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Engineering Design File

PROJECT NO. 23927

Waste Inventory for Phase II of the Accelerated Retrieval Project

Idaho National Engineering and Environmental Laboratory

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ENGINEERING DESIGN FILE

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3. NPH Performance Category: _____ or ☒ N/A

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5. Summary:

This engineering design file summarizes information on the weights, volumes, and transuranic activities, by waste type, of waste disposed of in the retrieval area selected for Phase II of the Accelerated Retrieval Project (ARP II). This retrieval area (formerly Area H) includes portions of Pits 4 and 6 and lies immediately to the east of the ARP retrieval area (Pit 4). The ARP and ARP II retrieval areas together encompass the whole of Subsurface Disposal Area Retrieval Area #1 as described in the Department of Energy Idaho Operations Office request for proposal for the Idaho Completion Project contract. The ARP II retrieval area contains Rocky Flats Plant (RFP) waste shipments dated from August 1966 to April 1968.

The estimated weights and as-disposed volumes (by waste type) of waste shipments within the ARP II retrieval area are summarized below:

Waste Category	Weight (lb)	Volume (ft^3)
RFP Series 741 sludge	328,423	4,753
RFP Series 742 sludge	660,483	9,879
RFP Series 743 sludge	2,179,169	27,573
RFP Series 744 sludge	166,704	2,748
RFP Series 745 sludge	625,442	11,250
RFP Miscellaneous sludges (746 & 776)	1,180	28
RFP Beryllium	16,082	572
RFP Roaster oxide	135,636	1,545
RFP Graphite	0	0
RFP Filters	67,570	6,373
RFP Line-generated waste	26,645	1,306
RFP Combustible debris	605,142	35,321
RFP Noncombustible debris	882,443	53,282
Non-RFP sludges	2,500	67
Non-RFP combustible debris	0[a]	40
Non-RFP noncombustible debris	63,224	3,709
Totals	5,760,643	158,446

a. No weight data available.

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(See instructions for definitions of terms and significance of signatures.)

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Operations		NA		
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Waste Inventory for Phase II of the Accelerated Retrieval Project

1. INTRODUCTION

The Radioactive Waste Management Complex at the Idaho National Engineering and Environmental Laboratory (INEEL) was used for subsurface disposal of transuranic (TRU) waste in various pits and trenches of the Subsurface Disposal Area (SDA) from 1952 until 1970, when the practice was suspended in favor of aboveground, retrievable storage. Low-level waste (LLW) from the INEEL and elsewhere was also disposed of in these pits and trenches. As part of a Comprehensive Environmental Response, Compensation, and Liability Act (42 USC § 9601 et seq., 1980) non-time critical removal action (NTCRA), the U.S. Department of Energy proposes to retrieve some of this waste in the SDA. The Accelerated Retrieval Project (ARP) intends to retrieve and process certain Rocky Flats Plant (RFP) waste forms (termed "targeted waste") from a described area within Pit 4 of the SDA within the Radioactive Waste Management Complex. Waste forms targeted for retrieval include wastes suspected to contain high levels of TRU contaminants or other contaminants of concern for the SDA. Phase II of the ARP (ARP II) will also be performed as an NTCRA and will extend the ARP retrieval area to the east to encompass the remainder of SDA Retrieval Area #1 as described in the Department of Energy Idaho Operations Office request for proposal for the Idaho Completion Project contract. This EDF addresses the buried waste contained in the extension area to the east of the ARP described area, hereafter referred to as the ARP II retrieval area.

2. SITE LOCATION

A study was conducted as part of the Pit 9 Stage III Project to evaluate and prioritize various areas of the SDA for possible removal of TRU contamination and collocated hazardous volatile organic compounds. These areas (A through J) were evaluated against a number of criteria (e.g., total TRU content, total volatile organic compound content, and accessibility). The ARP II retrieval area (formerly identified as Area H) was identified as the second highest priority after the initial ARP Pit 4 described area. The ARP II retrieval area is located toward the center of the SDA and covers the east end of Pit 4 and the west end of Pit 6. Specific coordinates for the ARP II retrieval area are provided in Drawing #629816.

As can be determined from these coordinates, the ARP II retrieval area is roughly rectangular with approximate dimensions: 248 ft (east-west) by 126 ft (north-south).

3. WASTE DISPOSAL INFORMATION AND ESTIMATE DEVELOPMENT

Both TRU waste and LLW were disposed of in the ARP II retrieval area. Waste was generally disposed of from west to east over time. The majority of waste came from the Rocky Flats Plant (RFP) near Denver, Colorado, and has varying levels of TRU contamination. The LLW came from various INEEL generators. For Pits 4 and 6, the disposal process historically involved excavating an area in the SDA to the outcroppings of the basalt bedrock, backfilling the area with 2 ft (nominally) of soil, and disposing of the waste containers in a random fashion. There was no stacking of containers in the ARP II retrieval area.

Disposal sheets for non-RFP shipments and trailer load lists for the RFP shipments are the ultimate source for the disposal locations and waste type designations (Clements 1982). These sheets are presently

maintained in the Operable Unit (OU) 13/14 Project file, which is located in the Technical Support Building in Idaho Falls. The disposal sheets are also available from INEEL Optical Imaging System with links from Electronic Document Management System. The disposal location and, in most cases, the footprint that the disposed containers covered, were recorded for each shipment. For instance, some disposal records simply identify a point measured from a survey marker (at a pit corner) while others provide a range in two directions for the area covered by the disposal after dumping (e.g., 300 to 310 ft west and 70 to 90 ft north of the southeast monument). The trailer load lists (for RFP shipments) and the disposal sheets also identify weights and volumes for the shipments (in most cases), but provide little information on the radioactive content in the shipment.

The information from the original shipments has been transferred to the INEEL Waste Inventory Location Database (WILD), from which reports for the ARP II retrieval area were obtained. This EDF is based strictly on the WILD data (as of December 1, 2004) for shipments intersecting the ARP II retrieval area including waste type assignments, total shipment weights, and total shipment volumes. Typically, a shipment would contain various types of wastes from various generators (e.g., buildings at RFP). The RFP generated waste was divided, on the trailer load lists, into general categories as shown in Table 1.

Table 1. Rocky Flats waste types.

Type	Description
Type I	Combustibles (e.g., paper, rags, and wood)
Type II	Glass and ceramics
Type III	Chemical Warfare System and high efficiency particulate air filters
Type IV	Sludges from coprecipitation treatment
Type V	Non-combustibles, scrap metal, and brick
Type VI	Empties (included in WILD as Type V)
Type VII	Series 743 Sludge (included in WILD as Type IV)

WILD = Waste Inventory Location Database

In developing the data for WILD, these types were converted to more descriptive categories based on additional information such as the RFP building designators and knowledge of the operations in those buildings. The waste categories used in WILD are described below. The descriptions of the various types of sludge were taken from Clements (1982).

- Series 741 sludge, also called first-stage sludge: Series 741 sludge was produced from aqueous wastes from various plutonium recovery operations. The process produced a precipitate of hydrated oxides of iron, magnesium, aluminum, and silicon that also carried some hydrate plutonium and americium oxides. The precipitates were filtered to produce a sludge containing 50 to 70 wt% water. The water was absorbed, to some extent, by the addition of Portland cement.

- Series 742 sludge, also called second-stage sludge: Series 742 sludge was generated in a fashion similar to the Series 741 sludge from various RFP aqueous streams that were lower in TRU content than the streams generating the Series 741 sludge and generally contains lesser amounts of plutonium or americium.

- Series 743 sludge, also called organic setups: Series 743 sludge is very different from the Series 741 and 742 types of sludge. Series 743 sludge is the result of stabilizing various organic

waste (e.g., carbon tetrachloride, trichloroethylene, tetrachloroethylene, Texaco Regal Oil, and other miscellaneous oils and degreasing agents). These types of liquid waste were mixed with calcium silicate to form a grease or paste-like substance. Waste containers designated as 74A on the trailer load lists are thought to be a precursor to the Series 743 sludge and are included in this category.

- Series 744 sludge, also called special setups: Series 744 sludge contains organic liquids that were stabilized with cement rather than calcium silicate. Containers of Series 744 sludge are expected to be firm monoliths.

- Series 745 sludge, also called evaporator salts: Series 745 sludges are nitrate salt residues from solar evaporation ponds that were used at one time at RFP. The chemical make-up of these salts is expected to be 60% sodium nitrate, 30% potassium nitrate, and 10% miscellaneous inorganic compounds. This waste stream was generated from the liquid effluent from the second stage treatment process and, as a result, expected to be very low in TRU content.

- Beryllium waste: Waste identified as coming from RFP buildings 444, 776, or 777 and designated on the trailer load lists as containing beryllium was categorized as beryllium waste. It is not clear whether this material was beryllium metal, other materials that were contaminated with beryllium, or a combination of the two.

- Roaster-oxide waste: Some types of waste from RFP Building 444 were designated as roaster-oxide waste. This roaster-oxide waste is incinerated depleted uranium.

- Graphite waste: Graphite was used as molds for certain casting operations. The plutonium was recovered to the extent practical before the graphite was disposed of. Data from various studies and measurements indicate that these graphite wastes may have some of the highest TRU contamination levels.

- Filters: This category is expected to contain the various high-efficiency particulate air filters. Other types of process filters may also be included in the shipments designated as filters in WILD.

- Line-generated waste: This category is expected to contain various waste materials removed from the plutonium-processing gloveboxes including items such as glovebox gloves, combustible waste, graphite, and filters.

- Combustible debris: Waste comprising paper, plastic, wood, and other combustible materials was designated as combustible debris.

- Metal debris: Waste that was predominantly metallic (e.g., pipe, equipment, conduit, and empty drums) was designated as metal debris.

These last two categories (i.e., combustible and metal debris) contained both RFP- and INEEL-generated waste.

It was necessary to perform some reformatting and processing of the WILD data in order to generate the values in this estimate. First, some data processing was necessary due to the way that waste type information is stored in WILD. Specifically, records previously tracked in Waste-O-Scope as mixed waste types (e.g., shown as both Type I and Type V) have been replicated in WILD so that each record has only one waste type. The associated number of containers, weight, and volume is the same for each record (i.e., these parameters were not partitioned when the mixed waste type records were separated).

Therefore, to prevent double counting in this estimate, an Excel-spreadsheet process was developed that would identify such instances (i.e., based on duplicate field values) and partition the weight and volume equally to the affected single-waste-type records. For example, if two WILD records have the same detail key and exactly the same weight, volume, and container count (indicating the split of a mixed-waste-type record), the associated weight and volume would be divided by two for each record. If there were three records with the same detail information (indicating that the containers held three waste types), the associated weight and volume was divided by three for each record. While the waste types were likely not equal in weight and volume, a simplifying assumption was necessary due to the lack of data on the true distribution.

Second, some waste disposal footprints were adjusted from that provided by WILD. As discussed above, some disposal locations are identified by only one or two points rather than a rectangular range (four points) with respect to one of the pit monuments. These disposals are shown as circles or ellipses in associated shape files, respectively. One option from WILD, for reporting the area of these disposals, is to have the database adjust the disposal area based on the depth of the waste zone in the location of the disposal. For disposals containing a large volume of waste, this is desirable to ensure the "depth" of the disposal does not exceed the physical limits of the pit. It also provides a visual indication of how large the shipment was. However, for small disposals or for deeper sections of the pit, the areal footprint can be quite small—suggesting a positional accuracy that is not likely to be representative of the actual location. For this reason, the WILD areas for disposals having only one locator point have been adjusted such that no disposal area is less than 100 ft^2 (e.g., a 10- × 10-ft square). This is consistent with anecdotal estimates of the positional accuracy of the disposal location information that was documented at the time the waste was buried. Also, the disposal area shapes for all disposals have been simplified to rectangles for this analysis.

The approximate locations of the disposal shipments within the ARP II retrieval area are depicted in Figure 1. Note that the waste shown in the last grid column on the right hand side has not been included in this estimate because the majority of this waste falls outside the ARP II retrieval area.

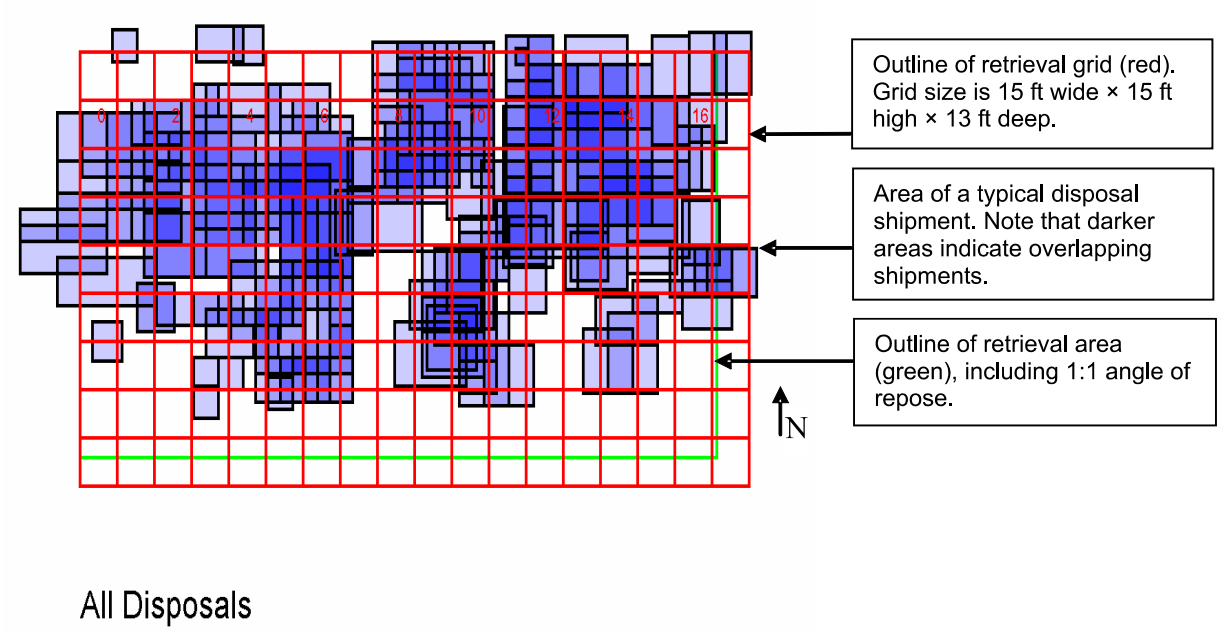

Figure 1. Approximate disposal shipment locations for the ARP II retrieval area.

While not specifically identified in WILD, it was noted in the review of the disposal records that several shipments might pose difficulties for normal targeted waste retrieval operations. Information on these disposals is presented in Section 5.

