ENERGY EMPLOYEES
COMPENSATION RESOURCE CENTER

December 16, 2013

Enclosed are your copies of paperwork submitted under the Energy Employees Occupational Illness Compensation Program (EEOICPA).

The original paperwork was forwarded to your assigned Claims Examiner at the appropriate Department of Labor District Office for inclusion in your EEOICPA case file.

Keep these copies in a safe place as copies are not kept in the Resource Center.

Please do not hesitate to call if you have questions. I can be reached at 1-866-540-4977 (toll-free) or 720-540-4977.

Sincerely,

Enclosures:
As stated

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Phone 720-540-4977 and 1-866-540-4977 (toll-free) fax: 720-540-4976
denver.center@rrohio.com

U.S. DEPARTMENT OF LABOR

Employment Standards Administration
Office of Workers' Compensation Programs
Division of Energy Employees' Occupational Illness Compensation

November 22, 2013

Dear Mr.

Thank you for participating in the Occupational History interview. Your input will aid the Claims Examiner at the DOL District Office in the development of your claim. The information gathered during this interview will be used to develop the most up to date information regarding the possible exposures the employee may have come into contact with while working at the Department of Energy's site(s). It will also provide the physicians who may be reviewing your case, or performing an evaluation, with a more complete picture of the employee's exposures, medical condition and history.

If you have any questions regarding the information gathered, or if you come upon other relevant information you want shared with this program, please contact the District Office at:

☐ 1-877-336-4272 DOL Jacksonville District Office

☐ 1-888-805-3401 DOL Seattle District Office

☒ **1-888-805-3389 DOL Denver District Office**

☐ 1-888-859-7211 DOL Cleveland District Office

Thanks again,

4.2.3 Chemical Constituents

The chemicals used in laboratory processes that may be present as contaminants of the waste generated in Building 123 are listed in Table 4-5 [RF-P181].

Table 4-5. Chemicals used in Building 123.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
Acetic acid	Analytical processes [RF-P181]
Acetone	Analytical processes [RF-P181]
Ammonium thiocyanate	Analytical processes [RF-P181]
Cyclohexane	Analytical processes [RF-P181]
Ether	Analytical processes [RF-P181]
Ethylene glycol	Analytical processes [RF-P181]
Isopropyl alcohol	Analytical processes [RF-P181]
Methanol	Analytical processes [RF-P181]
Oxalic acid	Analytical processes [RF-P181]
Toluene	Analytical processes [RF-P181]
Triisooctomine	Analytical processes [RF-P181]
Xylenes	Analytical processes [RF-P181]
Metals	
Arsenic	Analytical [RF-P181]
Beryllium	Analytical [RF-P181]
Cadmium	Analytical [RF-P181]
Chromium	Analytical [RF-P181]
Lead	Analytical [RF-P181]
Mercury	Analytical [RF-P181]
Other Chemicals/Constituents	
Ammonium hydroxide	Analytical processes [RF-P181]
Formic acid	Analytical processes [RF-P181]
Hydrochloric acid	Analytical processes [RF-P181]
Hydrofluoric acid	Analytical processes [RF-P181]
Nitric acid	Analytical processes [RF-P181]
Perchloric acid	Analytical processes [RF-P181]
Potassium permanganate	Analytical processes [RF-P181]
Sodium hydroxide	Analytical processes [RF-P181]
Sulfuric acid	Analytical processes [RF-P181]

4.2.4 Radionuclides

The radioisotopes that may be present in wastes generated from Building 123 processes include actinide elements, compounds, sources, and other radioactive materials historically used at the RFP including, but not limited to, the isotopes and radioactive decay products listed in Table 4-6. Radioactive spike solutions were used as additives during preparation of most samples, and radioisotopic sources were used in the determination of contamination as part of the normal operating health physics procedures associated with Building 123. Large plutonium/beryllium neutron sources were disposed of from this building in 1972. The sources were sealed in a produce can, placed in DOT 6M containers, and then placed in a drum with plutonium-contaminated LGW [RF-C138]. Although this occurred after the time of waste disposal at the INEEL addressed by this report, it is assumed that similar radioactive sources from Building 123 could have been disposed of at the INEEL previously. Radioisotopic content for individual wastes or wastes specific to RFP buildings cannot be determined. Radioisotopic content for all RFP waste is discussed in detail in Section 7 [RF-P181].

Table 4-6. List of radionuclides for the RFP site as potential contaminants—Building 123 [RF-P181].

	Radionuclides	
^{241}Am	^{63}Ni	^{90}Sr
^{133}Ba	^{210}Pb	^{234}U
^{250}Cf	^{238}Pu	^{235}U
^{244}Cm	^{239}Pu	^{236}U
^{137}Cs	^{240}Pu	^{238}U
^{3}H	^{241}Pu	—
^{148}Gd	^{242}Pu	—

4.3 Building 331

Building 331 was built in 1953 as a vehicle maintenance garage and the RFP fire department. The building also housed a small metallurgical R&D laboratory [RF-P065].

4.3.1 Building 331 Waste Generating Operations

Waste from Building 331 was primarily generated by the decontamination of fire fighting equipment and vehicles (on the vehicle maintenance side) that were contaminated with plutonium, uranium, or other radioactive materials handled during operations at the RFP.

