995. Sediment data for 1301-N from 1980 to 1985 and 1325-N crib data from 1985 to 1987 was averaged at each sampling location. Interviews with staff who collected the samples in 1325-N crib indicated that metal or plastic scoops were used to dip into the top of the sediment through the existing manholes. Very little sediment was collected because of the rocks and water under the concrete.

The following trends were observed in 1301-N. Cobalt-60 and strontium-90 generally decreased as one moved down the 1301-N trench away from the crib. Cesium-137 had two samples from 2 years, 1983 with a concentration of 83μCi/g and 1984 with 3μCi/g, which were much higher than the remainder of the data. Plutonium was much higher at TS-04 in 1982 at 2.8 μCi/g while other concentrations were in the nCi/g range. Table A1-13 presents the 1301-N sediment data.

Cobalt-60, and cesium-137 were consistently high at CS-1 in 1325-N crib. Cobalt-60 ranged from 9.1 μCi/g to 0.82 μCi/g. Strontium-90 and plutonium-239/240 were both significantly higher at CS-7 and 8 in 1325-N crib. There is no common physical reason that these should be higher than the other locations. Table A1-14 presents the 1325-N sediment data.

2.4 SOIL BORINGS AND CROSS SECTIONS

Digitized maps were made of the surface topography, the top of the Ringold gravel Unit E, the top of the Ringold Mud Unit, the present day water table, and the historical high water table. Once these digitized maps were made of each surface, a geologic cross section showing the relationships between the geologic units, the high water table, the present day water table, and the contaminants concentrations within the 100-N Area was created. The digitized grid of these surfaces was created by importing the scatter data (well locations, geologically interpreted contour lines, and aerial photography) into the program Earth Vision™. Earth Vision™ interpolates (using a minimum tension algorithm) the scatter data to a digitized grid in two-dimensional space. The scattered data used to create these grids came from the following sources:

Surface Topography: This comes from the AutoCad DXF files from the 1989-1990 fly over of the site. The 2.5 m (8.2 ft) contour lines from these files were used to create this map.

Hanford-Ringold Contact: This is modified from Figure 3 (Knepp et al. 1995). The contour lines and well elevations from this figure, along with the new data from wells 199-N-103A, 199-N-104A, and 199-N-105A, were used to create this map.

Ringold Gravel-Mud Contact: This surface was created by taking the data given in Figure 2-5 (Hartman and Lindsey 1993) and adding the data from wells 199-N-91, 199-N-92, 199-N-93, 199-N-94, 199-N-95, 199-N-96, 199-N-97, 199-N-99, 199-N-103A, 199-N-104A, and 199-N-105A.

Present Day Water Table: The data for this surface came from querying HEIS data base for the December 1994 Water Level Measurements.

Operational Water Table: The data for this came from querying the HEIS data base for all water level measurements during the operational history of the LWDFs. The most complete set of water level measurements came from 1969. This set was used for the 3-D representation of the 100-N Area. It was later modified by taking only the maximum water level measurement during operations.

Because the grids are created by the computer, the grids have to be checked manually to ensure they make sense. This is done by a number of different methods. The first method is to confirm the grids honor all the scatter data points. If the grid honors the data points, it was checked to verify the contouring algorithm did not create any artifacts (i.e., making features such as depressions or highs in the surfaces that are not supported by the scatter data). Finally, the last check was to build a series of layers in 3-D space that represents the site. This last step was to authenticate that all of the cross-cutting relationships between the geologic units, as wells as the water table, were correct. This was done by merging the different layers together and by visually inspecting the 3-D site representation. Once the 3-D representation of the site was reasonably accurate, it was manipulated to extract cross sections, place the contaminants in the appropriate layers, and estimate volumes of contaminant mass.

Figure A1-4 shows the location of the two cross sections discussed in this section. Figures A1-5 and A1-6 present the concentrations of radionuclides in the vadose zone downgradient from 1301-N/1325-N to the Columbia River. These figures show negligible concentrations (decayed to May 1995) of cobalt-60 and cesium-137 in the old groundwater mound region (12.2 to 21.3 m [40 to 70 ft]). However, strontium-90 is present in pCi/g concentrations in downgradient soils once saturated with effluent originating from the facilities (now stranded in the vadose zone region termed the old groundwater mound).

2.5 SUMMARY OF EXISTING DATA

Summarizing the existing data allows one to assess the data that exists and indicates the level of concentrations of cesium-137, strontium-90, cobalt-60, and plutonium-239/240. The data indicates significant quantities of cobalt, strontium, and cesium discharged to the facilities with lower amounts of plutonium-239/240 discharged.

High concentrations of all four radionuclides are present in the near surface sediment in the cribs and trenches. Much less cobalt, strontium, and cesium occur outside the footprint of the cribs and trenches. Concentrations of strontium in the old water table decrease from nCi/gm directly under 1301-N to 50 pCi/g in soil near the river at the 199-N-94A well. While concentrations of the cesium-137 and cobalt-60 are less overall in the soil near the river, the same pattern is found.

Strontium-90 concentrations are in the pCi/g level outside the foot print of the cribs and trenches in soils once saturated with effluent originating from facilities. The strontium-90 is now stranded in the vadose zone.

The plutonium-239/240 in the sediment samples exceeded the Transuranic (TRU) level during 1 year for each facility. During 1982, one out of four sampling events exceeded TRU in the 1301-N trench. During 1987, one of two sampling events indicated plutonium-239/240 levels above the TRU level in 1325-N crib. This summarizes the known information and provides the basis for producing a conceptual model.

3.0 CONCEPTUAL MODEL

3.1 PURPOSE OF CONCEPTUAL MODEL

The model is needed to allow a clear statement of the problem and to understand how much data will be used to resolve problems. A site conceptual model was developed by:

- Building the conceptual model based on the existing data just presented.
- Indicating areas or zones that have no supporting data.
- Preparing a conceptual representation in the area with no data.

3.2 MODEL OF CONTAMINANTS PER ZONE

A generic model for the cribs and trenches was developed for cobalt, cesium, and strontium. Plutonium has not migrated; therefore, it is as great a concern as the other radionuclides, but is not modeled. A vertical and horizontal profile of the crib/trenches was generated with the contaminates divided by concentration and by surface soil, vadose zone to include the old water table and finally the current groundwater table.

3.3 DESCRIPTION OF ZONES AND CONCENTRATIONS PER ZONE

Each zone is described and drawn by analyte in Figures 3-1, 3-2, and 3-3. While the analyses vary, the zone boundaries do not change. The zone descriptions are presented with summary information by analyte. The figures show the measured and assumed concentrations by zone for cobalt-60, cesium-137, and strontium-90.

Zone 1 consists of the rock and sediment in and immediately under the crib and trench. The depth from surface varies depending on which crib and trench one views. Generally, the bottom of the zone is 1.5 m (5 ft) beneath the bottom of the crib and trench. The concentrations in this zone may be the highest. Information presented later in this chapter discusses cribs in other Hanford areas which were used as analogous sites further indicating high concentrations immediately beneath the cribs. Actual data from the sediments indicate this is a high concentration zone. The horizontal boundary is the shadow of the crib. All three analyses have measured concentrations in this zone.

Zone 2 extends from about 1.5 m (5 ft) below the crib/trench to the capillary fringe above the old groundwater table. During the use of the facilities, the groundwater level rose about 9.15 m (30 ft). Soil data from groundwater wells all around the crib/trench indicate changes in concentration and soil appearance because of the decrease in the water table. Concentration probably spread horizontally at the base. The width of the flare at the base is not clearly defined.

Because no direct measurements exist beneath the crib/trenches at this depth, concentrations in this zone are estimated .

Zone 3a has an upper boundary of the old capillary fringe, including the old water table and lower boundary of the current water table. The horizontal boundaries are shown within the shadow of the upper cover of the crib/trench. This horizontal boundary is estimated and extend outside the shadow slightly.

Zone 3b is the sediment in the groundwater directly under the crib/trench. Concentrations are estimated based on surrounding groundwater data.

Zone 4a is the vadose zone from the capillary fringe to the current water table and includes the old water table outside the area directly under the crib/trench. Zone 4a horizontal boundaries are around the crib/trench. The primary area of zone 4a is from the crib/trench to the river. Measured concentrations exist for strontium, cesium, cobalt, and plutonium in this zone.

Zone 4b is the sediment in the groundwater outside the shadow of the crib/trench. While the horizontal boundaries surround the cribs/trenches, the primary area of concern is the groundwater at the river. Measured concentrations exist for the groundwater and sediment in the groundwater between the cribs/trenches and the river. The 100 N pump and treat occurs in this region to remove the strontium from the groundwater.

Table 3-1 outlines the general levels by analyte and zone with measured versus estimated or assumed concentrations. Figures A1-5 and A1-6 show the areas with measured concentrations in zone 4a and 4b. Figures A1-2 and A1-3 show the measured concentrations in zone 1. The concentrations assumed or estimated are based on speciation, partition coefficients from similar soil, inventory, and analogous site contaminant migration data.

Table 3-1. Conceptual Concentration Model Summary.

Zone	Strontium-90	Cesium-137	Cobalt-60
1	nCi/g range M	nCi/g range M	nCi/g range M
2	nCi/g range A	nCi/g range A	nCi/g range A
3a	pCi/g range A	pCi/g range A	pCi/g range A
3b	pCi/g range A	pCi/g range A	pCi/g range A
4a	low pCi/g range M	low pCi/g range M	low pCi/g range M
4b	low pCi/g range M	low pCi/g range M	low pCi/g range M
M = measured, A = assumed			

3.4 Methods Used to Confirm Conceptual Model

Several methods were used to assess radionuclide distribution in zones 1, 2, 3, and 4. These methods included the following:

- Interpretation of historical radiological concentrations in trench and crib sediments
- Analysis of the form and speciation of radiological contaminants
- Concentration estimates based on current surface radiological surveys
- Inventory balance
- Contaminant distribution data from analogous 100 Area sites.

3.4.1 Interpretation of Historical Sediment Data

Sediments from the 1301-N trench and 1325-N crib were collected for radiological analysis over various time periods during the operation of these facilities. Sediment data from 1301-N trench were collected from 1975 to 1985, while data from the 1325-N crib were collected from 1985 to 1987. Access to the 1301-N trench for sediment sampling was facilitated by nine manholes (referred to as TS-01 through TS-09) located in the concrete cover along the axis of the trench. Sampling access at the 1325-N crib was facilitated by 12 manholes (referred to as CS-01 through CS-12) located in the concrete crib cover.

Historical sediment data have been presented previously in Section 2.3 and in Tables A1-13, A1-14, and A1-15. Based on the decayed values, the following relative order-of-magnitude concentrations for cobalt-60, cesium-137, strontium-90, and plutonium-239/240 in zone 1 are anticipated:

cobalt-60	~ μCi/g
cesium-137	~ ηCi/g
strontium-90	~ ηCi/g
plutonium-239/240	~ ηCi/g

3.4.2 Form and Speciation of Contaminants

A major factor controlling the subsurface distribution and mobility of radionuclides is the physical state (form) and speciation of the contaminants. Table 3-2 indicates the relative distribution of particulate, cationic, and anionic forms of radionuclides measured in N reactor effluents discharged to the 1301-N and 1325-N facilities. In general, the cationic and particulate forms of the contaminants are expected to have low mobility in the subsurface. In addition, contaminants exhibiting large soil distribution coefficients (K_d) are expected to be highly reactive with the soil, and sorb quite readily. As a result, those contaminants that speciate primarily as cations, exhibit a high K_d, and/or form particulate phases are expected to concentrate in zone 1.

Therefore, high concentrations of cobalt-60, cesium-137, and plutonium-239/240should be confined to zone 1. High concentrations of strontium-90 will be found in zone 1, although significant concentrations of this contaminant will also be found distributed throughout the vadose zone (Zones 2, 3, and 4) due to its moderate K_d.

3.4.3 Concentration Estimates from Surface Radiological Surveys

Surface radiological surveys can be used to estimate the near-surface concentration of cobalt-60. Dose rates up to 350 mrem/hr at 1 m (3 ft) above the concrete panels at the 1301-N trench have been measured during recent surface radiological surveys. Using the radiation shielding program MICROSHIELD, conversion of dose rate measurements to near-surface concentrations indicates that mCi/g-levels of cobalt-60 are present in zone 1.

Table 3-2. Form and Speciation of Select Radiological Contaminants of Concern.

Isotope	Particulate	Cationic	Anionic	K_d
cobalt-60	40 to 98%	2 to 60%	<1%	~3500
cesium-137	1 to 5%	85 to 100%	<1.4%	2380±1000
plutonium-239/240	Precipitate at pH>2	N/A	N/A	100 - 2000
strontium-90	N/A	N/A	N/A	~10

References:
Closure and Post-Closure Plan for the 1301-N and 1325-N LWDF (UNI 3533)
Rad. Migration in Groundwater, Annual Progress Report for FY83 (NUREG/CR-371)
Radionuclide Migration in Groundwater, Annual Progress Report for FY81 (NUREG/CR-40)
Hanford Waste-Form and Sediment Interaction (PNL-7297)
Technical Reevaluation of the N-Springs Barrier Wall (BHI-00185)
N/A - not available

3.4.4 Activity Balance

Estimates of activity distribution in the subsurface can be made using the historical radionuclide inventory, near-surface sediment sampling data, facility dimensions, and assumptions concerning the bulk density of soils beneath the facility. These calculations indicate that the entire documented inventory of cobalt-60, cesium-137, and plutonium-239/240 can be accounted for in the upper 0.76 m (2.5 ft) of zone 1 for the 1301-N LWDF. The majority of strontium-90 is likely to be distributed throughout zone 1 and the upper portion of zone 2. Graphical examples of these calculations are provided in Figures 3-4 through 3-7.

3.4.5 Contaminant Distribution Data From Analogous 100 Area Sites

Soil radiochemistry data collected during various 100 Area LFI were examined to determine the characteristic vertical distribution of cesium-137, cobalt-60, plutonium-239/240, and strontium-90 in the soil column beneath facilities that had received reactor cooling water as a primary effluent. The purpose of this exercise was to use existing data to qualitatively assess the likely vertical extent and distribution of these contaminants in the soil column beneath the 1301-N/1325-N LWDF. The 100 Area facilities thought to be most comparable with the 1301-N/1325-N LWDFs include those that received large volumes of reactor cooling water as a primary waste. Generally, two types of 100 Area facilities fulfill this requirement. These facilities are unlined, process effluent, disposal trenches and cribs, and cement-lined retention basins. Process effluent disposal trenches and cribs received large volumes of reactor coolant effluent resulting from retention basin overflow and diversion of reactor coolant during retention basin cleaning and maintenance. Retention basins received reactor coolant during normal reactor operations. Although the retention basins were cement-lined, most (if not all) of these facilities leaked during their period of active use, contaminating the soil column beneath. Process effluent trenches examined include the 116-K-1 crib, 116-K-2 trench, 116-DR-1 trench, and 116-F-2 trench. Retention basins examined include the 116-DR-9 Retention Basin and 116-F-14 Retention Basin. Figure 3-8 illustrates the distribution of contaminants with depth for the 116-DR-1 and 116-K-2 process effluent trenches, and the 116-F-2 Retention Basin. In general, these figures illustrate that the highest concentration of contaminants are located immediately below the suspected base of each facility, and that concentrations logarithmically decrease with depth for all contaminants. Relative contaminant distribution trends beneath the 1301-N and 1325-LWDFs will be similar to those observed at these 100 Area sites.

Figure 3-1. Conceptual Model for Cobalt-60.

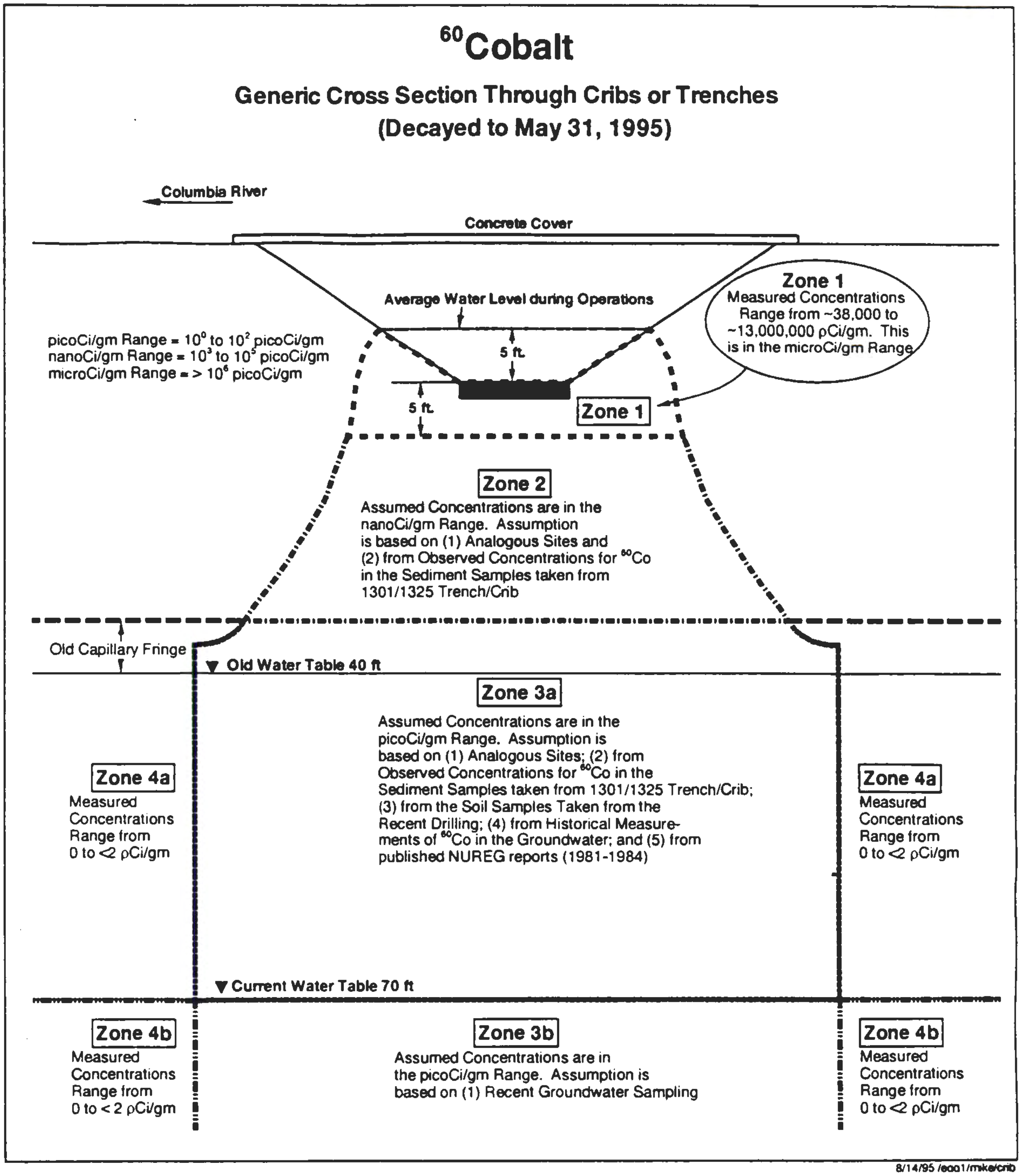


Figure 3-2. Conceptual Model for Cesium-137.

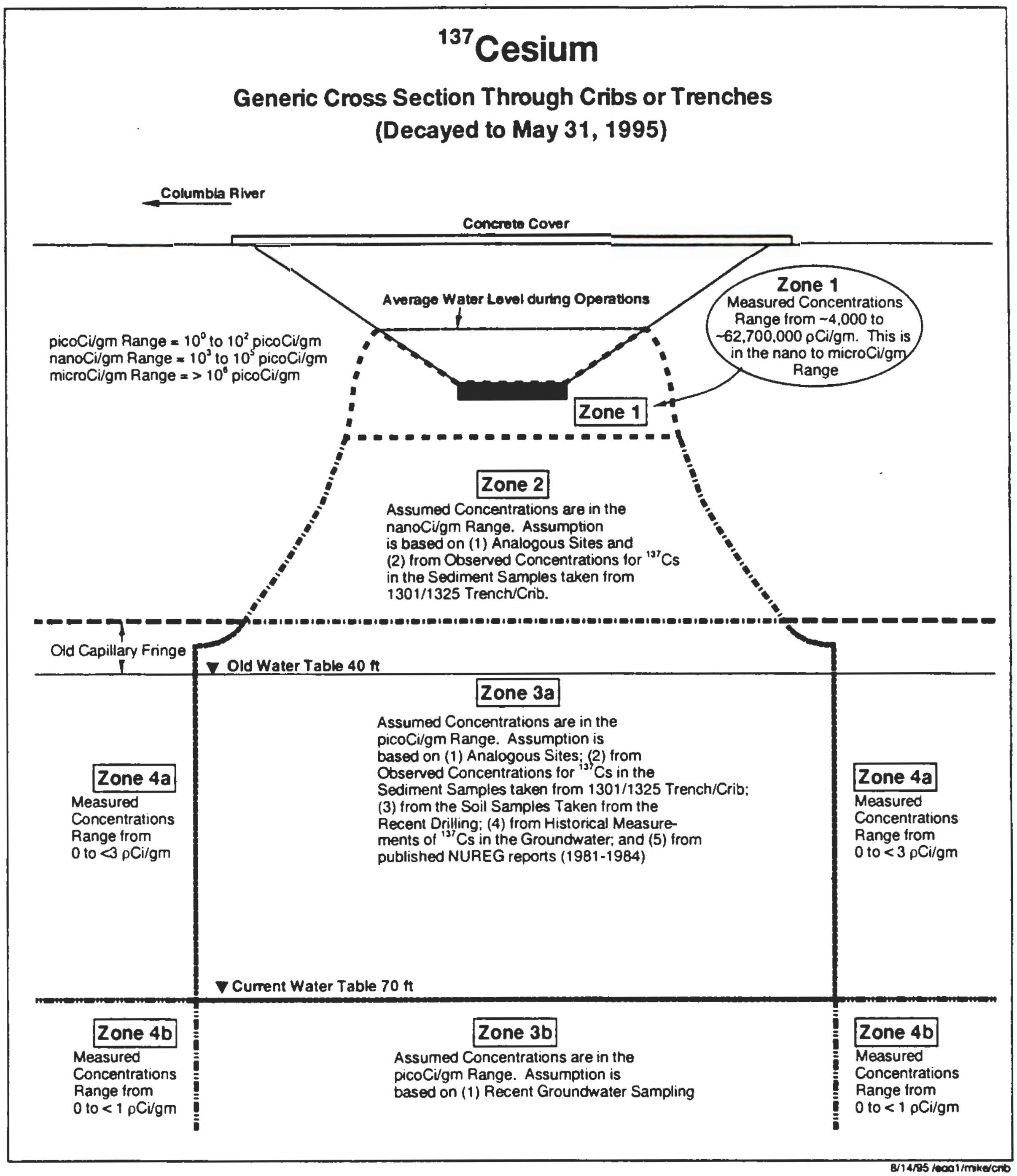
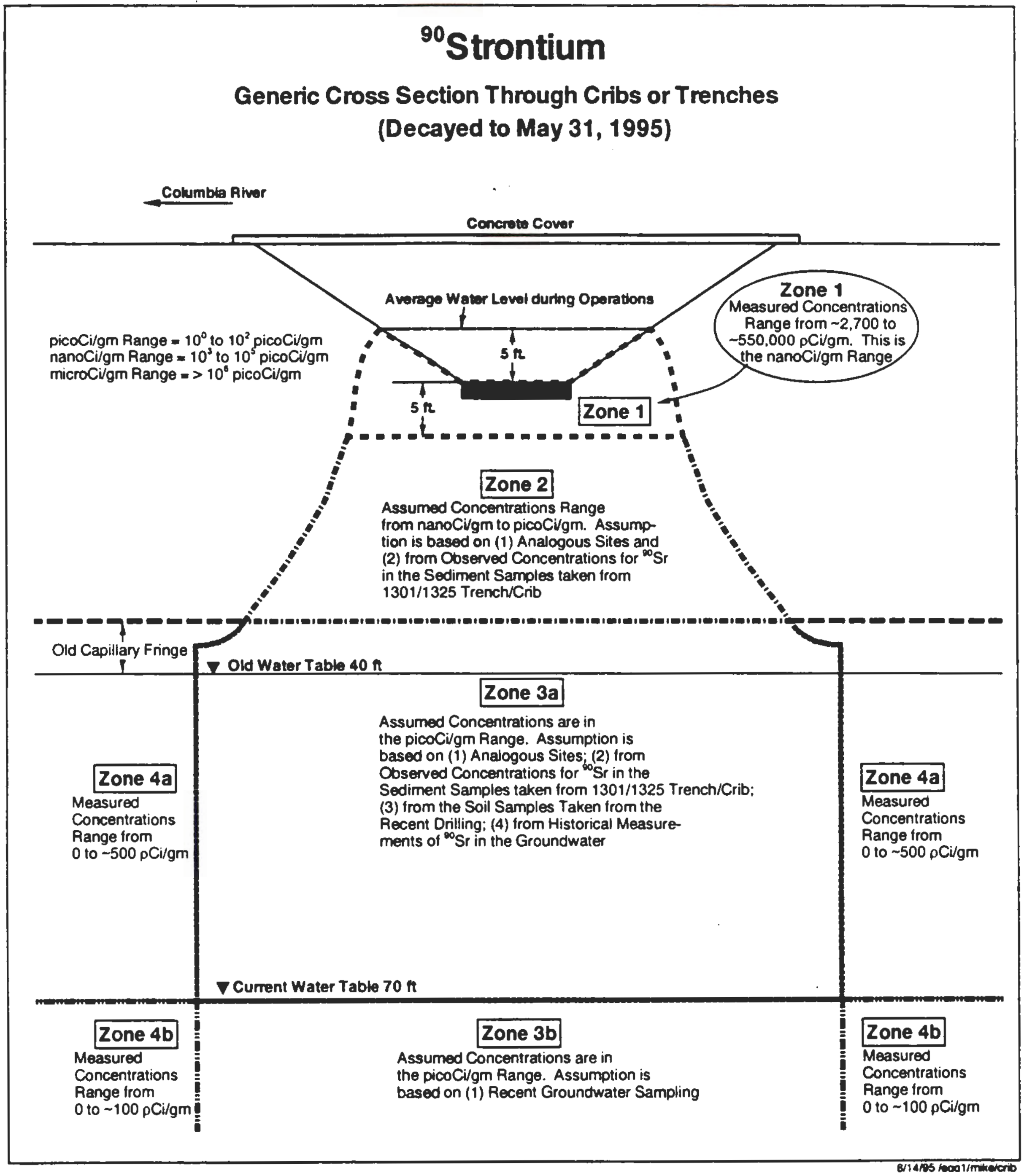
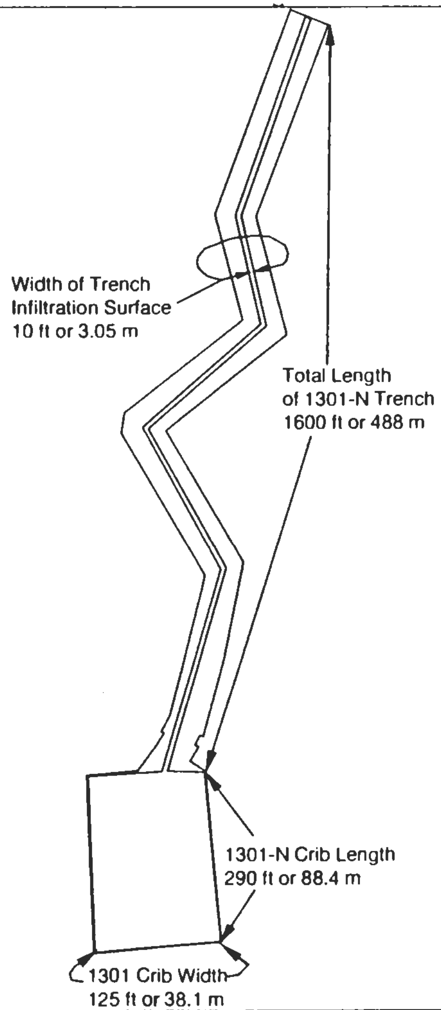


Figure 3-3. Conceptual Model for Strontium-90.





1. Calculate area of trench and crib
   a.) Crib area
   $88.4 \text{ m} \times 38.1 \text{ m} = 3{,}368.04 \text{ m}^2$
   b.) Tench area
   $3.05 \text{ m} \times 487.7 \text{ m} = 1{,}487.42 \text{ m}^2$
   c.) Total area
   $3{,}368.04 \text{ m}^2 + 1{,}487 \text{ m}^2 = 4{,}855.46 \text{ m}^2$
2. Assume a unit volume (depth = 1 m)
   Volume of soil = $4{,}855.46 \text{ m}^2 \times 1 \text{ m} = 4{,}855.46 \text{ m}^3$
   Convert m^3 to cm^3
   $4{,}855.46 \text{ m}^3 \times 1{,}000{,}000 \text{ cm}^3 = 4.86\text{E+09 cm}^3$
3. Calculate the mass of soil in a unit volume (bulk density = 1.6 gm/cm^3)
   $4.86\text{E+09 cm}^3 \times 1.6 \text{ gm/cm}^3 = 7.78\text{E+09}$ gm of soil
4. Use the 10-year (1975-1984 [UNI-3533]) average concentration for Cobalt-60 in sediment samples from 1301-N Trench to calculate the number of curies in the bottom of the LWDF.

Ten year average concentration for Cobalt-60 = 10,000,000 ρCi/gm or 1.0E-05 Ci/gm

   7.78E+09 gm X 1E-05 Ci/gm = 7.78E+04 Ci

5. If the 10-year average concentration is maintained for each unit volume, It would require this many unit volumes to account for Cobalt-60 5,100 Ci by 1985 [UNI-3533]) disposed to the 1301-N LWDF:
   5,100 Ci / 77,800 Ci = ~0.07 unit volumes
6. Because a unit volume is equal to 1 m depth, most of the Cobalt-60 should be accounted for in the first 0.07 m (0.25 ft) of soil directly underneath the LWDF.

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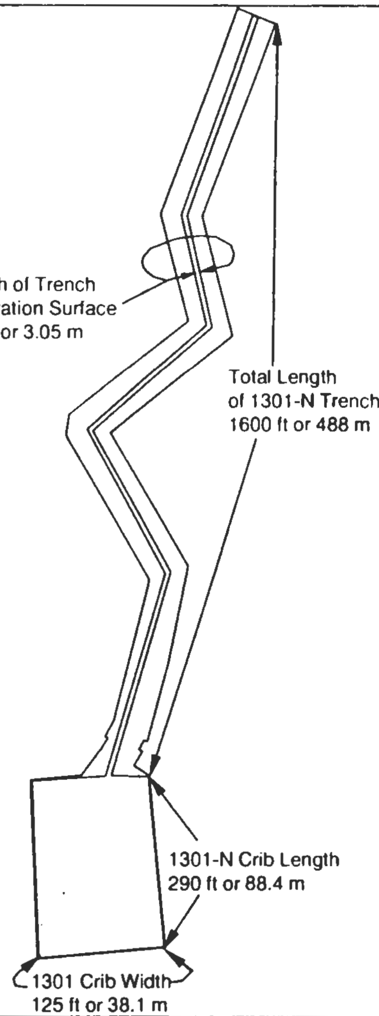
Figure 3-4. Mass Balance Calculation for Cobalt-60.