Section 6 of this EDF provides an estimate of TRU activity (limited to Am-241, Pu-239 and Pu-240) by waste type. This estimate assists decision-makers in identifying waste forms that may be efficient to target for removal as part of the NTCRA. This estimate also allows prediction of the average TRU activity concentration of the material remaining in the pit after removal of the targeted waste forms.

The complete process used to develop the volume, weight, and TRU activity estimates is diagrammed in Figure 2.

The following functions are performed by the spreadsheets and ARP Model application (shown in Figure 2) that were developed to generate the volume, weight, and activity estimates contained in this EDF. The list below is not meant to be all encompassing, but identifies those functions that are primary to the generation of the estimates:

<u>ARP II RFP TRU.xls:</u>

- Uses a subset of the activity data, from the SDA Map Builder Application (SMBA)—limited to only those records that are applicable to the ARP II retrieval area.
- Creates a lookup key to uniquely identify isotopic activity allocation (in curies) for each shipment and RFP waste type. This lookup table is used later by the ARP II Inventory Processor spreadsheet.
- Summarizes TRU isotopic activity allocation (i.e., Am-241, Pu-239, and Pu-240) by ARP II RFP disposal shipment. This summary provides a means to check that the spreadsheet is accounting for all the TRU activity allocated to each shipment by the SMBA
- Summarizes TRU isotopic activity allocation (i.e., Am-241, Pu-239, and Pu-240) by RFP waste type (e.g., series-741 sludge, graphite, filters, and line-generated waste).

<u>ARP II Inventory Processor.xls:</u>

- Provides a user interface to simplify data entry of retrieval-grid-input parameters for the execution of the ARP II-Model-java program.
- Allows user input to select the type of output (i.e., volume, weight, or activity).
- Allows user input to select between standard disposal footprints provided by WILD, 100 ft^2 for all circular disposals, or 100-ft^2 minimum for circular disposals. All disposal footprints are simplified to a rectangular shape (with equivalent surface area) for use by the ARP Model java program.
- Detects WILD records for drums containing multiple waste types and uses user-defined rules to allocate drum volumes and weights between the identified waste types. This is to prevent double counting of the waste volumes and weights.
- Creates a lookup key so that waste volumes (or weights, or activities [from the linked ARP II RFP TRU.xls file]) can be summarized by waste type for each shipment ID.

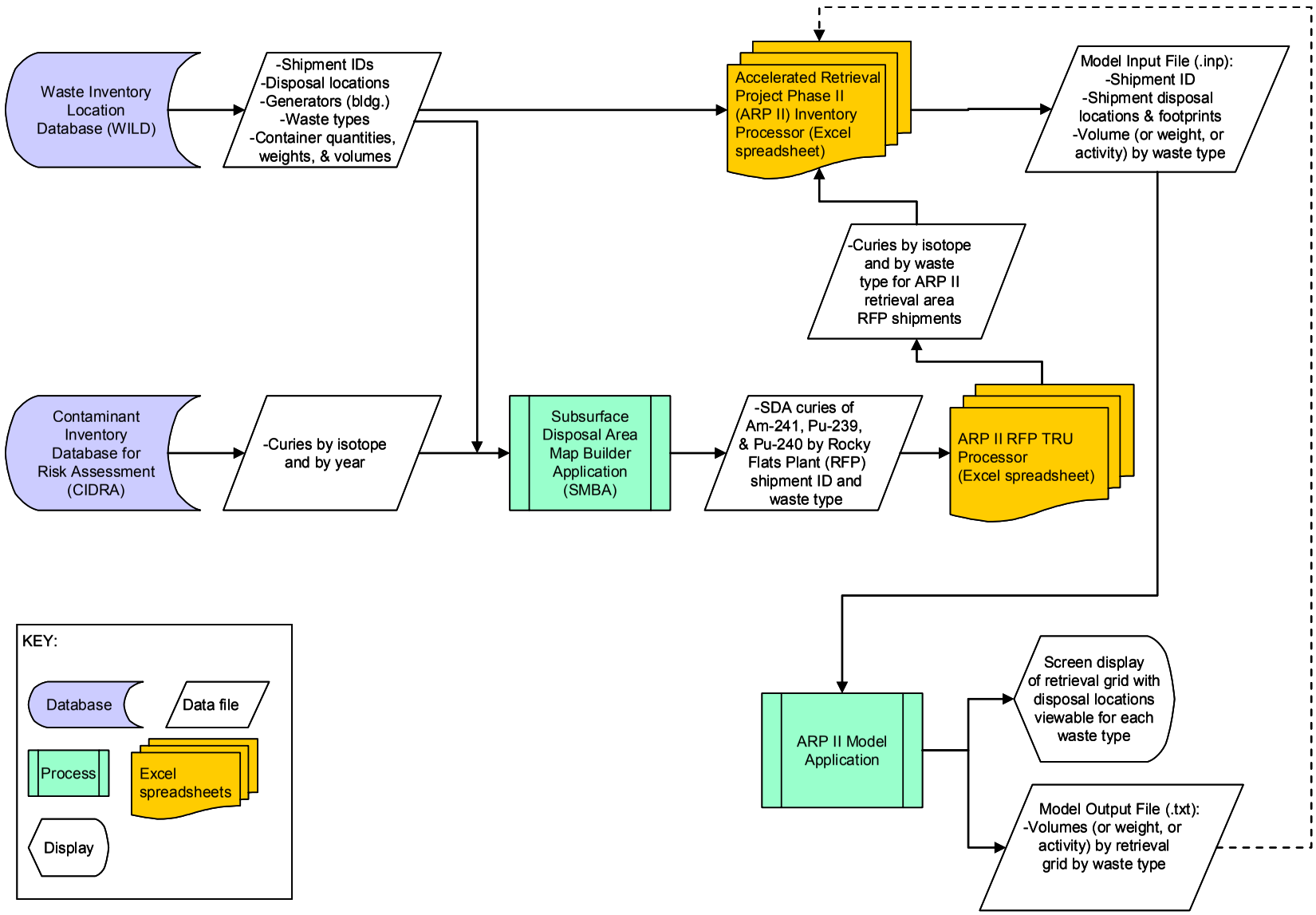

Figure 2. Diagram of data reduction and preparation process.

- Allows the creation of a drawing file (e.g., .dxf format) that can be used to check that the disposal-location data is converted correctly.

- Creates the text (.inp) file that is input for the ARP-Model-java program. This file contains the disposal locations for each waste shipment and the associated volumes (or weights, or TRU activities) for each waste type, as well as retrieval area coordinates and retrieval grid construction parameters.

- Pulls the ARP II-Model-java-program output (a .txt file) back into the spreadsheet for subsequent summarization, use, and analysis.

ARP II Model.jar:

- Draws a retrieval grid over the ARP II retrieval area) based on parameters entered in the program's execution line.

- For each disposal record in the input file, this program partitions the waste volume (or weight, or TRU activity) by waste type into the applicable retrieval grids. For this partitioning, the volume (or weight, or TRU activity) for each waste type is assumed to be evenly distributed over the disposal footprint. For example, if 40% of a shipment's disposal footprint lies within a retrieval grid, then 40% of the volume of each waste type contained in that shipment is placed within that retrieval grid.

- Creates an output text (.txt) file that identifies the total volume (or weight, or TRU activity) of each waste type contained within each retrieval grid location.

- Displays retrieval grid and disposal elements either for all shipments or by waste type (i.e., only the shipments containing the selected waste type).

For this estimate, the dimensions of the retrieval grid were set at 15 ft wide by 15 ft high. This grid corresponds to the grid system laid out within the ARP Retrieval Enclosure and to be continued in the future ARP II retrieval enclosure to support sampling activities. The depth of the retrieval grid has been set at 13 ft, which corresponds to the anticipated average depth of the waste zone (not including the overburden, potentially contaminated soil, and underburden layers).

4. WASTE VOLUME AND WEIGHT ESTIMATES

The WILD data contains the volume and weight of each disposal shipment. The volumes were, in most cases, the volumes of the containers, as disposed. In other words, the volume of a 55-gal drum was recorded as "55 gal" (or 7.4 ft^3). In some cases (e g., dumpsters), the volume recorded may be the volume of the dumpster, not the actual volume of the waste. Thus, the volume of waste in the various waste categories probably over-estimates the actual as-disposed volume. Note that the retrieved volume is expected to be much less because the waste was likely to be compressed during pit disposal operations and the containers are probably substantially corroded or decayed. The weights were recorded in pounds. Appendix A contains a summary of waste types by disposal ID number for the waste inventory contained in the ARP II retrieval area, which includes the area of the angle of repose. In generating this estimate, the ARP II retrieval area was extended on the west end approximately 8.75 ft so that the retrieval grids would coincide with those established for the initial ARP retrieval. Thus some overlap exists with the ARP retrieval area in the angle of repose on the east side. No partitioning of the waste in the overlap area was

attempted since the remaining material (i.e., below angle of repose) would be retrieved as part of the ARP II effort.

Waste was received in a number of container types, and in many cases the exact container type was not specified. At this point, the container type is probably not a major concern because most of the containers are expected to be significantly degraded. Generally, however, all types of RFP-generated sludge were contained in 55-gal drums.

The as-disposed weights and as-disposed volumes are shown in Table 2. As discussed previously, in Section 3, the weight and volume values obtained from WILD for the RFP wastes required some processing to prevent double counting. This condition is due to certain containers being identified in the trailer load lists as holding combinations of waste types. WILD tracks each waste type separately, so the container count, weight, and volume data in each WILD record reflects the total container count, weight, and volume of the associated containers. Summing these values across waste types can thus cause double counting. The values in Table 2 below for weight and volume have been adjusted from the WILD values to prevent any double counting. Typically, an equal portion of the original weight and volume of the combined-waste-type containers is allocated to each waste type (e.g., one-half of the original volume and weight to each waste type if two waste types were present in the containers, one-third of the original volume and weight to each waste type if three waste types were present in the containers).

Table 2. Summary of as-disposed volumes and weights for all shipments (or portions thereof) within the ARP II retrieval area (targeted waste forms are indicated).

Waste Category	Targeted (for retrieval)	Weight (lb)	Volume (ft^3)
RFP Series 741 sludge	**X**	**328,423**	**4,753**
RFP Series 742 sludge		660,483	9,879
RFP Series 743 sludge	**X**	**2,179,169**	**27,573**
RFP Series 744 sludge		166,704	2,748
RFP Series 745 sludge		625,442	11,250
RFP Miscellaneous sludges (746 & 776)		1,180	28
RFP Beryllium		16,082	572
RFP Roaster oxide	**X**	**135,636**	**1,545**
RFP Graphite	**X**	**0**	**0**
RFP Filters	**X**	**67,570**	**6,373**
RFP Line-generated waste		26,645	1,306
RFP combustible debris		605,142	35,321
RFP noncombustible debris		882,443	53,282
Non-RFP sludges		2,500	67
Non-RFP combustible debris		0	40
Non-RFP noncombustible debris		63,224	3,709
Totals		5,760,643	158,446

These volumes and weights have been adjusted to account for disposal shipments that intersect the boundaries of the retrieval grid as shown in Figure 1 (with the exception of the easternmost column of grids which have not been included in this estimate). In other words, if only part of a disposal shipment was within the retrieval grid area, the fraction of the disposal shipment that was outside the grid boundary was ignored. Even so, this estimate may slightly over-predict the amount of waste to be retrieved because waste below the angle of repose on the north and east sides is included—as if the excavation had vertical sides to the full depth of the pit. The slopes of the retrieval trench will intersect the waste zone on the north and east sides of the pit—leaving any waste that happens to lie in the sloped excavation walls. The slope on the south side of the retrieval area is thought to intersect only soil (i.e., the undisturbed strip between Pits 4/6 and 10), although some geophysical mapping data suggests that some metallic waste might be encountered. Modeling of a three-dimensional distribution of the waste to account for this slope was not warranted because the vertical distribution of the shipments is not known.

The current plan for retrieving waste zone material from the ARP II retrieval area involves a continuation of the moving trench campaign begun during ARP. In this campaign, 5-ft wide (approximate) by 2-ft deep swaths of waste zone material from the east side of the open trench are excavated and examined to remove targeted waste forms and then the remaining nontargeted waste is relocated to the west side of the trench, thus moving the active trench from west to east as the excavation proceeds. Table 3 identifies the approximate as-disposed volumes of waste (by type) that will be excavated and examined in each quarter of the retrieval area (RFP waste forms targeted for removal are indicated). Appendix B contains a set of figures showing the distribution of each waste form within the retrieval area (i.e., locations of individual shipments containing the specified waste form).

Table 3. Summary of as-disposed volumes by quarter (1/8-acre sections—west to east).

Waste Category	Targeted	Volume in 1st Quarter (ft^3)	Volume in 2nd Quarter (ft^3)	Volume in 3rd Quarter (ft^3)	Volume in 4th Quarter (ft^3)	Total Volumes (ft^3)
RFP Series 741 sludge	**X**	**1,209**	**1,828**	**1,352**	**364**	**4,753**
RFP Series 742 sludge		959	2,196	3,572	3,152	9,879
RFP Series 743 sludge	**X**	**4,592**	**10,145**	**10,115**	**2,721**	**27,573**
RFP Series 744 sludge		688	605	745	710	2,748
RFP Series 745 sludge		44	361	3,436	7,409	11,250
RFP Miscellaneous sludges (746 & 776)		0	7	7	14	28
RFP Beryllium		99	209	111	153	572
RFP Roaster oxide	**X**	**326**	**527**	**360**	**332**	**1,545**
RFP Graphite	**X**	**0**	**0**	**0**	**0**	**0**
RFP Filters	**X**	**3,242**	**3,086**	**0**	**45**	**6,373**
RFP Line generated waste		191	598	495	22	1,306
RFP combustible debris		5,894	8,092	11,832	9,503	35,321
RFP noncombustible debris		14,297	9,469	14,922	14,594	53,282
Non-RFP sludge		0	35	32	0	67
Non-RFP combustible debris		0	0	40	0	40
Non-RFP noncombustible debris		1,010	2,449	250	0	3,709
Totals		32,551	39,607	47,269	39,019	158,446
Percent targeted waste:		28.8	39.4	25.0	8.9	25.4
Percent targeted waste and 742 Sludge:		31.7	44.9	32.6	17.0	31.6

5. LARGE OR HIGHLY RADIOACTIVE OBJECTS

Due to the excavation and retrieval methods used by ARP, large objects and objects having high radiation fields could pose difficulties during operations. Table 4 presents a list of such disposals including shipment weight, volume, and description.