A small R&D laboratory also housed in this building was engaged in evaluating equipment and methods applicable to casting and fabricating DU items. A limited thorium project was also conducted in this facility [RF-U115].

identified in the late 1950s [RF-C124]. It is assumed that this sludge was from an accumulation of liquid waste material within processing equipment [RF-U115, RF-U1070].

4.5.2 Chemical Constituents

Chemicals and other potential waste constituents used in Building 444 are listed in Table 4-13. Cleaning solvents and other chlorinated compounds used in Building 444 operations included trichloroethylene (TCE), tetrachloroethylene (PCE), and chlorofluoro-hydrocarbons (CFCs) such as Freon, chloroform, tetrabromoethylene, and 1,1,1-trichloroethane (TCA). Spent solvents and other liquid wastes were sent to Building 774 for recycle and reuse or treatment and disposal. The spent salt baths contaminated with uranium oxide were identified as Type IV sludge waste either for this building.

Metals were identified as used in Building 444 processes such as metal etching and plating operations, or treatment of uranium parts prior to coating. The metals identified as potentially present in Building 444 waste are listed in Table 4-13 [RF-P085].

Table 4-13. Chemicals used in Building 444.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
1,1,1-trichloroethane	Replaced perchloroethylene for cleaning, machining, chemistry technology [RF-P084, RF-U115]
Acetone	Parts cleaning [RF-P085]
Carbon (graphite)	Unknown [RF-C502]
Celvacene Grease	Miscellaneous materials [RF-C215]
Chlorofluorocarbons	Cleaning solvent [RF-U115]
Chloroform	Chemistry technology [RF-P085]
Dimethylsulfoxide solution	Unknown [RF-C502]
Ethanol	Chemical inventory [RF-C215]
Freons; Freon TF-113 and Freon TF	Parts cleaning—physical metallurgy [RF-P040, RF-P084] Photo-processing chemical [RF-C215]
Kerosene	Unknown—chemical inventory [RF-C215]
Methanol	Joinings and coatings [RF-P040]
Motor oil 20-W	Unknown
Tetrabromoethylene	Float sink separation process media in conjunction with beryllium work [RF-P084]
Tetrachloroethylene	Used to clean coolants off of machined parts [RF-P084] Used to remove the dye penetrant from parts [RF-C215]
Trichloroethylene	Cleaning solvent and degreasing [RF-U115]
Trichloromethane	Parts cleaning prior to product inspection [RF-P084]
Metals	
Aluminum	Physical metallurgy [RF-P085]

Table 4-13. (continued).

Constituent	Generator/Process/Use (if known)
Beryllium	Physical metallurgy [RF-P085]
Brass	Physical metallurgy [RF-P085]
Cadmium	Physical metallurgy and electroplating [RF-P085]
Chromium	Physical metallurgy [RF-P085]
Copper	Physical metallurgy [RF-P085]
Gold	Parts, casting, or alloy [RF-P085]
Lead (lead fluoroborate and lead oxide)	Physical metallurgy [RF-P085]
Mercury	Physical metallurgy [RF-P085]
Molybdenum	Used as a lubricant during assembly testing [RF-P084]
Nickel	Parts, casting, or alloy [RF-P085]
Niobium	Uranium alloy processing [RF-C502]
Silver	Physical metallurgy [RF-P084]
Magnesium	Physical metallurgy [RF-P085]
Titanium	Parts, casting, or alloy [RF-P085]
Tungsten	Manufacturing [RF-P084]
Vanadium	Physical metallurgy [RF-P085]
Yttrium oxide	Coating beryllium molds [RF-P084, RF-U115]
Other Chemicals/Constituents	
Ammonium hydroxide	Uranium neutralization and precipitation from acid solutions [RF-P084]
Calcium fluoride	Coating beryllium molds [RF-U115]
Cimcool	Coolant used in DU machining [RF-P084]
Cyanide	Heat treating and electroplating [RF-C502]
Developer; Kodak	Photo processing chemical [RF-C215]
Developer rack cleaner (sodium thiosulfate and sodium ferricyanide)	Used photo processing chemical [RF-C215]
Developer system cleaner	Photo processing chemical [RF-C215]
Developer, Zyglo (ZP-5)	Photo processing chemical [RF-C215]
Dubl-Chek	Photo processing chemical [RF-C215]
Duo Seal	Unknown
Emulsifier, Zyglo (DP-50)	Photo processing chemical [RF-C215]
Emulsifier, Zyglo (ZE-2)	Photo processing chemical [RF-C215]
GS-3	Photo processing chemical [RF-C215]

Table 4-13. (continued).