1. Calculate area of trench and crib
   a.) Crib area
   88.4 m X 38.1 m = 3,368.04 m^2
   b.) Tench area
   3.05 m X 487.7 m = 1,487.42 m^2
   c.) Total area
   3,368.04 m^2 + 1,487 m^2 = 4,855.46 m^2
2. Assume a unit volume (depth = 1 m)
   Volume of soil = 4,855.46 m^2 X 1 m = 4,855.46 m^3
   Convert m^3 to cm^3
   4,855.46 m^3 X 1,000,000 cm^3 = 4.86E+09 cm^3
3. Calculate the mass of soil in a unit volume (bulk density = 1.6 gm/cm^3)
   4.86E+09 cm^3 X 1.6 gm/cm^3 = 7.78E+09 gm of soil.
4. Use the 10-year (1975-1984 [UNI-3533]) average concentration for Cesium-137 in sediment samples from 1301-N Trench to calculate the number of curies in the bottom of the LWDF.

Ten year average concentration for Cesium-137 = 560,000 pCi/gm or 5.6E-07 Ci/gm

7.78E+09 gm X 5.6E-7 Ci/gm = 4360 Ci

5. If the 10-year average concentration is maintained for each unit volume, It would require this many unit volumes to account for Cesium-137 (3,000 Ci by 1985 [UNI-3533]) disposed to the 1301-N LWDF:

   3,000 Ci / 4360 Ci = ~0.7 unit volumes
6. Because a unit volume is equal to 1 m depth, most of the Cesium-137 should be accounted for in the first 0.7 m (2.5 ft) of soil directly underneath the LWDF.

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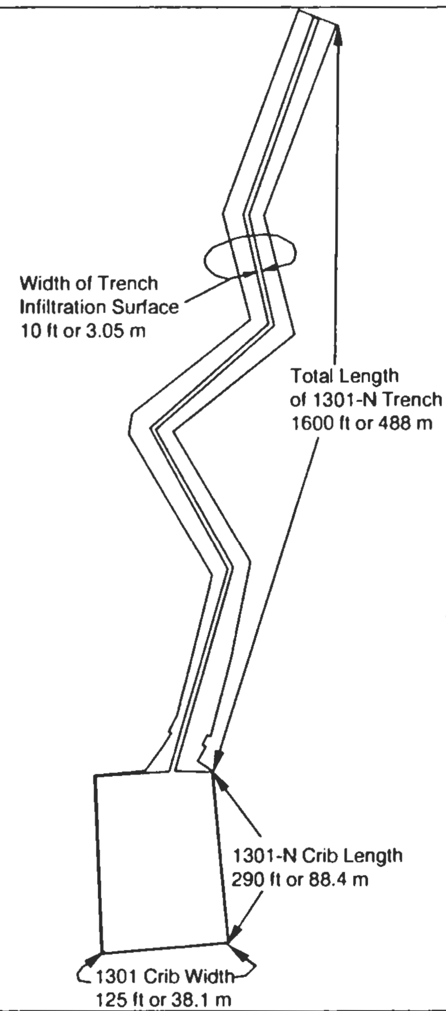
Figure 3-5. Mass Balance for Calculation for Cesium-137.



1. Calculate area of trench and crib
   - a.) Crib area
     88.4 m X 38.1 m = 3,368.04 m^2
   - b.) Tench area
     3.05 m X 487.7 m = 1,487.42 m^2
   - c.) Total area
     3,368.04 m^2 + 1,487 m^2 = 4,855.46 m^2
2. Assume a unit volume (depth = 1 m)
   Volume of soil = 4,855.46 m^2 X 1 m = 4,855.46 m^3
   Convert m^3 to cm^3
   4,855.46 m^3 X 1,000,000 cm^3 = 4.86E+09 cm^3
3. Calculate the mass of soil in a unit volume (bulk density = 1.6 gm/cm^3)
   4.86E+09 cm^3 X 1.6 gm/cm^3 = 7.78E+09 gm of soil
4. Use the 10-year (1975-1984 [UNI-3533]) average concentration for Plutonium-239/240 in sediment samples from 1301-N Trench to calculate the number of curies in the bottom of the LWDF.

Ten year average concentration for Plutonium-239/240 = 53,000 ρCi/gm or 5.6E-07 Ci/gm

7.78E+09 gm X 5.3E-8 Ci/gm = 412 Ci

5. If the 10-year average concentration is maintained for each unit volume, It would require this many unit volumes to account for Plutonium-239/240 (22 Ci by 1985 [UNI-3533]) disposed to the 1301-N LWDF:
   22 Ci / 412 Ci = ~0.06 unit volumes
6. Because a unit volume is equal to 1 m depth, most of the Plutonium-239/240 should be accounted for in the first 0.06 m (0.2 ft) of soil directly underneath the LWDF.

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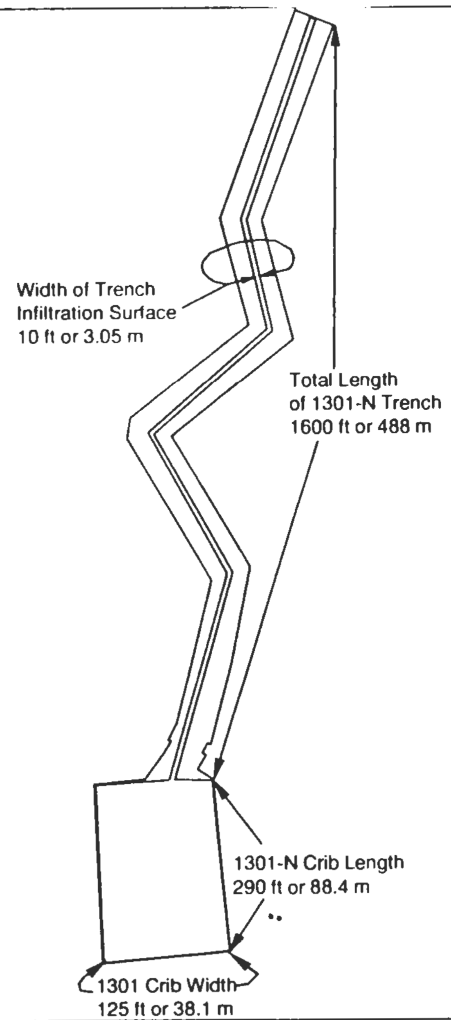
Figure 3-6. Mass Balance Calculation for Plutonium-239/240.



1. Calculate area of trench and crib
   a.) Crib area
   88.4 m X 38.1 m = 3,368.04 m^2
   b.) Tench area
   3.05 m X 487.7 m = 1,487.42 m^2
   c.) Total area
   3,368.04 m^2 + 1,487 m^2 = 4,855.46 m^2
2. Assume a unit volume (depth = 1 m)
   Volume of soil = 4,855.46 m^2 X 1 m = 4,855.46 m^3
   Convert m^3 to cm^3
   4,855.46 m^3 X 1,000,000 cm^3 = 4.86E+09 cm^3
3. Calculate the mass of soil in a unit volume (bulk density = 1.6 gm/cm^3)
   4.86E+09 cm^3 X 1.6 gm/cm^3 = 7.78E+09 gm of soil
4. Use the 10-year (1975-1984 [UNI-3533]) average concentration for Strontium-90 in sediment samples from 1301-N Trench to calculate the number of curies in the bottom of the LWDF.

Ten year average concentration for Strontium-90 = 69,000 ρCi/gm or 6.9E-08 Ci/gm

   7.78E+09 gm X 6.9E-8 Ci/gm = 537 Ci

5. If the 10-year average concentration is maintained for each unit volume, It would require this many unit volumes to account for Strontium-90 (2,100 Ci by 1985 [UNI-3533]) disposed to the 1301-N LWDF:
   2,100 Ci / 537 Ci = ~3.91 unit volumes
6. Because a unit volume is equal to 1 m depth, most of the Strontium-90 should be accounted for in the first 4 m (13 ft) of soil directly underneath the LWDF.

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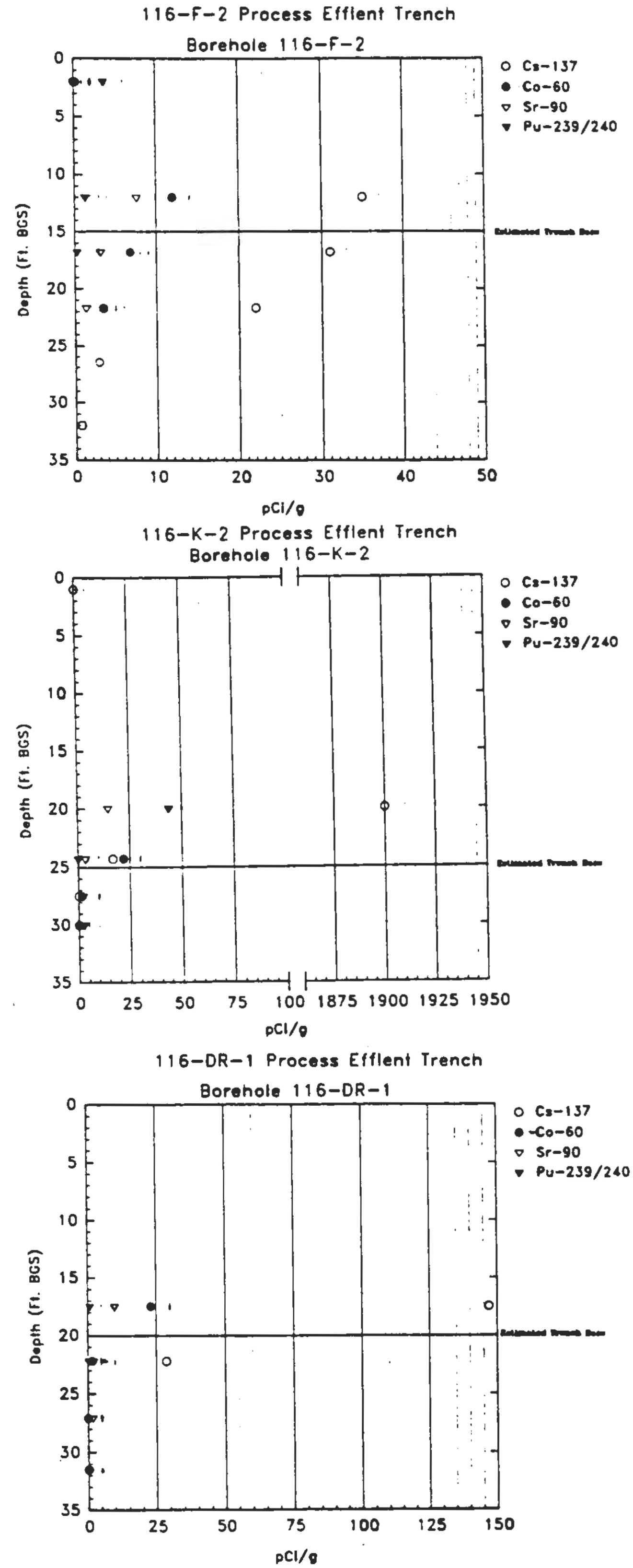
Figure 3-7. Mass Balance Calculation for Strontium-90.

Figure 3-8. Radionuclide Distribution in the Vadose Zone at Analagous Sites.



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4.0 STEP 1 -- PROBLEM STATEMENTS

Examination of the groundwater near the river indicates strontium-90 concentrations that range from below the maximum contaminant levels in drinking water of 8 pCi/L to above these levels. This has been presented as the problem in the pump-and-treat DQO process document for 100 N. While the river significantly dilutes these concentrations to levels that may pose little human health risk, public perception indicates concern over strontium-90. The strontium-90 and other radionuclides originate from the 1301-N and 1325-N cribs and trenches.

Data from soil borings from wells between 1301-N and the river indicate nondetects to <3 pCi/g levels of cobalt-60 and cesium-137. Strontium-90 concentrations from borings near the river range from nondetects to 500 pCi/g. Based on the measured data and the conceptual model, soil concentrations in zone 1, 2, and 3a under the cribs and trenches are probably much higher.

The problem is whether there is any reason to suspect that contaminant migration through the cribs/trenches will increase over time, thus, increasing the concentrations reaching groundwater and possibly the Columbia River.

A second problem is whether an immediate action is needed at the facility. Any characterization done now should provide usable data for short- and long-term decisions.

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5.0 STEP 2 -- DECISION STATEMENTS

5.1 SAFER DECISIONS

The SAFER decisions for the LFI used in the current DOW and listed below continue to be high-priority decisions.

1. Whether or not the 1301-N and 1325-N LWDF's are high-priority sites in the 100-NR-1 OU based on a qualitative risk assessment and actual contamination levels.

2. To support the evaluation of remedial technologies in terms of effectiveness implementablity, cost, and consistency with the final 100-NR-1 OU remedy.

5.2 ADDITIONAL DECISIONS

The following decisions were added in order of priority to the decision list.

3. What waste disposal strategy can be used if removal or treatment is the remedial alternative? **I did not remember this. This should be rephrased or deleted**

4. When is the most feasible time to perform remediation?

5.3 SAFER ASSUMPTIONS

The following SAFER assumptions were used as the basis for the existing DOW. These assumptions continue to be valid with the additional information provided.

- RCRA closure certification decisions will not be based on this characterization effort alone.

  Full RCRA closure normally requires extensive sampling. The radioactive contaminants are of greater concentration and are driving remediation priorities. Given the radioactivity, the most logical approach may be to allow decay to occur for several years before performing a formal closure. This approach is only feasible if contaminants are not increasing in mobility and if institutional controls remain in place to prevent direct human exposure to soils. Because of high-level radioactivity in the samples, sample volumes available for dangerous waste analysis may be minimal. Therefore, dangerous waste characterization will be done as a lower priority to the radionuclide characterization and to determine water content in the soils. Water is a driver for contaminant migration and is a high priority.

- No remedial technology is presupposed.

- Selected samples as specified in the DOW will be archived by depth interval and boring location.

- The preliminary list of potential contaminants of concern is based on process and historical information.

- This workscope only considers the vadose zone contamination of 1302/1325 cribs in NR-1. Skyshine will be addressed in a separate workscope.

- This SOW was developed assuming funding is available to complete the work.

- This SOW will not change without appropriate review of the schedule and cost.

- This SOW was developed assuming the soil column could be safely accessed and doses are acceptable within as low as reasonably achievable (ALARA) limits.

A list of decisions were generated by Ecology and EPA. Upon examination, these decisions were inputs to the above decisions.

6.0 STEP 3 -- INPUTS

Each decision was listed and related to specific data inputs in Table 6-1. Data inputs were listed and compared to specific pieces and types of data needed to make the decisions in Tables 6-2 and 6-3. A "Y" indicates data are available. An "N" indicates data are not available. A "?" indicates the team was unsure whether the data was available.

To assess the priority based on risk, assess alternatives, and remediation timing, one must understand the concentration of contaminants, mobility to groundwater and the river, and the decay factors for radionuclides. The major missing pieces of information are the concentrations of material in zones 2, 3a, and 3b for cobalt-60, cesium-137, and strontium-90 and the water content in the soil column. All cribs/trenches are shut down and have not been in use since 1985 and 1990, but residual moisture could act as a contaminant driver. The major input information is to assess the driving forces to the groundwater. This will effect ultimate timing of remediation, concentrations reaching the river, and volume of waste to be assessed for treatment.

Contaminants of potential concern (COPCs) were discussed. It was agreed that the following priority should be given as shown in Table 6-4.

Table 6-1. Inputs and Decisions from Ecology and EPA.

Input	Decision
Determine inventory of strontium-90, cobalt-60 left in the crib relative to that within the vadose zone and ultimately determine total amount released to river.	1. High priority based on risk 2. Remedial alternative
Determine the inventory of strontium-90 available to groundwater, including that within capillary fringe and associated with river fluctuations.	1. High priority based on risk 2. Remedial alternatives
Determine whether any TRU waste is contained in the crib.	1. High priority based on risk 2. Remedial alternatives 3. Waste disposal if remediated
Determine approximate radioactive waste volumes	2. Remedial alternatives 3. Waste disposal if remediated
Determine hazardous constituents and volumes	1. High priority based on risk 2. Remedial alternatives 3. Waste disposal if remediated
Determine risks associated with cleanup	2. Remedial alternatives

Table 6-1. Inputs and Decisions from Ecology and EPA. (Continued)

Add valuable information for evaluation of costs associated with treatment and remediation	2. Remedial alternatives 3. Waste disposal if remediated
Evaluate/validate strontium-90 assumptions in model	1. High priority based on risk 2. Remedial alternatives
Verify existence of erosional window	2. Remedial alternatives

Table 6-2. Data Inputs to SAFER QRA Evaluation.

Inputs	Data Needed	Data Available (Y/N/NA/?)
1. Determine the inventory of strontium-90 available to groundwater, including that within capillary fringe and associated with river fluctuations.	Conc. strontium-90 zone 1, 2, 3a, 3b, 4a, 4b	Y-zone 1, 4a, 4b N-zone 2, 3a, 3b
	Geochem properties-pH, Eh, Kd	Y
	Soil lithology	Y
	Background	Y
	Flow rate	Y
	Transport time to river	Y
	Hydraulic conductivity Transmissivity Porosity	Y-zone 4a/b N-zone 1, 2, 3a, 3b
	Volume material contaminated	Y-between 1301-N to River N-under crib/trench
	Percent moisture	Y-zone 4a/b N-zone 1, 2, 3a, 3b
	Inventory added	Y
2. Determine whether any TRU waste is contained in the crib.	Conc. TRU zone 1, 2, 3a, 3b, 4a, 4b	Y -Pu zone 1 Y -zone 4a, 4b N -zone 2, 3a, 3b
3. Determine hazardous constituents and volumes	Inventory of hazardous waste	Y
	Conc. hazardous waste zone 1, 2, 3a, 3b, 4a, 4b	Y -zone 1, 4a, 4b N -zone 2, 3a, 3b
	Input information from input #1	see input #1 above

Table 6-2. Data Inputs to SAFER QRA Evaluation.

Inputs	Data Needed	Data Available (Y/N/NA/?)
4. Evaluate/validate strontium-90 assumptions in model	Information from #1 allows validation of model	see input #1
5. Determine inventory of strontium-90, cobalt-60 left in the crib relative to that within the vadose zone and ultimately determine total amount released to the Columbia River.	Conc. strontium-90, cobalt-60 zone 1, 2, 3a, 3b, 4a, 4b	Y -zone 1, 4a, 4b N -zone 2, 3a, 3b
	Inputs from #1 as applied to cobalt-60	see #1 as applied to cobalt-60

Table 6-3. Data Needed for SAFER Remedial Alternative Evaluation.

Input	Data Needed	Data Available (Y/N/NA/?)
1. Determine inventory of strontium-90, cobalt-60 left in the crib relative to that within the vadose zone and ultimately determine total amount released to river.	See input #5, decision 1	See input #5
	Grain size	Y could use grain size from analogous borings
	Bulk density	Y
	Moisture	Y-4a/b N-1, 2, 3a, 3b
2. Determine the inventory of strontium-90 available to groundwater, including that within capillary fringe and associated with river fluctuations.	See input #1	See input #1
	Pump-and-treat results	N-in progress
	Barrier evaluation	N-in progress
	Percent moisture	Y-4a/b N-1, 2; 3a, 3b
3. Determine whether any TRU waste is contained in the crib.	See input #2	See input #2
	Cost to dispose TRU waste	??
	TRU waste disposal location	??
4. Determine approx. radioactive waste volumes	Conc. strontium-90, cobalt-60, cesium-137 and TRU in zones 1, 2, 3a, 3b, 4a, 4b	Y-zone 1, 4a, 4b N-zone 2, 3a, 3b
5. Determine hazardous constituents and volumes	See input 3, decision #1	
6. Determine risks associated with cleanup	Conc. strontium-90, cobalt-60, cesium-137, and TRU in zones 1, 2, 3a, 3b, 4a, 4b	Y-zone 1, 4a, 4b N-zone 2, 3a, 3b
	Remedial alternative	N
	Handling involved in remedial action	N
7. Add valuable information for evaluation of costs associated with treatment and remediation	Cost to dispose TRU waste	??
	TRU waste disposal location	??
8. Evaluate/validate strontium-90 assumptions in model	Information from #1, decision 1	

Table 6-3. Data Needed for SAFER Remedial Alternative Evaluation.

Input	Data Needed	Data Available (Y/N/NA/?)
9. Verify existence of erosional window	Log Hanford/Ringold contact	N

Table 6-4. Contaminants of Potential Concern.

COPC Type	Reason for Inclusion
1. Radionuclides - cobalt-60, cesium-137, strontium-90; plutonium-239/240	Key drivers to determine current risk in soil and groundwater, and driver to assess when material will decay enough to allow safe removal or remediation.
2. Water	Water content will drive contaminant mobility.
3. Metals	The past history of the RCRA Part A permit indicates primary contaminates to be lead, cadmium, mercury, and chromium from chromates.
4. Physical properties	Grain size distribution data will be used to assess transport and remedial alternatives.

It was agreed that volatile and semivolatile organics were not COPCs for this investigation, because they were not discharged to the facilities. Sediment samples collected once in zone 1 of the cribs indicated phthalates that are common plastizers. Samples were collected in plastic and, therefore, probably contaminated the samples. One sample of eleven indicated a response for pyrene and chrysene above detection limits. Considering that more data will likely be needed for final closure, and the handling required for collection of semivolatiles, it was recommended that semivolatiles not be examined for the RFI. Organic sediment and boring data is located in Attachment 1.

7.0 STEP 4 -- BOUNDARIES

Zones 1, 2, and 3a from the conceptual model define the vertical boundaries of the LFI. Decisions for remediation will be made using the conceptual boundaries 1, 2, 3a, and 3b. The effect on groundwater sediments will be assessed based on the existing well and boring data already available from zones 4a and 4b.

The lateral extent of soil contamination is poorly defined outside the shadow of the cribs and trenches. This was identified as a data need and was addressed in the sampling design.

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8.0 STEP 5 -- DECISION LOGIC

The group agreed that given the strontium levels likely to be in zones 1 and 2, a qualitative risk assessment would only confirm the fact that the site is a high health risk. Therefore, the next decision is whether the cleanup activity is a high priority because of high moisture content in the vadose zone or because of higher quantities of contaminants than currently hypothesized. With this information, a decision can be made as to which remedial alternative is reasonable and when the alternative should be implemented.

8.1 HYPOTHESIS

The current hypothesis is that concentration in zones 2, 3a, and 3b will be between those of zones 1 and 4. Table 3-1 provides the concentrations of the zones forecasted in the conceptual model.

8.2 DECISION RULES

1. If soil moisture and contaminant concentration profiles from 1301-N crib are in general agreement with those expected from the conceptual model, then no further LFI boreholes are needed.

2. If soil moisture and contaminant concentration profiles from 1301-N crib exceed those expected from the conceptual model, then additional evaluation will be done to assess priority of performing further analysis.

3. The data gathered from borings located at 1301-N crib and trench gamma logging and moisture logging will be used to create an analogous model for the 1325-N crib and trench. The 1325-N model will be confirmed and refined, if needed, using borehole logging techniques in the 1325-N Area (this is currently in DQO discussions with regulators).

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9.0 STEP 6 -- DECISION UNCERTAINTY

Preliminary calculations indicated for a high certainty of 80 to 90%, the number of borings or sampling points would need to be in the 30 to 50 sample range. Collecting and analyzing this number of samples is not feasible because of worker exposure in the highly radioactive area. The original DOW required three borings. Little benefit will be gained in decision certainty by using one boring or three.

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10.0 SAMPLING AND ANALYSIS ALTERNATIVES

Information for the original description of work, which was felt to be too costly and allow too much exposure, is compared to three alternatives.

10.1 EXISTING DESCRIPTION OF WORK

Three vadose zone borings through the cribs and trenches at 1301-N crib and trench, and 1325-N crib would be constructed. Locations of the boreholes are shown in Figure 10-1. Borehole 1301-N crib was located to intercept the expected maximum contaminate inventory in the 1301-N crib, whereas borehole 1301-N trench is expected to encounter a smaller contaminate inventory. Borehole 1325-N is located in the crib to intercept the maximum contaminant inventory in the 1325-N crib. Only one borehole was sited at 1325-N because the crib and the first 228 m (748 ft) of the trench received effluent, and because the 1325-N facility operated for a shorter time than 1301-N.

Radiation at the two facilities are too high to allow drilling without reduction of these levels by adding fill to act as a shield. The concrete panels would need to be removed as neither has sufficient integrity to support the drill rig. Boreholes would be drilled to penetrate no more than 1.5 m (5 ft) into the saturated zone and would have a depth of 19.8 to 22.8 m (65 to 75 ft).

The sampling strategy for the current DOW is listed in Table 10-1. The list of contaminants includes volatile field screening. If field screening produced concentrations greater than 5 ppm above background, then semivolatiles and pesticide/PCBs would be performed. Further discussion in this DQO process could not resolve how volatiles would indicate presence of semivolatiles, pesticides, and PCBs. Other alternatives do not contain this strategy.

10.2 ALTERNATIVE 1

Alternative 1 is a modification of the existing DOW. Three boreholes, as originally indicated through the 1301-N crib and trench and one through 1325-N crib, are included. This still requires placing the drill pads on the concrete decking. Figure 10-2 lists the drilling locations and summarizes the alternative. This plan uses a reduced sampling and analysis strategy, as described in Appendix E of the Description of Work (DOE/RL-94-104) and summarized in Table 10-1 with a reduced list of analytes.

10.3 ALTERNATIVE 2

Two vadose zone borings (1301-N-1 and 1301-N-2) will be constructed to investigate the distribution of radionuclide, metal contamination, and moisture content in soil beneath the 1301-

N crib and adjacent to the 1301-N trench. The locations of 1301-N-1 and 1301-N-2 borings are shown in Figure 10-3. Boring 1301-N-1 will provide data on vertical distribution of contaminants with depth in the highest contaminant zone to verify the conceptual model and data on moisture content with depth to evaluate the presence of a driving force to groundwater. Boring 1301-N-2 will provide information on the lateral spreading of contaminants and moisture content to verify the conceptual model and provide physical samples for modeling purposes to evaluate potential impacts to groundwater.

10.4 ALTERNATIVE 3

The alternative requires three boreholes. One borehole through 1301-N crib, one adjacent to the 1301-N trench, and one downgradient and next to 1325-N crib, as shown in Figure 10-4. The borehole logic for 1301-N is the same as Alternative 2. The additional borehole at 1325-N would confirm the analagous approach.

The sampling and analysis COPCs and strategy is the same as for Alternatives 1 and 2, as presented in Table 10-1.

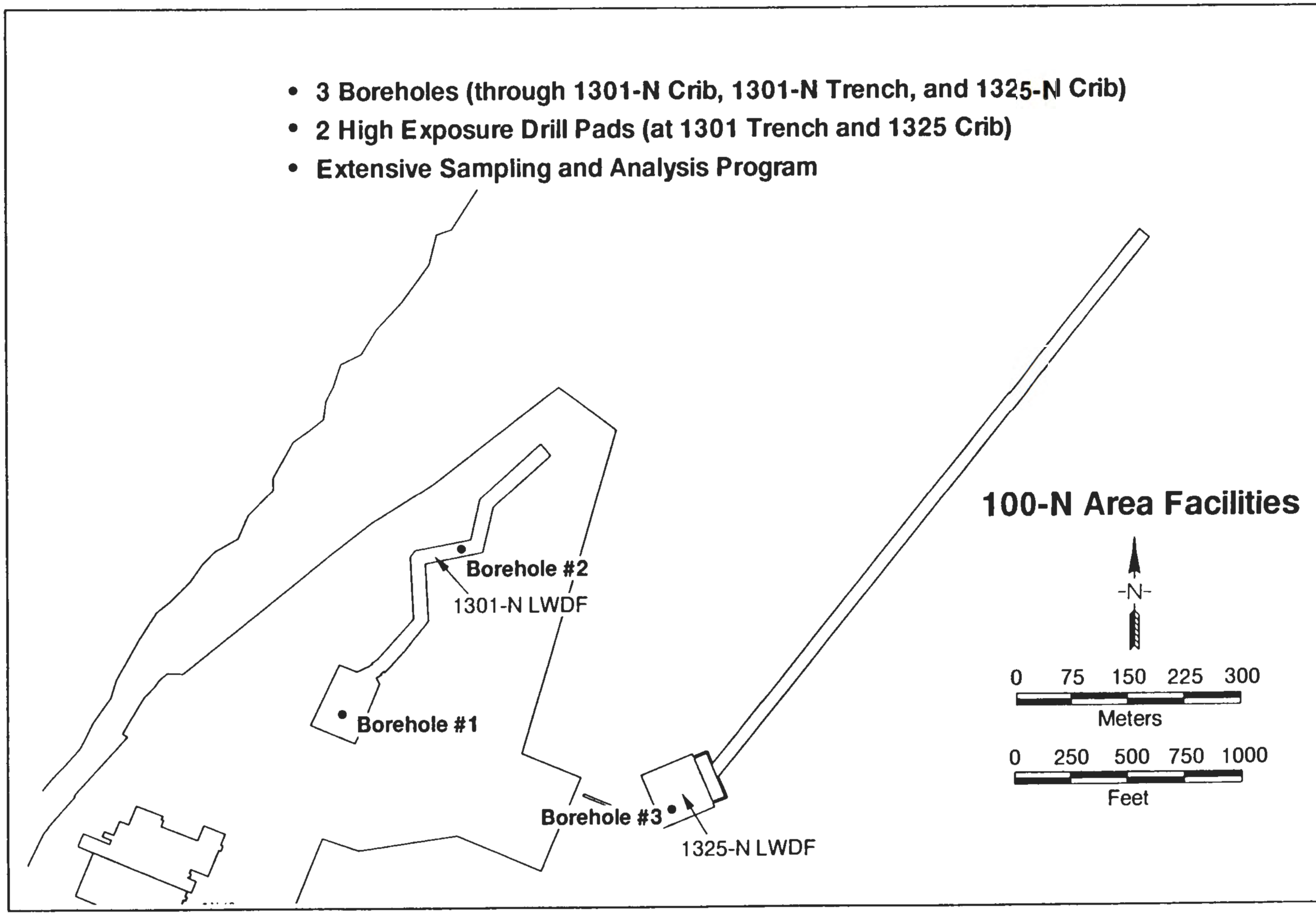

Figure 10-1. Current Description of Work.