Table 4. Summary of disposal shipments potentially[a] containing large, heavy, or highly radioactive objects that could pose difficulties during excavation and retrieval operations.

Disposal ID	Description / [Location]	Weight (lb)	Volume (ft^3)	Radiation Level (mR/hour @ contact / @ 1m)
INEEL Disposals				
ANL767SR008/01/67800	Contaminated equipment [Pit 4; Grids V6-7 & W6-7]	**4,000**[a]	250	10 / <1
ARA626SR009/15/67800	Contaminated metal from ARA hot cell [Pit 4; Grid AB3]	1,000	250	**200** / 1
CPP601SR005/11/67800	Pipe and pump heads from "F" cell [Pit 4; Grids U7 & V7]	1,500	60	**1,000** / **200** (3 Ci)
NRF618SR006/23/67800	Steel tank with corrosion products [Pit 4; Grids X4 & Y4]	**6,000**	250	**350** / 25 (500 mCi)
NRF618SR008/09/67800	four barrels of mixed fission waste materials, one steel stand [Pit 4; Grids W7 & X7]	3,000	90	**250** / 8 (175 mCi)
NRF618SR008/22/67810	eight barrels of bottom slurry from evaporator tanks, misc. steel pipe pieces [Pit 4; Grids X7-8]	5,000	70	**350** / 30 (265 mCi)
TAN607SR007/28/67800	Mild steel plate [Pit 4; Grid W7]	**21,000**[a]	360	0.5 / bkgrd
TAN633SR002/28/63810	22 × 11-ft-diameter cask containing mixed fission products from SL1 [Pit 4; Grids U1 & V1]	**76,000**	**2,486**	**1,500** / NA (150 Ci)
NRF618SR007/19/67800	Evaporator bottoms – concentrates in absorbents [Pit 6; Grid AC1]	NA	32	**800** / 30 (1.5 Ci)
RFP Disposals				
RFODOWSR103/03/6783020	10 wooden boxes containing scrap metal, equipment, etc. [Pit 4, Grid R4]	**4,000** 2,000 **4,500** **4,500** **5,400** 840 930 3,000 **6,500** 1,500	212 154 122 122 142 40 51 145 94 68	1.5 (trailer)
RFODOWSR102/15/6881010	28 55-gal drums containing paper, plastic, scrap metal, concrete, wood, etc. **(incl. two 55-gal drums marked "U233" weighing 1,100 lb each, presumably cemented, and possibly high rad due to daughters of U-232 [an impurity])**; 48 55-gal drums containing series 74 sludges; 10 cartons containing CWS type filters; 51 boxed 55-gal drums (empties) [Pit 6, Grids AG1 & AH1]	33,802	1,247	1.2 (trailer)

a. Certain heavy shipments may be composed of multiple smaller items with individual weights that would not be considered problematic.

6. TRANSURANIC ACTIVITY ESTIMATE

Table 5 provides an estimate of the TRU activity disposed of in the ARP II retrieval area (targeted waste forms are indicated). This estimate includes the principal TRU radionuclides only (i.e., Pu-239, Pu-240, and Am-241) and uses the SMBA scenario generator for allocation of TRU activity (from the Contaminant Inventory Database for Risk Assessment) to applicable RFP waste types (i.e., using the Ci/lb basis). This estimate, therefore, is consistent with the method used to produce the OU 7-13/14 TRU density maps of the SDA. It is important to note, however, that certain waste types that are known to contain TRU contaminants were not allocated a part of the total TRU activity by the SMBA scenario generator. It is believed that the contribution of activity from these minor sources is not significant compared to the heavily contaminated RFP waste forms (i.e., Series 741 sludge, filters, and graphite). When excavated, the minor contributors (e.g., series 742 sludge) are still likely to be contaminated at TRU-waste levels. This estimate does not adjust for the angle of repose and TRU activity that may not be retrieved (i.e., present in waste that lies under the angle of repose).

Table 5. Summary of TRU activity (Pu-239, Pu-240, and Am-241 only), as allocated for the OU 7-13/14 TRU density maps, by waste type for shipments (or portions thereof) within the ARP II retrieval area.

Waste Category	Targeted	Pu-239 (Ci)	Pu-240 (Ci)	Am-241 (Ci)	Total (Ci)
RFP Series 741 sludge		**671**	**150**	**14,186**	**15,007**
RFP Series 742 sludge		—	—	—	—
RFP Series 743 sludge	**X**	**84**	**19**	**—**	**103**
RFP Series 744 sludge		61	14	—	75
RFP Series 745 sludge		1	—	2	3
RFP Beryllium		—	—	—	—
RFP Roaster oxide	**X**	—	—	—	—
RFP Graphite	**X**	—	—	—	—
RFP Filters	**X**	**209**	**47**	**42**	**298**
RFP Line generated waste		1,456	326	3	1,785
RFP combustible debris		949	212	2,416	3,577
RFP noncombustible debris		268	60	100	428
Non-RFP sludge		—	—	—	—
Non-RFP combustible debris		—	—	—	—
Non-RFP noncombustible debris		—	—	—	—
Totals		3,699	828	16,749	21,276

From the values shown in Table 5, the removal of the targeted waste forms from the ARP II retrieval area should provide a TRU activity reduction of approximately 72%.

7. CONCLUSIONS AND RECOMMENDATIONS

The information presented here is based on the best information available about disposals in the ARP II retrieval area. It should be noted, however, that these data are approximate, at best. As noted previously, the location information for the shipments can be as little as a single point, with no indication of the area that was actually covered when the shipment was dumped into the pit. The volume information is imprecise as well. In some cases, the volume of the shipment may have been recorded as the volume of the dumpster in which it arrived at the site rather than the actual volume of waste in the dumpster. Similarly, the volume of a large shipment may have been recorded as the "bounding box" for the waste. Review of the data also indicate that, in some cases of overlapping disposal footprints, more waste volume is attributed to an area of the pit than is physically possible.

Nonetheless, the data presented here are believed to be the best data available and should be used as the design basis for Phase II of the ARP.

8. REFERENCES

42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code,* December 1980.

Clements, Jr., T. L., 1982, *Content Code Assessments for INEL Contact-Handled Stored Transuranic Wastes*, WM-F1-82-021, Idaho National Engineering and Environmental Laboratory, October 1982.

Appendix A

Summary of Waste Types by Disposal ID Number for the Waste Inventory Contained in the Phase II of the Accelerated Retrieval Project Retrieval Area Including the Angle of Repose

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Table A-1. Summary of waste types by disposal ID number for the waste inventory contained in the Phase II of the Accelerated Retrieval Project retrieval area including the angle of repose.

			Disposal Location[a] (upper left corner)		Disposal Footprint			Waste Volumes by Type (ft^3)														
								Rocky Flats Plant Wastes												Non-Rocky Flats Plant Waste[d]		
Document ID Number (Sorted by ID)	Weight (lb)	Volume (ft^3)	X-axis (ft)	Y-axis (ft)	Width (ft)	Height (ft)	Scale Factor	Series 741 Sludge	Series 742 Sludge	Series 743 Sludge	Series 744 Sludge	Series 745 Sludge[b]	Line Generated Waste	Beryllium Contaminated Waste	Roaster Oxide (DU[c])	Graphite	Filters	Combustible Debris	Non-Combustible Debris	Sludge	Combustible Debris	Non-Combustible Debris
ANL767SR008/01/67800[e]	4,000	250	879.08	92.30	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250
ARA626SR009/15/67800	1,000	250	962.85	35.40	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250
CFA601SR009/15/66110[f]	30	1	854.92	111.38	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
CFA690SR008/22/67800	0	630	899.96	112.44	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	630
CPP601SR005/11/67800[g]	1,500	60	865.00	102.19	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60
NRF601SR006/22/67800[h]	0	150	895.66	22.44	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150
NRF617SR005/02/67800	300	44	855.00	102.10	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
NRF618SR005/05/67820	0	243	855.70	17.10	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	243
NRF618SR006/23/67800	6,000	250	900.42	57.44	19	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250
NRF618SR007/19/67800	0	32	985.93	7.23	5	5	1	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0
NRF618SR007/19/67810	0	50	985.93	7.23	5	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0
NRF618SR007/25/67800	0	135	884.95	108.63	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135
NRF618SR008/09/67800	3,000	90	895.04	97.43	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90
NRF618SR008/22/67810	5,000	70	900.01	102.48	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	35	0	35
RFODOWSR101/11/6880010[i]	31,121	559	952.43	78.84	20	20	1	0	132	0	51	316	0	0	0	0	0	30	30	0	0	0
RFODOWSR101/11/6881000	30,705	558	952.54	68.85	20	20	1	0	147	0	37	272	0	0	0	0	0	73	29	0	0	0
RFODOWSR101/15/6880000	30,036	1,110	1,020.94	42.22	20	20	1	0	0	0	0	0	0	0	0	0	0	555	555	0	0	0
RFODOWSR101/15/6881000	34,880	559	1,020.94	32.22	20	20	1	0	162	7	22	368	0	0	0	0	0	0	0	0	0	0
RFODOWSR101/18/6880000	41,366	1,118	962.66	58.96	20	20	1	0	154	0	44	243	0	0	0	0	0	508	169	0	0	0
RFODOWSR101/18/6881020	33,298	560	1,020.93	12.22	20	20	1	0	140	0	15	375	0	0	0	0	0	30	0	0	0	0
RFODOWSR101/22/6880000	33,156	1,117	962.60	63.96	20	15	1	0	103	0	7	272	0	0	0	0	0	610	125	0	0	0
RFODOWSR101/22/6881010	35,348	1,118	962.31	88.96	20	29	1	0	169	0	7	213	0	15	0	0	0	612	102	0	0	0
RFODOWSR101/25/6880020	34,828	1,117	1,020.93	12.22	20	20	1	0	125	0	7	301	0	0	0	0	0	515	169	0	0	0
RFODOWSR101/25/6881010	33,829	1,115	1,020.94	42.22	20	20	1	0	118	0	29	301	0	0	0	0	0	601	66	0	0	0
RFODOWSR101/29/6880000	35,122	1,118	1,030.94	47.22	20	20	1	0	88	0	66	272	0	0	0	0	0	530	162	0	0	0
RFODOWSR101/29/6881030	31,022	1,117	1,030.94	22.22	20	20	1	0	0	0	0	0	0	7	103	0	0	573	434	0	0	0
RFODOWSR102/02/6880000	34,934	1,118	1,030.94	42.22	20	20	1	0	125	0	22	294	0	0	0	0	0	566	111	0	0	0
RFODOWSR102/02/6881000	34,646	1,116	972.20	99.08	20	19	1	0	118	0	7	301	0	0	0	0	0	297	393	0	0	0
RFODOWSR102/08/6880000	34,218	1,222	1,030.94	22.22	25	30	1	0	169	0	7	316	0	0	0	0	0	22	708	0	0	0
RFODOWSR102/08/6881000	28,009	559	1,030.94	42.22	25	30	1	0	110	0	15	412	0	0	0	0	0	22	0	0	0	0
RFODOWSR102/12/6880000	32,300	1,172	1,062.53	70.12	20	15	1	0	0	0	0	0	0	0	0	0	0	586	586	0	0	0
RFODOWSR102/12/6881020	27,600	2,122	1,062.53	70.12	20	15	1	0	0	0	0	0	0	0	0	0	0	1,061	1,061	0	0	0
RFODOWSR102/15/6880010	31,629	559	1,055.93	32.21	10	20	1	0	147	0	22	390	0	0	0	0	0	0	0	0	0	0

Table A-1. (continued).

			Disposal Location[a] (upper left corner)		Disposal Footprint			Waste Volumes by Type (ft^3)														
								Rocky Flats Plant Wastes												Non-Rocky Flats Plant Waste[d]		
Document ID Number (Sorted by ID)	Weight (lb)	Volume (ft^3)	X-axis (ft)	Y-axis (ft)	Width (ft)	Height (ft)	Scale Factor	Series 741 Sludge	Series 742 Sludge	Series 743 Sludge	Series 744 Sludge	Series 745 Sludge[b]	Line Generated Waste	Beryllium Contaminated Waste	Roaster Oxide (DU[c])	Graphite	Filters	Combustible Debris	Non-Combustible Debris	Sludge	Combustible Debris	Non-Combustible Debris
RFODOWSR102/15/6881010	33,799	1,248	1,040.93	3.22	15	19	1	0	110	0	15	213	0	0	5	0	61	116	728	0	0	0
RFODOWSR102/17/6783000	32,300	2,213	785.38	61.49	35	15	1	0	0	0	0	0	0	0	0	0	1,098	0	1,115	0	0	0
RFODOWSR102/19/6880020	31,339	1,117	1,065.93	3.21	15	19	1	0	0	0	0	0	0	110	110	15	0	276	606	0	0	0
RFODOWSR102/19/6881000	32,729	1,122	1,055.93	3.21	15	19	1	0	0	0	0	0	0	88	4	0	0	500	530	0	0	0
RFODOWSR102/22/6880000	34,894	1,117	1,040.94	22.22	15	15	1	0	140	0	7	272	0	0	0	0	0	305	393	0	0	0
RFODOWSR102/22/6881010	38,894	1,117	1,055.93	22.21	15	15	1	0	162	0	0	279	0	0	0	0	0	268	408	0	0	0
RFODOWSR102/26/6882010	32,097	1,223	1,050.94	32.21	10	20	1	0	132	0	29	272	0	0	0	0	0	85	705	0	0	0
RFODOWSR102/26/6883000	37,545	1,117	1,030.94	52.21	20	25	1	0	88	0	74	279	0	0	0	0	0	309	367	0	0	0
RFODOWSR102/29/6880000	36,695	1,117	982.54	69.19	15	20	1	0	125	0	29	279	15	0	0	0	0	441	228	0	0	0
RFODOWSR102/29/6881000	36,588	1,120	982.66	59.19	15	15	1	0	191	0	29	206	0	0	0	0	0	288	406	0	0	0
RFODOWSR103/03/6783020	33,170	1,150	785.42	56.49	35	10	1	0	0	0	0	0	0	0	0	0	0	0	1,150	0	0	0
RFODOWSR103/07/6880000	35,927	1,224	977.72	54.14	45	15	1	0	162	0	0	228	0	0	0	0	0	85	749	0	0	0
RFODOWSR103/07/6881000	37,031	1,110	1,007.60	64.48	15	15	1	0	125	0	15	286	0	0	0	0	0	287	397	0	0	0
RFODOWSR103/14/6880000	35,850	1,115	1,012.25	94.54	20	20	1	0	132	0	0	250	7	0	0	0	0	451	275	0	0	0
RFODOWSR103/14/6881000	31,252	1,222	1,017.36	84.60	25	15	1	0	118	0	22	279	0	0	0	0	0	73	730	0	0	0
RFODOWSR103/17/6783010	22,700	2,074	800.29	71.61	40	15	1	0	0	0	0	0	0	0	0	0	976	0	1,098	0	0	0
RFODOWSR103/21/6880000	30,928	1,224	1,052.54	70.00	20	10	1	0	162	0	22	294	0	0	0	0	0	30	716	0	0	0
RFODOWSR103/25/6880000	29,119	1,223	1,032.42	79.76	20	10	1	0	51	0	118	206	0	0	0	0	0	103	745	0	0	0
RFODOWSR103/25/6881010	31,717	1,229	1,022.31	89.65	20	25	1	0	132	0	110	213	0	0	0	0	0	51	723	0	0	0
RFODOWSR103/31/6780060	37,032	1,108	800.45	51.61	30	15	1	118	29	206	29	0	66	0	0	0	0	51	609	0	0	0
RFODOWSR103/31/6781020	40,868	996	810.66	26.69	30	20	1	7	37	331	37	0	0	0	0	0	437	37	110	0	0	0
RFODOWSR103/31/6782010	36,277	1,197	800.54	41.62	30	15	1	81	37	265	29	0	0	0	0	0	0	139	646	0	0	0
RFODOWSR103/31/6783010	35,652	552	800.67	26.61	30	15	1	7	81	272	37	0	0	0	0	0	0	30	125	0	0	0
RFODOWSR104/07/6780020	34,758	1,103	820.54	41.78	30	10	1	132	37	88	44	0	81	0	0	0	0	309	412	0	0	0
RFODOWSR104/07/6781060	34,201	1,110	820.45	51.78	30	15	1	0	0	0	0	0	0	88	140	0	0	632	250	0	0	0
RFODOWSR104/07/6782010	34,369	558	820.67	26.78	30	15	1	162	88	59	162	0	0	0	0	0	0	87	0	0	0	0
RFODOWSR104/07/6783010	25,600	2,074	840.21	81.94	30	10	1	0	0	0	0	0	0	0	0	0	732	671	671	0	0	0
RFODOWSR104/08/6880010	28,919	1,224	1,052.42	80.00	20	15	1	0	184	0	0	235	0	0	0	0	0	30	775	0	0	0
RFODOWSR104/08/6881020	34,832	1,118	1,047.54	69.94	15	15	1	0	0	0	0	0	0	59	88	0	0	335	636	0	0	0
RFODOWSR104/11/6880010	24,239	1,224	1,057.54	70.06	15	15	1	0	103	0	22	140	0	0	0	0	0	151	808	0	0	0
RFODOWSR104/11/6881010	26,947	1,222	1,052.71	55.00	15	20	1	0	0	0	0	0	0	0	0	0	0	279	943	0	0	0
RFODOWSR104/14/6780020	22,140	1,145	835.42	56.90	20	20	1	0	0	0	0	0	37	0	22	0	0	125	961	0	0	0
RFODOWSR104/14/67810120	29,559	1,103	830.71	21.87	20	15	1	0	0	243	0	0	7	0	0	0	0	379	474	0	0	0
RFODOWSR104/14/6782070	37,084	1,118	830.58	36.86	20	20	1	37	0	272	59	0	0	0	0	0	0	632	118	0	0	0