Constituent	Generator/Process/Use (if known)
Hydrochloric acid	Production plating [RF-P084]
Hydrogen peroxide	Acid etching, solution mixture, nitric acid, hydrogen peroxide, deionized water [RF-P085]
Lithium carbonate	Heat treating [RF-C502]
Mac Stop (toluene, xylene, and nickel chloride mixture)	Production plating [RF-P084]
Magnaflux No.1 Gray Powder	Photo processing chemical [RF-C215]
Molykote (molybdenum sulfide)	Unknown
Nitric acid	Metal etching and plating operations [RF-P085]
Oakite 162	Nonchlorinated solvent-chemistry technology [RF-U208]
Penetrant, Zyglo (DP-50)	Photo processing chemical [RF-C215]
Phosphoric acid	Physical metallurgy [RF-P085]
Potassium carbonate	Heat treating [RF-C502]
Potassium cyanide solutions	Plating [RF-C502]
Silicone	Unknown—chemical inventory [RF-C215]
Sodium cyanide solutions	Plating [RF-C502]
Sodium hydroxide	Unknown—chemical inventory [RF-P085]
Sulfur hexafluoride	Unknown—chemical inventory [RF-P085]
Sulfuric acid	Physical metallurgy [RF-P085]
Terry Cleaner	Unknown
Texaco CX	Petroleum-based water soluble coolant [RF-P084]
Trim Rinse detergent	Nonchlorinated solvent chemistry technology [RF-P084]
ZC-79	Used to clean Magnaflux No.1 Gray Powder from parts [RF-C215]
ZP-9	Photo processing chemical [RF-C215]

4.5.3 Radionuclides

Building 444 conducted nonplutonium operations that generated radioactive, LLW. The only radiological contamination related to the Building 444 wastes shipped to the INEEL is DU (Table 4-14). From 1954 until April 1978, these wastes were included in shipments of plutonium-contaminated wastes shipped to the INEEL for disposal [RF-P047].

4.8.2 Chemical Constituents

Chemicals used in laboratory processes conducted in Building 559 may be present as waste contaminants generated in Building 559 and are listed in Table 4-19.

Table 4-19. Chemicals used in Building 559.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
1,1,1-trichloroethane	Laboratory [RF-P085]
Dibutyl butyl phosphonate	Laboratory [RF-C502]
Carbon tetrachloride	Laboratory [RF-P085]
Chloroform	Laboratory [RF-P085]
Ethanolamine	Laboratory [RF-C502]
Formaldehyde	Laboratory [RF-P085]
Methylene chloride	Laboratory [RF-P085]
Tetrachloroethylene	Laboratory [RF-P085]
Thenoyl trifluoroacetone	Laboratory [RF-C502]
Tributyl phosphate	Laboratory [RF-C502]
Trioctyl phospine oxide	Laboratory [RF-C502]
Urea	Laboratory [RF-C502]
Metals	
Beryllium (oxide)	Laboratory [RF-P085]
Chromium (chloride, nitrate, oxide, potassium sulfate, sulfate, trioxide)	Laboratory [RF-P085]
Gallium	Laboratory [RF-C502]
Lead (acetate, chloride, metal nitrate, oxide, powder)	Laboratory [RF-P085]
Mercury (nitrate)	Laboratory [RF-P085]
Nickel (powder, nickelous chloride, nitrate, oxide, sulfate)	Laboratory [RF-P085]
Other Chemicals/Constituents	
Acids and bases; unspecified	Laboratory [RF-C205]
Nitric acid	Laboratory [RF-P085]
Potassium dichromate	Laboratory [RF-C502]

4.8.3 Radionuclides

The primary radionuclides that may be present in waste generated from Building 559 processes include plutonium, americium, uranium, and neptunium, as well as ingrowths and daughter products [RF-P094, RF-P085]. Radioisotopic content for individual wastes or RFP buildings cannot be determined. A detailed discussion of radionuclide content in the RFP wastes is presented in Section 7.

4.9 Building 707

Building 707 construction began in 1967 to support production of the Part V weapons design that could not be accomplished in Building 776 and 777; however, after the 1969 fire in Building 776 and 777, the plutonium foundry, casting, and machining operations for the Part IV design that were involved in the fired-damaged areas of 776 became part of the operations in Building 707. The Building 707 Annex (sometimes referred to as Building 707A) was constructed to accommodate all of the Building 776 and 777 operations that needed to be moved to Building 707 [RF-P084, RF-P085].

Plutonium manufacturing operations began on May 25, 1970. Beginning in 1970, Building 707 provided metallurgical support for plutonium and was involved in final product assembly. Plutonium metal was cast into ingots in the foundry. The ingots were then rolled and formed prior to being machined, cleaned, and assembled in various areas within the building. Once construction of Building 707 was completed, the majority of plutonium pit assembly operations were moved from Building 777 [RF-P084].

It is not known how many of the casting, fabrication, and assembly processes were operating at the time waste was shipped to the INEEL from Building 707 (October 1970) as shown in the WILD [RF-U1070] so these processes are briefly described below.

- Casting operations focused on production of feed and production ingots. The ingots were produced from blending plutonium from various Building 771 sources and/or rejected parts. Final gallium-stabilized WR ingots were then produced by blending feed ingots of known purity and composition. Casting operations were performed in several modules within Building 707. The processes employed in each module differed, mostly in the physical form of the starting materials used [RF-P084].

- After casting, the molded parts underwent a series of fabrication steps to produce the final shape. These steps included rolling, forming, thermal treatment, and final machining. Production ingots were rolled until a specified thickness was obtained. These were moved to another glovebox where shapes were cut out of the sheet in a blanking press. The cut blanks were sent to nearby gloveboxes for thermal treatment (annealing and homogenizing). After thermal treatment, the blanks were formed into hemishells in a hydroform press. Final machining on the bulk plutonium parts was conducted within various gloveboxes containing lathes, mills, a drillbox, and a high-precision drill press [RF-P084].