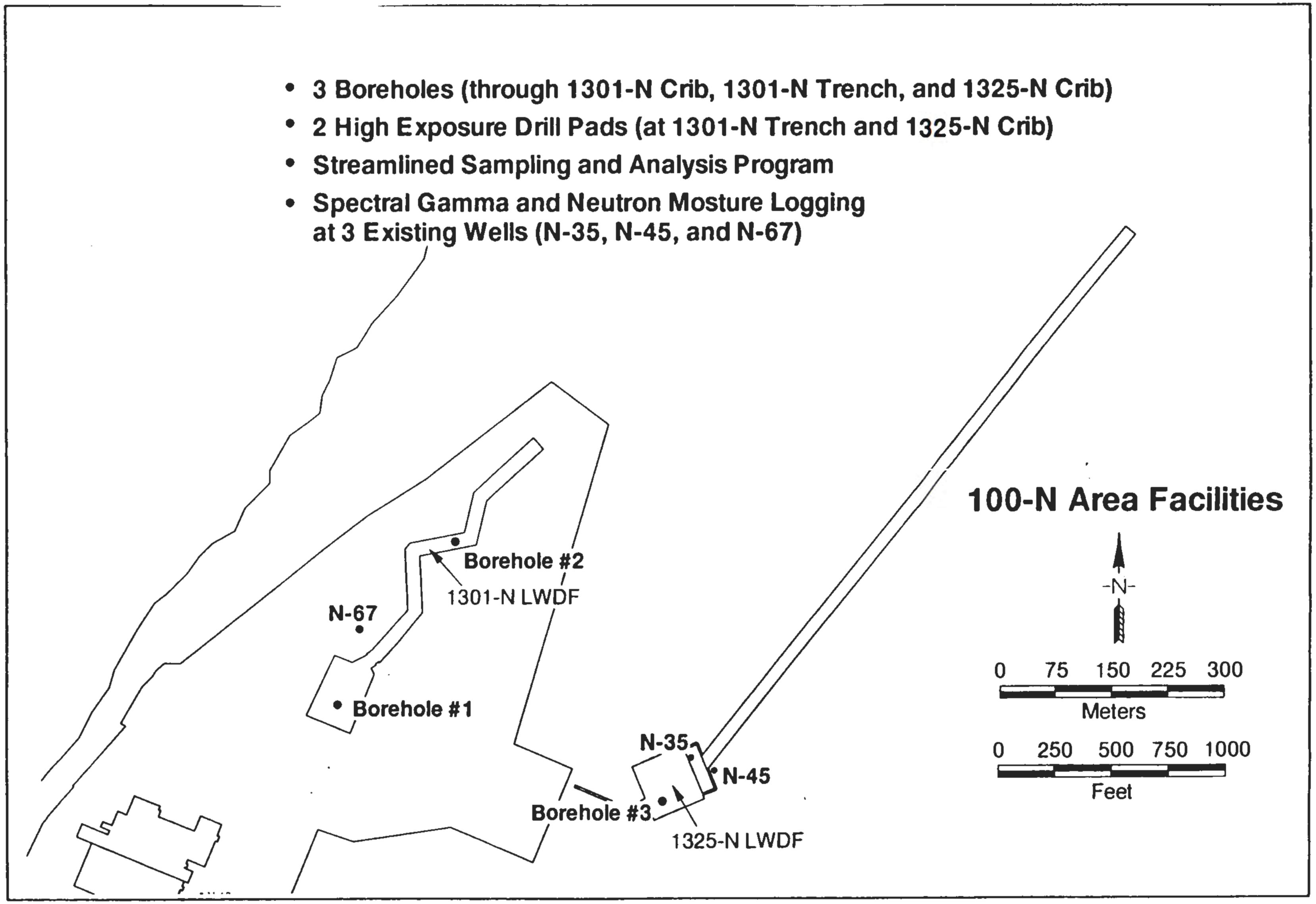

Figure 10-2. Alternative 1.

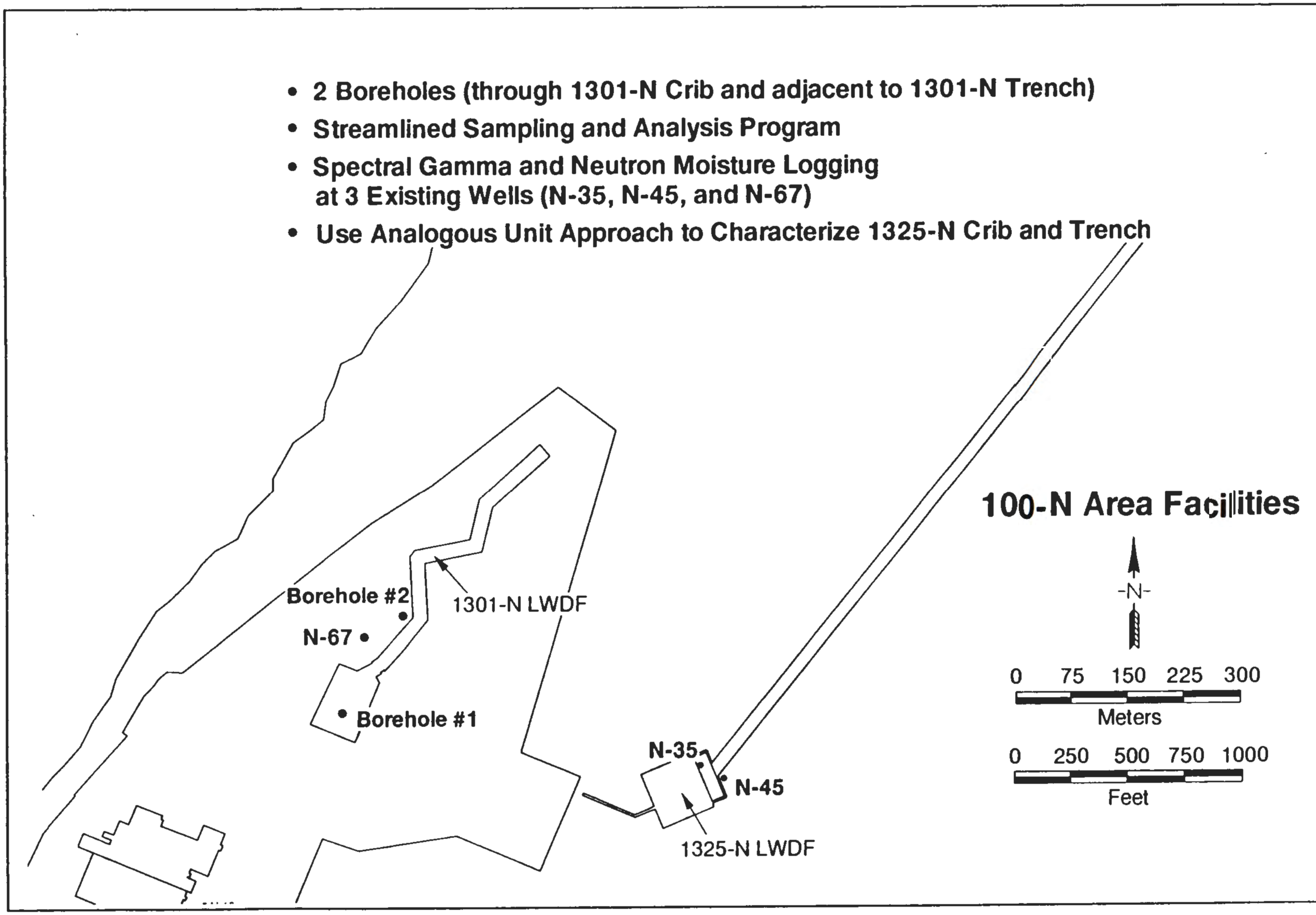

Figure 10-3. Alternative 2.

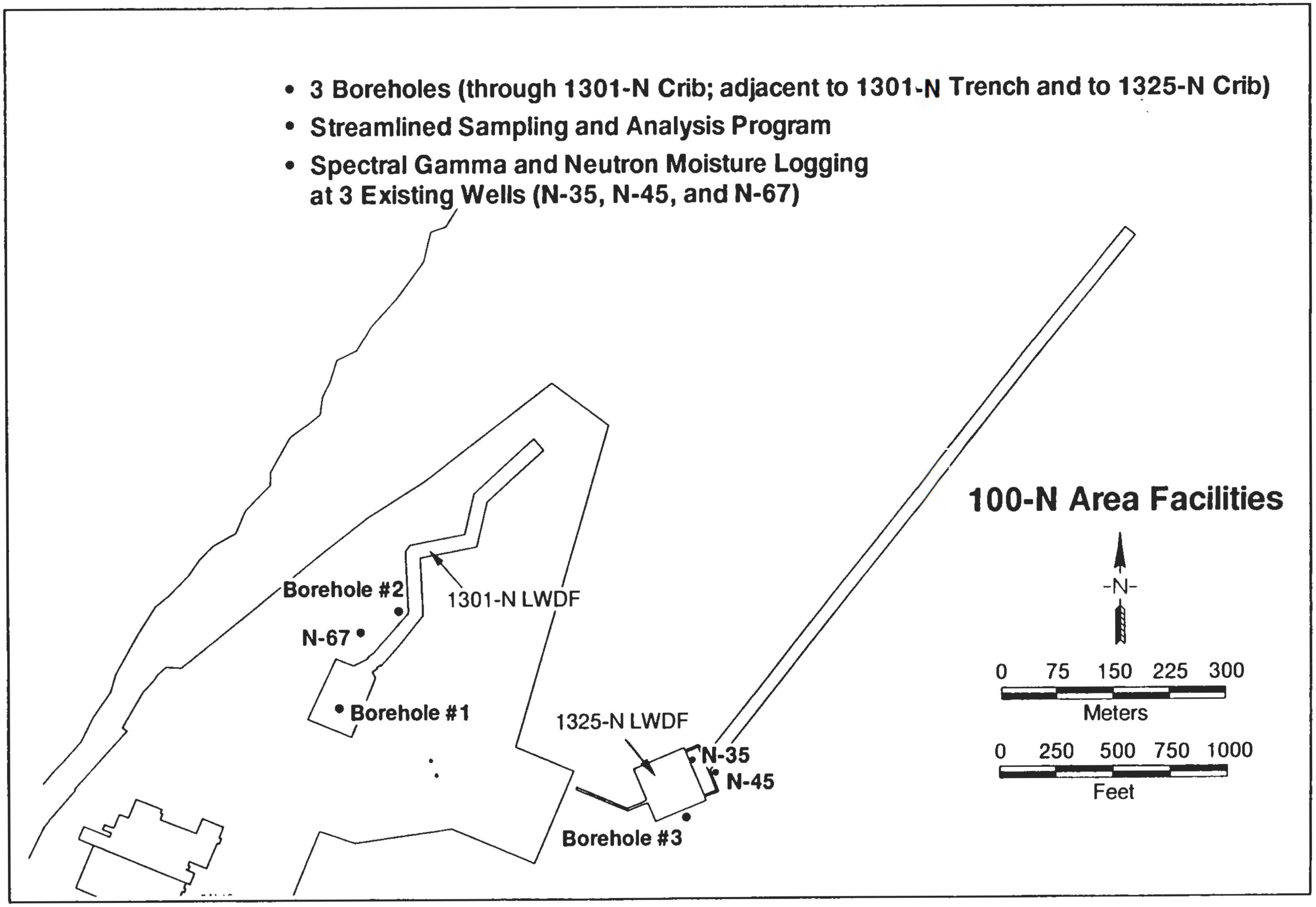

Figure 10-4. Alternative 3.

10.5 COMPARISON OF ALTERNATIVES

The DQO team performed a comparison of the existing DOW and the alternatives to identify the best characterization approach for the 1301-N/1325-N LWDF LFI relative to the decision inputs and technical criteria discussed in Section 4.0. Results of the comparison are presented in Table 10-2. The comparison was performed by assigning a letter grade to the existing DOW and characterization alternatives for most of the decision inputs and technical criteria. The letter grades range from "A" (best) to "D" (worst) and provide a relative ranking for the existing DOW and each alternative with respect to the applicable decision input or technical criteria. No letter grades were provided for "remedial alternatives assessment" or "qualitative risk assessment" since both the existing DOW and alternatives provide sufficient data for these decision inputs. In addition, a numerical value is provided for the "exposure" criteria because it can be easily estimated based on the scope of work for the existing DOW and alternatives. Combining the grading system with the exposure estimates result in assigning a numerical rank ranging from "1" (best) through "4" (worst) to the existing DOW and alternatives.

Based on this comparison, Alternative 2 is identified as the preferred characterization approach. Alternative 2 provides data and information needed to sufficiently assess the lateral distribution of contaminants and potential impacts to groundwater at lower exposure and cost compared to the other alternatives and existing DOW. The DQO team recognized that the existing DOW and Alternative 1 provide more data and information than Alternative 2 relative to total inventory, dangerous waste, and TRU primarily because more samples are collected. However, it was determined that the larger number of samples collected by the existing DOW and Alternative 1 would still not be sufficient to provide increased confidence on total inventory estimates, dangerous waste classification, or TRU classification. In addition, the existing DOW and Alternative 1 result in much higher cost and exposure, while providing inferior information regarding lateral spreading of contaminants and potential impacts to groundwater, as compared to Alternative 2.

Alternative 3 compares favorably with Alternative 2 in all areas except cost. The increased cost of Alternative 3 is because of drilling and sampling of a third borehole next to the 1325-N Crib. Alternative 2 is preferred over Alternative 3 because of the relative lower cost of Alternative 2.

10.6 ANALYTE LIST COMPARISON

A comparison of the COPCs between the original DOW and the alternatives was presented in Table 10-1. The same analyte list is proposed for all alternatives except the original DOW. Analyses not used by the process, not present in groundwater and sediment data or giving an inconsistent response, were excluded from the COPC list. Mercury, volatiles, semivolatiles, pesticide/PCBs, fluoride, nitrate/nitrite, and sulfate fall into this category. Because soil washing is no longer a likely remedial alternative for highly contaminated soils, total carbonate, total organic carbon, and cation exchange capacity were removed from the COPC list.

10.7 SAMPLING AND ANALYSIS SCHEME

The SAP for the DQO alternatives is described in Appendix E of DOW (DOE/RL-94-104). Essentially, four split-spoon samples and seven grab samples will be collected from each borehole. In addition, RLS logging will be performed before casing down sizing. Analytes to be samples for are listed in Table 10-3.

Table 10-1. Comparison of Current and Alternative DOW Sampling and Analysis Plan - Analyte List. (Page 1 of 3)

Analyte/COPC	Method/Technique	Current DOW	Alternate DOW	Rationale/Comments
Gross Alpha Gross Beta	Gas Proportional Counter	✓	✓	COPC
Strontium-90	Radiochemical Separation and Beta Counting	✓	✓	COPC/Additional verticle distribution data obtained by downhole strontium-90 measurement via Y-90 bremstrahlung gamma is being investigated.
Potassium-40 Manganese-54 Cobalt-60 Ruthenium-106 Cesium-134 Cesium-137 Cerium-144 Europium-154 Europium-155 Radium-226 Thorium-228 Thorium-232	Gamma Spectrometry (Laboratory and Downhole Logging)	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	COPC
Uranium-233/234 Uranium-238 Plutonium-238 Plutonium-239/240	Alpha Spectrometry	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	COPC/May be needed to evaluate TRU
Cadmium Chromium (VI) Lead Nickel	ICP	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	COPC
Mercury	Atomic Absorption	✓		The mercury analysis has short holding time compared to all of the other rad and metal analyses that are to be proposed in the revised DOW. This creates a significant problem in the batching and shipping of the samples and will result in increased cost.

Table 10-1. Comparison of Current and Alternative DOW Sampling and Analysis Plan - Analyte List. (Page 2 of 3)

Analyte/COPC	Method/Technique	Current DOW	Alternate DOW	Rationale/Comments
Volatile Organics	CLP-TCL, VOCs	✓		Not a COPC. Presumed to have largely volatilized if ever present, will not significantly affect remediation decisions. Analysis is costly and has a short holding time (days), thus it will increase cost due to batching and shipping considerations as well.
Semi-Volatile Organics, Pesticides and PCBs	CLP-TCL, SVOCs, etc	✓		Not a COPC. No evidence that compounds are present, will not affect remediation decisions.
				Analysis is costly and has a short holding time (days), thus it will increase cost due to batching and shipping considerations as well.
Fluoride Nitrate/Nitrite Sulfate	EPA 300.0	✓ ✓ ✓		No added value. Anions are highly mobile, moved through soil column, no historical positive GW hits nearing MCL limits.
Total Carbonate	EPA 310.1	✓		Not useable for QRA, formation ion exchange potential expended, demineralized water as influent. Used for soil washing remedial design, which is no longer feasible for highly contaminated soils.
Total Organic Carbon	EPA 415.2	✓		Same as Total Carbonate.
Cation Exchange Capacity	EPA 9081A	✓		Same as Total Carbonate.
Grain Size Distribution and Contaminant Conc.	Combination	✓		Generally used for soil washing remedial design, no QRA value.
Grain Size Distribution	WHC/GEL or ASTM	✓	✓	May be needed to help in the interpretation of moisture logging data. There may be a radiological dose problem with 1 liter sample requirement. This sample would be optional, based on ALARA.

Table 10-1. Comparison of Current and Alternative DOW Sampling and Analysis Plan - Analyte List. (Page 3 of 3)

Analyte/COPC	Method/Technique	Current DOW	Alternate DOW	Rationale/Comments
Bulk Density	WHC/GEL or ASTM	✓		Enough data currently available, assumed bulk density is 1.6 g/cm^3.
Moisture Content	Neutron Moisture Logging/Physical Sampling	✓	✓	Physical samples may be taken to assist in the interpretation of logging data. There may be a radiological dose problem with sample volume requirement. This sample would be optional, based on ALARA.
Total Activity	WHC/222S Liquid Scintillation	✓	✓	Required for samples that are shipped offsite (PNL or Other Commercial)

Table 10-2. 1301/1325 Crib Characterization Data Quality Objectives, Technical Criteria.

1301/1325 Crib Characterization
Data Quality Objectives, Technical Criteria

Alt	Type	Description	Impact to GW, Driving Force	Total Inventory Conceptual Model	Lateral Distribution	Dangerous Waste	TRU	Remedial Alt	QRA	Exposure (Person-rem)	Relative Cost	Rank
	Existing DOW Full SAP/QAPP	Borings at 1301 Crib, Trench and 1325 Crib. Full laboratory analysis.	C	B+	D	C+	C+	✓	✓	14	D	4
1	Streamlined DOW Streamlined SAP/QAPP RLS, Moisture (N-5, N-35 and N-45)	Boring at 1301 Crib 1301 Trench and 1325 Crib. Limited Sample handling.	B+	A	C	C+	C+	✓	✓	13	C	3
2	Streamlined SAP/QAPP 2 Boreholes RLS, Moisture (N-5, N-35 and N-45)	Boreholes at 1301 Crib and side of 1301 Trench.	A-	C+	A	C	C	✓	✓	2	A	1
3	Streamlined SAP/QAPP 3 Boreholes RLS, Moisture (N-5, N-35 and N-45)	Boring at 1301 Crib side borings at 1301 Trench and 1325 Crib <u>or</u> Trench.	A	C+	A	C	C	✓	✓	3	B	2

Note: The lettering system was used for ranking alternatives in the DQO Workshop.

Table 10-3. Analyte List.

Sample Type	Analyte	Method	Detection Limit (pCi/gm or ppm)	Container Type/ Volume	Maximum Holding Time
PART A Chemical / Radiological (Split Spoon Soil Samples)	Radionuclides				
	• Gross alpha	Gas Proportional	--	amber glass 60 ml.	6 months
	• Gross beta	Gas Proportional	--		
	• Strontium-90	Beta Counting	1.0		
	• Uranium-233/234	Alpha Spectrometry	0.6		
	• Uranium 238		0.6		
	• Plutonium-238		0.6		
	• Plutonium-239/240		0.6		
	• Potassium-40	Gamma Spectrometry	10		
	• Manganese-54		0.25		
	• Cobalt-60		0.05		
	• Ruthenium-106		1.5		
	• Cesium-134		0.25		
	• Cesium-137		0.25		
	• Cerium-144		0.75		
	• Europium-152		0.60		
	• Europium-154		0.75		
	• Radium-226		4.5		
	• Thorium-228		0.6		
	• Thorium-232		0.6		
	Metals				
	• Cadmium	Inductively Coupled Plasma / EPA 6010	1.0	amber glass 40 ml	6 months
	• Chromium		1.0		
	• Lead		1.0		
	• Nickel		1.0		
	For <detectable Rad samples Total Activity	222-S Liquid Scintillation	50	20 ml	6 months
	For Radioactive Samples gross alpha gross beta GEA	222-S methods	tbd		
Part B Radiological (Grab Soil Sample)	Gross alpha Gross beta Gamma Emitters Sr-90	Gas Proportional Gas Proportional Gamma Spectrometry Beta Counting	tbd	amber glass 40 ml	6 months
Physical Properties	Moisture content	ASTM D2216 (GEL-14)	NA	one capped liner; one 400 gm moisture tin (sealed)	NA
	Moisture retention	GEL-19			
	Bulk density / porosity	GEL-14, GEL-16			
	Permeability	ASTM C 127-83 (GEL-09)			
	Particle size distribution	ASTM D422-63 (GEL-07)	NA	depends on grain size	NA

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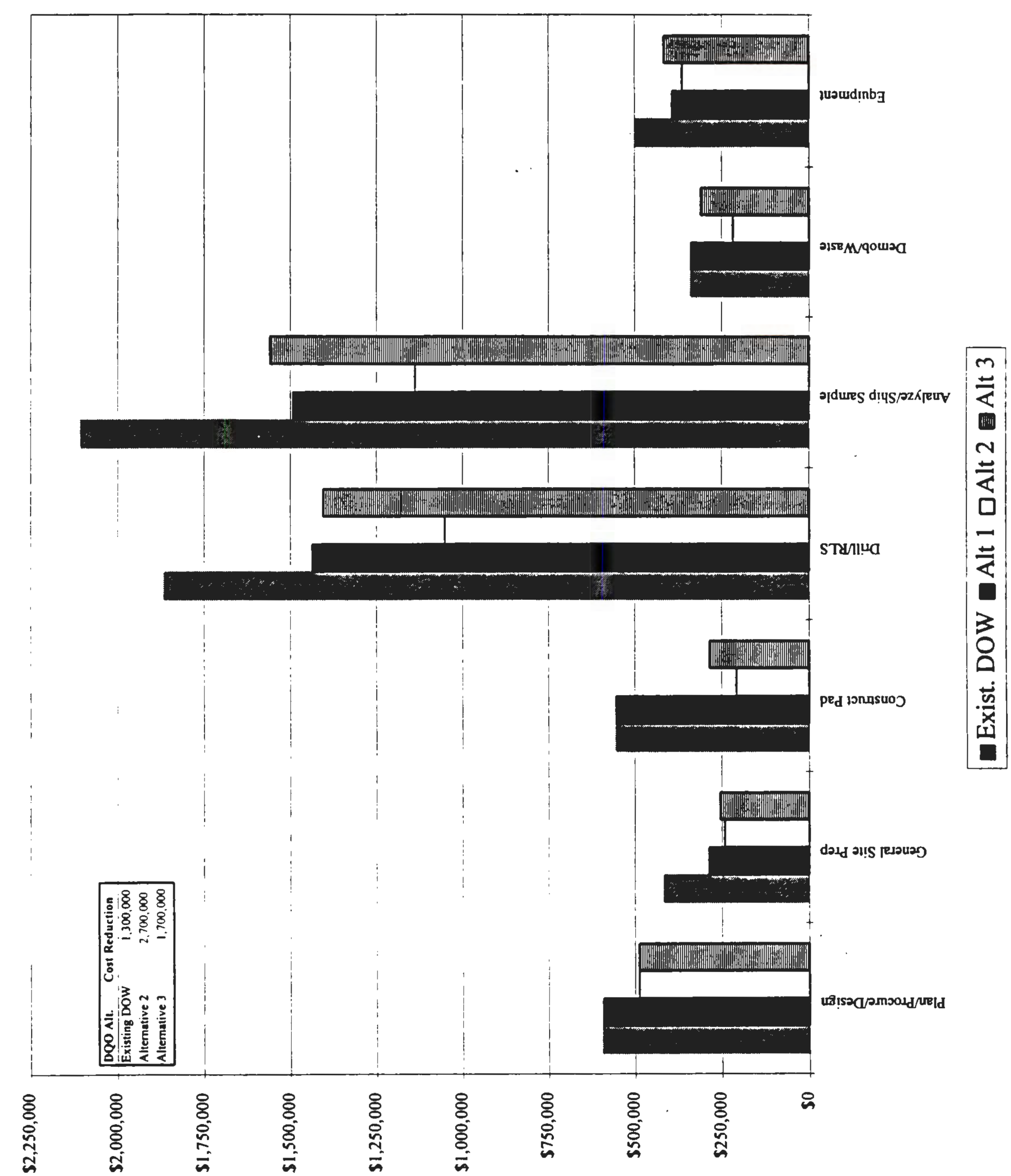
11.0 COST COMPARISON

To evaluate the cost effectiveness of the DQO alternatives, estimates of cost reductions were prepared. These cost reductions were estimated by comparing cost components required in the existing DOW to those components required in the alternatives. For instance, the existing DOW required three drill pads to drill three boreholes. In Alternative 2, only two drill pads (for two boreholes) were required, which deleted the cost for the third pad. Another cost reduction example was to reduce equipment costs by a certain percentage if fewer samples were collected. The results of the cost reduction evaluation is presented in Figure 11-1.

Detailed cost estimates were not prepared because of time constraints. However, detailed engineering costs were not required to compare costs. All costs discussed do not include contingency. Alternative 3 approximate costs were $3.5 million while Alternative 2 approximate costs were $2.4 million. The original DOW cost was estimated at $5.52. Alternative 2 provided the most cost saving compared to the existing DOW.

Figure 11-1. DQO Alternative Cost Comparison.



12.0 EXPOSURE COMPARISON

Exposure comparisons were calculated in the same manner as the cost comparisons. If one borehole was deleted from the original scope, then all exposures associated with the borehole were removed. The person-rem exposure was totaled for each alternative and is presented in Table 12-1. Alternatives 2 and 3 reduced the exposures significantly compared to the existing DOW.

Table 12-1. Radiation Exposure Summary.

SUMMARY OF ESTIMATED RADIATION EXPOSURES		
Alternative	**Major Exposures[a] (person-rem)**	**Comments**
Existing DOW	Total = 14 person-rem Site preparation = 1.5 1301 crib 0.15; 1301 trench 0.52; 1325 crib 0.85 drill pad construction = 7 1301 crib 0.3; 1301 trench 2.1; 1325 crib 4.7 drilling = 2.95 1301 crib 0.95; 1301 trench 0.68; 1325 crib 1.3 sampling = 0.80 1301 crib 0.25; 1301 trench 0.20; 1325 crib 0.35 demobilization = 1.0 1301 crib 0.30; 1301 trench 0.30; 1325 crib 0.40 RLS = 0.2	High exposures occur during drill pad construction in the middle of 1301-N trench and 1325-N crib over concrete panels (labor intensive in a high radiation field). High exposures occur during sample handling (labor intensive with a hot source). High exposures during general site prep at 1325-N Crib because of radiation field. High exposures occur during waste handling (emptying core barrel/filling drums) because exposure rates could be as high as 5 R/hr. The exposures for long-term management of the waste once it is in long-term storage is negligible.
Alternative 1 3 boreholes streamlined SAP/QAPP RLS	Total = 13 person-rem Site preparation = 1.5 drill pad construction = 7 drilling = 2.4 sampling = 0.40 demobilization = 1.0 RLS = 0.2	High exposures occur during drill pad construction in the middle of 1301-N trench and 1325-N crib over concrete panels (labor intensive in a high radiation field). Reduces exposures during sample handling; less samples collected, lower vol. shipped. High exposures during general site prep at 1325-N Crib because of radiation field.
Alternative 2 1 crib, 1 side borehole streamlined SAP/QAPP RLS	Total = 2 person-rem Site preparation = 0.35 drill pad construction = 0.30 drilling = 0.95 sampling = 0.15 demobilization = 0.35 RLS = 0.2	Reduces exposures during drill pad construction because pad will be placed adjacent to the 1301-N trench (no more concrete panel problem) and other drill pad is eliminated. Reduces exposures during sample handling (less samples collected, lower volumes shipped than existing DOW). Eliminates exposures during general site prep, drilling and sampling at 1325-N Crib.
Alternative 3 1 crib, 2 side borehole streamlined SAP/QAPP RLS	Total = 3 person-rem Site preparation = 0.45 drill pad construction = 0.30 drilling = 1.1 sampling = 0.25 demobilization = 0.4 RLS = 0.2	Reduces exposures during drill pad construction because pad will be placed adjacent to the 1301-N trench and 1325-N crib (no more concrete panel problem). Reduces exposures during sample handling (less samples collected, lower volumes shipped than existing DOW, but more than Alternative 2).

13.0 CONCLUSION AND RECOMMENDATIONS

Summarizing the existing data allows one to assess the data that exists and indicates the level of concentrations of cesium-137, strontium-90, cobalt-60, and plutonium-239/240. The data indicates significant quantities of cobalt, strontium, and cesium discharged to 1301-N/1325-N with lower amounts of plutonium discharged.

High concentrations of all four radionuclides are present in the near-surface sediment in the cribs and trenches. Significantly less cobalt, strontium, and cesium occur outside the footprint of the cribs and trenches. Concentrations of strontium in the old water table decrease from nCi/gm directly under 1301-N to 50 pCi/g in soil near the river at the N-94A well. While concentrations of the cesium and cobalt are less overall, the same pattern is found.

Strontium-90 concentrations are in the pCi/g level outside the footprint of the cribs and trenches in soils once saturated with effluent originating from facilities. The strontium is now stranded in the vadose zone.

This DQO summary presents the current status of the process. The regulators and DOE have not agreed upon which alternative to pursue. The DOE and its support contractor believe that Alternative 2 is the most cost effective while still providing the data necessary for the decisions. Ecology and EPA indicate that Alternative 3 is preferred. All parties agree that the original DOW and Alternative 1 are not the preferred strategies.

Alternatives 2 and 3 require one boring in the 1301-N crib that will confirm or deny the vertical profile. Both alternatives require one boring near the highest surface concentration area, but not directly in the 1301-N trench to provide data in regard to lateral movement and physical characteristics at a low cost and exposure.