Table A-1. (continued).

Document ID Number (Sorted by ID)	Weight (lb)	Volume (ft^3)	Disposal Location[a] (upper left corner) X-axis (ft)	Disposal Location[a] (upper left corner) Y-axis (ft)	Disposal Footprint Width (ft)	Disposal Footprint Height (ft)	Disposal Footprint Scale Factor	Waste Volumes by Type (ft^3) Rocky Flats Plant Wastes Series 741 Sludge	Series 742 Sludge	Series 743 Sludge	Series 744 Sludge	Series 745 Sludge[b]	Line Generated Waste	Beryllium Contaminated Waste	Roaster Oxide (DU[c])	Graphite	Filters	Combustible Debris	Non-Combustible Debris	Non-Rocky Flats Plant Waste[d] Sludge	Combustible Debris	Non-Combustible Debris
RFODOWSR104/14/6783000	37,955	558	830.46	51.86	20	15	1	7	0	492	0	0	0	0	0	0	0	0	59	0	0	0
RFODOWSR104/21/6780070	35,501	1,117	835.70	21.90	25	15	1	66	51	206	22	0	15	0	0	0	0	698	59	0	0	0
RFODOWSR104/21/6781080	31,730	1,096	835.63	31.91	25	15	1	110	74	147	22	0	0	0	0	0	0	415	328	0	0	0
RFODOWSR104/21/6782010	34,947	551	835.50	46.90	25	10	1	74	88	257	51	0	0	0	0	0	0	59	22	0	0	0
RFODOWSR104/21/6783000	36,322	558	835.42	56.90	25	20	1	0	88	323	29	0	0	0	0	0	0	0	118	0	0	0
RFODOWSR104/28/67800461	35,962	1,110	845.62	31.99	35	15	1	147	140	66	0	0	0	0	0	0	0	426	331	0	0	0
RFODOWSR104/28/6781010	36,377	1,110	840.42	56.94	40	20	1	132	22	198	0	0	0	0	0	0	0	357	401	0	0	0
RFODOWSR104/28/6782090	35,857	558	850.71	22.02	20	25	1	7	66	309	44	44	0	0	0	0	0	81	7	0	0	0
RFODOWSR104/28/6783020	35,410	556	840.54	41.95	40	15	1	44	66	316	44	0	0	0	0	0	0	43	43	0	0	0
RFODOWSR105/05/6780050	37,940	1,117	855.58	37.06	35	15	1	0	0	0	0	0	0	22	323	0	0	294	478	0	0	0
RFODOWSR105/05/6781020	37,251	1,109	855.50	47.07	35	15	1	51	44	235	22	0	7	0	0	0	0	559	191	0	0	0
RFODOWSR105/05/6782020	22,171	1,133	855.66	27.07	30	15	1	0	0	0	0	0	0	0	0	0	0	280	853	0	0	0
RFODOWSR105/05/6783020	30,743	1,073	855.41	57.06	30	20	1	0	0	0	0	0	0	0	0	0	0	22	1,051	0	0	0
RFODOWSR105/12/6780000	26,843	1,517	860.75	17.11	30	15	1	0	0	0	0	0	0	0	0	0	959	228	330	0	0	0
RFODOWSR105/12/6781000	35,911	558	860.50	47.10	20	10	1	88	66	228	88	0	0	0	0	0	0	66	22	0	0	0
RFODOWSR105/12/6782000	35,477	557	860.50	47.10	20	20	1	59	51	316	29	0	0	0	0	0	0	66	36	0	0	0
RFODOWSR105/12/6783000	32,409	1,118	860.37	62.10	20	15	1	59	29	243	22	0	0	0	0	0	0	206	559	0	0	0
RFODOWSR105/18/6780010	39,931	1,743	875.50	47.23	35	20	1	44	66	221	22	0	0	0	0	0	1,184	191	15	0	0	0
RFODOWSR105/18/6781010	32,881	1,255	875.53	42.23	35	10	1	44	29	272	7	0	0	0	0	0	0	169	734	0	0	0
RFODOWSR105/19/6780010	41,017	1,677	875.53	42.23	35	10	1	37	37	257	7	0	0	0	0	0	1,119	213	7	0	0	0
RFODOWSR105/26/6780060	38,834	1,118	885.62	32.31	34	15	1	74	15	250	15	0	0	0	0	0	0	639	125	0	0	0
RFODOWSR105/26/6781030	39,570	559	885.57	37.31	34	20	1	66	44	323	37	0	0	0	0	0	0	74	15	0	0	0
RFODOWSR105/26/6782010	35,479	1,150	885.74	17.31	25	15	1	37	15	257	44	0	0	0	0	0	232	161	404	0	0	0
RFODOWSR106/02/6780000	37,519	558	890.41	57.36	10	10	1	37	29	382	22	0	0	0	0	0	0	59	29	0	0	0
RFODOWSR106/02/6781015	36,314	558	890.49	47.35	10	10	1	37	51	353	29	0	0	0	0	0	0	33	55	0	0	0
RFODOWSR106/09/6780000	39,468	557	895.46	52.39	10	15	1	29	66	353	22	0	0	0	0	0	0	32	55	0	0	0
RFODOWSR106/09/6781030	38,359	1,118	895.29	72.39	15	5	1	37	37	265	15	0	81	0	0	0	0	485	198	0	0	0
RFODOWSR106/09/6782010	39,918	1,109	910.46	52.52	5	15	1	0	0	0	0	0	0	51	191	0	0	213	654	0	0	0
RFODOWSR106/09/6783010	39,191	551	910.29	72.52	5	10	1	51	7	397	15	0	0	0	0	0	0	81	0	0	0	0
RFODOWSR106/15/6780020	35,979	551	890.58	37.36	29	40	1	44	103	272	22	7	0	0	0	0	0	59	44	0	0	0
RFODOWSR106/15/6781000	38,245	552	890.58	37.36	29	40	1	59	37	331	44	0	0	0	0	0	0	22	59	0	0	0
RFODOWSR106/16/6780010	34,774	552	890.66	27.35	29	25	1	51	37	309	0	0	0	0	0	0	0	30	125	0	0	0
RFODOWSR106/16/6781010	38,317	1,117	880.25	77.27	20	15	1	7	66	184	37	0	103	0	0	0	0	441	279	0	0	0
RFODOWSR106/22/67800120	35,531	551	990.93	3.23	10	19	1	29	59	316	37	0	15	0	0	0	0	40	55	0	0	0

Table A-1. (continued).

			Disposal Location[a] (upper left corner)		Disposal Footprint			Waste Volumes by Type (ft^3)														
								Rocky Flats Plant Wastes												Non-Rocky Flats Plant Waste[d]		
Document ID Number (Sorted by ID)	Weight (lb)	Volume (ft^3)	X-axis (ft)	Y-axis (ft)	Width (ft)	Height (ft)	Scale Factor	Series 741 Sludge	Series 742 Sludge	Series 743 Sludge	Series 744 Sludge	Series 745 Sludge[b]	Line Generated Waste	Beryllium Contaminated Waste	Roaster Oxide (DU[c])	Graphite	Filters	Combustible Debris	Non-Combustible Debris	Sludge	Combustible Debris	Non-Combustible Debris
RFODOWSR106/22/6781020	34,473	558	927.84	25.41	20	20	1	37	147	206	66	0	0	0	0	0	0	44	58	0	0	0
RFODOWSR106/23/6780010	36,984	1,118	917.84	35.42	20	20	1	44	59	191	0	0	184	0	0	0	0	397	243	0	0	0
RFODOWSR106/23/6781010	37,593	1,108	912.85	50.42	15	20	1	22	110	154	7	0	81	0	0	0	0	330	404	0	0	0
RFODOWSR106/28/6780010	36,082	558	860.17	87.10	25	15	1	66	22	331	22	0	0	0	0	0	0	22	95	0	0	0
RFODOWSR106/28/6781020	36,549	559	870.29	72.19	25	20	1	29	66	323	44	0	15	0	0	0	0	41	41	0	0	0
RFODOWSR106/29/6780010	35,613	556	927.83	15.41	30	15	1	51	110	279	29	0	0	0	0	0	0	47	40	0	0	0
RFODOWSR106/29/6781010	35,911	558	927.83	5.41	30	15	1	51	66	331	22	0	0	0	0	0	0	44	44	0	0	0
RFODOWSR106/30/6780020	36,814	558	917.84	35.42	30	15	1	29	74	338	29	0	44	0	0	0	0	22	22	0	0	0
RFODOWSR106/30/6781010	37,553	1,117	917.86	50.42	30	20	1	22	81	235	15	0	51	0	0	0	0	0	713	0	0	0
RFODOWSR107/06/6780030	35,337	558	927.84	35.41	20	20	1	51	103	316	37	0	0	0	0	0	0	22	29	0	0	0
RFODOWSR107/06/6781010	36,744	559	937.83	15.41	20	20	1	29	66	360	0	0	0	0	0	0	0	52	52	0	0	0
RFODOWSR107/11/6780010	36,257	550	932.84	30.41	20	20	1	51	88	323	7	0	7	0	0	0	0	67	7	0	0	0
RFODOWSR107/11/6781010	36,950	559	932.84	30.41	20	20	1	74	59	323	11	0	0	0	0	0	0	55	37	0	0	0
RFODOWSR107/13/6780030	30,999	1,116	890.33	67.35	29	20	1	0	0	0	0	0	0	125	81	0	0	367	543	0	0	0
RFODOWSR107/13/6781010	36,369	551	937.83	5.41	15	10	1	22	29	360	15	44	15	0	0	0	0	44	22	0	0	0
RFODOWSR107/19/6780090	35,219	557	937.83	5.41	10	10	1	51	51	279	29	59	0	0	0	0	0	88	0	0	0	0
RFODOWSR107/19/6781010	35,358	558	937.85	40.41	20	10	1	29	132	294	7	15	0	0	0	0	0	81	0	0	0	0
RFODOWSR107/21/6780010	37,134	1,118	942.84	20.41	15	20	1	22	81	228	22	0	0	0	0	0	0	743	22	0	0	0
RFODOWSR107/21/6781010	34,500	1,044	885.45	52.31	25	15	1	44	44	265	0	0	51	0	0	0	0	243	397	0	0	0
RFODOWSR107/25/6780080	36,130	559	952.84	30.40	10	20	1	74	66	331	0	0	0	0	0	0	0	88	0	0	0	0
RFODOWSR107/25/6781010	36,531	559	952.84	30.40	10	20	1	22	103	331	15	0	0	0	0	0	0	55	33	0	0	0
RFODOWSR107/26/6780020	36,408	558	890.25	77.36	20	10	1	37	103	323	7	0	7	0	0	0	0	22	59	0	0	0
RFODOWSR107/26/6781080	36,475	1,117	890.33	67.35	20	10	1	0	74	272	7	0	0	0	0	0	0	720	44	0	0	0
RFODOWSR108/02/6780020	35,182	559	937.84	10.40	20	10	1	15	15	441	0	0	0	0	0	0	0	40	48	0	0	0
RFODOWSR108/02/6781010	35,133	558	937.83	15.41	20	15	1	29	37	404	0	0	22	0	0	0	0	33	33	0	0	0
RFODOWSR108/04/67800110	37,750	558	937.85	40.41	20	15	1	51	96	316	0	0	44	0	0	0	0	22	29	0	0	0
RFODOWSR108/04/6781010	38,679	1,116	952.83	5.40	10	15	1	44	81	198	0	0	51	0	0	0	0	507	235	0	0	0
RFODOWSR108/09/6780010	36,261	558	880.20	82.27	20	10	1	59	66	345	0	0	0	0	0	0	0	66	22	0	0	0
RFODOWSR108/09/6781010	36,406	559	870.16	87.19	20	10	1	59	74	338	0	0	0	0	0	0	0	73	15	0	0	0
RFODOWSR108/11/6780030	39,842	1,120	957.83	10.39	10	15	1	37	44	243	0	0	81	0	0	0	0	354	361	0	0	0
RFODOWSR108/11/6781010	38,063	558	952.84	30.40	10	15	1	29	118	323	0	0	0	0	0	0	0	29	59	0	0	0
RFODOWSR108/16/6780010	35,895	551	890.04	102.35	10	14	1	51	74	331	0	0	15	0	0	0	0	40	40	0	0	0
RFODOWSR108/17/6780050	36,655	552	885.12	92.31	15	15	1	59	110	301	0	0	0	0	0	0	0	41	41	0	0	0
RFODOWSR108/18/6780010	36,807	551	900.09	97.44	19	19	1	294	103	74	0	0	0	0	0	0	0	51	29	0	0	0

Table A-1. (continued).