- Machined parts went through a series of cleaning and assembly steps to produce the final plutonium pit; the steps varied depending on the design of the pit (Part IV or V design) but were usually iterative. After cleaning in an ultrasonic cleaner, plutonium parts were welded with electron beam welders as part of the subassembly. An outer metal casing was welded onto the plutonium subassembly with a pigma or electron beam welder in the "Superdry" process. Some metals parts were joined using a process called electron bombardment brazing in which a nonferrous alloy was used that melted at a lower temperature than the metals being joined. Building 707 also housed a

4.9.2 Chemical Constituents

Chemicals used in plutonium manufacturing processes conducted in Building 707 may be present as waste contaminants generated in Building 707 and are listed in Table 4-21.

Table 4-21. Chemicals used in Building 707.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
Acetone	Cleaning prior to brazing [RF-P084]
Carbon tetrachloride	Cleaning and degreasing [RF-P084]
Ethanol	Components cleaning [RF-P084]
Freon (compound unspecified)	Leak testing of tantalum crucibles [RF-U084]
Freon 113	Density testing of plutonium parts, cooling, and lubrication during beryllium machining and destructive testing [RF-P084]
Isopropyl alcohol	Cleaning of compressors [RF-P084]
Oil, unnamed light	Equipment lubrication during beryllium machining [RF-P084]
Texaco 634 oil	Machining [RF-P084]
Texaco Regal Oil	Machining [RF-U115]
Trichloroethane	Cleaning of plutonium parts [RF-P084]
Trichloroethylene	Cleaning plutonium parts in assembly process [RF-P084]
Metals	
Beryllium (trace amounts)	Metal component [RF-P084, RF-U115]
Lead	Shielding in the form of lead and leaded glass; leaded rubber gloves; welding rods [RF-P047, RF-P084]
Other Chemicals/Constituents	
Calcium fluoride	Coating graphite molds [RF-P084]
Developer	Inspection/testing of welds [RF-P084]
Electro etch	Mark imperfections on plutonium parts [RF-P084]
Fixer solution	Radiographic film development [RF-P084]
Fluorescent dye	Inspection and testing of plutonium parts [RF-P084]
Helium	Pressure testing [RF-P084]
Liquid nitrogen	Leak testing [RF-P084]
Metal cleaner; unspecified	Cleaning bell jars after brazing [RF-P084]
Potassium hydroxide	Used in compressors during pressure testing [RF-P084]

4.9.3 Radionuclides

Weapons grade plutonium, EU, and DU were commonly used in the Building 776 and 777 processes, and many of the same processes were continued in Building 707. It was assumed that the same radioisotopes are present in Building 707 wastes in the same ratios. The radioisotopes that may be present in Building 707 wastes are listed in Table 4-22. Radioisotopic content for individual wastes or specific to the RFP buildings cannot be determined; however, radioisotopic content for all of the RFP waste was estimated and is discussed in detail in Section 7.

Table 4-22. Radioisotopes expected to be present in Building 707 wastes [RF-P084, RF-P085, RF-U115].

Radionuclides	
^{241}Am	^{237}Np
^{238}Pu	^{241}Pu
^{239}Pu	^{234}U
^{240}Pu	^{235}U
^{242}Pu	^{238}U

4.10 Building 771

Building 771 (originally referred to as the C-Plant or Building 71) was constructed and placed into operation in 1953. It was designed as a totally self-contained plutonium production facility to provide plutonium component manufacturing, plutonium recovery, and plutonium purification [RF-P047, RF-P084, RF-P085, RF-P091, RF-P260, RF-P262, RF-P264]. All fabrication of plutonium components was conducted in Building 771 from 1953 until 1957 when plutonium fabrication and component assembly operations were moved to Building 776/777. From 1954 to 1958, Building 771 had its own laundry facility. At that time, all laundry operations for plutonium-related buildings was moved to Building 778 [RF-P085, RF-U115]. By the mid-1950s, increasing complexity of the plutonium part fabrication processes necessitated the construction of a dedicated plutonium fabrication facility, Building 776 (originally Building 76). A large plutonium casting residue fire occurred in the development laboratory on September 11 and 12, 1957, which seriously contaminated the metals laboratory and most of Building 771 [RF-P047, RF-P085, RF-P091, RF-P108, RF-P265].

Renovation of Building 771 included removal of the original production line beginning in late 1958 or early 1959, and was completed by 1962.

In 1957, the primary mission of Building 771 became plutonium recovery and purification [RF-P047, RF-P084, RF-P085, RF-P091, RF-P260, RF-P262, RF-P264]. Recovery operations in Building 771 included recovery of fissionable radioisotopes as well as recovery of solvents for reuse. Early recovery operations were conducted in gloveboxes and consisted of simple manually operated equipment. By 1957, a small incinerator located in Building 771 was used to reduce the bulk of combustible waste materials by incineration. A larger incinerator and off-gas system replaced the original incinerator in 1961. The combustion was sometimes incomplete in both incinerators. In the small incinerator and the first few runs of the larger incinerator, the feed to the incinerator was anything that would burn. This included PVC plastic, polyethylene, rubber (glovebox) gloves, paper, some graphite, rags, wood, and ion exchange resins. Later, glovebox gloves and PVC plastic were excluded because they caused plugging of the filters and equipment corrosion [RF-P107, RF-P162, RF-U114].