If Alternative 2 is used, 1325-N LWDF will be assumed to be an analogous site. This is thought to be a conservative assumption. The 1301-N LWDF should present higher concentrations than 1325-N LWDF for the following reasons:

- The 1325-N LWDF received lower flow and volume than 1301-N LWDF. The 1325-N LWDF operated a shorter time.
- The 1325-N trench was added to improve the flow of water because the associated crib did not allow rapid flow.
- The 1301-N had LWDF saturated the soil and allowed strontium to reach the river before building 1325-N LWDF.

The spectral gamma and neutron moisture logging in both boreholes in the 1301-N Area and in three existing wells will provide sufficient data to confirm the analogous site theory without the cost of the additional borehole near the 1325-N crib.

The spectral gamma and neutron moisture logging in both boreholes in the 1301-N Area and in three existing wells will provide sufficient data to confirm the analogous site theory without the cost of the additional borehole near the 1325-N crib.

Ecology and EPA perceive that more information than the logging is required to ensure the 1325-N LWDF to be an analogous site. The logging may give lower strontium concentrations because of the measurement process than actual soil data, or not detect its presence at all. Assuming the site to be analogous could also result in more remediation activity and higher cost for remediation.

Current discussions are underway to reach an agreement between Alternative 2 or 3 or to establish added decision criteria to determine whether to perform the boring near 1325-N LWDF.

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ATTACHMENT 1

1301-N/1325-N LWDF
EXISTING DATA PACKAGE

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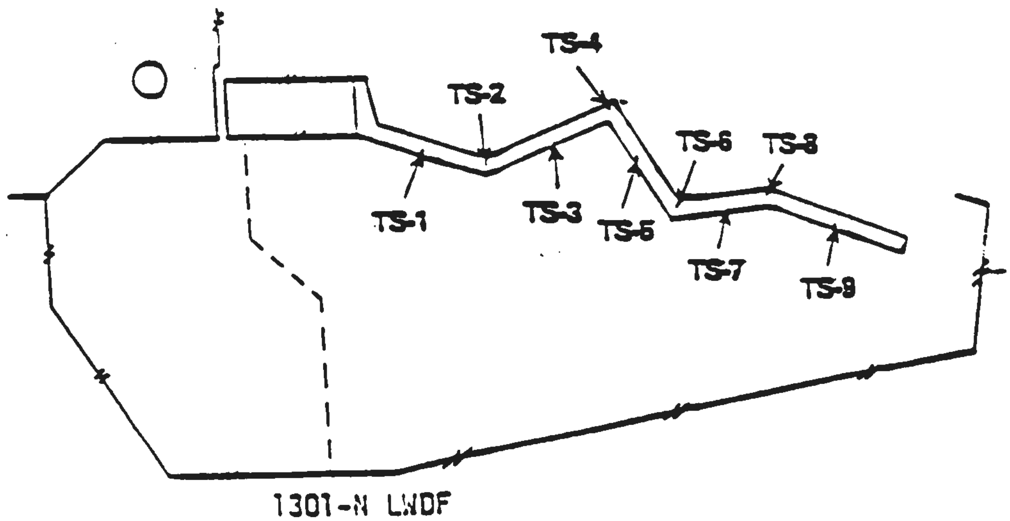
SEDIMENT DATA
1301-N TRENCH AND 1325-N CRIB

Figure A1-1. Sediment Sampling Locations for the 1301-N and 1325-N LWDFs.



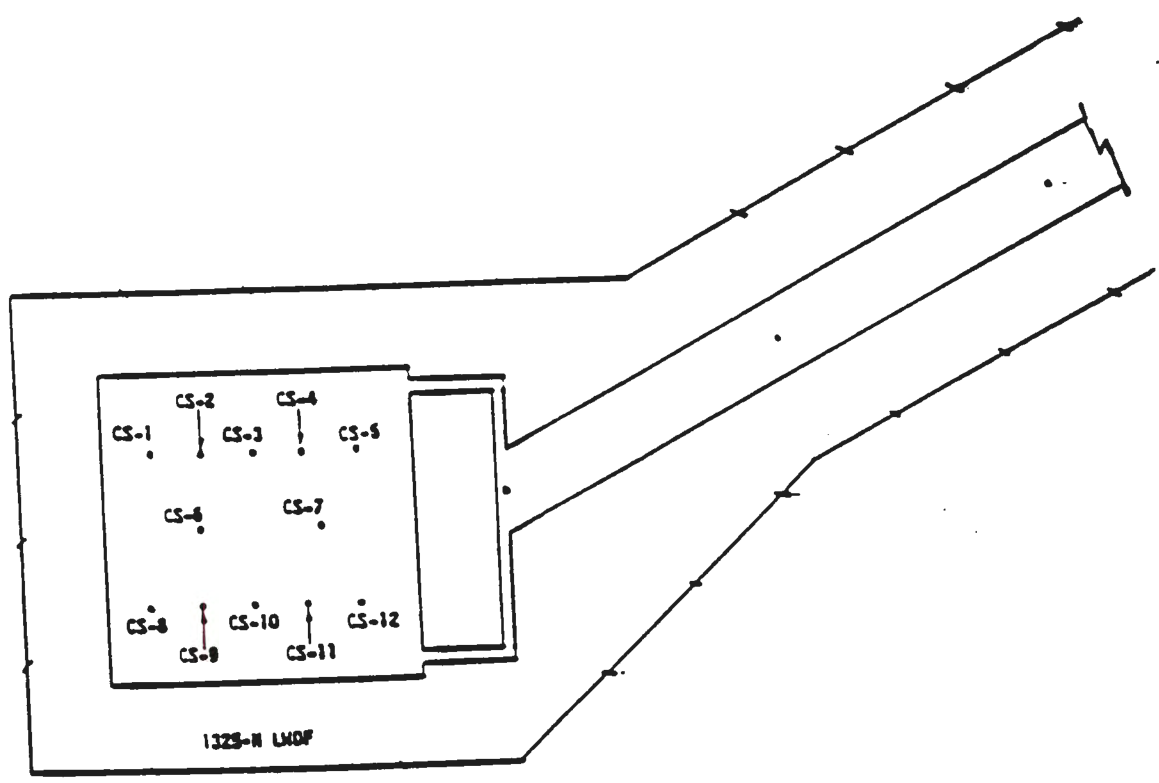
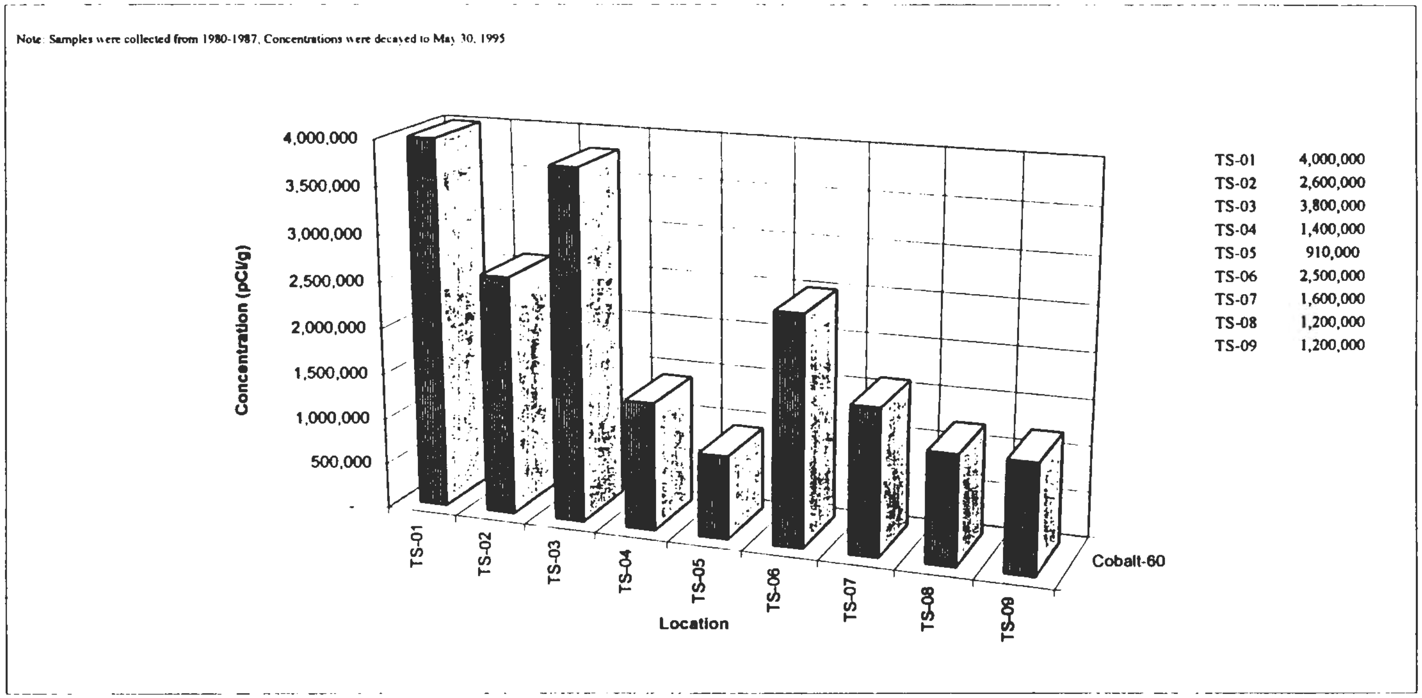


Figure A1-2 . Average Concentrations in 1301-N Trench Decayed to May 30, 1995. (Page 1 of 2)



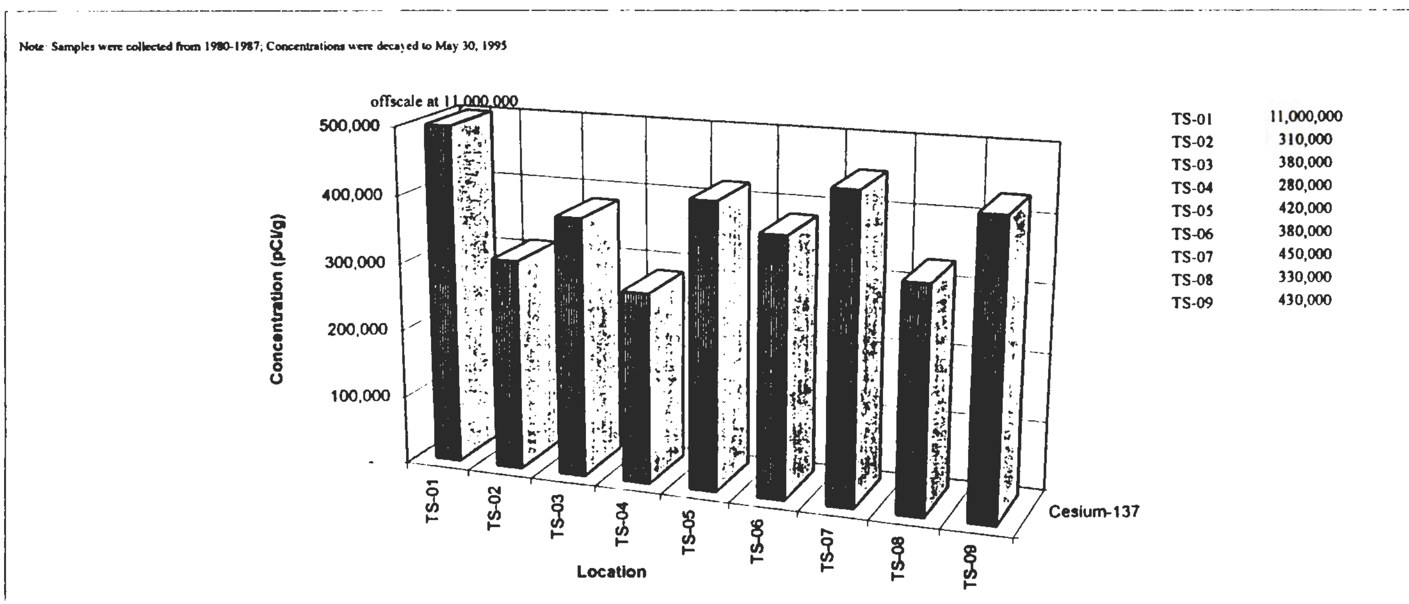
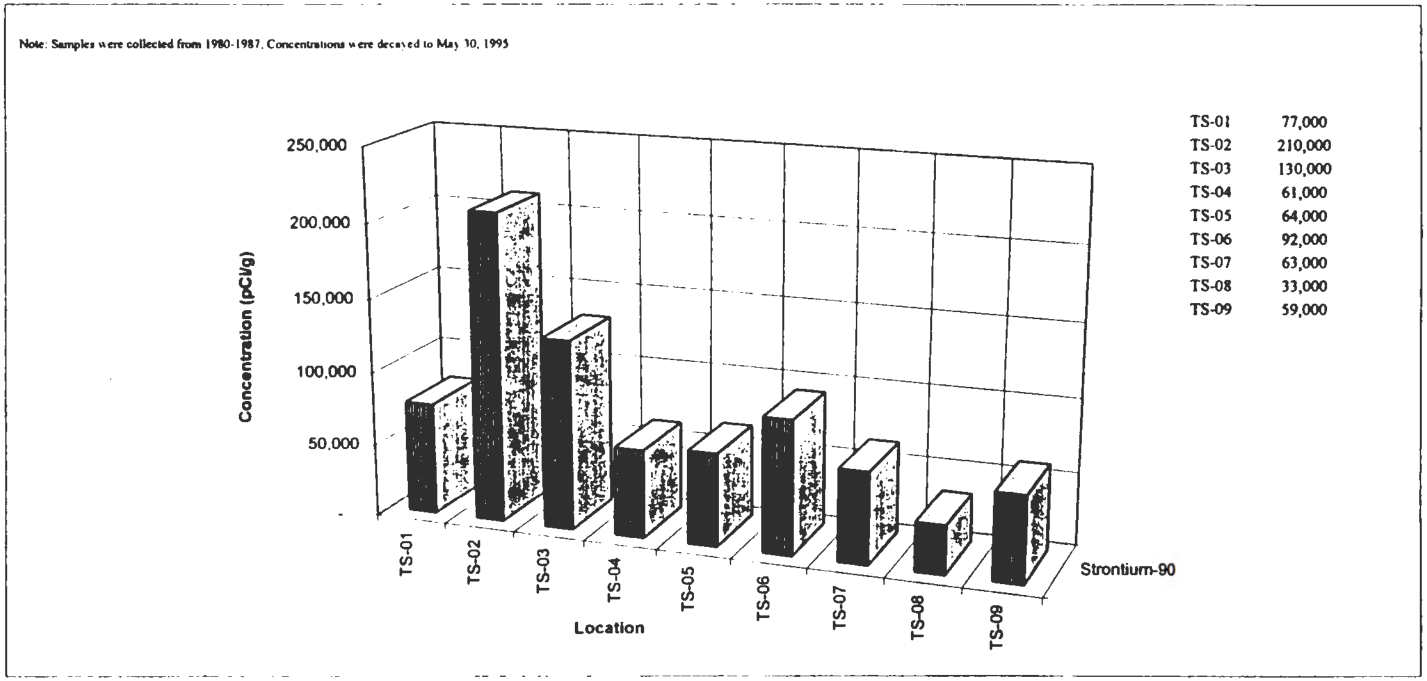


Figure A1-2. Average Concentrations in 1301-N Trench Decayed to May 30, 1995. (Page 2 of 2)



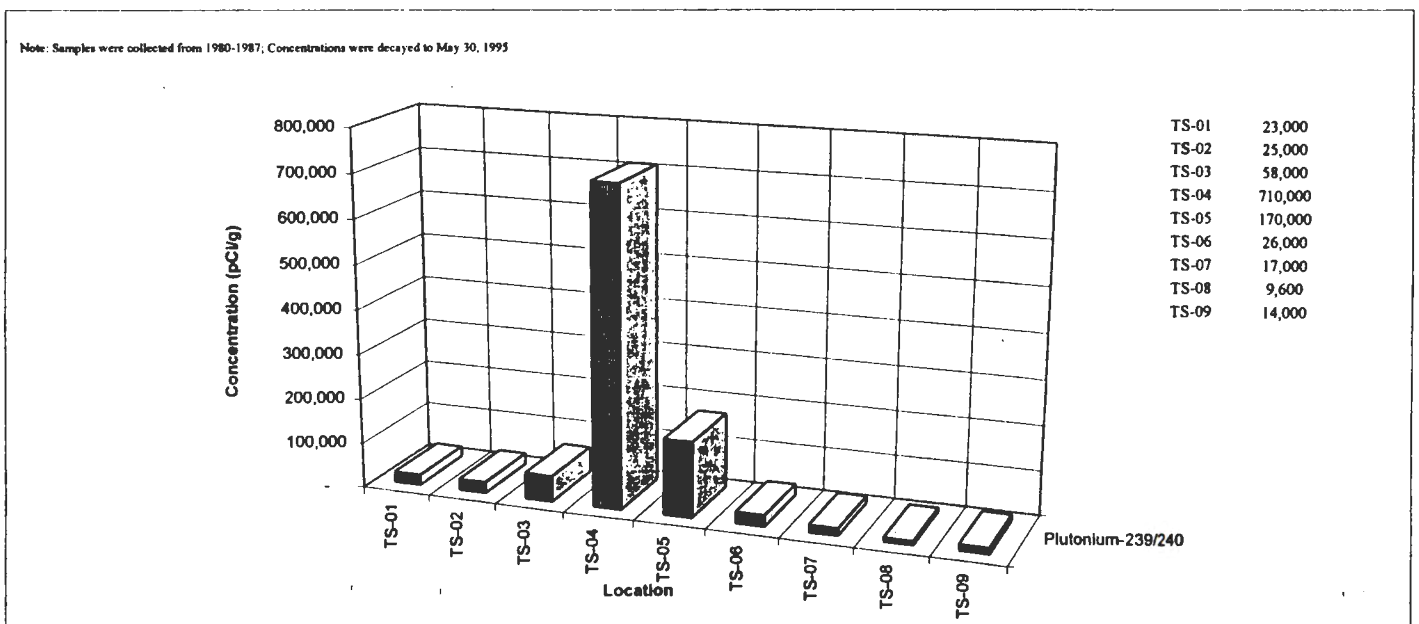
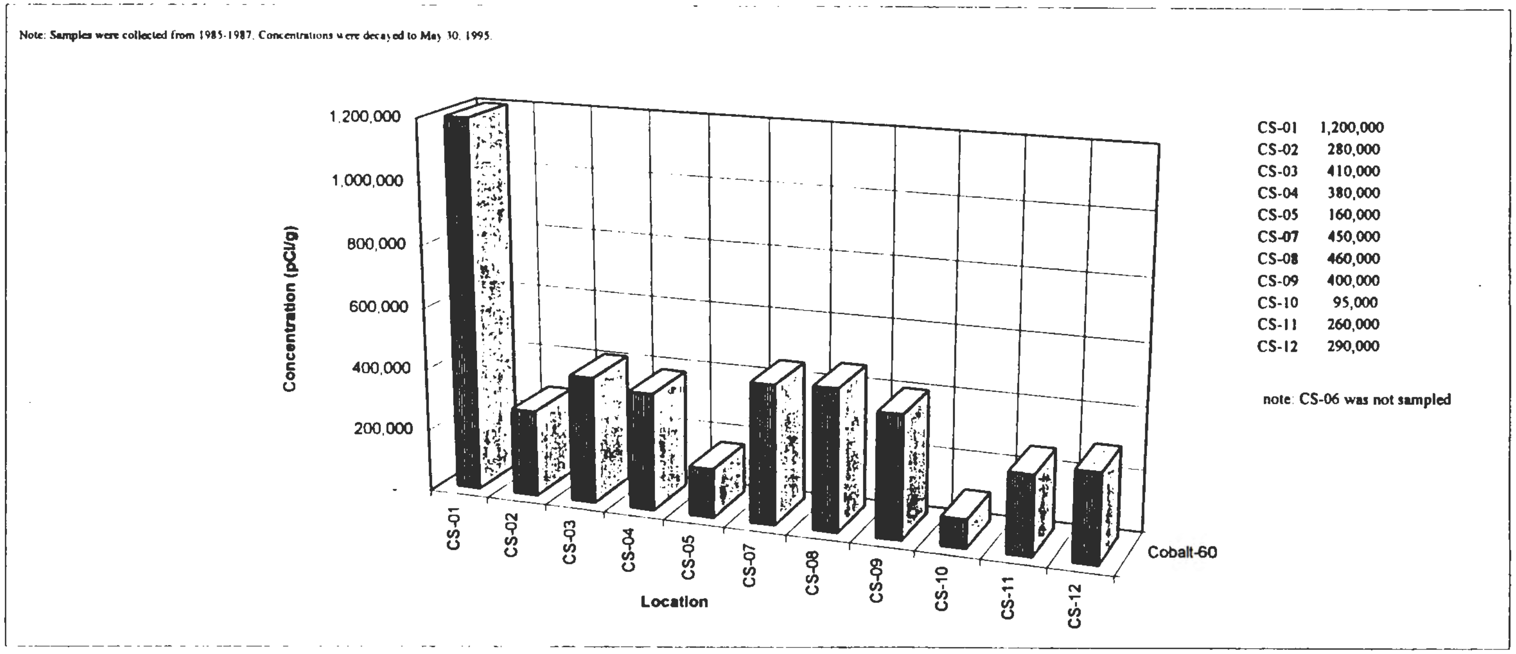


Figure A1-3 . Average Concentrations In 1325-N Crib Decayed to May 30,1995. (Page 1 of 2)



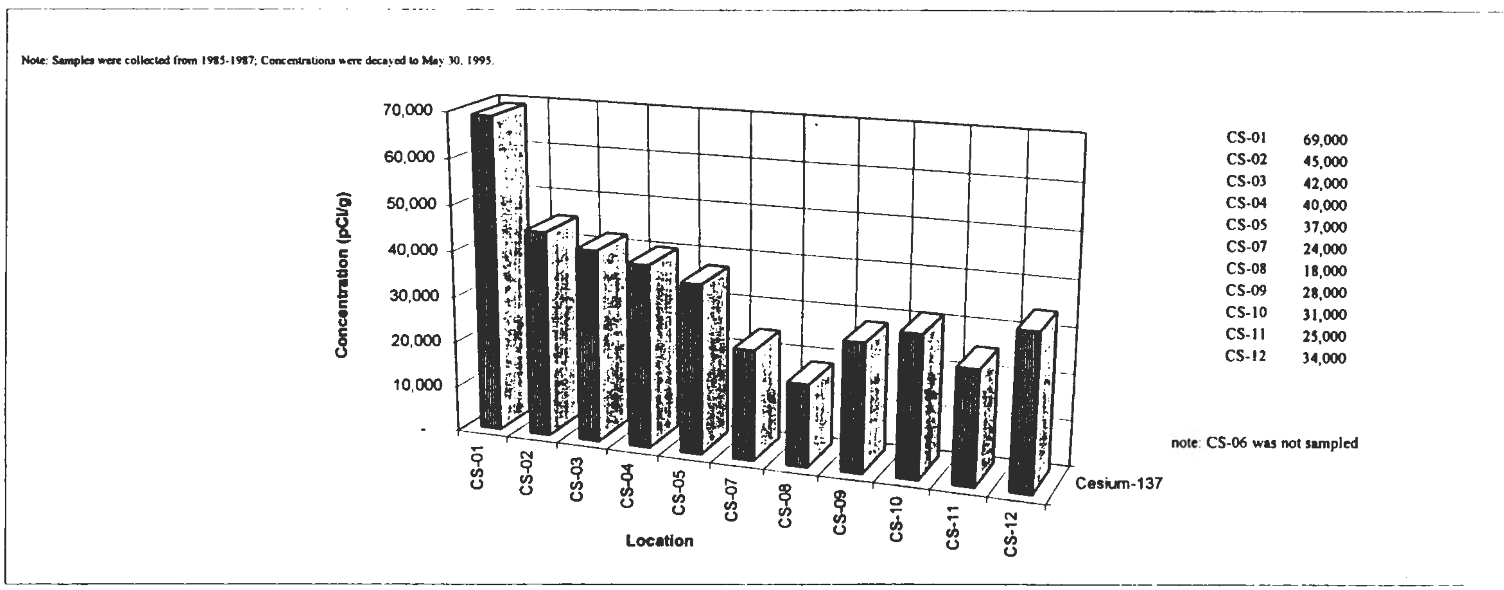
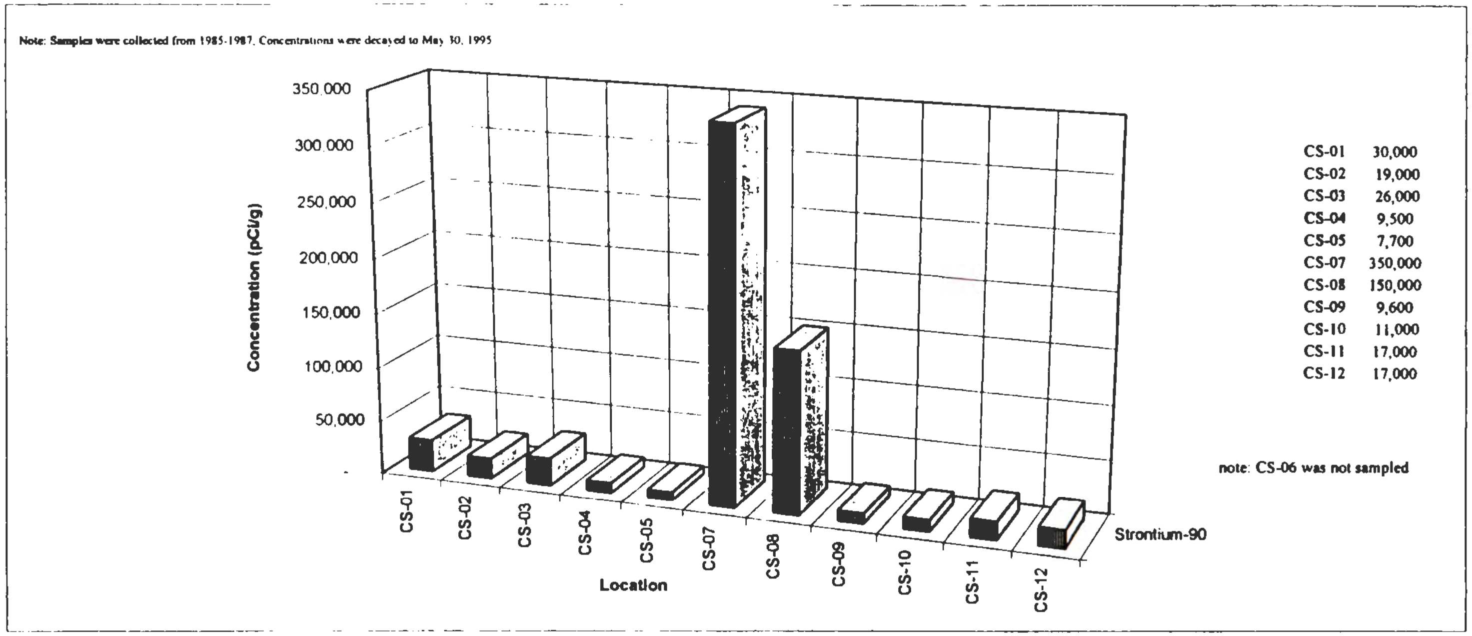
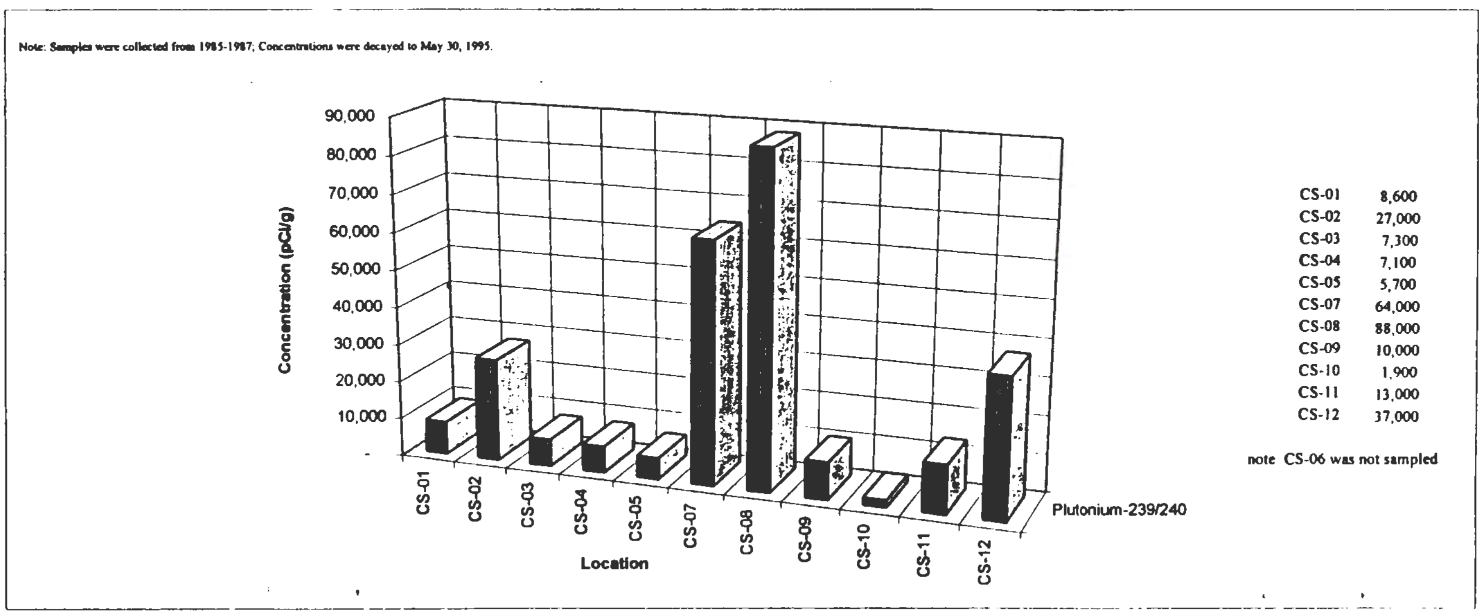


Figure A1-3. Average Concentrations In 1325-N Crib Decayed to May 30,1995. (Page 2 of 2)





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SOILS DATA
N SPRINGS AREA WELLS AND BOREHOLES

Figure A1-4
100-N Area Facilities, Wells, and Sampling Locations Shown with the Location for Cross Sections A - A' and B-B'.