			Disposal Location[a] (upper left corner)		Disposal Footprint			Waste Volumes by Type (ft^3)														
								Rocky Flats Plant Wastes												Non-Rocky Flats Plant Waste[d]		
Document ID Number (Sorted by ID)	Weight (lb)	Volume (ft^3)	X-axis (ft)	Y-axis (ft)	Width (ft)	Height (ft)	Scale Factor	Series 741 Sludge	Series 742 Sludge	Series 743 Sludge	Series 744 Sludge	Series 745 Sludge[b]	Line Generated Waste	Beryllium Contaminated Waste	Roaster Oxide (DU[c])	Graphite	Filters	Combustible Debris	Non-Combustible Debris	Sludge	Combustible Debris	Non-Combustible Debris
RFODOWSR108/19/6683010	15,800	1,623	814.17	90.86	12	12	1	0	0	0	0	0	0	0	0	0	0	0	1,623	0	0	0
RFODOWSR108/22/6780010	35,802	558	957.83	15.40	19	10	1	37	132	294	7	0	29	0	0	0	0	59	0	0	0	0
RFODOWSR108/22/6781010	37,829	558	880.04	102.27	30	14	1	22	96	345	7	0	0	0	0	0	0	66	22	0	0	0
RFODOWSR108/23/6780020	35,809	1,118	947.84	35.40	15	10	1	0	0	0	0	0	66	96	125	0	0	335	496	0	0	0
RFODOWSR108/23/6781010	29,790	1,118	880.17	87.27	39	20	1	0	0	0	0	0	0	0	0	0	0	559	559	0	0	0
RFODOWSR108/29/6780080	37,279	558	910.13	92.52	9	10	1	51	37	360	22	0	0	0	0	0	0	81	7	0	0	0
RFODOWSR108/29/6781040	32,680	559	962.83	5.39	10	10	1	59	37	345	29	0	0	0	0	0	0	74	15	0	0	0
RFODOWSR108/30/6780000	37,950	1,109	957.83	15.40	19	30	1	29	44	198	7	15	118	0	0	0	0	349	349	0	0	0
RFODOWSR108/30/6781070	37,953	557	957.84	25.40	19	10	1	44	88	279	0	59	0	0	0	0	0	65	22	0	0	0
RFODOWSR109/06/6780010	38,186	550	957.84	20.39	19	20	1	51	29	331	7	44	0	0	0	0	0	51	37	0	0	0
RFODOWSR109/06/6781040	34,605	1,178	905.34	67.48	14	49	1	37	7	154	0	96	0	0	0	0	0	261	623	0	0	0
RFODOWSR109/12/6682010	15,400	1,347	832.59	79.37	15	15	1	0	0	0	0	0	0	0	0	0	0	0	1,347	0	0	0
RFODOWSR109/12/6683010	27,650	1,128	855.17	82.10	10	10	1	0	0	0	0	0	0	0	0	0	564	0	564	0	0	0
RFODOWSR109/13/6780010	33,015	552	910.21	82.51	9	15	1	29	74	206	0	162	0	0	0	0	0	59	22	0	0	0
RFODOWSR109/13/6781010	35,885	1,223	967.84	20.39	9	30	1	44	7	213	0	118	0	0	0	0	0	88	753	0	0	0
RFODOWSR109/16/6682000	21,500	1,308	832.59	79.37	15	15	1	0	0	0	0	0	0	0	0	0	0	0	1,308	0	0	0
RFODOWSR109/16/6683020	11,200	848	865.16	82.19	10	10	1	0	0	0	0	0	0	0	0	0	0	0	848	0	0	0
RFODOWSR109/20/6780050	37,036	1,216	900.62	32.44	19	15	1	22	44	213	0	103	0	0	0	0	0	117	717	0	0	0
RFODOWSR109/20/6781020	31,268	1,111	900.33	67.43	19	15	1	0	0	0	0	0	0	22	96	0	0	611	382	0	0	0
RFODOWSR109/20/6782010	34,358	1,160	957.85	40.40	19	20	1	22	0	162	0	184	0	0	0	0	0	221	571	0	0	0
RFODOWSR109/20/6783010	34,152	1,160	957.83	5.40	19	20	1	22	22	206	0	132	0	0	0	0	0	88	690	0	0	0
RFODOWSR109/22/6780010	34,764	1,215	981.94	17.23	19	20	1	29	22	256	0	74	0	0	0	0	0	122	712	0	0	0
RFODOWSR109/22/6781010	33,025	1,121	981.94	47.23	19	15	1	0	0	0	0	0	0	0	0	0	0	448	673	0	0	0
RFODOWSR109/27/6780000	35,551	1,216	942.78	78.59	34	15	1	29	59	235	29	0	0	0	0	0	0	103	761	0	0	0
RFODOWSR109/27/6781000	34,453	1,216	935.99	91.97	29	20	1	59	37	169	88	0	0	0	0	0	0	92	771	0	0	0
RFODOWSR109/28/6780000	39,810	1,118	981.93	32.22	19	20	1	37	29	228	59	0	0	0	0	0	0	335	430	0	0	0
RFODOWSR109/28/6781000	38,525	1,224	981.93	22.22	19	50	1	0	0	0	0	0	0	0	0	0	0	280	944	0	0	0
RFODOWSR110/04/6780010	36,350	1,118	981.93	3.22	19	19	1	59	37	191	0	96	0	0	0	0	0	603	132	0	0	0
RFODOWSR110/04/6781020	36,715	1,251	981.93	3.22	19	19	1	29	37	184	0	103	0	0	0	0	0	103	795	0	0	0
RFODOWSR110/04/67820170	33,558	1,216	990.93	12.23	20	20	1	37	59	162	96	0	0	0	0	0	0	103	759	0	0	0
RFODOWSR110/05/6780010	35,677	1,118	947.30	69.68	24	25	1	15	74	132	22	140	0	0	0	0	0	613	122	0	0	0
RFODOWSR110/12/6780010	35,217	1,110	990.93	32.22	20	20	1	0	29	206	0	118	0	0	0	0	0	632	125	0	0	0
RFODOWSR110/12/6781040	33,938	1,216	990.93	12.23	20	20	1	22	66	169	0	125	0	0	0	0	0	74	760	0	0	0
RFODOWSR110/18/6780000	38,581	1,111	980.64	24.91	20	50	1	37	59	243	0	15	0	0	0	0	0	364	393	0	0	0

Table A-1. (continued).

Document ID Number (Sorted by ID)	Weight (lb)	Volume (ft^3)	Disposal Location[a] (upper left corner) X-axis (ft)	Disposal Location[a] (upper left corner) Y-axis (ft)	Disposal Footprint Width (ft)	Disposal Footprint Height (ft)	Disposal Footprint Scale Factor	Waste Volumes by Type (ft^3) – Rocky Flats Plant Wastes: Series 741 Sludge	Series 742 Sludge	Series 743 Sludge	Series 744 Sludge	Series 745 Sludge[b]	Line Generated Waste	Beryllium Contaminated Waste	Roaster Oxide (DU[c])	Graphite	Filters	Combustible Debris	Non-Combustible Debris	Waste Volumes by Type (ft^3) – Non-Rocky Flats Plant Waste[d]: Sludge	Combustible Debris	Non-Combustible Debris
RFODOWSR110/18/6781020	40,711	1,104	971.60	42.74	20	30	1	15	110	221	7	0	0	0	0	0	0	372	379	0	0	0
RFODOWSR110/26/6780010	37,789	559	958.03	69.50	20	20	1	22	44	360	0	44	0	0	0	0	0	70	19	0	0	0
RFODOWSR110/26/6781000	40,697	1,118	948.98	87.34	20	20	1	22	15	272	0	44	0	0	0	0	0	346	419	0	0	0
RFODOWSR111/02/6780010	32,290	552	1,000.93	12.22	20	20	1	74	15	176	0	206	0	0	0	0	0	29	52	0	0	0
RFODOWSR111/02/6781020	34,741	553	1,000.93	32.22	20	20	1	44	44	243	15	125	0	0	0	0	0	41	41	0	0	0
RFODOWSR111/03/6780000	37,453	558	1,010.93	22.22	20	20	1	0	51	265	0	154	0	0	0	0	0	44	44	0	0	0
RFODOWSR111/06/6780080	34,332	551	990.93	22.22	20	20	1	66	169	162	44	29	0	0	0	0	0	37	44	0	0	0
RFODOWSR111/08/6780020	34,284	559	1,000.93	22.22	20	20	1	59	88	213	0	118	0	0	0	0	0	37	44	0	0	0
RFODOWSR111/08/6781010	36,834	559	1,000.94	52.22	20	20	1	15	29	316	0	140	0	0	0	0	0	44	15	0	0	0
RFODOWSR111/10/6780020	34,588	558	1,005.94	22.22	25	20	1	22	29	272	0	147	0	0	0	0	0	44	44	0	0	0
RFODOWSR111/10/6781010	33,061	559	1,005.94	62.22	25	20	1	37	59	191	0	184	0	0	0	0	0	22	66	0	0	0
RFODOWSR111/15/6780000	27,492	1,116	947.37	83.79	25	25	1	0	0	0	0	0	7	0	0	0	0	540	569	0	0	0
RFODOWSR111/15/67810703	38,139	557	1,005.92	3.22	25	24	1	22	29	301	0	147	0	0	0	0	0	29	29	0	0	0
RFODOWSR111/16/6780010	37,355	559	1,005.93	12.22	25	20	1	22	37	287	7	118	0	0	0	0	0	44	44	0	0	0
RFODOWSR111/16/6781010	38,514	1,118	1,005.94	42.22	25	20	1	15	22	184	7	125	15	0	0	0	0	375	375	0	0	0
RFODOWSR111/30/6780020	31,044	1,118	1,010.94	27.22	20	25	1	0	0	0	0	0	0	51	132	0	0	339	596	0	0	0
RFODOWSR111/30/6781000	33,371	1,117	1,010.94	47.22	20	25	1	0	0	0	0	0	0	0	0	0	0	544	573	0	0	0
RFODOWSR112/04/6780000	25,419	1,117	1,010.93	22.22	20	30	1	0	0	0	0	0	0	0	0	0	0	548	569	0	0	0
RFODOWSR112/04/6781000	38,028	1,122	1,010.93	52.22	20	30	1	0	0	0	0	0	0	0	4	0	0	559	559	0	0	0
RFODOWSR112/08/6780020	23,679	1,118	962.31	88.96	15	15	1	0	0	0	0	0	7	0	59	0	0	474	578	0	0	0
RFODOWSR112/08/6781030	28,847	1,116	962.20	98.96	15	15	1	0	0	0	0	0	0	0	176	0	0	294	646	0	0	0
TAN607SR004/17/64210[j]	5,000	1,600	871.95	-0.44	12	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,600
TAN607SR004/21/64113	5,000	0	822.83	0.46	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TAN607SR007/28/67800	21,000	360	890.04	102.35	10	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	360
TAN633SR002/28/63810	76,000	2,486	857.44	-0.28	19	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,486
Totals[k]	6,167,696	174,311						4,912	10,334	28,472	2,839	11,911	1,344	734	1,659	15	7,362	38,126	59,902	67	50	6,584

Notes:

a. Disposal locations are relative to a coordinate system whose origin is located at the northwest monument of Pit 4 with the X-axis parallel to the north boundary of Pit 4.
b. Series 745 sludge entries include 28 cubic feet of miscellaneous 746 and 776 sludge.
c. DU = depleted uranium
d. Non-Rocky Flats Plant waste sources include various Idaho National Engineering and Environmental Laboratory (INEEL) generators.
e. ANL = Argonne National Laboratory
f. CFA = Central Facilities Area
g. CPP = Chemical Processing Plant
h. NRF = Naval Reactor Facility
i. RFODOW = Rocky Flats Operation - Dow Chemical Company
j. TAN = Test Area North
k. These totals are higher than those reflected in Tables 2 and 3 of EDF-4478. This table has not been adjusted to ignore the portion of some shipments that lie outside of the retrieval grid based on their retrieval footprint location and size.