4.10.2 Chemical Constituents

Because of the wide range of operations conducted, a variety of chemicals may be present in the waste shipped from Building 771. A list of chemicals used in the building, and the processes in which they were used, is provided in Table 4-24.

Table 4-24. Chemicals used in Building 771.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
1,1,1-Trichloroethane	Product R&D [RF-P100, RF-P241]
2-ethyleneoxyethanol	Plutonium metallurgical R&D [RF-U217]
Acetic acid	Plutonium metallurgical R&D
Acetone	Plutonium metallurgical R&D, analytical and mass spectrometry laboratories (until 1967) [RF-P084, RF-U117, RF-U202]
Alcohol	Plutonium metallurgical R&D [RF-P084]
Alcohol; denatured	Peroxide precipitation [RF-P084]
Ammonium thiocyanate	Americium precipitation, Building 771 analytical laboratory [RF-C205, RF-C502, RF-P085, RF-P260]
Benzene	Radiation instrument group (until July, 1956) [RF-U182]
Bromobenzene	Density determination of plutonium metal buttons [RF-C502]
Carbon	Plutonium metallurgical R&D [RF-P084]
Carbon tetrachloride	Plutonium machining, plutonium metallurgical R&D, product R&D, analytical and mass spectrometry laboratories, chemistry R&D [RF-P137, RF-P187, RF-U117, RF-U201, RF-U202]
Chloroform	Analytical and mass spectrometry laboratories (after 1967) [RF-C214, RF-P084]
Dibutyl butyl phosphonate	Building 771 analytical laboratory [RF-C502]
Dodecane	Uranium-plutonium solvent extraction [RF-P091]
Ethylene glycol	Plutonium metallurgical R&D [RF-U217]
Freon 113	Density balance [RF-P084]
Freon 12	Refrigeration [RF-P084]
Hexane (cyclohexane)	Analytical laboratory [RF-P084]
Isopropyl alcohol	Plutonium metallurgical R&D; laboratory, peroxide precipitation [RF-P084]
Oils: machining, coolant, and vacuum pump	Plutonium machining, plant operations, plutonium metallurgical R&D, product R&D, chemistry R&D [RF-P084, RF-P100, RF-U133]

Table 4-24. (continued).

Constituent	Generator/Process/Use (if known)
Oxalic acid	Oxalate precipitation [RF-P085, RF-P260]
Perchloroethylene (Chlorothene®, Chlorothene NU®, Chlorothene VG®, Tri-Ethane 314®, Tri-Ethane 324®)	Product R&D, chemistry R&D [RF-P100, RF-P187]
Separan (a polyacrylamide)	Peroxide precipitation [RF-P262]
Shell Vitrea oil	Plutonium machining [RF-P084, RF-P272, RF-U133]
Sodium 2, 4-dihydroxyazbene	Unknown [RF-C211, RF-U182]
Toluene	Radiation instrument group after July, 1956
Trioctyl phosphine oxide	Building 771 analytical laboratory [RF-C502]
Tributyl phosphate	Solvent extraction [RF-P091]
Trichloroethane-perchloroethylene mixture (Dowclene EC®, CSM-320®)	Product R&D [RF-P100]
Trichloroethylene (Neu-Tri®, Blacosolv, Alk-Tri®, Ex-Tri®)	Cleaning concrete, plutonium metallurgical R&D, product R&D, analytical and mass spectrometry laboratories [RF-P100, RF-P102, RF-P187, RF-P241, RF-U117]
Trichlorotrifluoroethane (Genesolv D®, Freon MF®, Freon TF®)	Product R&D, degreasing, cleaning, density balances [RF-P100]
Trichlorotrifluoroethane-ethylene glycol monobutyl ether mixture (Freon TB-1®)	Product R&D [RF-P187]
Thenoyl trifluoroacetone	Building 771 analytical laboratory [RF-C502]
<u>Metals</u>	
Beryllium	Technical staff (1960), spectrograph (1964), site returns [RF-P085]
Cadmium salts	Neutron poison [RF-C502]
Calcium metal	Thermite reduction [RF-P084, RF-P091, RF-P260]
Calcium-zinc alloy	Direct oxide reduction [RF-P264]
Gallium	Alloyed with plutonium [RF-C502]
Magnesium oxide	Thermite reduction [RF-P084, RF-P260]
Magnesium; powdered	Thermite reduction [RF-P084]
Molybdenum	ZPPR [RF-C219, RF-C220]
Nickel	Production plating, R&D plating [RF-P084]
Palladium	Plutonium metallurgical R&D [RF-U202]
Silver	Plating [RF-P084]

Table 4-24. (continued).