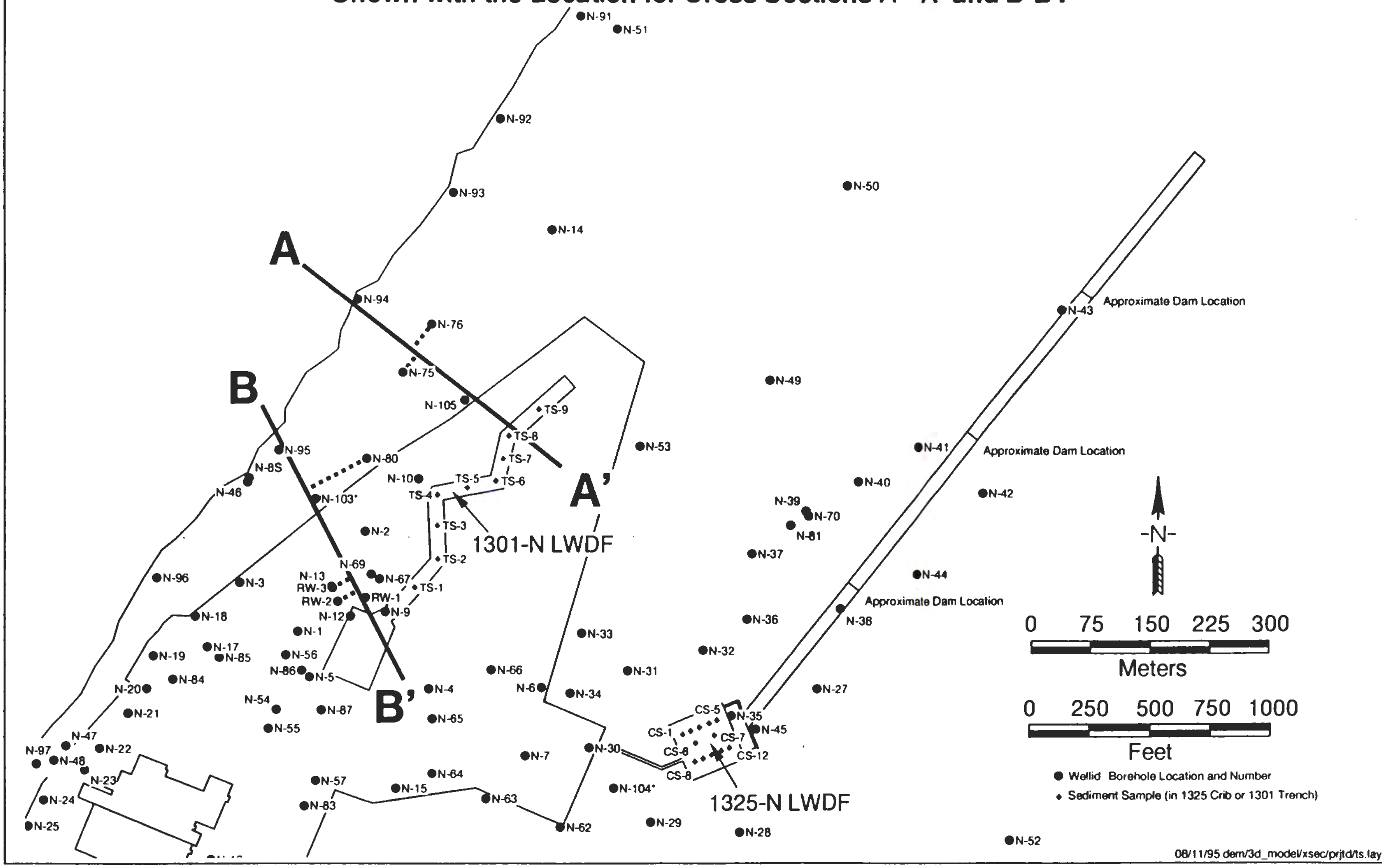
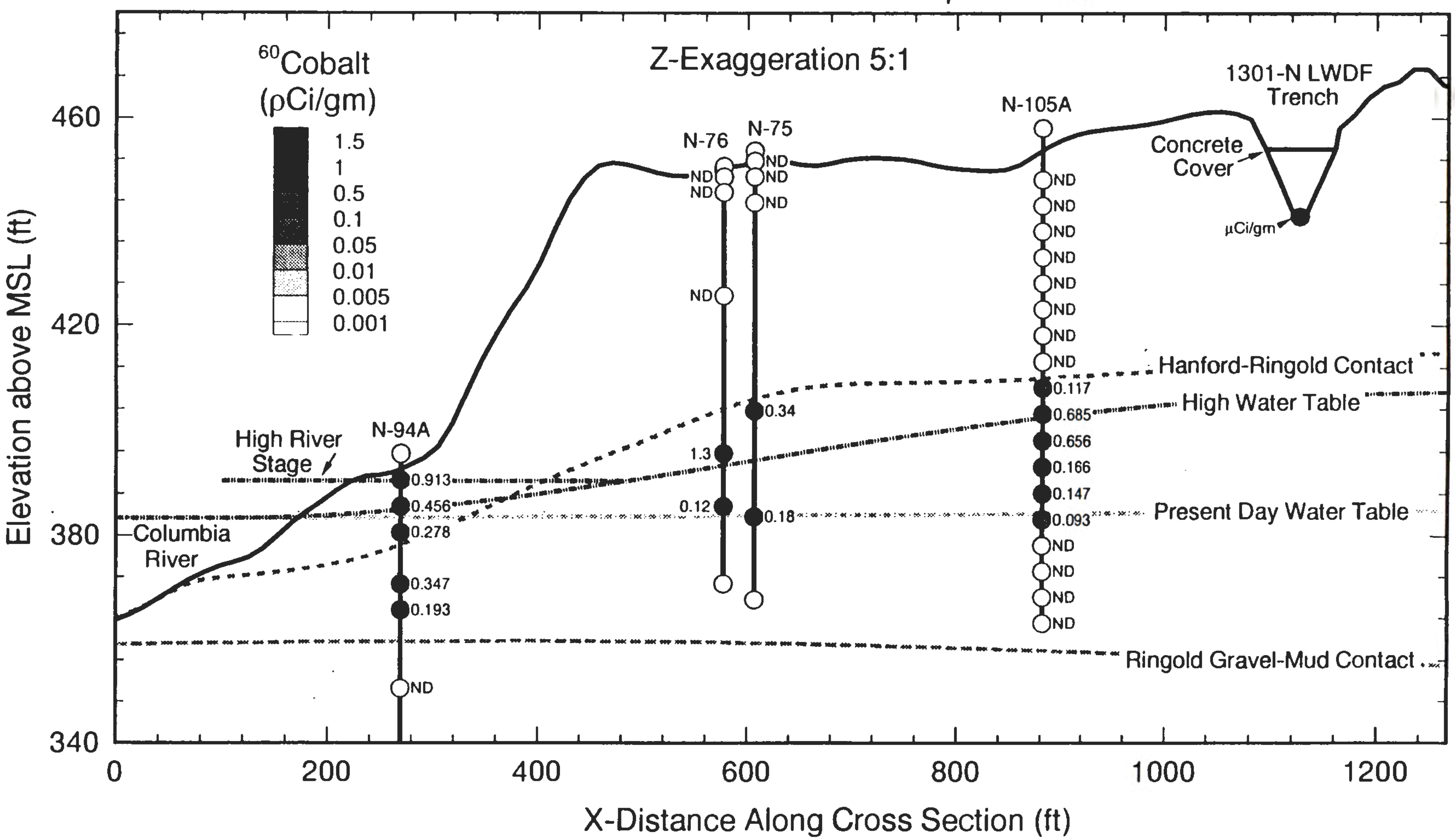


Figure A1-5.

Cross Section A to A' for Radionuclide Concentrations (Decayed to May 1995)
^{60}Cobalt Soil and Sediment Sample Locations. (Page 1 of 3)



08/11/95 dem/3d_model/xsec/prjtd/nco lay

Figure A1-5.

Cross Section A to A' for Radionuclide Concentrations (Decayed to May 1995)

^{137}Cesium Soil and Sediment Sample Locations (Page 2 of 3)

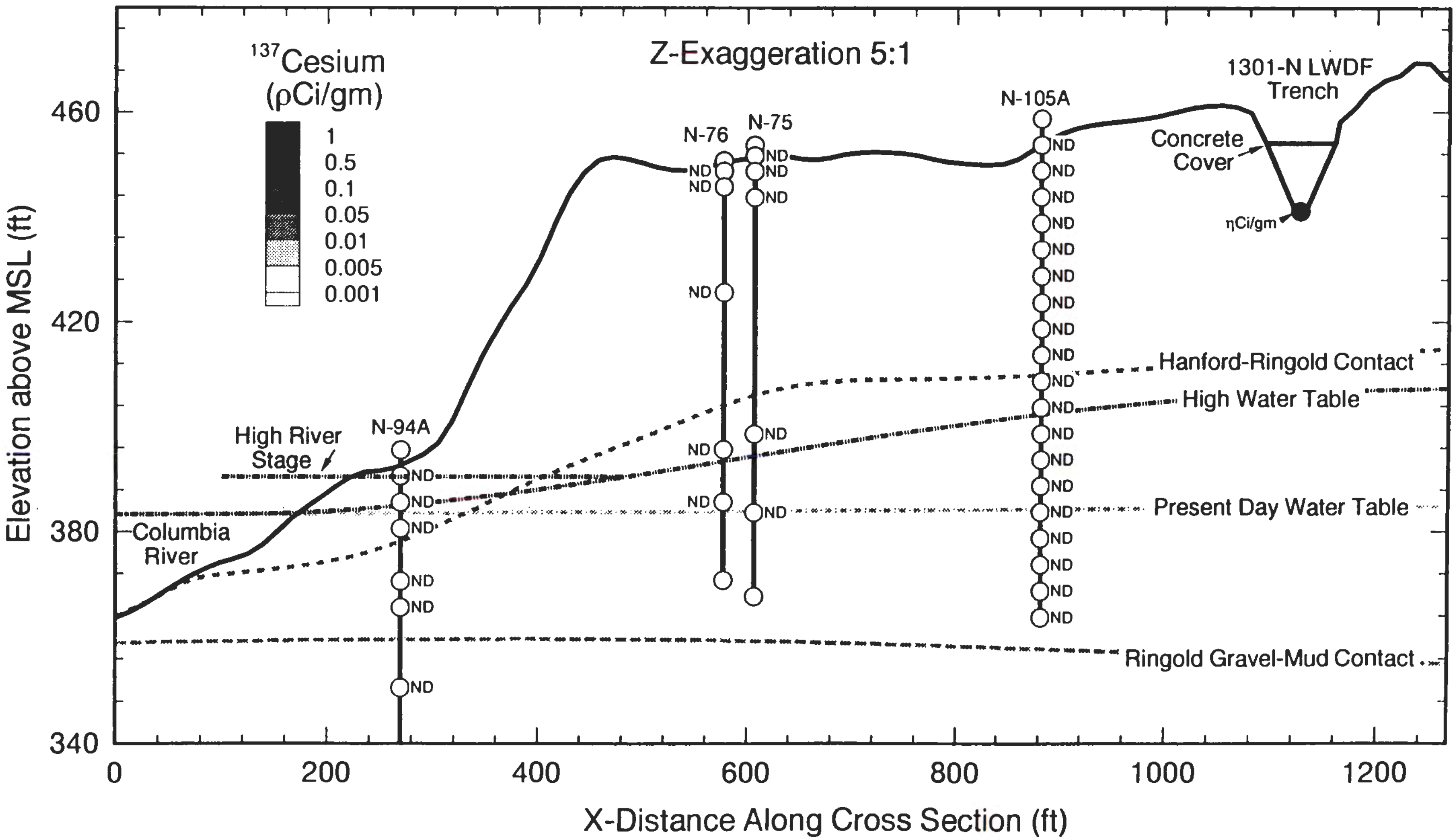
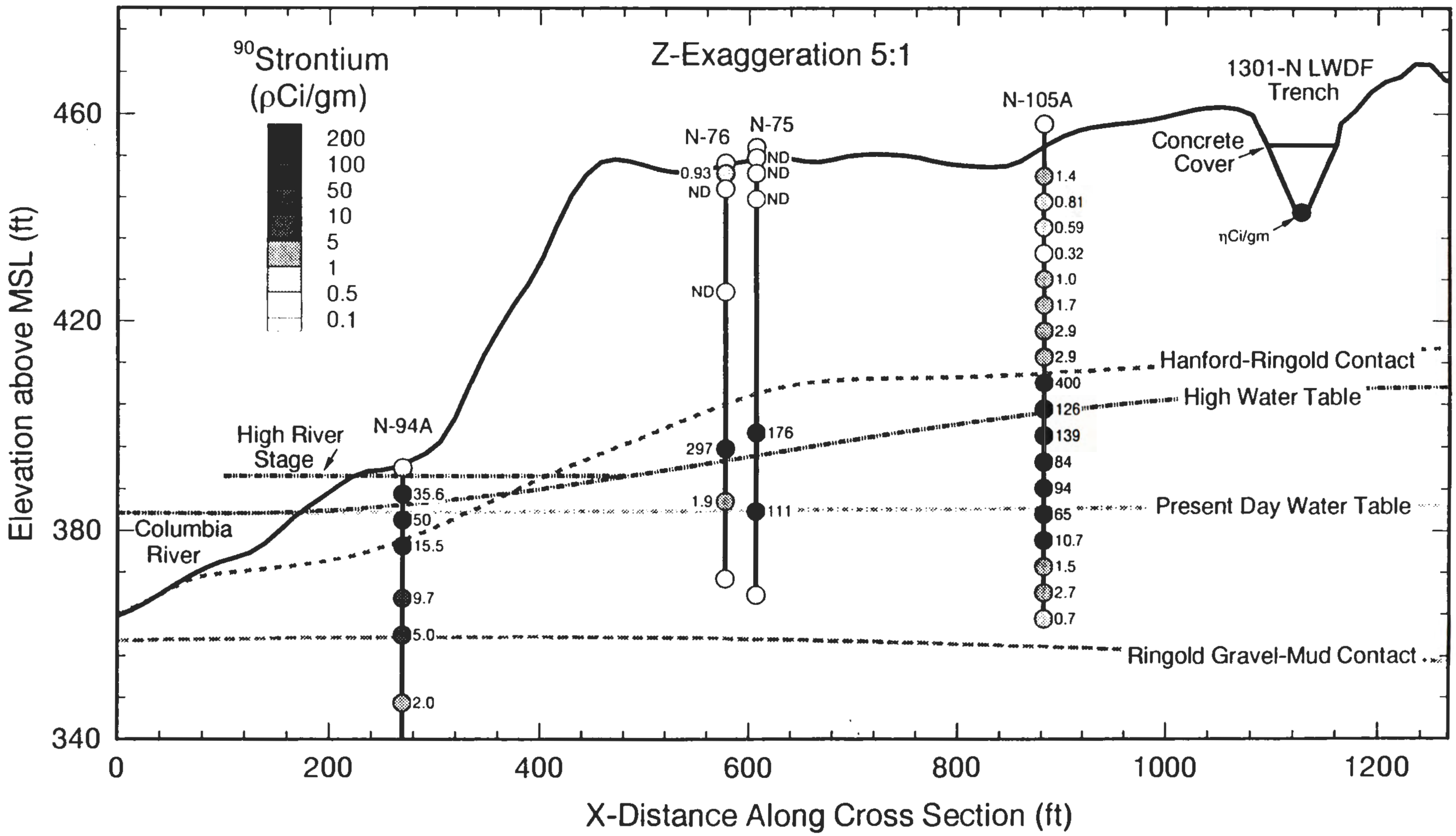


Figure A1-5.

Cross Section A to A' for Radionuclide Concentrations (Decayed to May 1995) ^{90}Strontium Soil and Sediment Sample Locations. (Page 3 of 3)



08/11/95 dem/3d_model/xsec/prjtd/nsr.lay

Figure A1-6.

Cross Section B to B' for Radionuclide Concentrations (Decayed to May 1995)
^{60}Cobalt Soil and Sediment Sample Locations. (Page 1 of 3)

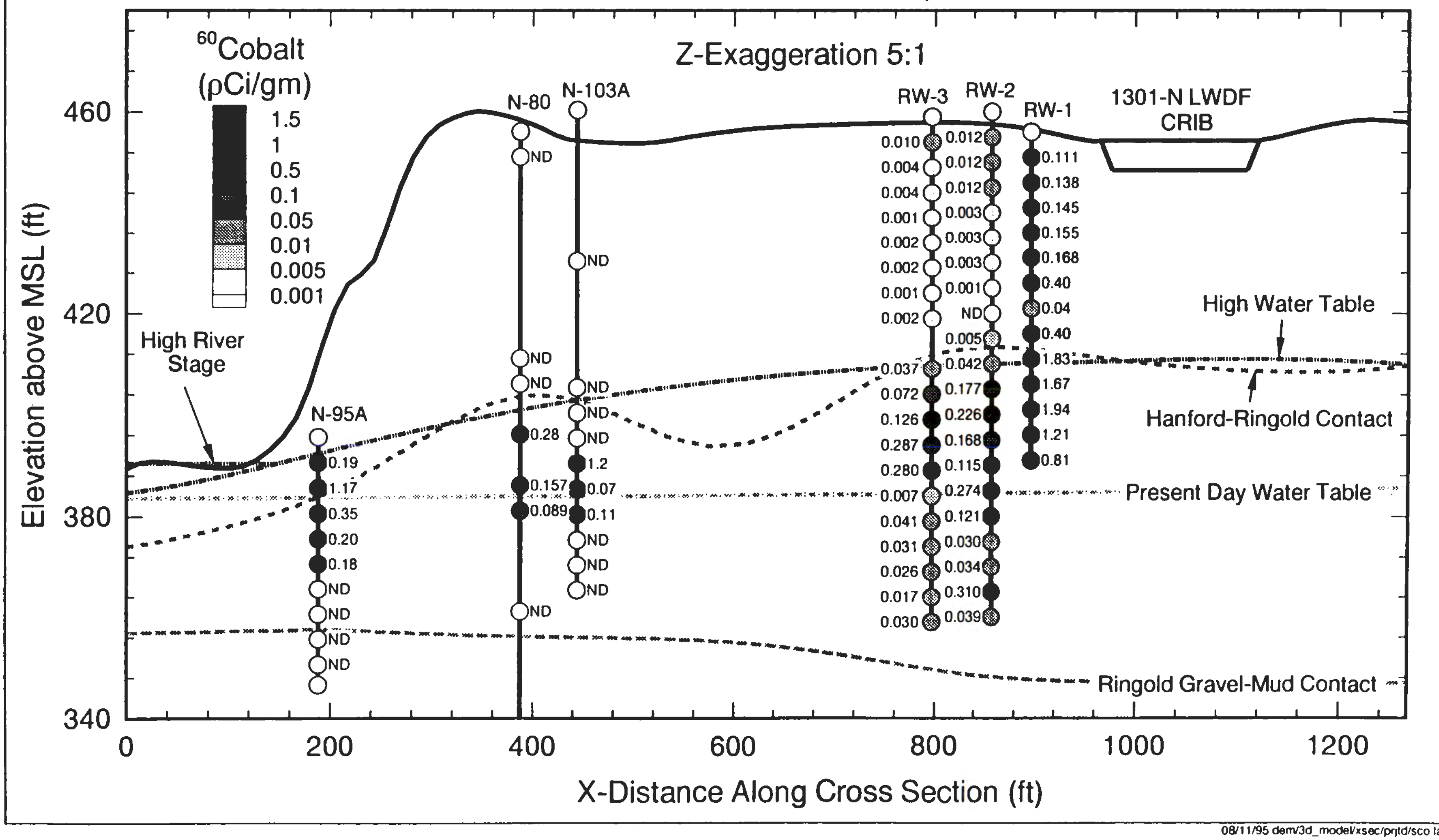
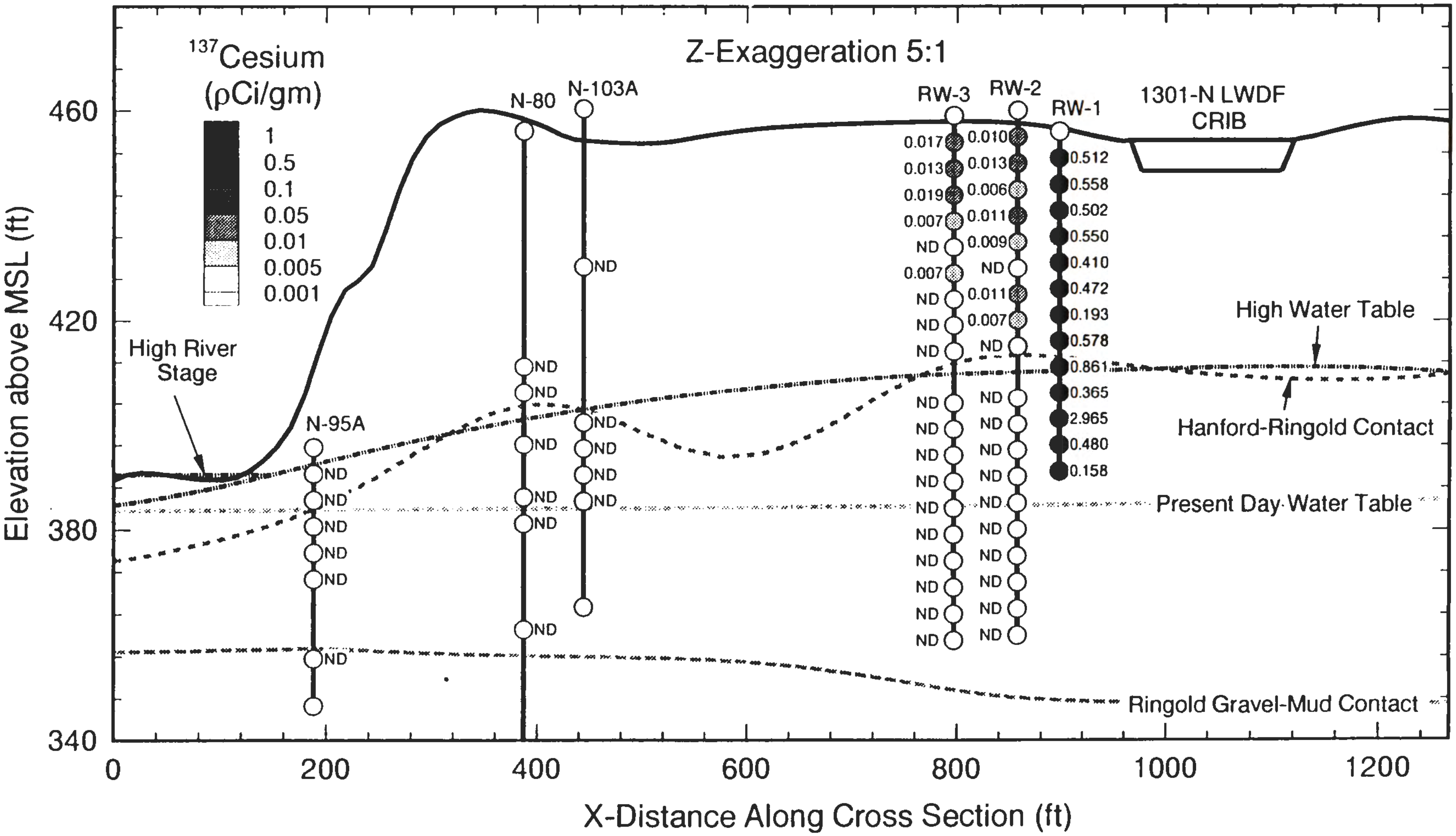


Figure A1-6.

Cross Section B to B' for Radionuclide Concentrations (Decayed to May 1995)

^{137}Cesium Soil and Sediment Sample Locations. (Page 2 of 3)



08/11/95 dem/3d_model/xsec/prjtd/scs lay

Figure A1-6.

Cross Section B to B' for Radionuclide Concentrations (Decayed to May 1995)
^{90}Strontium Soil and Sediment Sample Locations. (Page 3 of 3)

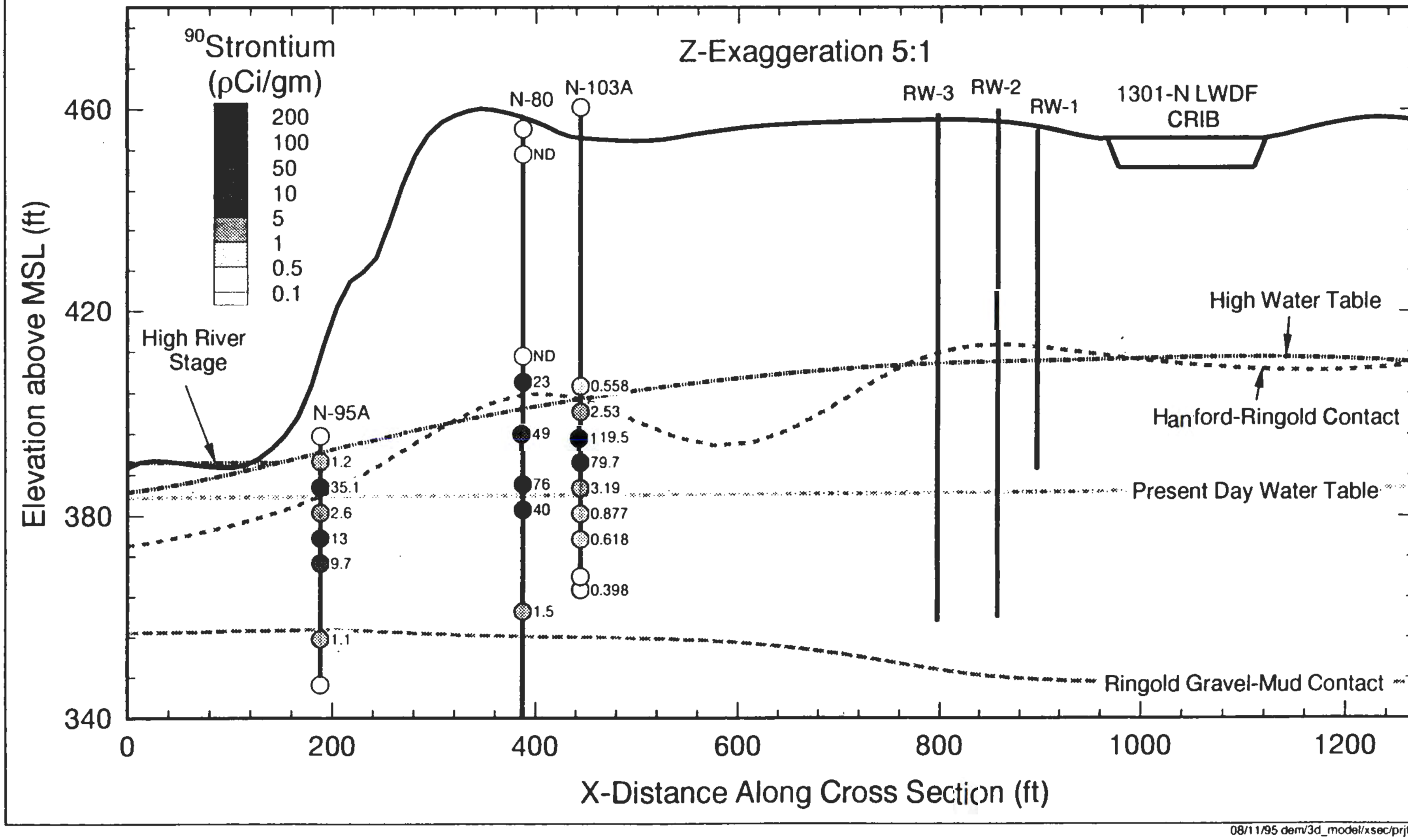


Table A1-1. Radionuclides Concentrations Detected in 1301-N Trench Sediment from 1980 to 1985 from Locations TS-01 to TS-09. (Page 1 of 2)

Location: Analyte Units:	TS-01 pCi/g	TS-02 pCi/g	TS-03 pCi/g	TS-04 pCi/g	TS-05 pCi/g	TS-06 pCi/g	TS-07 pCi/g	TS-08 pCi/g	TS-09 pCi/g
Collection Date:					1980				
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cerium-144	11,000,000	4,100,000	1,100,000	800,000	510,000	860,000	410,000	ND	330,000
Europium-154	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-134	NA	NA	NA	NA	41,000	NA	NA	NA	NA
Cesium-137	270,000	210,000	120,000	220,000	260,000	210,000	240,000	630,000	350,000
Cobalt-60	13,000,000	8,800,000	8,400,000	5,100,000	3,100,000	5,600,000	1,700,000	7,600,000	4,300,000
Cobalt-58	250,000		NA	NA	NA	NA	NA	NA	NA
Iron-59	NA	330,000	NA	NA	NA	NA	NA	NA	NA
Manganese-54	4,400,000	2,800,000	1,400,000	1,000,000	610,000	1,100,000	350,000	430,000	700,000
Niobium-95	3,600,000	1,500,000	220,000	260,000	140,000	270,000	92,000	ND	120,000
Plutonium-238	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ruthenium-103	NA	110,000	NA	NA	NA	NA	NA	NA	NA
Ruthenium-106	2,700,000	870,000	NA	NA	NA	NA	NA	NA	NA
Strontium-90	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zirconium-95	1,980,000	790,000	NA	NA	NA	NA	NA	NA	NA
Collection Date:					1981				
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cerium-144	2,700,000	1,100,000		1,200,000	440,000	770,000	840,000	790,000	110,000
Europium-154	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-134	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137	190,000	190,000	530,000	330,000	490,000	570,000	530,000	440,000	780,000
Cobalt-60	6,600,000	6,300,000	19,000,000	6,000,000	4,400,000	17,000,000	8,900,000	5,400,000	8,300,000
Cobalt-58	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron-59	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese-54	1,300,000	1,100,000	1,700,000	980,000	390,000	1,300,000	900,000	750,000	990,000
Niobium-95	140,000	90,000	NA	NA	NA	NA	NA	NA	NA
Plutonium-238	5,500	1,500	6,200	1,800	780	4,900	6,300	1,200	4,000
Plutonium-239/240	26,000	9,200	25,000	12,000	5,500	25,000	30,000	6,600	20,000
Ruthenium-103	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ruthenium-106	750,000	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	170,000	770,000	110,000	36,000	21,000	96,000	110,000	25,000	45,000
Zirconium-95	NA	NA	NA	NA	NA	NA	NA	NA	NA
Collection Date:					1982				
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cerium-144	NA	2,100,000	NA	NA	NA	NA	NA	NA	1,300,000
Europium-154	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-134	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137	940,000	490,000	940,000	530,000	540,000	500,000	1,000,000	460,000	560,000
Cobalt-60	21,000,000	27,000,000	34,000,000	6,400,000	6,600,000	15,000,000	14,000,000	4,500,000	4,300,000
Cobalt-58	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron-59	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese-54	710,000	1,900,000	860,000	460,000	460,000	470,000	490,000	270,000	ND
Niobium-95	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-238	5,500	14,000	29,000	510,000	120,000	9,300	3,800	9,500	1,100
Plutonium-239/240	28,000	63,000	170,000	2,800,000	660,000	44,000	17,000	16,000	13,000
Ruthenium-103	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ruthenium-106	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	110,000	250,000	320,000	150,000	110,000	230,000	83,000	70,000	150,000
Zirconium-95	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table A1-1. Radionuclides Concentrations Detected in 1301-N Trench Sediment from 1980 to 1985 from Locations TS-01 to TS-09. (Page 2 of 2)

Location: Analyte Units:	TS-01 pCi/g	TS-02 pCi/g	TS-03 pCi/g	TS-04 pCi/g	TS-05 pCi/g	TS-06 pCi/g	TS-07 pCi/g	TS-08 pCi/g	TS-09 pCi/g
Collection Date:	1983								
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cerium-144	NA	NA	NA	380,000	NA	NA	NA	NA	NA
Europium-154	130,000	ND	ND	54,000	80,000	170,000	ND	ND	ND
Cesium-134	ND	ND	ND	ND	28,000	ND	37,000	28,000	NA
Cesium-137	83,000,000	550,000	580,000	380,000	720,000	950,000	800,000	400,000	390,000
Cobalt-60	22,000,000	16,000,000	25,000,000	8,000,000	5,200,000	16,000,000	6,000,000	4,000,000	4,000,000
Cobalt-58	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron-59	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese-54	610,000	410,000	620,000	940,000	130,000	300,000	140,000	170,000	220,000
Niobium-95	NA	NA	NA	120,000	NA	NA	NA	NA	NA
Plutonium-238	2,400	3,000	1,800	1,500	560	2,000	1,100	830	920
Plutonium-239/240	12,000	13,000	10,000	7,500	3,000	9,800	6,200	4,600	4,300
Ruthenium-103	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ruthenium-106	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	46,000	46,000	29,000	26,000	13,000	46,000	27,000	13,000	8,700
Zirconium-95	NA	NA	NA	NA	NA	NA	NA	NA	NA
Collection Date:	1984								
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cerium-144	NA	NA	NA	NA	NA	NA	870,000	NA	NA
Europium-154	NA	NA	NA	NA	150,000	NA	NA	NA	NA
Cesium-134	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137	3,100,000	960,000	820,000	750,000	1,300,000	750,000	980,000	730,000	1,300,000
Cobalt-60	53,000,000	22,000,000	32,000,000	16,000,000	8,300,000	23,000,000	16,000,000	16,000,000	15,000,000
Cobalt-58	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron-59	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese-54	790000 U	470,000	520,000	1,300,000	190000 U	350,000	3,200,000	750,000	1,100,000
Niobium-95	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-238	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ruthenium-103	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ruthenium-106	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zirconium-95	NA	NA	NA	NA	NA	NA	NA	NA	NA
Collection Date:	1985								
Gross alpha	35,000	28,000	52,000	38,000	34,000	42,000	19,000	18,000	28,000
Gross beta	1,900,000	19,000,000	13,000,000	6,500,000	5,000,000	10,000,000	6,000,000	2,800,000	2,300,000
Cerium-144	87000 U	67000 U	84000 U	85000 U	69000 U	79000 U	50,000	11000 U	83000 U
Europium-154	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-134	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137	29,000	26,000	37,000	28,000	55,000	68,000	56,000	22,000	25,000
Cobalt-60	1,300,000	1,100,000	1,600,000	1,200,000	950,000	1,100,000	1,300,000	260,000	640,000
Cobalt-58	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron-59	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese-54	54,000	17,000	23000 U	100,000	56,000	18000 U	150,000	28,000	40,000
Niobium-95	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-238	4,600	2,900	5,100	4,000	3,900	4,200	2,300	1,600	3,400
Plutonium-239/240	26,000	16,000	27,000	23,000	21,000	24,000	14,000	11,000	20,000
Ruthenium-103	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ruthenium-106	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	93,000	77,000	210,000	110,000	190,000	120,000	120,000	70,000	110,000
Zirconium-95	NA	NA	NA	NA	NA	NA	NA	NA	NA

U = Table indicates not detected at specified detection limit. However, the reference indicates the sample was less than the concentration indicated.
NA = Not analyzed
ND = Not detected; no detection limit given

References:
UNI-1581 = Radiological Surveillance Report for the 100-N Areat-FY1980
UNI-1849 = UNC Environmental Surveillance Report for the 100 Areas-FY1981.
UNI-2228 = UNC Environmental Surveillance Report for the 100 Areas-FY1982.
UNI-2640 = UNC Environmental Surveillance Report for the 100 Areas-FY1983.
UNI-3069 = UNC Environmental Surveillance Report for the 100 Areas-FY1984.
UNI-3760 = UNC Environmental Surveillance Report for the 100 Areas-FY1985.