Appendix B

Waste Grid Location – Summary and by Waste Type – for the Waste Shipments Contained in the Phase II of the Accelerated Retrieval Project Retrieval Area Including the Angle of Repose

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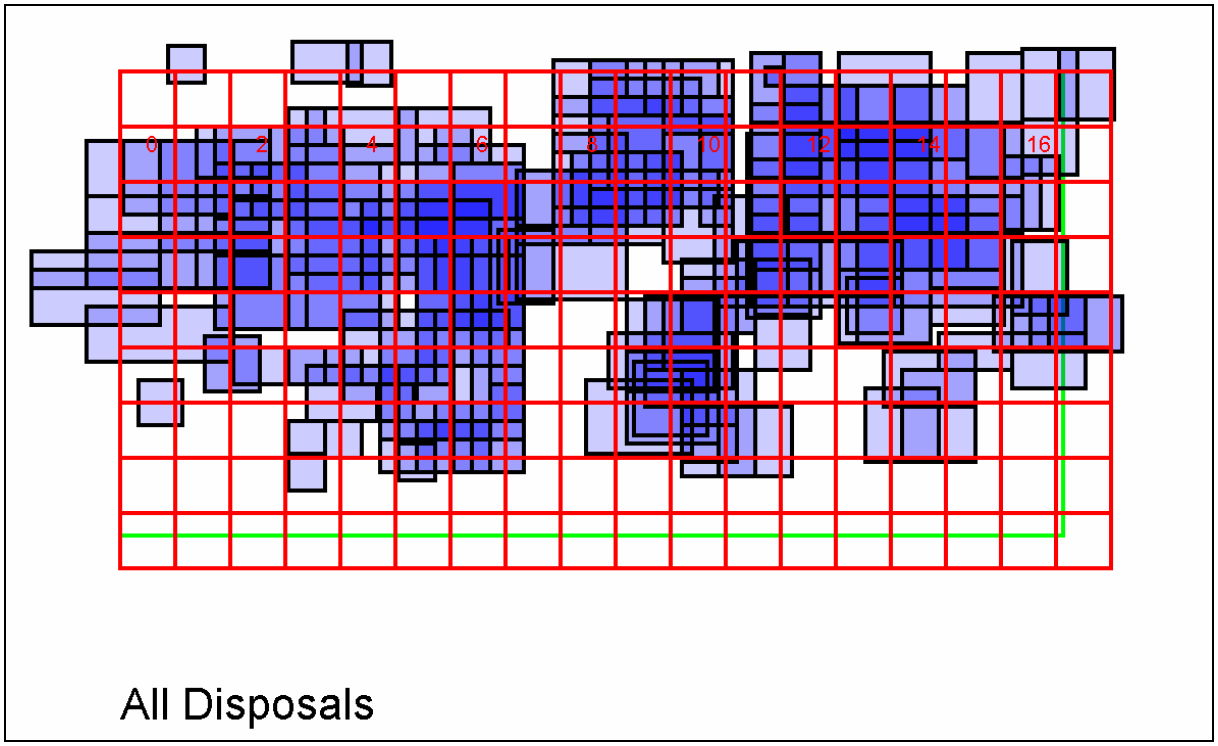

Figure B-1. Shipment locations for all disposals within the ARP II retrieval area including angle of repose.

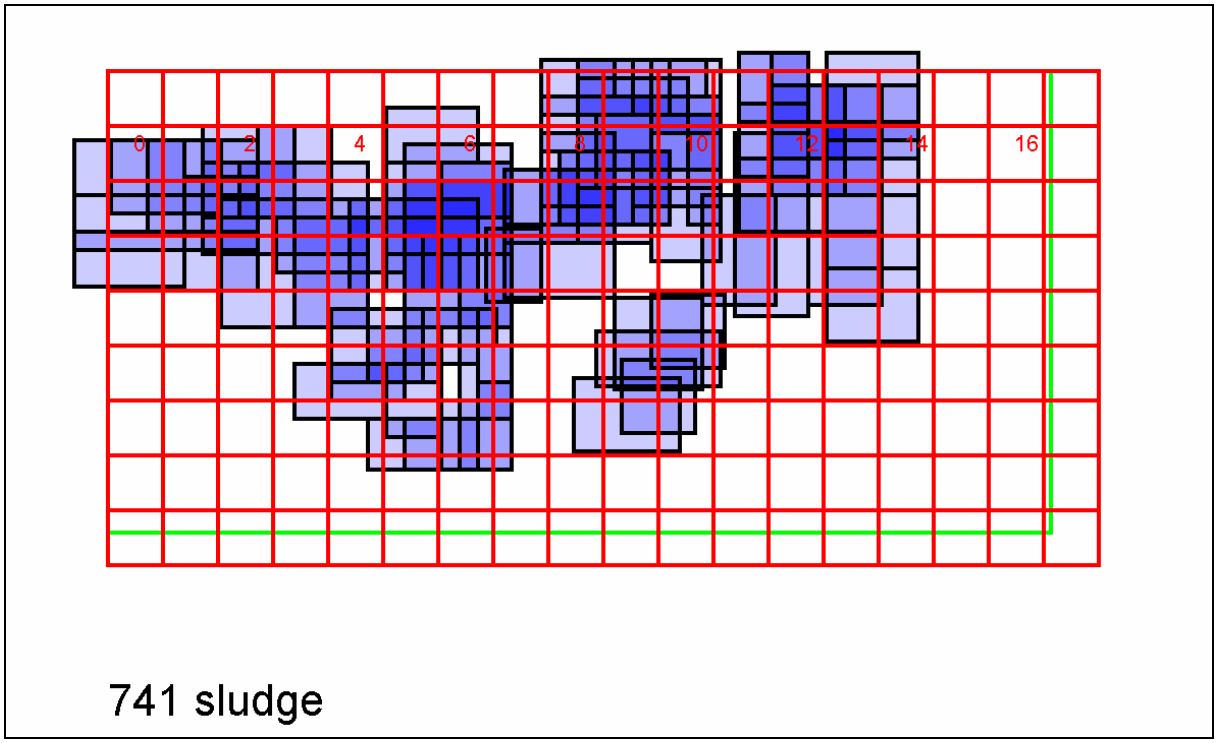

Figure B-2. Shipment locations for disposals containing RFP Series 741 sludge within the ARP II retrieval area.

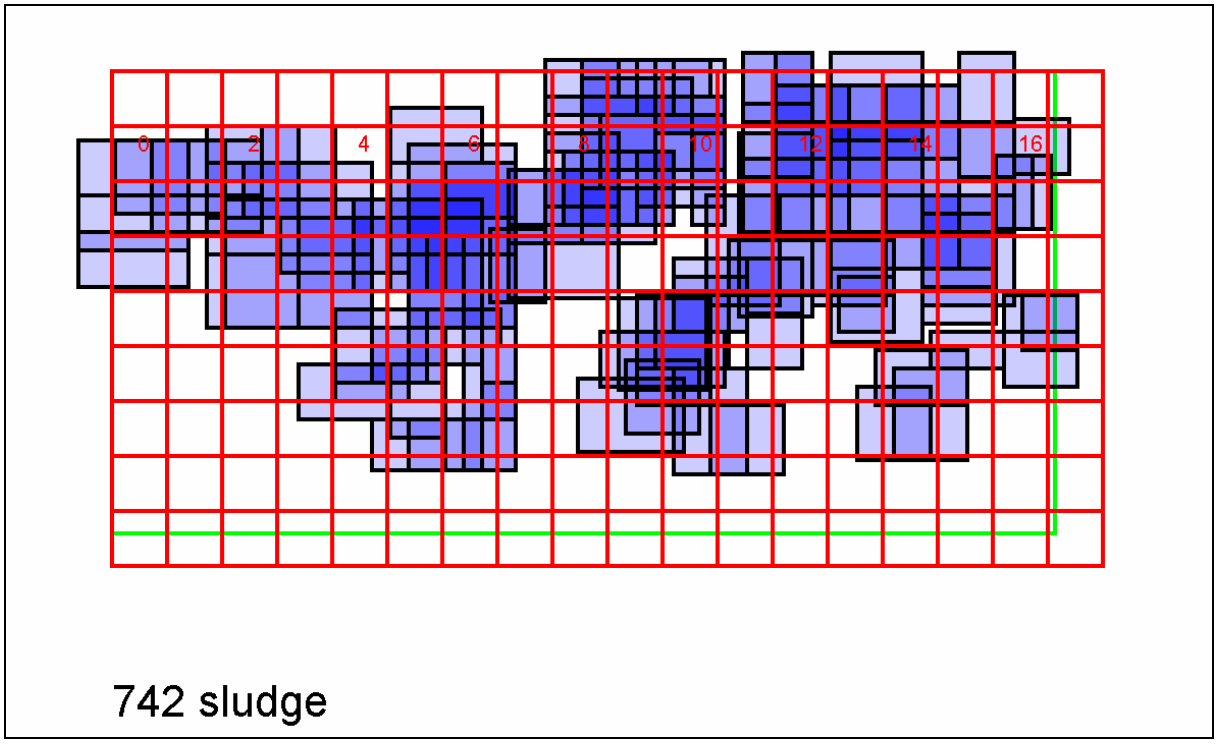

Figure B-3. Shipment locations for disposals containing RFP Series 742 sludge within the ARP II retrieval area.

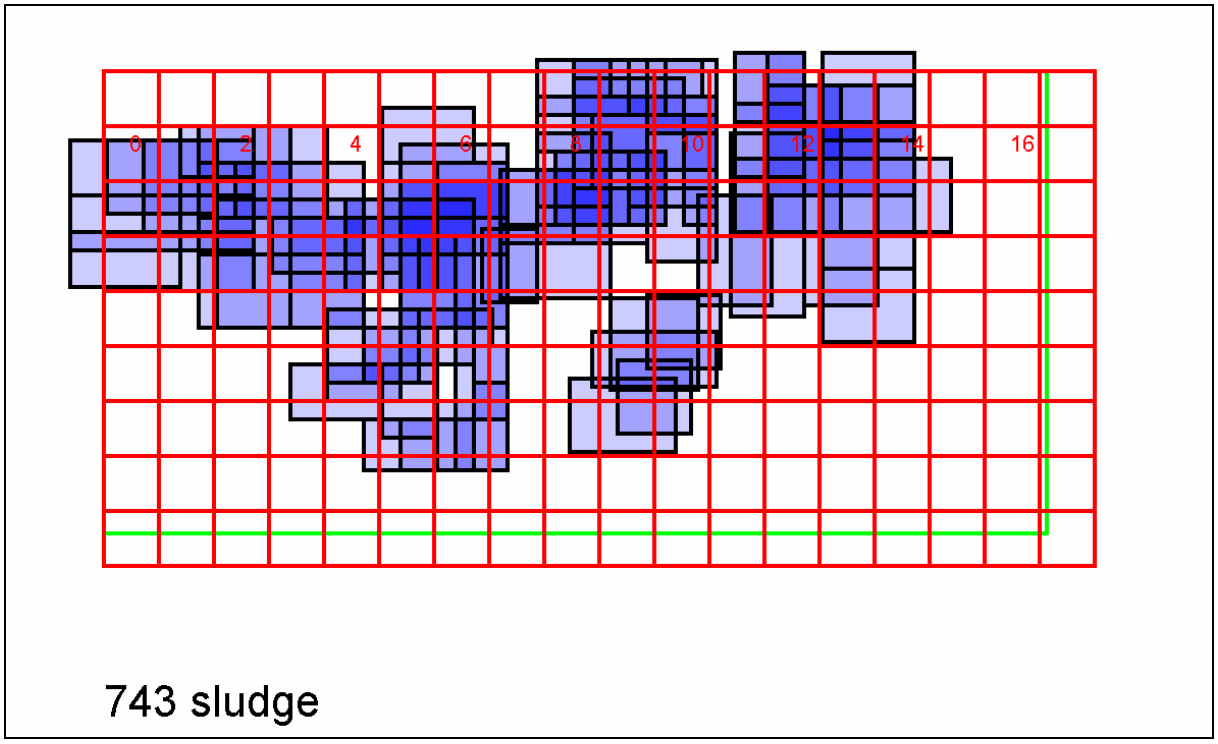

Figure B-4. Shipment locations for disposals containing RFP Series 743 sludge within the ARP II retrieval area.

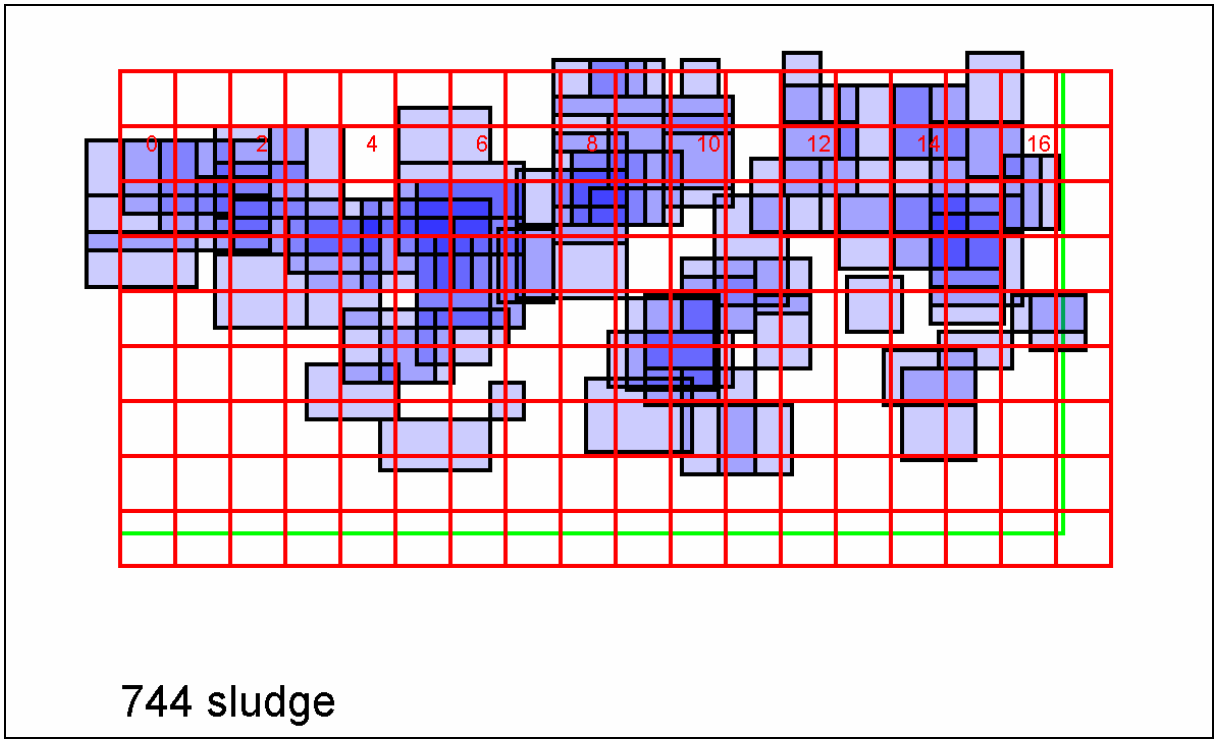

Figure B-5. Shipment locations for disposals containing RFP Series 744 sludge within the ARP II retrieval area.