Constituent	Generator/Process/Use (if known)
Silver solder (contained cadmium)	Maintenance [RF-P040, RF-C499]
Other Chemicals/Constituents	
Aluminum nitrate	Anion exchange [RF-P084, RF-P091, RF-P260]
Amercoat paint	Floor and equipment paint [RF-P262]
Ammonium hydroxide	^{233}U recovery [RF-P263]
Ammonium sulfate	Peroxide precipitation [RF-P264]
Ammonium thiosulfate	Peroxide precipitation [RF-P260]
Ascorbic acid	Neptunium precipitation, americium purification [RF-C502, RF-P260]
Calcium chloride	Direct oxide reduction [RF-P108]
Calcium fluoride	Dissolution [RF-P084, RF-P091]
Chromic acid	Plutonium metallurgical R&D [RF-U202]
Dowex 1 and 21K	Anion exchange resin [RF-C502]
Dowex 50	Cation exchange resin [RF-C502]
Ferrous sulfamate	Anion exchange, neptunium anion exchange[RF-P084, RF-P091, RF-P260]
Ferrous sulfate	Neptunium anion exchange [RF-P260]
Fluorine	Anion exchange, neptunium anion exchange [RF-C502]
Fluorinert liquids (FC-40, FC-43, FC-75, FC-77, FC-78, FC-88)	Product R&D [RF-P272]
Fluosilicic acid	Formed in anion exchange [RF-P264]
Glycerol	Plutonium metallurgical R&D [RF-U201]
Gulf BT	Solvent extraction [RF-P264]
Hollingshead 333 Cocoon	Paint stripping, contamination fixative [RF-U139]
Hydrazine	Neptunium anion exchange [RF-P260]
Hydrochloric acid	Americium cation exchange, neptunium precipitation, laboratory [RF-P091, RF-P260]
Hydrofluoric acid	Dissolution [RF-P091, RF-P260]
Hydrogen fluoride; anhydrous	Hydrofluorination, fluid-bed fluoridation [RF-P084, RF-P091]
Hydrogen peroxide (35 and 50%)	Peroxide precipitation [RF-P084]
Hydroiodic acid	Neptunium anion exchange, neptunium precipitation [RF-P260]
Hydroxylamine hydrochloride	Neptunium precipitation [RF-P260]

Table 4-24. (continued).

Constituent	Generator/Process/Use (if known)
Hydroxylamine nitrate	Neptunium anion exchange, neptunium precipitation [RF-P260]
Hydroxylamine sulfate	Solvent extraction [RF-P264]
Iodine	Thermite reduction [RF-P260]
Magnesia cement	Waste packaging [RF-U288]
Magnesium chloride	MSE (B776) [RF-P260]
Magnesium granules	Thermite reduction [RF-C502]
Magnesium perchlorate/sulfuric acid mixture	Laboratory scrubber [RF-P091]
Nickel carbonyl	Nickel plating (to at least 1963) [RF-P047, RF-U042, RF-U046]
Nitric acid	Dissolution, calciner scrubber, anion exchange, batching, peroxide precipitation, americium recovery [RF-P084, RF-P085, RF-P091, RF-P260]
Nitrous oxide	Analytical laboratory [RF-P084, RF-P091]
Perchloric acid	Laboratory [RF-U208]
Phosphoric acid	Plutonium metallurgical R&D [RF-U201]
Potassium hydroxide	Anion exchange, americium recovery [RF-P084, RF-P260]
Potassium iodate	Thermite reduction [RF-P084]
Sodium fluoride	Fluidized-bed fluorinator [RF-P264]
Sodium hydroxide	Solvent extraction, peroxide precipitation [RF-P084, RF-P108, RF-P260]
Sodium peroxide	Thermite reduction [RF-P084]
Sulfamic acid	Solvent extraction, dissolution [RF-P264]
Sulfuric acid	Peroxide precipitation, neptunium dissolution [RF-P084]

4.10.3 Radionuclides

A range of activities took place within Building 771, including a wide range of plutonium processing, recovery, and purification; process development; support; and experimental development operations. For example, several different TRU elements were handled in the Chemistry R&D Laboratory areas and Special Recovery areas throughout the history of the building. The RFP also produced components from other metallic radionuclides (including ^{237}Np, ^{241}Am, ^{238}Pu, and ^{244}Cm) on a limited basis for incorporating into pits as "special order" operations. Consequently, any or all of these radionuclides could be present in the wastes in trace quantities generated during their processing, including waste generated during recovery operations [RF-P085, RF-P091, RF-P108, RF-P265]. Radionuclides identified in waste from Building 771 are listed in Table 4-25, together with the process areas in which they may have been used.

Table 4-25. Radionuclides used in Building 771.

Radionuclides	
^{3}H	Plutonium
^{241}Am	DU
EU	

4.11 Building 774

When Building 774 was constructed in 1952, its primary purpose was to support Building 771 by treating its radioactive liquid wastes. Secondarily, it treated radioactively and/or chemically contaminated liquid waste from the rest of the RFP. The facility was divided into two separate areas or "stages." The first stage received and treated only plutonium- and americium-contaminated aqueous liquid wastes. The second stage received and treated EU- and DU-contaminated aqueous liquid wastes, plus treated plutonium- and americium-contaminated wastes from the first stage. Aqueous waste solutions that did not meet the feed specifications for the first or second stage treatment processes were processed separately. Before the bottle process was developed to treat these wastes in Building 774, the solutions were set up directly in the waste container or drum and identified as either 741 or 742 sludge. After treatment of these liquids began in 1967 in the Building 774 bottle process the solutions were processed in an open tank, or if in small quanitities, set up directly in the container (bottle) or drum. The solidified liquid waste was listed as 744 sludge, or special setups. Also in 1966, the Grease Plant began processing backlog and newly generated organic liquid wastes. This sludge was listed as 743 sludge. Installed in 1966 and in service in 1967, an evaporator and double-drum dryer began to treat liquids that had accumulated in the solar evaporation ponds. The dry salt produced was packaged in drums and was listed as 745 sludge [RF-P047, RF-P085, RF-P098, RF-P260, RF-P264, RF-U115, RF-U1070].