Table A1-2. Radionuclide Concentrations Detected in 1325-N Crib Sediments from 1985 to 1987 from Locations CS-01 To CS-12.

Location:	CS-01	CS-02	CS-03	CS-04	CS-05	CS-06	CS-07	CS-08	CS-09	CS-10	CS-11	CS-12
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Collection Date:	1985											
Gross alpha	18,000	7,000	18,000	6,000	4,700	NR	44,000	26,000	18,000	12,000	9,700	6,100
Gross beta	2,300,000	3,100,000	1,600,000	830,000	400,000	NR	15,000,000	2,400,000	2,200,000	1,100,000	1,500,000	620,000
Cerium-144	120,000	64,000	94,000	41,000	5,800	NR	100000 U	100,000	15,000	67,000	76,000	40,000
Cesium-137	41,000	49,000	49,000	35,000	13,000	NR	11,000	29,000	5,000	56,000	48,000	71,000
Cobalt-60	1,300,000	660,000	1,100,000	600,000	180,000	NR	1,600,000	1,700,000	140,000	520,000	800,000	580,000
Manganese-54	270,000	190,000	280,000	160,000	52,000	NR	260,000	360,000	32,000	150,000	240,000	170,000
Plutonium-238	2,000	740	2,000	660	460	NR	5,000	8,600	1,800	350	1,100	530
Plutonium-239/240	12,000	5,000	13,000	4,300	2,800	NR	30,000	56,000	12,000	2,300	6,900	34,000
Strontium-90	88,000	26,000	89,000	27,000	15,000	NR	200,000	100,000	17,000	13,000	12,000	5,800
Collection Date:	1986											
Gross alpha	NR	NR	NA	NA	NA	NR	NR	NA	NA	NR	NR	NR
Gross beta	NR	NR	NA	NA	NA	NR	NR	NA	NA	NR	NR	NR
Cerium-144	770,000	34,000	86,000	130,000	55,000	NR	NR	120,000	130,000	NR	NR	NR
Cesium-137	180,000	62,000	88,000	85,000	92,000	NR	NR	66,000	80,000	NR	NR	NR
Cobalt-60	9,100,000	520,000	2,300,000	2,500,000	620,000	NR	NR	1,700,000	2,800,000	NR	NR	NR
Manganese-54	1,600,000	140,000	380,000	480,000	170,000	NR	NR	310,000	510,000	NR	NR	NR
Plutonium-238	NA	NA	NA	NA	NA	NR	NR	NA	NA	NR	NR	NR
Plutonium-239/240	NA	NA	NA	NA	NA	NR	NR	NA	NA	NR	NR	NR
Strontium-90	9,100	3,900	5,000	5,000	3,400	NR	NR	NR	9,200	NR	NR	NR
Collection Date:	1987											
Gross alpha	NA	NA	NA	NA	NA	NR	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NR	NA	NA	NA	NA	NA	NA
Cerium-144	60000 U	91000 U	35000 U	53000 U	58000 U	NR	98000 U	81000 U	46000 U	16000 U	73000 U	83000 U
Cesium-137	32,000	17000 U	18,000	29,000	30,000	NR	48,000	15,000	17,000	21,000	13,000	13,000
Cobalt-60	820,000	1,400,000	630,000	630,000	680,000	NR	1,300,000	1,100,000	820,000	140,000	840,000	1,200,000
Manganese-54	130,000	200,000	97,000	96,000	100,000	NR	270,000	120,000	120,000	31,000	130,000	140,000
Plutonium-238	1,100	6,700	250	1,400	1,300	NR	17,000	21,000	1,300	2,300	3,100	6,000
Plutonium-239/240	5,200	49,000	1,600	9,900	8,500	NR	98,000	120,000	8,300	1,400	20,000	39,000
Strontium-90	14,000	40,000	5,900	4,300	10,000	NR	630,000	270,000	10,000	14,000	29,000	35,000

U = Not detected at specified detection limit
NR = Not reported
NA = Not analyzed
NS = Not samples

Reference:
UNI-3760 = UNC Environmental Surveillance Report for the 100 Areas - FY 1985
UNI-4065 = UNC Environmental Surveillance Report for the100 Areas - FY 1986
WHC-EP-0161 = Westinghouse Hanford Co. Environmental Surveillance Annual Report-100 Areas-FY 1987

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Table A1-3. Semivolatile Organics Compounds Detected in 1325-N Crib Sediments in April 1989

Location	Sediment Concentration (ug/kg)											
Sample ID	A	B	C	D	E	F	G	H	I	J	K	
Phenol	ND	ND	ND	ND	480	ND	ND	ND	ND	ND	ND	ND
bis(2-chloroisopropyl) ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	22 JB
Nitrobenzene	ND	ND	ND	ND	34 J	ND	ND	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	91 J	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	58 J	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND	78 J	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	42 J	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	22 J	ND	ND	ND	ND	ND	ND	ND
Dimethylphthalate	ND	ND	ND	ND	510	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	14 J	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	40 J	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	30 J	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	ND	ND	ND	ND	92 J	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	35 J	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	28 J	ND	ND	12 J	2800	22 J	17 J	22 J	27 J	110 J	410 J	ND
Fluoranthene	ND	ND	ND	15 J	230 J	ND	ND	9 J	ND	ND	13 J	ND
Pyrene	ND	ND	ND	16 J	430	ND	ND	14 J	ND	11 J	22 J	ND
Butylbenzylphthalte	24 J	22 J	26 J	28 J	ND	23 J	40 J	46 J	26 J	ND	ND	ND
Benzo(a)anthracene	ND	ND	ND	15 J	340	ND	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	15 J	370	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	400 B	440 B	250 JB	450 B	3800 B	830 B	720 B	840 B	600 B	340 B	540 B	450 B
Di-n-octylphthalte	330 B	13 JB	18 JB	22 JB	5200 B	100 JB	26 JB	19 JB	63 JB	25 JB	22 JB	54 JB
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Samples analyzed by Method SW-846.

ND = Table indicates not detected at specified detection level. However, the reference indicates the sample was less than the concentration indicated.

J = The associated numerical value is an estimated quantity.

B = The analyte is found in the associated blank as well as the sample.

Samples labeled A -F were collected from the 1325-N manholes exact location not reported.

Reference: DOE/RL-93-80, Rev. 0

Table A1-4. Inorganics Compounds Detected in 1325-N Crib Sediments in 1989.

Sample ID:		A	B	C	D	E	F	G	H	I	J	J	K
Analyte: Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aluminum	ND	3,500	3,100	5,650	5,150	4,400	5,100	5,150	4,100	4,200	4,700	4,450	5,550
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	220	83	65	126	95	220	116	110	109	99	100	100	109
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	22,000	6,950	3,950	22,000	5,350	10,300	6,100	6,300	5,250	5,150	5,050	5,250	8,000
Chromium	450	ND	ND	ND	ND	450	ND	ND	30 J	ND	ND	ND	20 J
Cobalt	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	15 J	10 J	ND
Copper	230	80 J	20 J	40 J	40 J	230	30 J	40 J	40 J	30 J	40 J	30 J	10 J
Iron	135,000	28,700	21,900	26,700	31,800	135,000	36,000	37,300	30,000	29,000	31,800	32,300	29,800
Lead	500	ND	ND	ND	ND	500 J	ND	ND	ND	ND	ND	ND	ND
Magnesium	8,950	4,650	3,800	8,950	5,400	3,200	5,450	5,850	4,000	4,600	4,450	4,750	6,601
Manganese	920	370	230	505	370	920	370	370	280	530	330	350	480
Mercury	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	200	ND	20 J	50 J	30 J	200 J	30 J	30 J	50 J	30 J	30 J	30 J	50 J
Phosphorus	2,400	1,700 J	800 J	2,100 J	1,200 J	2,400 J	1,200 J	1,000 J	1,000 J	1,000 J	1,100 J	1,000 J	1,000 J
Potassium	500	280 J	280 J	500 J	450 J	250 J	400 J	450 J	350 J	400 J	500 J	450 J	400 J
Silver	ND	450	470	430	330	380	500	500	320	300	500	330	300
Sodium	430	270 J	270 J	430 J	350 J	300 J	360 J	370 J	320 J	330 J	310 J	350 J	350 J
Strontium	45	25	15	42	25	45	24	23	21	19	19	21	25
Thallium	3,350	1,650	1,900	2,200	2,700	620	3,350	2,850	1,750	2,680	2,600	2,100	2,150
Vanadium	100	40	50	70	80	20 J	100	100	60	80	80	70	60
Zinc	1,650	60	90	240	150	1,650	230	250	200	130	190	170	290
Zirconium	40	10 J	20 J	40 J	30 J	20 J	10 J	20 J	40 J	40 J	30 J	30 J	30 J

Samples analyzed by EPA Method EPA6010

ND = Table indicates not detected values at specified detection level. However, the reference indicates the sample was less than the concentration indicated.

J = The associated value is an estimated quantity.

Reference: WHC-SD-EN-DP-056, Rev. 0-A

Table A1-5. Concentrations Detected in Soil Located Near 1301/1325N. (Page 1 of 8)

Ref. Doc.:	WHC/H	WHC/H	WHC/H	WHC/H	WHC/H	WHC/H	WHC/H	WHC/H	WHC/H	WHC/H	WHC/H
Location:	199-N-75	199-N-75	199-N-75	199-N-75	199-N-75	199-N-76	199-N-76	199-N-76	199-N-76	199-N-76	199-N-76
Sample ID:	B06837	B06838	B06839	B06843	B06845	B06835	B06836	B06840	B06841	B06842	B06844
Method:											
Collection Date:	4/14/92	4/14/92	4/14/92	4/23/92	4/24/92	4/13/92	4/13/92	4/16/92	4/16/92	4/16/92	4/23/92
Depth:	2-3	5-6	9	56-58	68-70	2-3	5-6	24-25	24-25	55-57	64.5-66.5
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Gross alpha	3.1 U	1.9 U	8.5 U	-0.12 U	0.67 U	3.5 J	1.8 U	-0.94 U	5.3 U	5.9 U	0.65 U
Gross beta	12 J	8.7 J	37	430	250	18	8.6	14 J	36	650	23
Tritium	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Carbon-14	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Uranium-233/234	NR	NR	NR	0.62	0.69	NR	NR	NR	NR	1.2	0.4 U
Uranium-235	0.046 U	0.03 U	0.024 U	-0.026 U	0.11 U	0.08 U	0.021 U	0.1 U	0.047 U	0.12 U	0.25 U
Uranium-238	0.53	0.5	0.73	0.47	0.18 U	0.53	0.46	0.53	0.52	0.49	0.54
Plutonium - 238	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Plutonium-239/240	0.007 U	0.003 U	0.002 U	-0.007 U	0.002 U	0.004 U	-0.003 U	-0.002 U	0.004 U	0.003 U	-0.002 U
Americium-241	0.003 U	0.016 U	0.006 U	0.006 U	0.002 U	-0.004 U	0.029 U	-0.007 U	-0.004 U	0.011 U	-0.005 U
Strontium-90	0.11 U	-1.6 U	-1.077 U	190.0	120.0	0.17 U	0.04 U	0.045 U	0.13 U	320.0	2.0
Technetium-99	0.44 J	0.74 U	0.19 U	-0.055 U	0.52 U	1.0	0.1 U	0.43 J	0.24 U	0.13 U	0.11 U
Gamma Scan											
Potassium-40	10.0	1.1	9.4	13.0	12.0	9.4	9.3	8.8	7.6	13.0	12.0
Iron-59	NR	NR	NR	0.52 U	0.43 U	NR	NR	NR	NR	0.68	0.46 U
Manganese-54	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chromium 51	5.9 U	6.6 U	6.5 U	3.8 U	3.5 U	7 U	4.5 U	6 U	6.1 U	6 U	2.4 U
Cobalt-60	0.088 U	0.072 U	0.12 U	0.52	0.28	0.13 U	0.1 U	0.13 U	0.13 U	1.2	0.18
Zinc-65	0.29 U	0.24 U	0.3 U	0.15 U	0.13 U	0.33 U	0.21 U	0.27 U	0.3 U	0.22 U	0.13 U
Ruthenium-103	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.35 U
Ruthenium-106	NR	NR	NR	0.46 U	0.39 U	NR	NR	NR	NR	0.65 U	0.043 U
Cesium-134	0.12 U	0.11 U	0.13 U	0.052 U	0.075 U	0.12 U	0.095 U	0.16 U	0.12 U	0.077 U	0.033 U
Cesium-137	0.095 U	0.096 U	0.095 U	0.046 U	0.034 U	0.10 U	0.06 U	0.099 U	0.1 U	0.57 U	0.078 U
Europium-152	NR	NR	NR	0.18 U	0.15 U	NR	NR	NR	NR	0.23 U	0.057 U
Europium-154	NR	NR	NR	0.1 U	0.097 U	NR	NR	NR	NR	0.15 U	NR
Radium-226	0.18 U	0.35	0.49	0.35	0.35	0.27	0.26	0.35	0.43	0.43	0.4
Thorium-228	0.55	0.7	0.67	0.47	0.59	0.62	0.41	0.52	0.59	0.59	0.5
Thorium-232	0.42	0.52	0.72	0.39	0.62	0.69	0.43	0.52 U	0.53 U	0.41	0.46
Lead-214	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin-125	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table A1-5. Concentrations Detected in Soil Located Near 1301/1325N. (Page 2 of 8)

Ref. Doc.:	HEIS	HEIS	HEIS	HEIS	HEIS	HEIS	HEIS	BHI-00135	BHI-00135	BHI-00135	BHI-00135	BHI-00135	BHI-00135
Location:	199-N-80	199-N-80	199-N-80	199-N-80	199-N-80	199-N-80	199-N-80	199-N-94A	199-N-94A	199-N-94A	199-N-94A	199-N-94A	199-N-94A
Sample ID:	B06M60	B06M37	B06M62	B072P4	B072P5	B072P7	B072P9						
Method:			(Dup)										
Collection Date:	7/1/92	7/1/92	7/1/92	7/1/92	7/1/92	7/1/92	7/1/92	10/1/94	10/1/94	10/1/94	10/1/94	10/1/94	10/1/94
Depth:	45-47	50-52	50-52	57-59	68-70	75-77	95.7-99	5	10	15	25	30	45
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Gross alpha	8.8 R	3 R	6.9 R	0.75 R	4.2 R	4.9 R	0.34 R	ND	ND	ND	ND	ND	ND
Gross beta	19	62	NA	130	200	93	20	ND	ND	ND	ND	ND	ND
Tritium	NA	NA	NA	NA	NA	NA	NA	0.324	1.71	3.8	7.34	6.58	0.448
Carbon-14	3.9 U	3.1 U	4.2 U	-2.7 U	-6.3 U	0.28 U	1.6 U	ND	ND	ND	ND	ND	ND
Uranium-233/234	0.38 R	0.32 R	0.18 R	33	0.36	0.37	0.33	ND	ND	ND	ND	ND	ND
Uranium-235	0 R	0 R	-0.036 R	0.017 U	0 R	0.025 R	0.032 R	ND	ND	ND	ND	ND	ND
Uranium-238	0.48 R	0.27 R	0.21 R	0.38 R	0.35	0.35	0.27	ND	ND	ND	ND	0.275	ND
Plutonium - 238	0.002 U	-0.012 U	0.015 U	-0.009 U	0.004 R	0.004 U	-0.003 U	ND	ND	ND	ND	ND	ND
Plutonium-239/240	0 U	0.004 U	0.002 U	-0.003 U	0.008 R	0.002 U	-0.003 U	ND	ND	ND	ND	ND	ND
Americium-241	0.003 U	0.007 U	-0.012 U	0.007 U	0.009 U	0.006 U	0 U	ND	ND	ND	ND	ND	ND
Strontium-90	0.3 UJ	28 J	25 J	52	81	43	1.6	36.2	51.0	15.7	9.9	5.1	2.0
Technetium-99	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Gamma Scan													
Potassium-40	13.0	8.6	9.0	12.0	13.0	14.0	12.0	20.4	25.3	23.0	24.8	23.2	28.2
Iron-59	0.33 U	0.36 U	0.42 U	0.61 U	0.21 U	0.22 U	0.2 U	ND	ND	ND	ND	ND	ND
Manganese-54	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Chromium 51	1.2 U	1.7 U	1.4 U	2.1 U	1.1 U	0.75 U	0.72 U	ND	ND	ND	ND	ND	ND
Cobalt-60	0.064 U	0.2 U	0.17 U	0.41	0.23	0.13	0.045 U	0.996	0.497	0.30	0.38	0.21	ND
Zinc-65	0.18 U	0.35 U	0.29 U	0.31 U	0.11 U	0.12 U	0.1 U	ND	ND	ND	ND	ND	ND
Ruthenium-103	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Ruthenium-106	0.5 U	0.88 U	0.87 U	0.89 U	0.4 U	0.35 U	0.31 U	ND	ND	ND	ND	ND	ND
Cesium-134	0.056 U	0.13 U	0.11 U	0.12 U	0.052 U	0.048 U	0.04 U	0.308	0.195	0.537	3.953	ND	1.035
Cesium-137	0.053 U	0.094 U	0.1 U	0.12 U	0.044 U	0.037 U	0.037 U	ND	ND	ND	ND	ND	ND
Europium-152	0.1 U	0.2 U	0.19 U	0.24 U	0.15 U	0.093 U	0.083 U	ND	ND	ND	ND	ND	ND
Europium-154	0.068 U	0.13 U	0.12 U	0.17 U	0.098 U	0.068 U	0.055 U	ND	ND	ND	ND	ND	ND
Radium-226	0.51	0.49	NA	0.27	0.34	0.43	0.4	ND	ND	ND	ND	ND	ND
Thorium-228	1.1	0.64	0.47	0.49	0.63	0.75	0.81	ND	ND	ND	ND	ND	ND
Thorium-232	0.67	0.57 U	0.77 U	0.58 U	0.59	0.8	0.62	0.758	0.858	0.857	1.022	0.894	1.644
Lead-214	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Tin-125	NA	NA	NA	NA	NA	NA	NA	0.809	1.069	0.996	1.139	1.058	2.291

Table A1-5. Concentrations Detected in Soil Located Near 1301/1325N. (Page 3 of 8)

Ref. Doc.:	BHI-00135	BHI-00135	BHI-00135	BHI-00135	BHI-00135	BHI-00135	BHI-00135	BHI-00135	HEIS	SERNE	HEIS	SERNE
Location:	199-N-95A	199-N-95A	199-N-95A	199-N-95A	199-N-95A	199-N-95A	199-N-95A	199-N-95A	199-N-103A	199-N-103A	199-N-103A	199-N-103A
Sample ID:									B0DRK7		B0DRK8	
Method:												
Collection Date:	9/1/94	9/1/94	9/1/94	9/1/94	9/1/94	9/1/94	9/1/94	9/1/94	4/1/95	4/1/95	4/1/95	4/1/95
Depth:	5	10	15	20	25	30	35	40	29-32	55	59-60.5	60
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Gross alpha	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Gross beta	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Tritium	0.196	0.052	2.88	2.3	0.952	ND	ND	11.8	281	NA	127000	NA
Carbon-14	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Uranium-233/234	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Uranium-235	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Uranium-238	ND	ND	ND	ND	ND	ND	ND	ND	0.518	NA	NA	NA
Plutonium - 238	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Plutonium-239/240	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Americium-241	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Strontium-90	1.3	37.8	2.8	14.0	10.5	ND	ND	1.2	0.0399 U	0.56	2.26	2.54
Technetium-99	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Gamma Scan												
Potassium-40	21.8	22.6	19.7	18.5	19.5	ND	ND	19.0 D	15.4	NA	15.4	NA
Iron-59	ND	ND	ND	ND	ND	ND	ND	ND	0.00291 U	NA	0.00459 U	NA
Manganese-54	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Chromium 51	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Cobalt-60	0.206	1.29	0.39	0.22	0.19	ND	ND	ND	0.00186 U	NA	0.149 U	NA
Zinc-65	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Ruthenium-103	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Ruthenium-106	ND	ND	ND	3.953	ND	ND	ND	ND	NA	NA	NA	NA
Cesium-134	NR	NR	0.402	0.392	NR	ND	ND	0.617	NA	NA	NA	NA
Cesium-137	ND	ND	ND	ND	ND	ND	ND	ND	0.00079 U	NA	0.0159 J	NA
Europium-152	ND	ND	ND	ND	ND	ND	ND	ND	0.00459 U	NA	0.00334 U	NA
Europium-154	ND	ND	ND	ND	ND	ND	ND	ND	0.0141 U	NA	-0.005 U	NA
Radium-226	ND	ND	ND	ND	ND	ND	ND	ND	0.452	NA	0.368	NA
Thorium-228	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Thorium-232	0.673	0.647	0.789	0.632	0.617	ND	ND	0.778	NA	NA	NA	NA
Lead-214	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Tin-125	0.76	0.734	1.233	0.724	0.746	ND	ND	1.163	NA	NA	NA	NA

Table A1-5. Concentrations Detected in Soil Located Near 1301/1325N. (Page 4 of 8)

Ref. Doc.:	HEIS	SERNE	SERNE	SERNE	HEIS	SERNE	SERNE	SERNE				
Location:	199-N-103A	199-N-103A	199-N-103A	199-N-103A	199-N-103A	199-N-103A	199-N-103A	199-N-103A	Well #1	Well #1	Well #1	Well #1
Sample ID:	B0DRK9				B0DRL0							
Method:												
Collection Date:	4/1/95	4/1/95	4/1/95	4/1/95	4/1/95	4/1/95	4/1/95	4/1/95	8/1/82	8/1/82	8/1/82	8/1/82
Depth:	65-67	65	70	75	77-78.5	80	85	95	5	10	15	20
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tritium	84800	NA	NA	NA	59400	NA	NA	NA	NA	NA	NA	NA
Carbon-14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-233/234	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-235	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium - 238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Americium-241	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	153	120	80	3.2	0.976 J	0.88	0.62	0.4	NA	NA	NA	NA
Technetium-99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma Scan												
Potassium-40	18.2	NA	NA	NA	9.47	NA	NA	NA	9.30	10.30	10.30	7.58
Iron-59	-0.035 U	NA	NA	NA	-0.006 U	NA	NA	NA	NA	NA	NA	NA
Manganese-54	NA	NA	NA	NA	NA	NA	NA	NA	0.063	0.043	0.053	0.05
Chromium 51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt-60	0.617 U	NA	NA	NA	0.0678 U	NA	NA	NA	0.598	0.745	0.779	0.836
Zinc-65	NA	NA	NA	NA	NA	NA	N	NA	NA	NA	NA	NA
Ruthenium-103	NA	NA	NA	NA	NA	NA	NA	NA	0.019	0.012	0.026	0.011 U
Ruthenium-106	NA	NA	NA	NA	NA	NA	NA	NA	0.04 U	0.04 U	0.05 U	0.04 U
Cesium-134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137	0.0201 J	NA	NA	NA	0.00435 U	NA	NA	NA	0.684	0.746	0.671	0.735
Europium-152	-0.0254 U	NA	NA	NA	-0.0112 U	NA	NA	NA	NA	NA	NA	NA
Europium-154	0.0293 U	NA	NA	NA	-0.0283 U	NA	NA	NA	NA	NA	NA	NA
Radium-226	0.469	NA	NA	NA	0.301	NA	NA	NA	NA	NA	NA	NA
Thorium-228	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thorium-232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead-214	NA	NA	NA	NA	NA	NA	NA	NA	0.408	0.428	0.424	0.385
Tin-125	NA	NA	NA	NA	NA	NA	NA	NA	0.115	0.145	0.131	0.194

Table A1-5. Concentrations Detected in Soil Located Near 1301/1325N. (Page 5 of 8)

Ref. Doc.:														
Location:	Well #1	Well #1	Well #1	Well #1	Well #1	Well #1	Well #1	Well #1	Well #1	Well #2	Well #2	Well #2	Well #2	Well #2
Sample ID:														
Method:														
Collection Date:	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82
Depth:	25	30	35	40	45	50	55	80	65	5	10	15	20	25
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tritium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon-14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-233/234	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-235	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium - 238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Americium-241	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Technetium-99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma Scan														
Potassium-40	8.21	4.74	10.08	8.16	8.52	8.41	9.57	10.70	13.30	9.75	8.95	7.26	11.41	7.26
Iron-59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese-54	0.024	0.203	0.019	0.206	0.521	0.383	0.858	0.143	0.043	0.008	0.013 U	0.01	0.006 U	0.004 U
Chromium 51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt-60	0.906	2.17	0.23	2.17	9.9	9	10.5	6.56	4.38	0.065	0.065	0.07	0.014	0.018
Zinc-65	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ruthenium-103	0.016	0.014 U	0.013 U	0.017 U	0.253	0.163	0.185	0.182	0.191	0.008 U	0.008	0.01 U	0.01 U	0.007 U
Ruthenium-106	0.064	0.063	0.04 U	0.05 U	1.6	1.39	1.47	1.2	1.3	0.04 U	0.04 U	0.06	0.05 U	0.03 U
Cesium-134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137	0.548	0.631	0.258	0.772	1.15	0.488	3.96	0.641	0.211	0.014	0.018	0.01	0.015	0.012
Europium-152	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Europium-154	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Radium-226	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thorium-228	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thorium-232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead-214	0.4	0.375	0.441	0.668	0.376	0.347	0.362	0.389	0.454	0.432	0.448	0.32	0.519	0.303
Tin-125	0.189	0.102	0.013 U	0.057	2.99	2.91	3.13	2.25	1.76	0.013 U	0.013	0.01 U	0.041	0.014 U

Table A1-5. Concentrations Detected in Soil Located Near 1301/1325N. (Page 6 of 8)