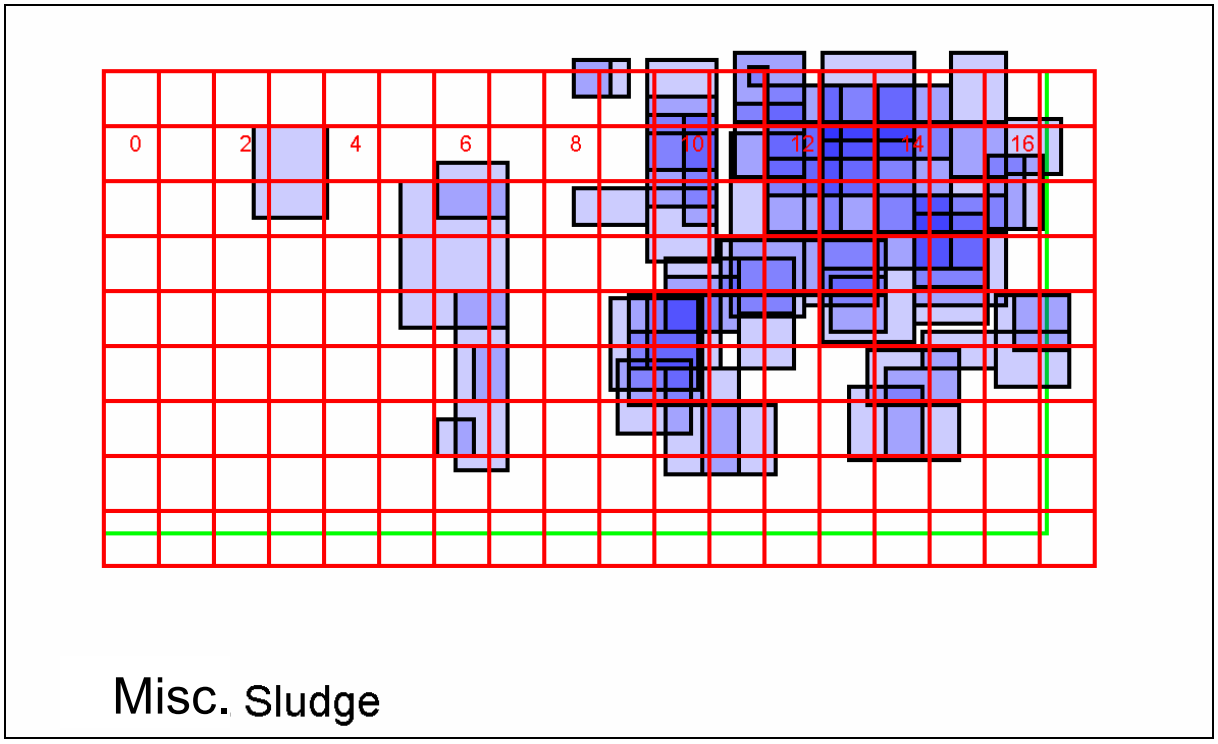

Figure B-6. Shipment locations for disposals containing miscellaneous RFP and INEEL sludges (predominantly Series 745 sludge) within the ARP II retrieval area.

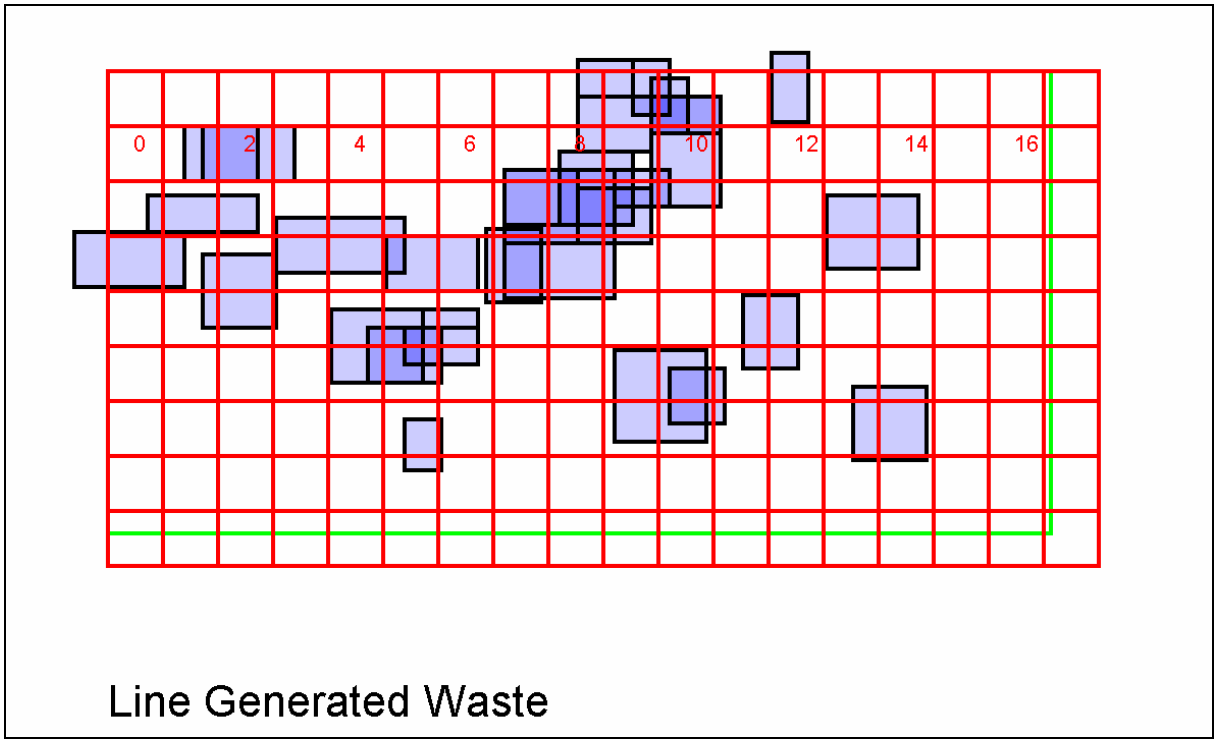

Figure B-7. Shipment locations for disposals containing RFP line generated waste within the ARP II retrieval area.

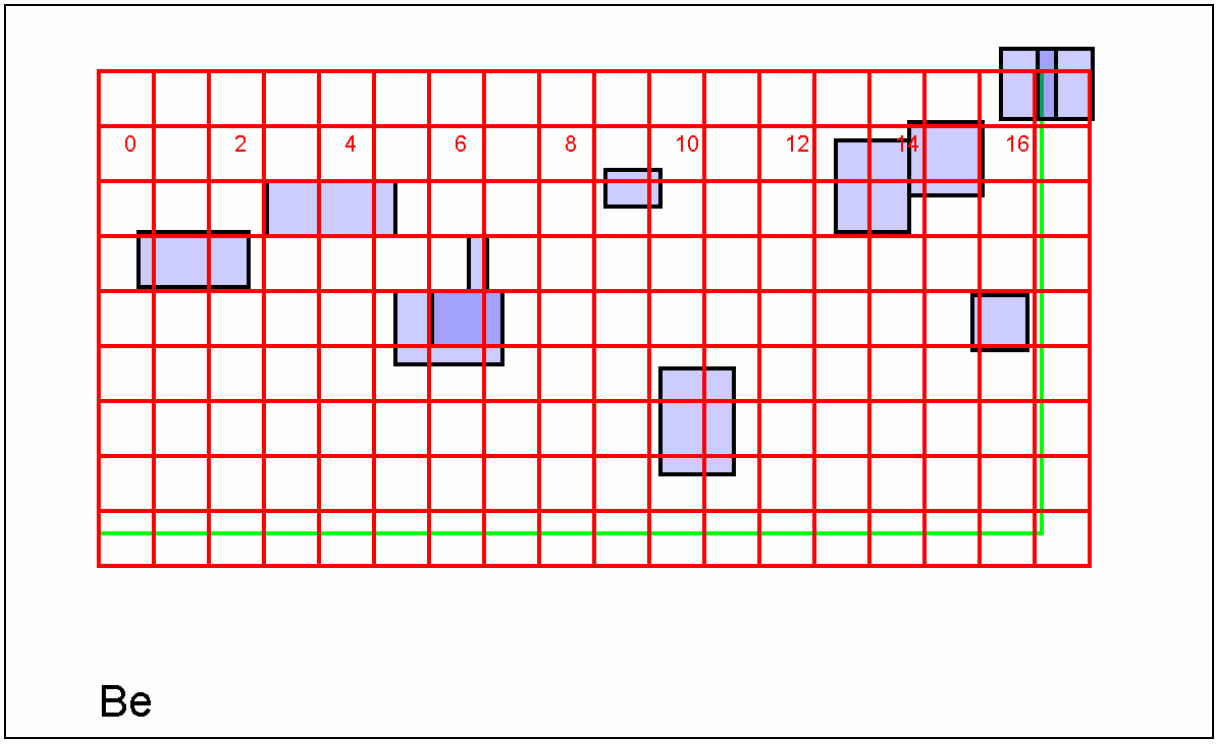

Figure B-8. Shipment locations for disposals containing RFP beryllium contaminated waste within the ARP II retrieval area.

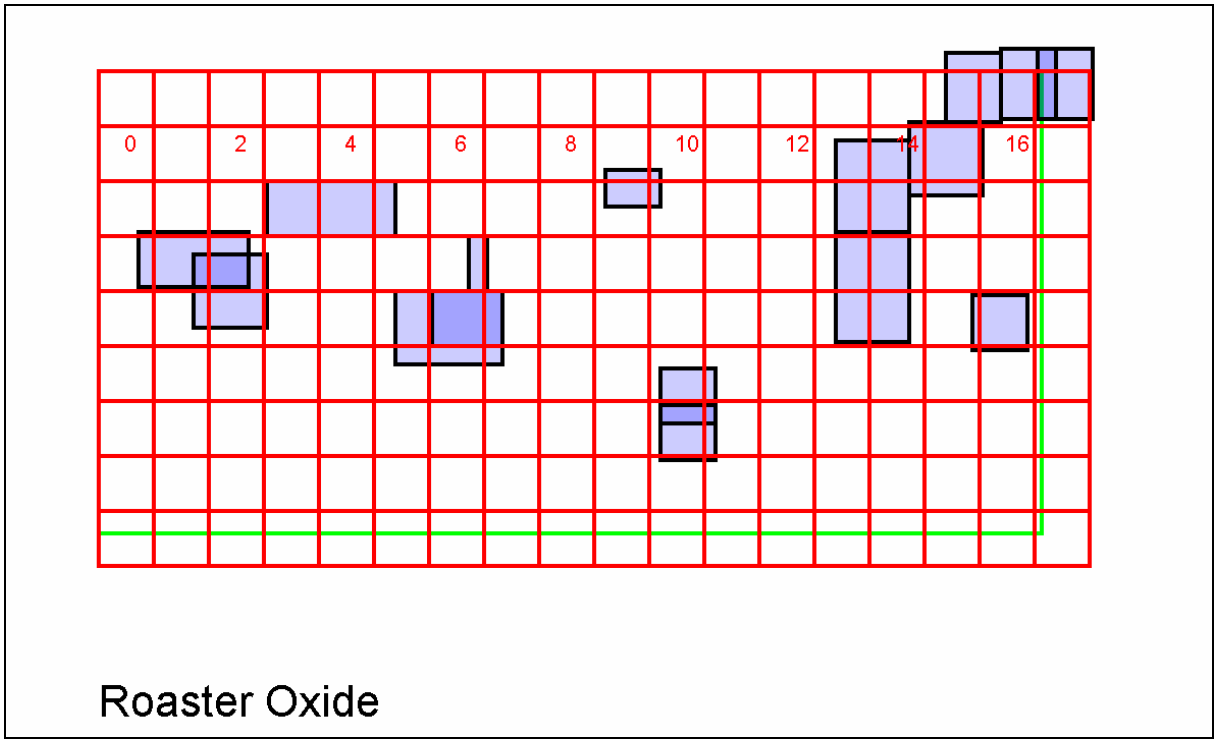

Figure B-9. Shipment locations for disposals containing RFP roaster oxide waste within the ARP II retrieval area.

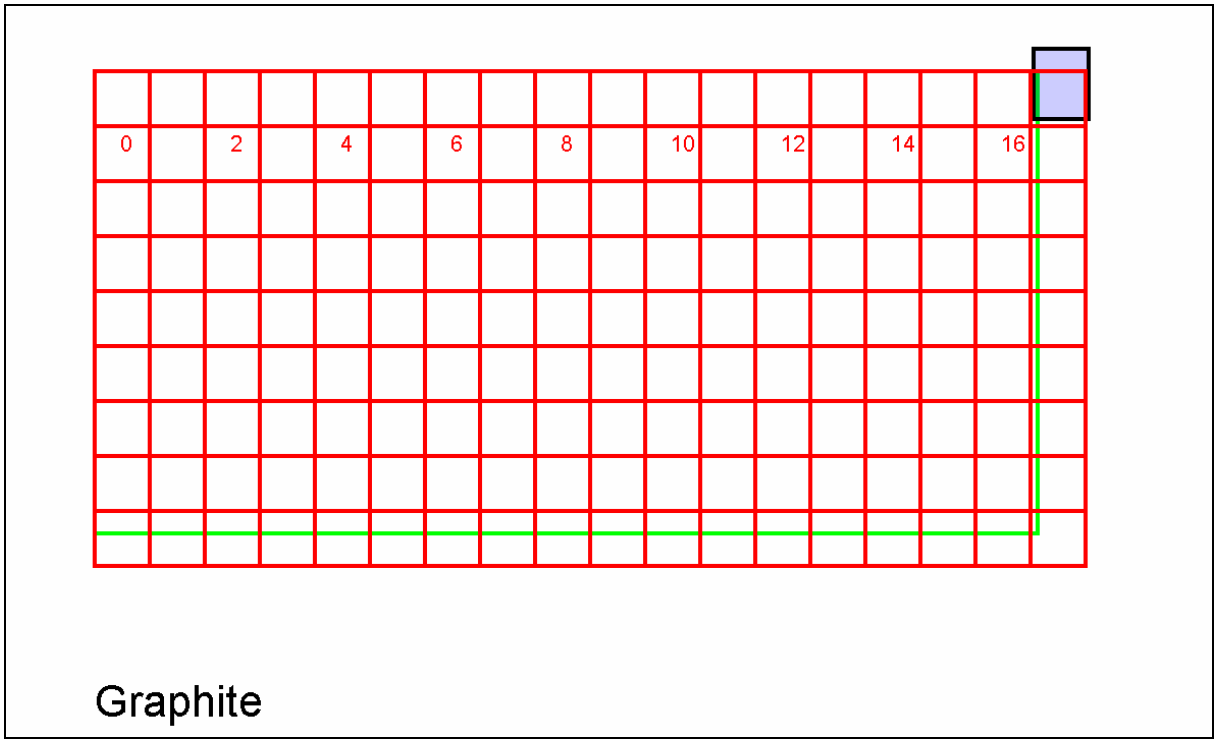

Figure B-10. Shipment locations for disposals containing RFP graphite waste within the ARP II retrieval area.