The treatment operations were for the purpose of liquid waste disposal to reduce the volume of wastes and convert them to a form acceptable for transportation to offsite burial grounds or for release to offsite surface waters. Treatment operations in Building 774 did not include recovery of plutonium or other radionuclides. Liquid waste processing involved relatively consistent technology over the years, with only some refinements to achieve greater treatment capacity and eliminate offsite discharges [RF-P047, RF-P085, RF-P260, RF-P264, RF-U115].

The Building 774 facility was initially divided into two separate stages, as illustrated in Figure 4-6. Additional stages and refinements were added over time to reflect the expanded scope described below [RF-P047, RF-P085, RF-P098, RF-P260, RF-P264, and RF-U115]:

Table 4-32. Waste volumes shipped to INEEL designated 746 [RF-U1070].

	746 Empty Contaminated Drums and Associated Waste		
Waste Type	Waste Description	Container Count	Volume (ft^3)
I	Combustibles	159	18,796
I and V	Combustibles and noncombustibles	578	12,521
II	Filter paper	0	0
III	Filters	1	185
IV	Inorganic sludges	0	0
V	Noncombustibles	5,211	59,461
VI	Organic wastes	0	0
VII	Beryllium-contaminated debris	3	22
	Total	5,952	90,985

4.11.2 Chemical Constituents

Building 774 was a waste treatment facility responsible for treating liquid wastes generated at the RFP. The wastes generated from this building may contain any of the chemicals used across the site as well as the chemicals used to treat (solidify) the liquids. A list of chemicals used is provided in each building section. The list of chemical reagents used in the Building 774 first- and Second Stage Sludge processes is provided in Table 4-33. A comprehensive list of chemicals used at the RFP during the 1954 to 1971 time frame has been included in Section 6.

For 743 sludge, Cab-O-Sil was used initially in the preproduction runs of the stabilization process, but did not work well with the equipment in place. Use of Cab-O-Sil was then replaced by Johns-Manville Microcel E calcium silicate. The majority of the organic sludge waste produced was solidified using Microcel E [RF-C015, RF-P047, RF-U115]. In 744 sludge, liquid wastes requiring neutralization were neutralized using caustic soda, lime, sodium hydroxide, or potassium hydroxide [RF-P047, RF-U115].

Beginning in the 1930s, PCBs were used for industrial purposes and were not regulated until after the Toxic Substance Control Act was passed in 1976. Arochlor-1254 was used at the RFP for 15 years as a vacuum pump and heat transfer fluid. In addition to debris waste containing low concentrations of PCBs from paint, solidified PCB waste, oil, and motors and pumps containing PCBs (from the 1969 fire) were all sent to the INEEL for disposal. It is also possible that PCB-contaminated oil could have been processed with other organic liquid wastes and sent to the INEEL. Containers of PCB-containing oils such as transformer fluid were collected and stored with other oils until a treatment process became available in 1966. Up to 5,000 drums of oil waste had been accumulated by that time. This waste was processed through Building 774 as organic liquids beginning in August 1966 and shipped to the INEEL as 743 sludge. Processing data collected from PCB wastes processed in later years indicate that the PCB waste were combined with other wastes in the treatment process. Sampling and analysis data collected from 1979 through 1986 for organic sludge wastes showed a UCL_{90} >50 ppm PCBs. The PCB contamination was attributed (at least in part) to the inclusion of mineral oils in the feed waste to the Building 774 treatment process. It is assumed that PCB-contaminated oils were processed in Building 774 prior to 1970 and are, therefore, a constituent of the 743 sludge waste. One of the large metal presses in

Building 883 was filled with oil containing PCBs, but it is not known whether oil from this machine was ever treated in Building 774 [RF-C058, RF-C426, RF-P047, RF-P084, RF-P090, RF-U115].

Table 4-33. Chemicals used in Building 774.