Ref. Doc.:														
Location:	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2	Well #2
Sample ID:														
Method:														
Collection Date:	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82
Depth:	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tritium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon-14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-233/234	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-235	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium - 238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Americium-241	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Technetium-99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma Scan														
Potassium-40	6.38	6.60	7.53	8.28	8.13		10.30	9.47	9.99	11.60	10.60	8.83	9.07	9.47
Iron-59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese-54	0.007 U	0.006 U	0.003 U	0.004 U	0.004 U	0.02 U	0.007 U	0.01 U	0.02 U	0.03 U	0.03 U	0.02 U	0.03 U	0.02 U
Chromium 51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt-60	0.017	0.005	0.004 U	0.025	0.227	0.957	1.22	0.905	0.623	1.48	0.654	0.16	0.185	0.17
Zinc-65	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.04 U	0.04 U	0.03 U	0.06 U
Ruthenium-103	0.01 U	0.008 U	0.006 U	0.007 U	0.008 U	0.04 U	0.024	0.03 U	0.116	0.6	0.2 U	0.2 U	0.2 U	0.2 U
Ruthenium-106	0.06 U	0.03 U	0.03 U	0.03 U	0.04 U	0.23 U	0.157	0.255	0.19 U					
Cesium-134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137	0.007 U	0.015	0.01	0.004 U	0.004 U	0.02 U	0.006 U	0.01 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Europium-152	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Europium-154	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Radium-226	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thorium-228	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thorium-232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead-214	0.359	0.324	0.331	0.356	0.322	0.349	0.363	0.331	0.339	0.416	0.384	0.278	0.395	0.37
Tin-125	0.019 U	0.01 U	0.01 U	0.01 U	0.062 U	0.623	0.707	0.647	0.64	0.938	0.519	0.273	0.255	0.19

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Table A1-5. Concentrations Detected in Soil Located Near 1301/1325N. (Page 7 of 8)

Ref. Doc.:														
Location:	Well #2	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3
Sample ID:														
Method:														
Collection Date:	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82
Depth:	100	5	10	15	20	25	30	35	40	45	50	55	60	65
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Gross alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tritium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon-14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-233/234	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-235	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium - 238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Americium-241	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium-90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Technetium-99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma Scan														
Potassium-40	10.80	7.10	7.19	5.91	2.39	5.48	4.83	1.95	5.91	1.24	5.92	2.04	0.72	4.36
Iron-59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese-54	0.006 U	0.006	0.004 U	0.006 U	0.003 U	0.003 U	0.003 U	0.004 U	0.005 U	0.005 U	0.004 U	0.007 U	0.008 U	0.009 U
Chromium 51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt-60	0.211	0.054	0.019	0.019	0.006	0.009	0.009	0.008	0.009	0.009	0.2	0.392	0.678	1.55
Zinc-65	0.008 U													
Ruthenium-103	0.078	0.004 U	0.005 U	0.009 U	0.007 U	0.005 U	0.005 U	0.006 U	0.006 U	0.008 U	0.006 U	0.008 U	0.009 U	0.037
Ruthenium-106		0.03 U	0.03 U	0.05 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.04 U	0.04 U	0.04 U	0.278
Cesium-134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137	0.0434	0.023	0.017	0.025	0.009	0.003 U	0.009	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Europium-152	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Europium-154	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Radium-226	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thorium-228	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thorium-232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead-214	0.408	0.366	0.361	0.314	0.344	0.326	0.337	0.348	0.338	0.385	0.376	0.323	0.354	0.353
Tin-125	0.142	0.01 U	0.01 U	0.028	0.01 U	0.01 U	0.009 U	0.01 U	0.01 U	0.01 U	0.033 U	0.112	0.372	0.88

Table A1-5. Concentrations Detected in Soil Located Near 1301/1325N. (Page 8 of 8)

Ref. Doc.:							
Location:	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3	Well #3
Sample ID:							
Method:							
Collection Date:	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82	8/1/82
Depth:	70	75	80	85	90	95	100
Analyte: Units:	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Gross alpha	NA	NA	NA	NA	NA	NA	NA
Gross beta	NA	NA	NA	NA	NA	NA	NA
Tritium	NA	NA	NA	NA	NA	NA	NA
Carbon-14	NA	NA	NA	NA	NA	NA	NA
Uranium-233/234	NA	NA	NA	NA	NA	NA	NA
Uranium-235	NA	NA	NA	NA	NA	NA	NA
Uranium-238	NA	NA	NA	NA	NA	NA	NA
Plutonium - 238	NA	NA	NA	NA	NA	NA	NA
Plutonium-239/240	NA	NA	NA	NA	NA	NA	NA
Americium-241	NA	NA	NA	NA	NA	NA	NA
Strontium-90	NA	NA	NA	NA	NA	NA	NA
Technetium-99	NA	NA	NA	NA	NA	NA	NA
Gamma Scan							
Potassium-40	3.55	4.48	1.91	8.42	6.76	6.54	5.95
Iron-59	NA	NA	NA	NA	NA	NA	NA
Manganese-54	0.006 U	0.004 U	0.004 U	0.005 U	0.005 U	0.004 U	0.005 U
Chromium 51	NA	NA	NA	NA	NA	NA	NA
Cobalt-60	1.51	0.366	0.223	0.165	0.141	0.093	0.159
Zinc-65							
Ruthenium-103	0.034	0.025	0.024	0.011 U	0.011 U	0.009 U	0.006 U
Ruthenium-106	0.367	0.097	0.04 U	0.05 U	0.04 U	0.03 U	0.05 U
Cesium-134	NA	NA	NA	NA	NA	NA	NA
Cesium-137	0.005 U	0.004 U	0.004 U	0.005 U	0.004 U	0.004 U	0.004 U
Europium-152	NA	NA	NA	NA	NA	NA	NA
Europium-154	NA	NA	NA	NA	NA	NA	NA
Radium-226	NA	NA	NA	NA	NA	NA	NA
Thorium-228	NA	NA	NA	NA	NA	NA	NA
Thorium-232	NA	NA	NA	NA	NA	NA	NA
Lead-214	0.352	0.381	0.363	0.362	0.384	0.368	0.932
Tin-125	1.12	0.39	0.265	0.119	0.094	0.031	0.037

ND = Not detected at specified detection limits.

NR = Not reported.

NA = Not analyzed.

References:

Summary Data Section, Reporting Group 7032, 8/6/92 (TMA NORCAL), p. 11-19.

Limited Field Investigation Report for the 100-NR-1 Operable Unit (DOE/RL-93-80).

Summary of Maximum Concentrations for Radionuclides, (100-NR-1), p. 1, 2, and 3.

Sediment Chemistry For Wells N-75, N76, N-77, (WHC-SD-EN-DP-056, Rev. 0-A), p B19.

Draft data for Sr-90 from Jane Borghese

EAL - Gross Radionuclide Soil Screening Sample Analysis Report

Seme - excel file

N-Springs Barrier Wall Drilling Program Data Package, BHI-00135, Rev. 1

Table A1-6. Volatile Organic Compounds Detected in Soil Borings Near 1301-N and1325-N in 1992.

Location:	199-N-75						199-N-76					
Sample ID:												
Collection Date:	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992
Depth:	2-3	5-6	9	56-58	56-58*	68-70	2-3	5-6	24-25	24-25	55-57	55-57*
Analyte: Units:	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Methylene Chloride	4 J	4 J	4	28	11 B	5 J	3 J	8 J	3 J	4 J	55	10 BJ
Acetone	17 J	8 J	22	51 J	49 B	20 J	12 J	ND	31 J	40 J	120 J	55 B
Carbon Disulfide	ND	1 J	ND	2 J	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	3 BJ	ND	ND	ND	ND	ND	ND	3 BJ
Toluene	2 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Location:	199-N-80						
Sample ID:	B06M60	B06M37	B06M62	B072P4	B072P5	B072P7	B072P9
Collection Date:	July, 1992	July, 1992	July, 1992	July, 1992	July, 1992	July, 1992	July, 1992
Depth (ft):	44-46	50-52	50-52	61-63	70-72	75-77	96-99
Analyte: Units:	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Methylene Chloride	6 J	3 J	ND	ND	ND	ND	5 J
Acetone	23 J	13 B	9 J	16	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND
Toluene	4 J	ND	ND	ND	3 J	7 J	6 J
2-Butanone	ND	ND	ND	ND	ND	ND	8 J

B = The analyte is found in the associated blank, as well as the sample.

J = The associated numerical value is an estimated quantity.

ND = Table indicates not detected at specified detection level. However, the reference indicates the sample was less than the concentration indicated.

* = Lab rerun.

Reference: HEIS Data Base, DOE/RL-93-80 Rev. 0.

Table A1-7. Semivolatile Organics Compounds Detected in Soil Near 1301-N/1325-N in1992

Location	Soil from Well199-N-75						Soil from Well 199-N-76							Soil from Well 199-N-80		
Sample ID	B06837	B06838	B06839	B06843	B06843	B06845	B06835	B06836	B06841	B06841	B06842	B06842	B06844	B06M60	B06M61	B06M37
Date Received	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	April, 1992	July, 1992	July, 1992	July, 1992
Depth (feet)	2-3	5-6	9	56-58	56-58 *	68-70	2-3	5-6	24-25	24-25	55-57	55-57*	64.5-66.5	44-46	44-46	50-52
Analyte: Units	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-chloroisopropyl) ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	51 J	42 J	ND	76 J	ND	110 J	63 J	56 J	56 J	ND	100 J	ND	99 J	44 J	ND	39 J
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalte	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	ND	ND	ND	ND	ND	61 J	ND	ND	530 J	ND	ND	ND	63 J	ND	260 J	ND
Di-n-octylphthalte	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7 J	ND	ND	ND
N-Nitrosodiphenylamine	ND	ND	110 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Analysis Method not reported.

ND = Table indicates not detected at specified detection level. However, the reference indicates the sample was less than the concentration indicated.

J = The associated numerical value is an estimated quantity.

B = The analyte is found in the associated blank as well as the sample.

* = Lab rerun

Reference: HEIS Data Base, Original data oackage dated May 22, 1989 (DOE/RL-93-80 Rev. O)

Table A1-8. Inorganics Compounds Detected in Soil Near 1301-N and 1325-N in 1992.

Location:	Soil from Well 199-N-75					Soil from Well 199-N-76						Soil from Well 199-N-80								
Sample ID	B06837	B06838	B06839	B06843	B06845	B06835	B06836	B06840	B06841	B06842	B06844	B06M58	B06M60	B06M61	B06M37	B06M62	B072P4	B072P5	B072P7	B072P9
Method	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA6010	EPA601	EPA6010
Collection Date	4/17/92	4/17/92	4/17/92	4/29/92	4/30/92	4/17/92	4/17/92	4/22/92	4/22/92	4/22/92	4/30/92	Jul-92	Jul-92	Jul-92	Jul-92	Jul-92	Jul-92	Jul-92	Jul-92	Jul-92
Depth (ft)	2-3	5-6	9	56-58	68-70	2-3	5-6	24-25	24-25	55-57	64.5-66.5	3.5-5	45-47	45-47	50-52	50-52	57-59	68-70	75-77	95.7-99
Analyte: Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aluminum	6,720	6,470	5,720	6,300	4,480	6,440	5,750	7,020	7,670	5,740	3,920	ND	3,130 J	ND	ND	ND	ND	ND	ND	3,690 J
Arsenic	3	2	2	2 B	1 B	3	2	4	3	2 B	1 B	ND	ND	ND	ND	2 B	ND	ND	ND	ND
Barium	59	82	61	64	62	52	51	61	70	75	53	ND	ND	ND	ND	ND	ND	ND	29 B	ND
Beryllium	0 B	0 B	0 B	ND	ND	0 B	0 B	0 B	0 B	ND	ND	ND	0 B	ND	ND	ND	ND	ND	ND	ND
Cadmium	0 B	1 B	0 B	ND	ND	0 B	1 B	ND	ND	1 B	1 B	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	6,760	6,380	7,370	2,590	2,240	7,040	5,960	5,670	5,790	2,530	4,480	ND	ND	4,600 J	ND	ND	ND	ND	ND	ND
Chromium	9	9	8	15	8	8	8	10	11	11	9	ND	ND	ND	ND	ND	13 J	ND	ND	ND
Cobalt	10 B	9 B	9 B	6 B	5 B	10 B	9 B	11 B	11	6 B	5 B	ND	11 B	ND	7 B	7 B	5 B	4 B	ND	5 B
Copper	15	15	16	14	9	19	18	26	20	16	10	ND	ND	ND	ND	ND	ND	ND	ND	
Iron	17,400	17,100	18,100	11,000	9,620	18,100	18,500	21,400	21,400	10,800	9,230	ND	ND	6,470 J	ND	ND	ND	ND	ND	9,890 J
Lead	5	4	4	3	2	5	3	8	7	3	3	ND	ND		ND	ND	ND	ND	ND	ND
Magnesium	4,460	4,390	4,400	4,350	2,230	4,460	4,220	5,460	5,410	3,610	2,100	ND	ND	2,040 J	ND	ND	ND	ND	ND	135 J
Manganese	320	298	317	227	182	269	262	328	345	345	208	ND	ND	135 J	ND	ND	ND	ND	ND	0 B
Mercury	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	11	10	9	14	8	10	10	12	13	15	9	ND	ND	ND	ND	ND	ND	ND	5 B	ND
Phosphorus	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	1,350	1,240	1,210	919 B	689 B	1,040	855 B	1,220	1,350	831 B	639 B	ND	ND	ND	655 B	590 B	535 B	976 B	645 B	433 B
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1 B	ND	ND	ND	ND	ND	ND	1 B
Sodium	204 B	171 B	164 B	203 B	246 B	190 B	172 B	282 B	314	178 B	198 B	ND	227 B	ND	154 B	179 B	104 B	233 B	112 B	149 B
Strontium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	0 B	ND	ND	0 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	36	37	34	23	24	34	36	43	45	22	23	42 J	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	41	43	40	29	21	42	40	45	47	34	40	40 J	ND	22 J	ND	ND	ND	ND	ND	ND
Zirconium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Table indicates not detected values at specified detection level. However, the reference indicates the sample was less than the concentration indicated.

J = The associated value is an estimated quantity.

B = The analyte is found in the associated blank as well as the sample.

Reference: HEIS Data Base

WHC-SD-EN-DP-056, Rev. 0-A

9513388.1677

SUMMARY OF INVENTORY DATA

Table A1 - 9. Annual and Cumulative Release to 1301-N and 1325-N LWDF's (Curies).

ANNUAL RELEASES (Curies)

Radionuclide	1964-1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Cobalt-60	NR	200	82	84	230	330	220	320	320	370	640	870	940	770
Strontium-90	NR	270 *	270	7 4	7 3	17	21	16	63	93	110	120	120	130
Ruthenium-106	NR	NR	NR	NR	29	110	63	190	82	110	130	230	330	310
Cesium-134	NR	NR	NR	NR	16	18	4 1	23	39	50	69	83	68	56
Cesium-137	NR	88	41	2 8	51	92	18	46	170	240	320	380	340	290
Plutonium-239/2	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.37	0.55	0.67	1.3	1.1
Totals	**NR**	**560**	**390**	**94**	**330**	**570**	**330**	**600**	**670**	**860**	**1,300**	**1,700**	**1,800**	**1,600**

Radionuclide	1980	1981	##	1983*	1984**	1985	1986	1987	1988	1989	1990	1991	1992	1993
Cobalt-60	1200	370	##	770	1500	590	390	200	11	33	7.8	0.0048	7.8	0.0048
Strontium-90	160	84	##	110	310	240	36	15	15	28	14	0.85	14	0.85
Ruthenium-106	320	100	##	65	130	80	49	15	2 8		NA	NA	NA	NA
Cesium-134	55	21	30	14	18	5 7	7 4	2	0 32	0.52	0.12	0.00064	0.12	0.00064
Cesium-137	360	240	##	200	210	88	210	46	8	23	7.1	0.13	7.1	0.13
Plutonium-239/2	1.4	0.56	2	2	3 9	3.4	0.24	0 31	0.044	0.023	0.0097	0.00028	0.0097	0.00028
Totals	**2,100**	**820**	**#**	**1,200**	**2,200**	**1,000**	**700**	**300**	**37**	**85**	**29**	**1**	**29**	**1**

NR = Not reported

* = 22% of total release to 1325-N LWDF

** = 19% of total release to 1325-N LWDF

Cumulative Inventory (Curies)**

Radionuclide	1964-1966*	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Cobalt-60	500	620	620	630	780	980	1,100	1,200	1,400	1,600	2,000	2,500	3,100	3,400
Strontium-90	580	830	1,100	1,100	1,000	1,000	1,000	1,000	1,100	1,100	1,200	1,300	1,400	1,500
Ruthenium-106	100	140	140	140	100	130	110	190	150	160	170	250	360	410
Cesium-134	40	44	48	51	53	54	42	49	68	91	120	180	170	170
Cesium-137	180	260	290	290	330	420	420	460	620	840	1,100	1,500	1,800	2,000
Plutonium-239/2	2.3	3.1	3.9	4.7	5.5	6.2	7.0	7.8	8.6	8.9	9.5	10	11	12
Totals	**1,400**	**1,900 #**	**2,200**	**2,200**	**2,300**	**2,600**	**2,700**	**2,900**	**3,400**	**3,800**	**4,600**	**5,700**	**6,800**	**7,500**

Radionuclide	1980	1981	##	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Cobalt-60	4,100	4,000	#	4,200	5,100	5,000	4,800	4,400	3,900	3,400	3,000	2,600	2,300	2,000
Strontium-90	1,600	1,700	#	1,800	2,100	2,300	2,300	2,200	2,200	2,200	2,100	2,100	2,000	2,000
Ruthenium-106	440	300	#	170	180									
Cesium-134	170	140	#	100	87									
Cesium-137	2,300	2,500	#	2,900	3,000	3,000	3,200	3,100	3,100	3,000	3,000	2,900	2,800	2,800
Plutonium-239/2	14	14	#	18	22	26	27	27	27	27	27	27	27	27
Totals	**8,700**	**8,600**	**#**	**9,200**	**11,000**	**NC**	**NC**	**NC**	**NC**	**NC**	**NC**	**NC**	**NC**	**NC**

* Extrapolated

** = Inventory = Annual Release

Reference: UNI-3533

NC = Not Calculated in DQO Workshop because cumulative inventory was not calculated for all radionulcides.

Table A1-10. Estimated Amounts of Hazardous Waste Discharged to 1301-N and 1325-N.

Dangerous Waste	Total Pounds per Year, 1301-N	Total Pounds per Year, 1325-N
Acetone (F003)	6,200	6,200
Corrosive (D002)	20,600	20,600
Cadmium (D006)	100	100
Lead (D008)	150	150
Mercury (D009)	6,200	6,200
Hydrazine (U133)	100	100
Carcinogens (WC02)	4,000	4,000
Toxins (WT02)	15,000	15,000
Sodium dichromate (D007)	10,000	None
References: 1301-N LWDF RCRA Permit, Draft Revision 5 1325-N LWDF RCRA Permit, Draft Revision 5		

SUMMARY OF DANGEROUS WASTE OCCURRENCES IN N SPRINGS AREA GROUNDWATER

Table A1-11. Drinking Water Standards Exceed in 100-N Area Wells Data Reporting Period July 1 through September 30, 1994.

Constituents (DWS)	Wells Exceeding DWS (number of samples)
Field conductivity (700 μumho/cm)	1301-N: N-3 (4), N-57 (4)
Lab conductivity (700 μumho/cm)	1301-N: N-3, N-57
Chromium, unfilters samples (50 ppb)	1301-N: N-57, N-67 1325-N: N-4, N-81
Iron, unfiltered samples (300 ppb)	1301-N: N-57, N-67 1325-N: N-32, N-41, N-74, N-81
Manganese, unfiltered samples	1301-N: N-57 1325-N: N-81
Nitrate (45,000 ppb)	1301-N: N-3
Strontium-90 (8 pCi/L)	1301-N: N-2, N-34, N-57 (2), N-67, N-75 1325-N: N-27, N-29, N-81
Tritium (20,000 pCi/L)	1301-N: N-2, N-34, N-67, N-69, N-75 1325-N: N-27, N-29, N-32, N-41, N-70, N-81

DWS = drinking water standard
Modified from DOE/RL-94-36-3

SUMMARY OF RLS DATA

Table A1-12. Spectral Gamma Logging and Field Screening Results for wells near 1301-N/1325-N. (Page 1 of 6)

Depth (feet)	Well #1 1982									Well #2 1982						Well #3 1982						N-27 1984		N-28 1984		N-25 1980
	Manganese-54	Cobalt-60	Cesium-137	Potassium-40	Cobalt-60	Ruthenium-103	Cesium-137	Iodine-131	Antimony-125	Potassium-40	Cobalt-60	Ruthenium-103	Cesium-137	Iodine-131	Antimony-125	Potassium-40	Cobalt-60	Ruthenium-103	Cesium-137	Iodine-131	Antimony-125	Gross	Cobalt-60	Gross	Cobalt-60	Gross
0																						310	1.1	978	0.3	
5	0.78	3.54	6.64	11.7	0.45		0.08	0.07	0.13													57		55		80
10	0.87	12.2	12.3	12.3	0.09		0.12			10.3	0.05											55		52		80
15	1.07	1.71	11	11.4	3.68		2.46			10.1	0.03					11						51		54		80
20	49.8	169	323	12.8	1.53		1.4		0.26	9.89	0.05					11.2	0.02	0.07		0.05		62		67		80
25	182	273	1836	10	0.61		1.02	0.04		9.44	0.01					10.7	0.01					69		67		80
30				11.1	0.15					10.1	0.03				0.19	11.6						65		65		80
35				12	0.11					11.1	0.02											124	1.1	67		80
40				13.6	11				0.07	11.5	0.03					12.1					0.15	126	0.8	64		80
45				12.4	10.5			0.69	1.97	11.1	0.03	0.04				13.2						173	2.5	64		80
50				11.8	7.7			0.72	1	11.5	0.71				0.27	12.5	0.38	0.03				1138	58.8	83		80
55				11.5	7.28	0.27		7.61	1.56	14.2	0.93	0.19		1.26	1.1	13.2	0.68		0.05			366	15.4	101		325
60																13.6	1.44	0.08		0.96	0.99	262	6.1	95	0.2	325
65																15	2.34			1.24	1.39	268	7.3	182	3.7	325
70																12.1	1.64			2.94	1.35			161	2.4	200
75																								102	0.9	200
80																								116	1.5	160
85																										150
90																										130
95																										
100																										
105																										
110																										
115																										
120																										

Gross count rate in counts per second. All other concentrations are in pCi/g

A blank is used to denote no isotope identified by spectroscopic system, (i.e. below detection threshold if present).

9513386.1680

Table A1-12. Spectral Gamma Logging and Field Screening Results for wells near 1301-N/1325-N. (Page 2 of 6)

	N-29 1984					N-30 1984	N-31 1984	N-32 1984	N-33 1984	N-34 1984	N-35 1984	N-36 1984	N-39 1984					N-40 1984	N-41 1984	N-42 1984	N-44 1984					N-45 1984
Depth (feet)	Gross	Cobalt-60	Potassium-40	Uranium	Thorium	Gross	Gross	Gross	Gross	Gross	Gross	Gross	Gross	Cobalt-60	Potassium-40	Uranium	Thorium	Gross	Gross	Gross	Gross	Cobalt-60	Potassium-40	Uranium	Thorium	Gross
0	1025		6.2	0.9									171		10	0.7	0.6				180		8.8	0.8	0.9	
5	54		3.1	0.7	0.3	50	50	45	25	50	90	60	105		17.6	1.1	1.4	60	55	65	103		15.6	0.8	1.1	75
10	57		8.2	0.6	1	50	50	40	25	50	75	50	84		11.3	0.6	1	60	50	60	76		13.3	0.9	0.9	50
15	50		2.7	0.6	0.6	50	50	40	25	50	75	60	71		12.2	0.8	0.9	60	55	60	75		11.2	0.7	1	50
20	46		5.1	0.4	0.7	50	50	50	25	50	75	50	72		11.7	0.7	0.3	60	55	50	69		7.5	0.6	0.7	50
25	69		9.8	0.6	0.6	50	60	55	25	50	100	50	81		11.4	0.4	1.5	60	60	60	70		9.5	0.7	0.7	50
30	64		11.1	0.8	0.7	50	60	50	25	50	250	55	82		17	0.6	0.6	30	60	65	68		9.6	0.5	0.7	50
35	67	0.1	9.4	0.7	0.8	50	60	50	25	50	175	55	78		9.4	0.9	0.7	65	60	70	70		9.8		0.6	60
40	69		9.1	0.8	1.1	50	60	50	25	50	500	70	100		11.5	0.7	0.4	75	65	75	94		14.3	0.4	0.5	75
45	79		11.8	1.4	0.4	60	60	55	50	60	4000	60	81		11.5	0.3	0.4	75	65	75	92		12.1	0.4	0.7	90
50	92	0.1	8.3	0.5	0.5	75	75	70	50	60	2500	55	113	0.2	14.4	1.1	0.9	65	70	70	109		18.2	1.1	1.4	150
55	109	0.1	11	0.5	0.7	90	75	90	60	60	2100	45	108	0.1	15.9	1.2	0.7	65	65	75	113	1.3	13.5	0.5	0.4	125
60	151	0.9	9.1	0.6	0.6	100	75	100	60	75	2500	55	132	0.3	18	1.2	0.9	70	60	80	127	0.8	16.8	0.6	0.7	110
65	430	9	13.8	0.9	0.5	100	75	65	75	80	2500	70						55	55	65	181	4	19.3	0.8	0.7	800
70	175	1.3	12.9	0.8	0.5	140	100	60	75	100		55						55	50	55						800
75	129	1	16	0.9	0.7	150	125	55		125		50						55	50	50						
80	147	1.6	12.3	1.1	0.5	200	100	60		100		60							50							
85																										
90																										
95																										
100																										
105																										
110																										
115																										
120																										

Gross count rate in counts per second. All other concentrations are in pCi/g

A blank is used to denote no isotope identified by spectroscopic system, (i.e. below detection threshold if present).

Table A1-12. Spectral Gamma Logging and Field Screening Results for wells near 1301-N/1325-N. (Page 3 of 6)

	N-67 1988	N-69 1988	N-70 1984					N-75 1984						N-76 1984					N-80 1984		N-90 1984					
Depth (feet)	Gross	Gross	Gross	Cobalt-60	Potassium-40	Uranium	Thorium	Gross	Cesium-137	Cobalt-60	Potassium-40	Uranium	Thorium	Gross	Cobalt-60	Potassium-40	Uranium	Thorium	Gross	Cobalt-60	Gross	Cesium-137	Cobalt-60	Potassium-40	Uranium	Thorium
0			173		17.5	0.7	1.1	177			5.1			119		8.7	0.3	0.6	187		654	0.9	19.8	2	0	0
5	40	50	84		7.9	0.7	0.5	42			7.6	1.1		57		6.1	0.7		47		53			6.3	1.2	1.3
10	40	50	59		4.5	1.2	0.5	47			5.3	0.4	0.4	178		10.6	2.2	2.8	46		51			8	0.7	0.7
15		50	66		5.2	0.7	0.4	46			5.5	0.2	0.2	178		7.1	2.6	3	43		51			7.9	1	0.3
20	125	50	177		4.8	2.9	2.5	62			10.5	0.5	0.6	183		8.9	2.4	4.3	67							
25		50	150		9.4	1.6	2.3	65			8	0.4	1.1	167		7.8	2.5	2	67							
30	40	50	158		9	1.5	2.3	62			10.7	0.5	0.6	171		10.1	2.8	2.8	69							
35		55	156		9.3	2.3	1.7	61			10.2	0.6	0.9	174	0.1	10.8	2.8	2.4	74							
40	1000	60	195		8.3	2.2	3.2	69			11.4	0.8	0.6	168		13.2	2.7	3.1	76							
45		75	187		11.1	2.9	2.8	71			12.1	0.8	0.7	169		11.9	1.9	1.7	81							
50	800	110	178		9.9	1.9	4.5	72			11.1	0.4	0.9	182		13.6	2.5	3	91	0.2						
55		250	143		11.6	1.5	2.9	88		0.2	11.6	0.7	0.6	162	0.5	21.1	1.1	0.7	105	0.4						
60	200	225	121	0.3	16.6	1	1.3	126		0.2	13.4	0.9	0.7	128	0.2	18.4	1	0.7	97	0.3						
65		200	100		19.9	0.7	1.3	124		0.3	11.1		0.9	96		18.5		0.5	125	0.6						
70	125	180	87	0.1	8.8	0.4	1.5	61		0.2	8.2		0.5	93	0.1	16.2	0.4	1.1	94							
75	125	75	112	0.1	7.4	1.5	2.3	62			6.5	1		90		17	0.2	0.3	84							
80		75	113		12.1	2.3	2	58			9.6	0.8	1						73							
85		75	80	0.3	14.6	1.4		53		0.4	12.1	0.5	0.5						75							
90		75	94	1.3	12.7	0.7	0.8												79							
95		95	78	0.1	16.1	0.3	0.7												79							
100																			102		102					
105																			120		120					
110																			109		109					
115																			88		88					
120																			125		125					

Gross count rate in counts per second. All other concentrations are in pCi/g

A blank is used to denote no isotope identified by spectroscopic system, (i.e. below detection threshold if present).

Table A1-12. Spectral Gamma Logging and Field Screening Results for wells near 1301-N/1325-N. (Page 4 of 6)

Depth (feet)	199-N-91A 1994 Potassium-40	Cobalt-60	Ruthenium-106	Radoim-226	Thorium-232	Uranium-235	Strontium-90
0							
5							
10	23.84	0.12		0.74	0.84		1.16
15	22.85	0.26	1.81	0.73	0.77		0.81
20	21.45	0.15		0.93	1.02		0.61
25							
30							
35							
40							
45	28.79			1.50	2.02	2.84	0.84
50							
55							
60							
65							
70							
75							
80							
85							
90							
95							
100							
105							
110							
115							
120							

Depth (feet)	199-N-92A 1994 Potassium-40	Cobalt-60	Ruthenium-106	Antimony-125	Cesium-137	Radoim-226	Thorium-232	Uranium-235	Strontium-90
0									
5									
10									
15	32.82	0.37		0.77	0.09	1.06	1.34	2.63	0.62
20	28.63	0.13				0.63	0.74		1.01
25									
30									
35									
40									
45	12.17		4.04			0.66	1.71		0.81
50									
55									
60									
65									
70									
75									
80									
85									
90									
95									
100									
105									
110									
115									
120									

Depth (feet)	199-N-93A 1994 Potassium-40	Cobalt-60	Antimony-125	Cesium-137	Radoim-226	Thorium-232	Uranium-235	Tritium	Strontium-90
0									
5	23.24	0.39	0.36		0.83	0.92		0.29	2.17
10	22.11	1.20	1.54		1.56	2.06	2.90	4.77	22.00
15	26.37	0.43	0.48		0.84	1.02		8.56	6.90
20									
25									
30									
35	32.10		1.14		1.63	2.52	5.76	3.86	0.91
40									
45									
50									
55									
60									
65									
70									
75									
80									
85									
90									
95									
100									
105									
110									
115									
120									

Gross count rate in counts per second. All other concentrations are in pCi/g

A blank is used to denote no isotope identified by spectroscopic system, (i.e. below detection threshold if present).