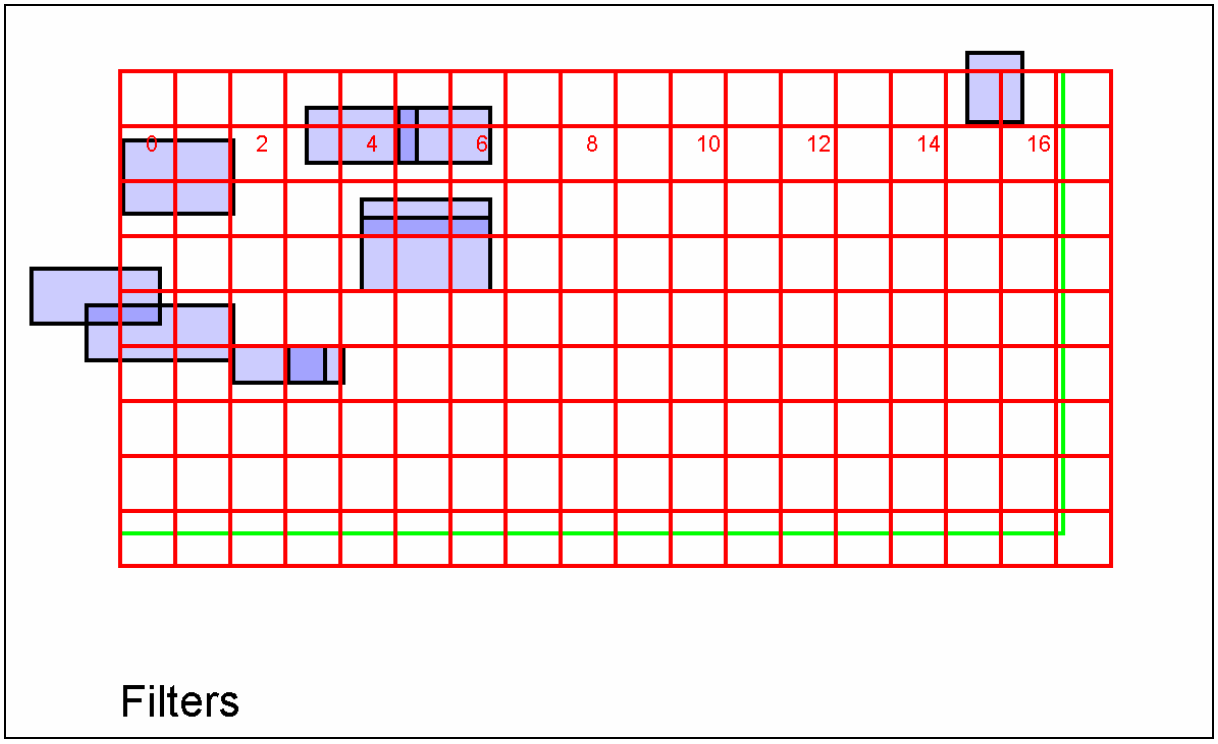

Figure B-11. Shipment locations for disposals containing RFP filter and filter media waste within the ARP II retrieval area.

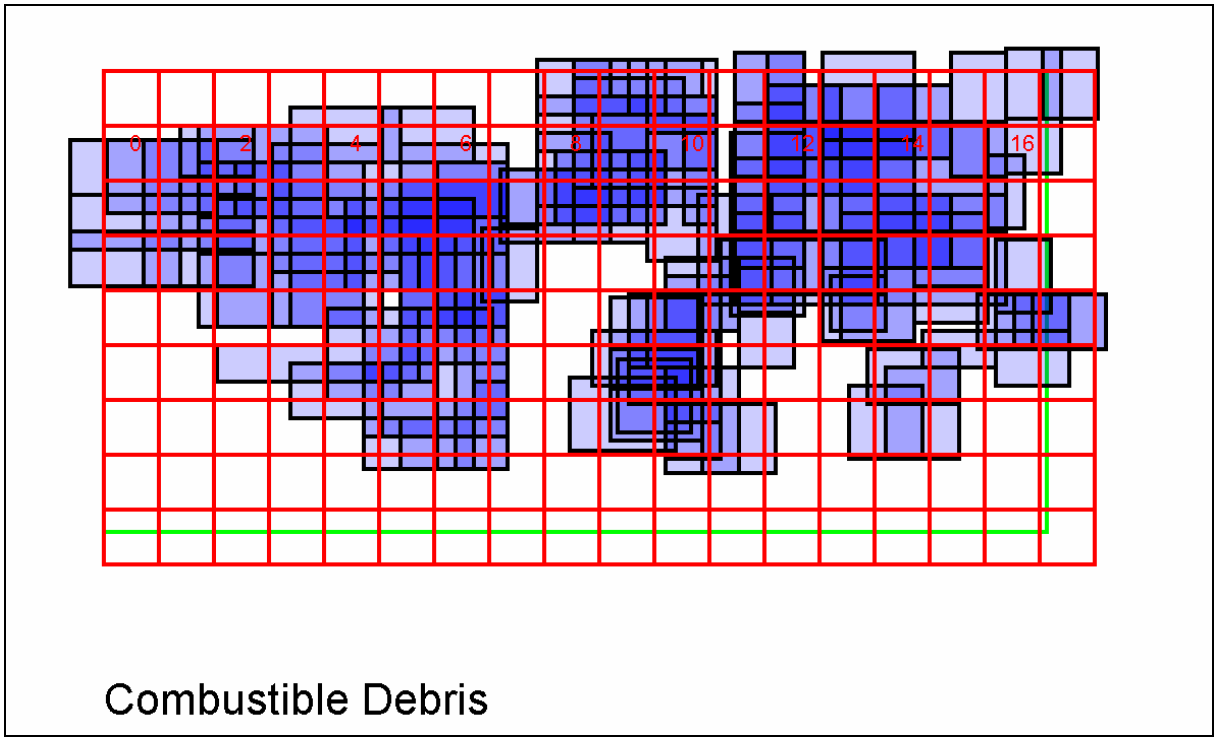

Figure B-12. Shipment locations for disposals containing RFP combustible debris within the ARP II retrieval area.

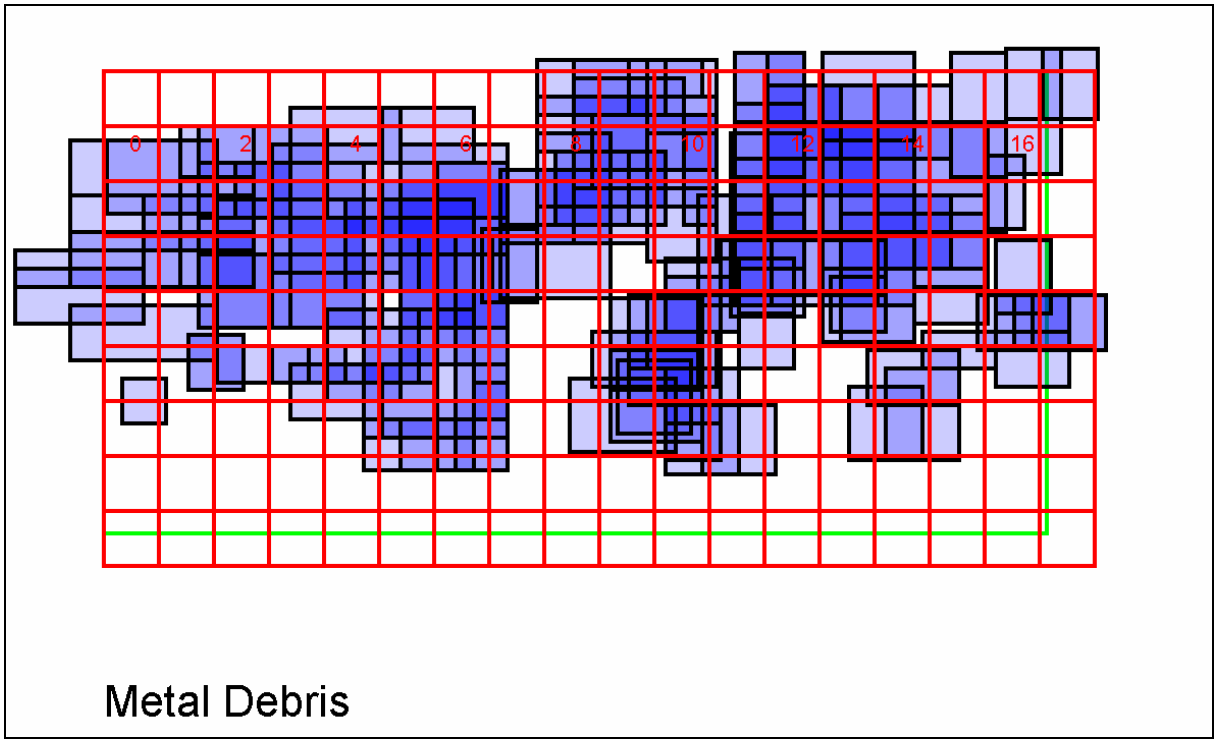

Figure B-13. Shipment locations for disposals containing RFP noncombustible debris within the ARP II retrieval area.

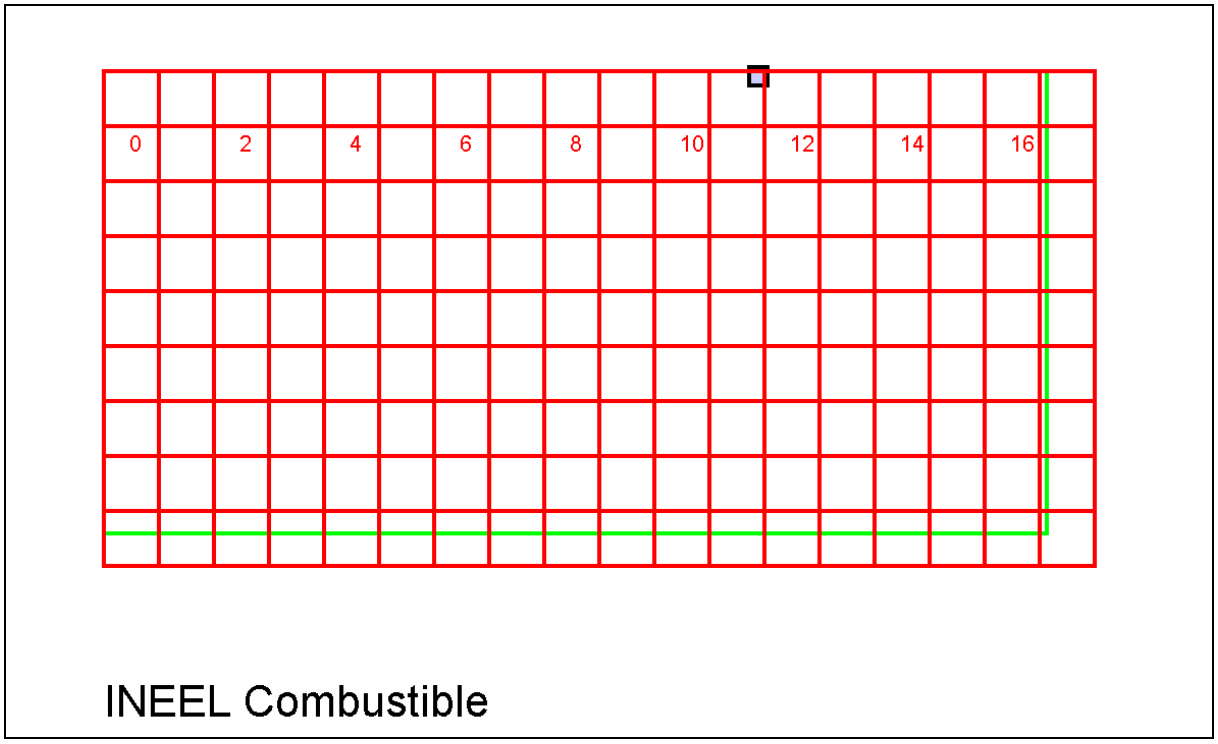

Figure B-14. Shipment locations for disposals containing INEEL combustible debris within the ARP II retrieval area.

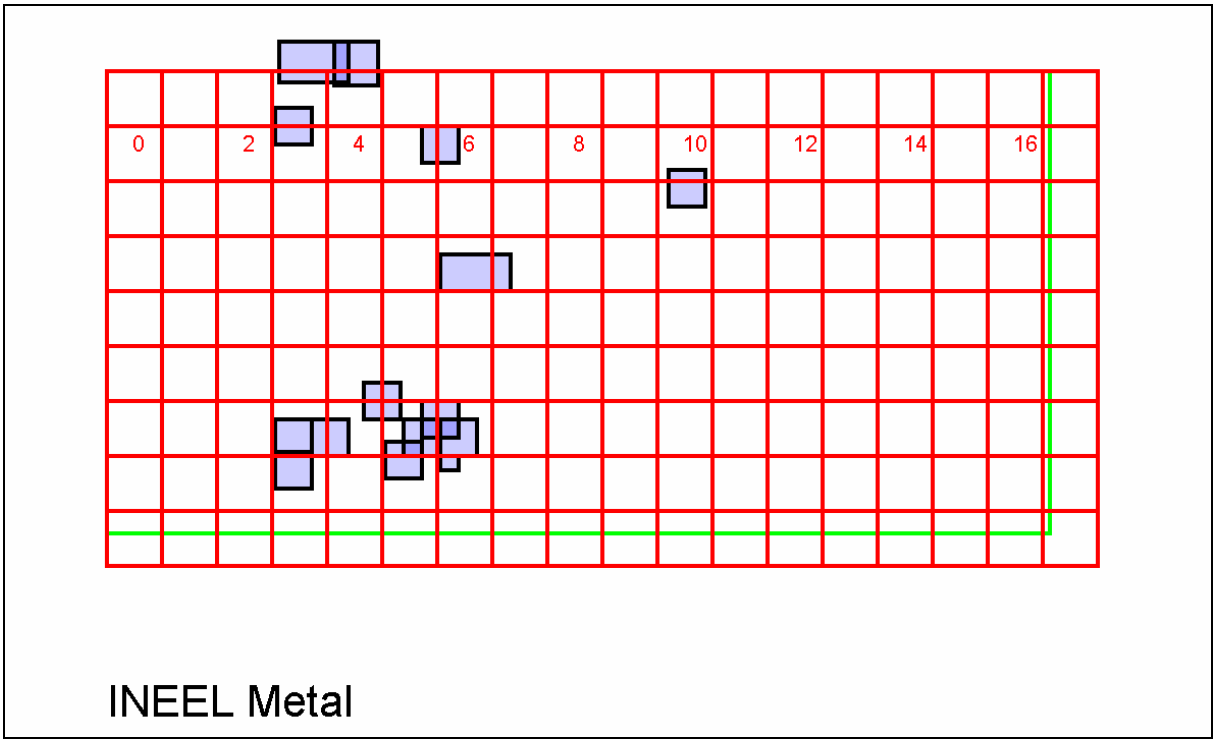

Figure B-15. Shipment locations for disposals containing INEEL noncombustible debris within the ARP II retrieval area.