Table A1-12. Spectral Gamma Logging and Field Screening Results for wells near 1301-N/1325-N. (Page 5 of 6)

Depth (feet)	199-N-94A 1994 Potassium-40	Cobalt-60	Cadium-109	Antimony-125	Radoim-226	Thorium-232	Uranium-235	Tritium	Strontium-90
0									
5	20.36	1.00		0.31	0.76	0.81		0.32	36.20
10	25.34	0.50		0.20	0.86	1.07		1.71	51.00
15	23.03	0.30		0.54	0.86	1.00		3.60	15.70
20									
25	24.57	0.38	3.95		1.02	1.14		7.34	9.86
30	23.23	0.21			0.89	1.06		6.58	5.10
35									
40									
45	28.22			1.04	1.64	2.29	0.28	0.45	2.04
50									
55									
60									
65									
70									
75									
80									
85									
90									
95									
100									
105									
110									
115									
120									

Depth (feet)	199-N-95A 1994 Potassium-40	Cobalt-60	Antimony-125	Radoim-226	Thorium-232	Tritium	Strontium-90
0							
5	21.76	0.21		0.67	0.76	0.20	1.26
10	22.57	1.29		0.65	0.73	0.05	37.80
15	19.69	0.39	0.40	0.79	1.23	2.88	2.76
20	18.45	0.22	0.39	0.63	0.72	2.30	14.00
25	19.49	0.19		0.62	0.75	0.95	10.50
30							
35	19.01		0.62	0.78	1.16	11.80	1.22
40							
45							
50							
55							
60							
65							
70							
75							
80							
85							
90							
95							
100							
105							
110							
115							
120							

Depth (feet)	199-N-96A 1994 Potassium-40	Cobalt-60	Antimony-125	Radoim-226	Thorium-232	Uranium-235	Tritium	Strontium-90
0								
5								
10	22.65			0.71	0.70		0.05	0.56
15	19.47		0.19	0.90	0.84	2.22	0.03	0.60
20	26.83	0.05		1.00	1.03		0.19	0.82
25	21.19	0.43		0.84	1.05	3.69	0.14	1.14
30								
35								
40								
45	23.14	0.16		0.97	1.33		0.80	0.70
50								
55								
60								
65								
70								
75								
80								
85								
90								
95								
100								
105								
110								
115								
120								

Gross count rate in counts per second. All other concentrations are in pCi/g

A blank is used to denote no isotope identified by spectroscopic system, (i.e. below detection threshold if present).

9513388.1682

Table A1-12. Spectral Gamma Logging and Field Screening Results for wells near 1301-N/1325-N. (Page 6 of 6)

Depth (feet)	199-N-97A 1994								
	Potassium-40	Cobalt-60	Ruthenium-106	Antimony-125	Cesium-137	Radoim-226	Thorium-232	Uranium-235	Strontium-90
0									
5									
10	19.01	0.10				0.62	0.65		
15	22.31		1.72	0.46		0.81	1.08		0.84
20	24.07	0.08		0.64		0.94	1.25		0.86
25									
30								1.90	
35	38.27	0.09			0.05	1.82	2.52	5.55	1.02
40									
45									
50									
55									
60									
65									
70									
75									
80									
85									
90									
95									
100									
105									
110									
115									
120									

Gross count rate in counts per second. All other concentrations are in pCi/g

A blank is used to denote no isotope identified by spectroscopic system, (i.e. below detection threshold if present).

9513388.1683

BACKUP FOR GRAPHICAL SUMMARIES

Table A1-13. Summary of Calculation for Average Concentrations in 1301-N Trench Sediment in May 30, 1995.

		Original Data (pCi/g)				Decayed to May 30, 1995 (pCi/g)				Average- 1995 (pCi/g)			
Location	Collection Date	Cobalt 60	Cesium 137	Strontium 90	Plutonium 239/240	Cobalt 60	Cesium 137	Strontium 90	Plutonium 239/240	Cobalt 60	Cesium 137	Strontium 90	Plutonium 239/240
TS-01	1/1/80	13,000,000	270,000	NA	NA	1,700,000	190,000						
	1/1/81	6,600,000	190,000	170,000	26,000	990,000	140,000	120,000	26,000				
	1/1/82	21,000,000	940,000	110,000	28,000	3,600,000	690,000	80,000	28,000				
	1/1/83	22,000,000	83,000,000	46,000	12,000	4,300,000	63,000,000	34,000	12,000				
	8/1/84	53,000,000	3,100,000	NA	NA	13,000,000	2,400,000						
	8/1/85	1,300,000	29,000	93,000	26,000	360,000	23,000	74,000	26,000	4,000,000	11,000,000	77,000	23,000
TS-02	1/1/80	8,800,000	210,000	NA	NA	1,200,000	150,000						
	1/1/81	6,300,000	190,000	770,000	9,200	950,000	140,000	550,000	9,200				
	1/1/82	27,000,000	490,000	250,000	63,000	4,600,000	360,000	180,000	63,000				
	1/1/83	16,000,000	550,000	46,000	13,000	3,100,000	420,000	34,000	13,000				
	8/1/84	22,000,000	960,000	NA	NA	5,300,000	750,000						
	8/1/85	1,100,000	26,000	77,000	16,000	300,000	21,000	61,000	16,000	2,600,000	310,000	210,000	25,000
TS-03	1/1/80	8,400,000	120,000	NA	NA	1,100,000	85,000						
	1/1/81	19,000,000	530,000	110,000	25,000	2,900,000	380,000	78,000	25,000				
	1/1/82	34,000,000	940,000	320,000	170,000	5,800,000	690,000	230,000	170,000				
	1/1/83	25,000,000	580,000	29,000	10,000	4,900,000	440,000	22,000	10,000				
	8/1/84	32,000,000	820,000	NA	NA	7,700,000	640,000						
	8/1/85	1,600,000	37,000	210,000	27,000	440,000	30,000	170,000	27,000	3,800,000	380,000	130,000	58,000
TS-04	1/1/80	5,100,000	220,000	NA	NA	670,000	160,000						
	1/1/81	6,000,000	330,000	36,000	12,000	900,000	240,000	26,000	12,000				
	1/1/82	6,400,000	530,000	150,000	2,800,000	1,100,000	390,000	110,000	2,800,000				
	1/1/83	8,000,000	380,000	26,000	7,500	1,600,000	290,000	19,000	7,500				
	8/1/84	16,000,000	750,000	NA	NA	3,900,000	590,000						
	8/1/85	1,200,000	28,000	110,000	23,000	330,000	22,000	87,000	23,000	1,400,000	280,000	61,000	710,000
TS-05	1/1/80	3,100,000	260,000	NA	NA	410,000	180,000						
	1/1/81	4,400,000	490,000	21,000	5,500	660,000	350,000	15,000	5,500				
	1/1/82	6,600,000	540,000	110,000	660,000	1,100,000	400,000	80,000	660,000				
	1/1/83	5,200,000	720,000	13,000	3,000	1,000,000	540,000	9,700	3,000				
	8/1/84	6,300,000	1,300,000	NA	NA	2,000,000	1,000,000						
	8/1/85	950,000	55,000	190,000	21,000	260,000	44,000	150,000	21,000	910,000	420,000	64,000	170,000
TS-06	1/1/80	5,600,000	210,000	NA	NA	740,000	150,000						
	1/1/81	17,000,000	570,000	96,000	25,000	2,600,000	410,000	68,000	25,000				
	1/1/82	15,000,000	500,000	230,000	44,000	2,600,000	370,000	170,000	44,000				
	1/1/83	16,000,000	950,000	46,000	9,800	3,100,000	720,000	34,000	9,800				
	8/1/84	23,000,000	750,000	NA	NA	5,500,000	590,000						
	8/1/85	1,100,000	68,000	120,000	24,000	300,000	54,000	95,000	24,000	2,500,000	380,000	92,000	26,000
TS-07	1/1/80	1,700,000	240,000	NA	NA	220,000	170,000						
	1/1/81	6,900,000	530,000	110,000	30,000	1,300,000	380,000	78,000	30,000				
	1/1/82	14,000,000	1,000,000	63,000	17,000	2,400,000	740,000	60,000	17,000				
	1/1/83	6,000,000	800,000	27,000	6,200	1,200,000	600,000	20,000	6,200				
	8/1/84	16,000,000	980,000	NA	NA	3,900,000	770,000						
	8/1/85	1,300,000	56,000	120,000	14,000	360,000	45,000	95,000	14,000	1,600,000	450,000	63,000	17,000
TS-08	1/1/80	7,600,000	630,000	NA	NA	1,000,000	440,000						
	1/1/81	5,400,000	440,000	25,000	6,600	810,000	320,000	18,000	6,600				
	1/1/82	4,500,000	460,000	70,000	16,000	770,000	340,000	51,000	16,000				
	1/1/83	4,000,000	400,000	13,000	4,600	780,000	300,000	9,700	4,600				
	8/1/84	16,000,000	730,000	NA	NA	3,900,000	570,000						
	8/1/85	260,000	22,000	70,000	11,000	71,000	18,000	55,000	11,000	1,200,000	330,000	33,000	9,600
TS-09	1/1/80	4,300,000	350,000	NA	NA	570,000	250,000						
	1/1/81	8,300,000	780,000	45,000	20,000	1,200,000	560,000	32,000	20,000				
	1/1/82	4,300,000	560,000	150,000	13,000	740,000	410,000	110,000	13,000				
	1/1/83	4,000,000	390,000	8,700	4,300	780,000	290,000	6,500	4,300				
	8/1/84	15,000,000	1,300,000	NA	NA	3,600,000	1,000,000						
	8/1/85	640,000	25,000	110,000	20,000	180,000	20,000	87,000	20,000	1,200,000	430,000	59,000	14,000

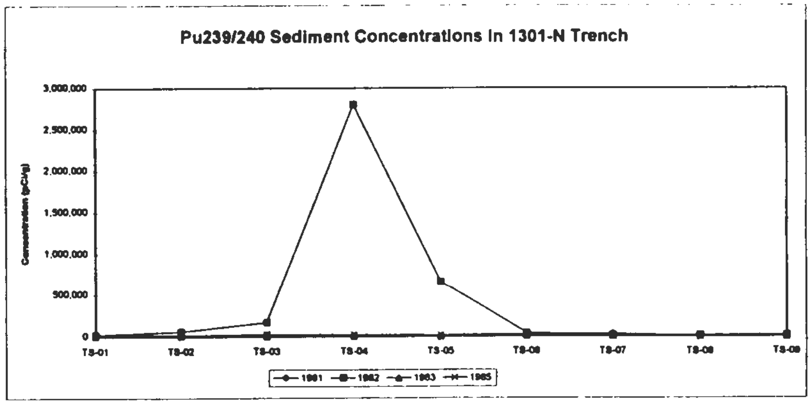
9513388.1684

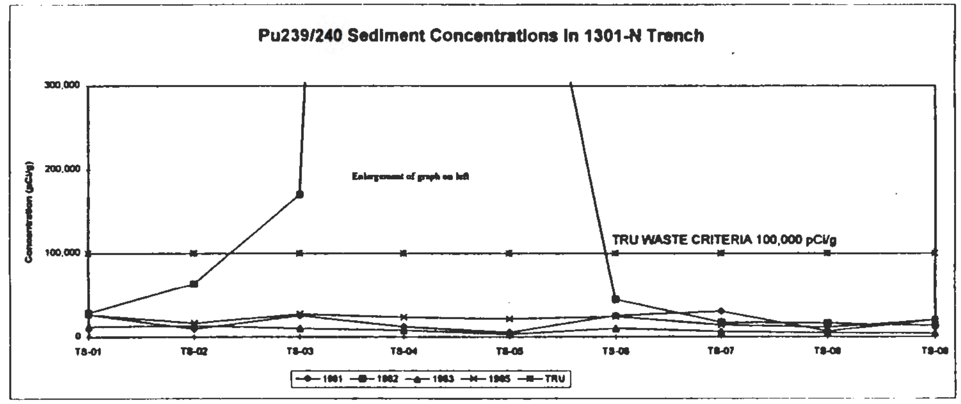
Table A1-14. Summary of Calculation for Average Concentrations in 1325-N Crib Sediment in May 30, 1995.

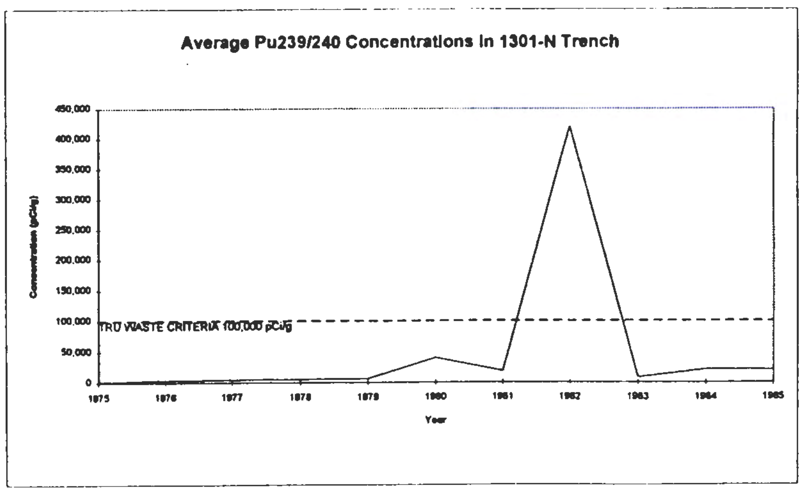
		Original Data (pCi/g)				Decayed to May 30, 1995 (pCi/g)				Average - 1995 (pCi/g)			
Location	Collection Date	Cobalt 60	Cesium 137	Strontium 90	Plutonium 239/240	Cobalt 60	Cesium 137	Strontium 90	Plutonium 239/240	Cobalt 60	Cesium 137	Strontium 90	Plutonium 239/240
CS-01	8/1/85	1,300,000	41,000	88,000	12,000	360,000	33,000	70,000	12,000				
	6/24/86	9,100,000	180,000	9,100	NA	2,600,000	150,000	7,400	NA				
	7/8/87	820,000	32,000	14,000	5,200	290,000	27,000	12,000	5,200				
										1,200,000	69,000	30,000	8,600
CS-02	8/1/85	660,000	49,000	26,000	5,000	180,000	39,000	21,000	5,000				
	6/24/86	520,000	82,000	3,900	NA	160,000	50,000	3,200	NA				
	7/8/87	1,400,000	ND	40,000	49,000	500,000	ND	33,000	49,000				
										280,000	45,000	19,000	27,000
CS-03	8/1/85	1,100,000	49,000	89,000	13,000	300,000	39,000	70,000	13,000				
	6/24/86	2,300,000	88,000	5,000	NA	710,000	72,000	4,000	NA				
	7/8/87	630,000	18,000	5,900	1,600	220,000	15,000	4,900	1,600				
										410,000	42,000	28,000	7,300
CS-04	8/1/85	600,000	35,000	27,000	4,300	160,000	28,000	21,000	4,300				
	6/24/86	2,500,000	85,000	5,000	NA	770,000	69,000	4,000	NA				
	7/8/87	830,000	29,000	4,300	9,900	220,000	24,000	3,600	9,900				
										380,000	40,000	9,500	7,100
CS-05	8/1/85	180,000	13,000	15,000	2,800	49,000	10,000	12,000	2,800				
	6/24/86	620,000	92,000	3,400	NA	190,000	75,000	2,700	NA				
	7/8/87	680,000	30,000	10,000	8,500	240,000	25,000	8,300	8,500				
										160,000	37,000	7,700	5,700
CS-07	8/1/85	1,600,000	11,000	200,000	30,000	440,000	8,800	160,000	30,000				
	6/24/86		ND		NA		ND		NA				
	7/8/87	1,300,000	48,000	630,000	98,000	460,000	40,000	520,000	98,000				
										450,000	24,000	340,000	64,000
CS-08	8/1/85	1,700,000	29,000	100,000	56,000	470,000	23,000	79,000	56,000				
	6/24/86	1,700,000	66,000		NA	530,000	54,000		NA				
	7/8/87	1,100,000	15,000	270,000	120,000	390,000	13,000	220,000	120,000				
										460,000	18,000	150,000	88,000
CS-09	8/1/85	140,000	5,000	17,000	12,000	38,000	4,000	13,000	12,000				
	6/24/86	2,800,000	80,000	9,200	NA	870,000	65,000	7,400	NA				
	7/8/87	820,000	17,000	10,000	8,300	290,000	14,000	8,300	8,300				
										400,000	28,000	9,600	10,000
CS-10	8/1/85	520,000	56,000	13,000	2,300	140,000	45,000	10,000	2,300				
	7/8/87	140,000	21,000	14,000	1,400	50,000	18,000	12,000	1,400				
										95,000	31,000	11,000	1,900
CS-11	8/1/85	600,000	48,000	12,000	6,900	220,000	38,000	9,500	6,900				
	7/8/87	840,000	13,000	29,000	20,000	300,000	11,000	24,000	20,000				
										260,000	25,000	17,000	13,000
CS-12	8/1/85	580,000	71,000	5,800	34,000	160,000	57,000	4,600	34,000				
	7/8/87	1,200,000	13,000	35,000	39,000	420,000	11,000	29,000	39,000				
										290,000	34,000	17,000	37,000

NA = not analyzed, ND= Undetected at specified detection limit
ND = Undetected at specified detection limit

Table A1-15. Plutonium-239/240 was detected in TRU levels at 1301-N Trench in 1982 only. All other years are less than TRU criteria.





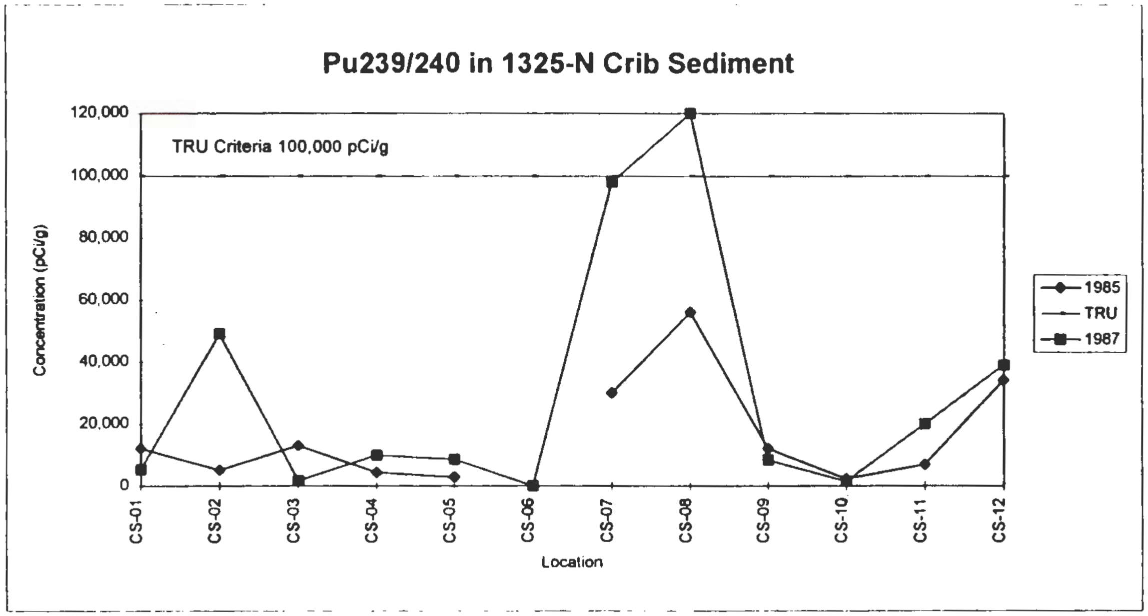


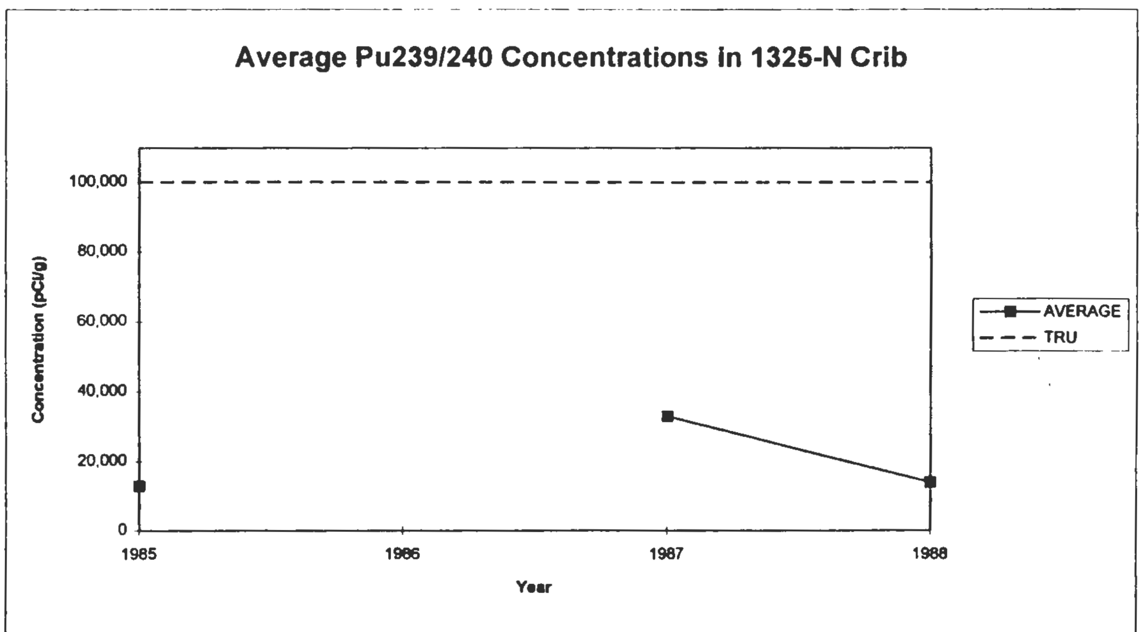
Pu239/240 Concentrations (pCi/g) 1301-N Trench

	1981	1982	1983	1985	TRU
TS-01	26,000	28,000	12,000	26,000	100,000
TS-02	9,200	63,000	13,000	16,000	100,000
TS-03	25,000	170,000	10,000	27,000	100,000
TS-04	12,000	2,800,000	7,500	23,000	100,000
TS-05	5,500	660,000	3,000	21,000	100,000
TS-06	25,000	44,000	9,800	24,000	100,000
TS-07	30,000	17,000	6,200	14,000	100,000
TS-08	6,600	16,000	4,600	11,000	100,000
TS-09	20,000	13,000	4,300	20,000	100,000

Year	Average	TRU
1975	980	100,000
1976	3,700	100,000
1977	4,600	100,000
1978	5,200	100,000
1979	6,200	100,000
1980	40,000	100,000
1981	18,000	100,000
1982	420,000	100,000
1983	7,800	100,000
1984	21,000	100,000
1985	20,000	100,000

Table A1-16. Plutonium-239/240 was not detected in TRU levels at 1325-N Crib; however, sampling was limited to 2 years.





Pu239/240 Concentrations (pCi/g) 1325-N Crib

	1985	1987	TRU
CS-01	12,000	5,200	100,000
CS-02	5,000	49,000	100,000
CS-03	13,000	1,600	100,000
CS-04	4,300	9,900	100,000
CS-05	2,800	8,500	100,000
CS-06			100,000
CS-07	30,000	98,000	100,000
CS-08	56,000	120,000	100,000
CS-09	12,000	8,300	100,000
CS-10	2,300	1,400	100,000
CS-11	6,900	20,000	100,000
CS-12	34,000	39,000	100,000

YEAR	AVERAGE	TRU
1985	13,000	100,000
1986		100,000
1987	33,000	100,000
1988	14,000	100,000

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Table A1-17. Summary of Soil Data for Cross section A-A'.

Depth (feet)	Cobalt-60 Original Concentration (pCi/g) 199-N-94A	199-N-76	199-N-75	199-N-105A	Cobalt-60 Decayed to May 30, 1995 (pCi/g) 199-N-94A	199-N-76	199-N-75	199-N-105A	Cesium-137 Original Concentration (pCi/g) 199-N-94A	199-N-76	199-N-75	199-N-105A	Cesium-137 Decayed to May 30 ,1995 (pCi/g) 199-N-94A	199-N-76	199-N-75	199-N-105A
Date	10/1/94	4/1/92	4/1/92	4/1/95					10/1/94	4/1/92	4/1/92	4/1/95				
2		ND	ND			ND	ND			ND	ND			ND	ND	
5	0.996	ND	ND		0.913	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND
10	0.497		ND	ND	0.456		ND	ND	ND		ND	ND	ND		ND	ND
15	0.303			ND	0.278			ND	ND			ND	ND			ND
20				ND				ND				ND				ND
25	0.378	ND		ND	0.347	ND		ND	ND	ND		ND	ND	ND		ND
30	0.211			ND	0.193			ND	ND			ND	ND			ND
35				ND				ND				ND				ND
40				ND				ND				ND				ND
45	ND			ND	ND			ND	ND			ND	ND			ND
50				0.120				0.117				ND				ND
55		2.0	0.52	0.700		1.3	0.34	0.685		ND	ND	ND		ND	ND	ND
60				0.670				0.656				ND				ND
65		0.18		0.170		0.12		0.166		ND		ND		ND		ND
70			0.28	0.150			0.18	0.147			ND	ND			ND	ND
75				0.095				0.093				ND				ND
80				ND				ND				ND				ND
85				ND				ND				ND				ND
90				ND				ND				ND				ND
95				ND				ND				ND				ND
100																

Depth (feet)	Strontium-90 Original Concentration (pCi/g) 199-N-94A	199-N-76	199-N-75	199-N-105A	Strontium-90 Decayed to May 30 ,1995 (pCi/g) 199-N-94A	199-N-76	199-N-75	199-N-105A	Plutonium-239/240 Original (pCi/g) 199-N-76/	199-N-75	Plutonium-239/240 May 30 ,1995 (pCi/g) 199-N-76	199-N-75
Date	10/1/94	4/1/92	4/1/92	4/1/95		4/1/92	4/1/92	4/1/95	4/1/92	4/1/92	4/1/92	4/1/92
2		1.0	ND			0.93	ND		ND	ND	ND	ND
5	36.2	ND	ND		35.8	ND	ND		ND	ND	ND	ND
10	51		ND	1.5	50		ND	1.4		ND		ND
15	15.7			0.87	15.5			0.81				
20				0.64				0.59				
25	9.9	ND		0.34	9.7	ND		0.32	ND		ND	
30	5.1			1.1	5.0			1.0				
35				1.8				1.7				
40				3.1				2.9				
45	2.0			3.1	2.0			2.9				
50				431				400				
55		320	190	136		297	176	126	ND	ND	ND	ND
60				149				139				
65		2.0		91		1.9		84	ND		ND	
70			120	101			111	94		ND		ND
75				70				65				
80				11.5				10.7				
85				1.7				1.5				
90				2.9				2.7				
95				0.8				0.7				

ND - Not detected

Table A1-18. Summary of Soil Data for Cross section B-B'.

	Original Concentration (pCi/g)						Concentration Decayed to May 30 ,1995 (pCi/g)					
Depth (feet)	199-N-95A	199-N-80	199-N-103A	Well #3	Well #2	Well #1	199-N-95A	199-N-80	199-N-103A	Well #3	Well #2	Well #1
Date	9/1/94	7/1/92	4/1/92	8/1/82	8/1/82	8/1/82						
Cobalt-60												
5	0.21	ND		0.054	0.065	0.598	0.19	ND		0.010	0.012	0.111
10	1.29			0.019	0.065	0.745	1.17			0.004	0.012	0.138
15	0.39			0.019	0.067	0.779	0.35			0.004	0.012	0.144
20	0.22			0.006	0.014	0.838	0.20			0.001	0.003	0.155
25	0.19			0.009	0.018	0.906	0.18			0.002	0.003	0.168
30	ND		ND	0.009	0.017	2.17	ND		ND	0.002	0.003	0.40
35	ND			0.008	0.005	0.23	ND			0.001	0.001	0.04
40	ND			0.009	ND	2.17	ND			0.002	ND	0.40
45	ND	ND		0.009	0.025	9.90	ND	ND		0.002	0.005	1.83
50		ND		0.200	0.227	9.00		ND		0.037	0.042	1.67
55			ND	0.390	0.957	10.50			ND	0.072	0.177	1.94
60		0.41	ND	0.680	1.220	6.56		0.28	ND	0.126	0.226	1.21
65			ND	1.550	0.905	4.38			ND	0.287	0.168	0.81
70		0.230	1.2	1.510	0.623			0.157	0.8	0.280	0.115	
75		0.130	0.07	0.037	1.480			0.089	0.04	0.007	0.274	
80			0.11	0.220	0.654				0.07	0.041	0.121	
85			ND	0.170	0.160				ND	0.031	0.030	
90			ND	0.140	0.185				ND	0.026	0.034	
95		ND	ND	0.090	0.166			ND	ND	0.017	0.031	
100				0.160	0.211					0.030	0.039	
Concentrations of Cesium-137 in Vadose Zone (pCi/g)												
5	ND			0.023	0.014	0.684	ND			0.017	0.010	0.512
10	ND			0.017	0.018	0.746	ND			0.013	0.013	0.558
15	ND			0.025	0.008	0.671	ND			0.019	0.006	0.502
20	ND			0.009	0.015	0.735	ND			0.007	0.011	0.550
25	ND			ND	0.012	0.548	ND			ND	0.009	0.410
30			ND	0.009	ND	0.631			ND	0.007	ND	0.472
35				ND	0.015	0.258				ND	0.011	0.193
40	ND			ND	0.010	0.772	ND			ND	0.007	0.578
45		ND		ND	ND	1.150		ND		ND	ND	0.861
50		ND		ND	ND	0.488		ND		ND	ND	0.365
55				ND	ND	3.960				ND	ND	2.965
60		ND	ND	ND	ND	0.641		ND	ND	ND	ND	0.480
65			ND	ND	ND	0.211			ND	ND	ND	0.158
70		ND	ND	ND	ND			ND	ND	ND	ND	
75		ND	ND	ND	ND			ND	ND	ND	ND	
80				ND	ND					ND	ND	
85				ND	ND					ND	ND	
90				ND	ND					ND	ND	
95		ND		ND	ND			ND		ND	ND	
100				ND	ND					ND	ND	

Strontium-90

	Original Concentration (pCi/g)			Conc. Decayed to May 30, 1995		
Depth (feet)	199-N-95A	199-N-80	199-N-103A	199-N-95A	199-N-80	199-N-103A
Date	9/1/94	7/1/92	4/1/92			
5	1 3	ND		1 2	ND	
10	37 8			35 1		
15	2 8			2 6		
20	14			13		
25	10.5			9.7		
30						
35						
40	1.22			1.1		
45		ND			ND	
50		25			23	
55			0.56			0.52
60		52	2.54		49	2.36
65			120			112
70		81	80		76	74
75		43	3.2		40	3.0
80			0.68			0.82
85			0.62			0.58
90						
95		1.6	0.4		1.5	0.38

ND - Not detected