Constituent	Generator/RF-Process/Use (if known)
Organic Compounds	
Carbon; activated	First and second stage processing [RF-C096, RF-C132, RF-P098, RF-P108, RF-P165, RF-U111, RF-U283]
Separan®	First and second stage processing [RF-C096, RF-C132, RF-P098, RF-P108, RF-P165, RF-U110]
Separan 2610®	First and second stage processing [RF-U111, RF-U283]
Other Chemicals/Constituents	
Ferric hydroxide or aluminum hydroxide	First and second stage processing [RF-U111]
Ferric sulfate	First and second stage processing [RF-C096, RF-P098, RF-P108, RF-P165]
Ferric sulfate and calcium chloride or magnesium sulfate	First and second stage processing [RF-P047, RF-P260, RF-P265, RF-U115, RF-C522]
Ferrous chloride and calcium hydroxide	First and second stage processing [RF-C132, RF-U110]
Ferrous sulfate	First and second stage processing [RF-U048]
Ferrous sulfate (aluminum hydroxide may be used)	First and second stage processing [RF-U111, RF-U283]
H.T.H. and Norite A	First and second stage processing [RF-U048]
Lime and caustic soda	First and second stage processing [RF-C132, RF-U110, RF-U111, RF-U283]
Lime and sodium hydroxide	First and second stage processing [RF-U048]
Lime and sodium hydroxide, calcium hydroxide, or potassium hydroxide	First and second stage processing [RF-C096, RF-P098, RF-P108, RF-P165]
Lime and sodium hydroxide or potassium hydroxide	First and second stage processing [RF-P047, RF-P260, RF-P265, RF-U115, RF-C522]
Purifloc 501®	First and second stage processing [RF-P047, RF-P260, RF-P265, RF-U115, RF-C522]
Super RF-Cell	Used as filter aid in first and second stage processing [RF-U111, RF-U283]

4.11.3 Radionuclides

Waste treatment operations in Building 774 produced all liquid process wastes generated in Building 771 plus all other plant liquid process wastes that did not meet the requirements for offsite release. Radioactive contaminants in the liquids thus reflected all radionuclides that could be present at the RFP and included EU, DU, plutonium, small amounts of americium, and trace amounts of ^{244}Cm, ^{237}Np, and ^{233}U from R&D, production, and processing areas. The radionuclides that may be present in wastes generated from Building 774 are listed in Table 4-34 [RF-P260, RF-P264].

Table 4-34. Radioisotopes present in Building 774 wastes [RF-P260, RF-P264].

Radionuclides	
Plutonium	^{241}Am
DU	EU
^{233}U	^{244}Cm
^{237}Np	—

Seventy (70) g of ^{241}Am a month was present in the waste stream sent for waste treatment in the late 1960s because the americium recovery line in Building 771 did not have the capability to recover all of the americium that was present in the waste stream. This americium would be captured in the 741 sludge. The amount of americium in the Building 774 series 741 sludge in fiscal year 1969 was 4.8755 kg. In April 1969, a significant increase in gamma radiation dose was noticed for some of the Building 774 personnel as a result of an increase in ^{241}Am content in the waste sludge. In January 1970, a gamma detector was installed in the first stage drum filter in Building 774 to help protect against "surprise" processing of americium-rich sludges [RF-U128, RF-U135, RF-U157].

4.12 Buildings 776 and 777

Buildings 776 and 777 are a combined complex (referred to as Building 776/777), sharing a common wall, utilities, and maintenance, that was completed in 1957 to accommodate plutonium technological changes and designs. In the late 1950s, a change in the weapon concept occurred, which resulted in an increase in plutonium relative to uranium content. In addition, different shapes of plutonium with closer dimensional tolerances were also required. This required more rolling, forming, and machining of plutonium than in the earlier years of production [RF-P047, RF-P084, RF-U015].

These facilities contain foundry, machining, plutonium storage, and assembly operations [RF-P116]. As a result of the new construction and expansion of the C-Plant (Building 771), and the 1957 fire in Building 771, the plutonium foundry and machining operations were transferred to Building 776 from Building 771 in 1958. Likewise, the assembly and certification operations were transferred to Building 777 from Building 991 [RF-P047, RF-P084, RF-U115].

The mission of Building 776 was plutonium components manufacturing, including casting and plutonium parts fabrication from 1958 through 1969. This building was the main manufacturing facility for plutonium weapons components. The production pyrochemical operation was also located in Building 776 and the operation was expanded in 1967 to accommodate the MSE process. The MSE process was used to remove americium, and the spent pyrochemical salts were used as the feed source for the americium purification process [RF-P084, RF-P085, RF-U115]. The mission of Building 777 was

Specifics on the amount of CPR present in waste containers are not provided in the AK record. As a conservative measure, it may be assumed that the Type I combustible and Type II filter paper wastes are predominately CPR, and that some of the Type III filter waste was generated prior to 1957 and is combustible. It should also be assumed that one-half of the waste identified for the combination of Type I and V is also comprised of CPR [RF-D001].

There are no written reports of munitions or firearms identified as being placed in waste containers; however, there is testimony by RFP personnel that there were as many as four revolvers confiscated from guards by Health Physics on the day of the Building 776 1969 fire [RF-P047]. It is not known whether munitions were included with the weapons.

4.12.2 Chemical Constituents

A variety of chemicals used during operations conducted in Building 776/777, and the associated process and/or use are presented in Table 4-36.

Table 4-36. Chemical contaminants used in Building 776/777.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
1,1,1-trichloroethane	Components cleaning [RF-P084]
Acetone	Components cleaning [RF-C167, RF-P084]
Carbon tetrachloride	1957–1969 cleaning and degreasing machined parts [RF-C234, RF-P047, RF-P084, RF-U143]
Ethanol	Components cleaning [RF-P084]
Formula 409	Decontamination and fire clean-up [RF-U167]
Freon	Cleaning agent [RF-C502]
Isopropyl alcohol	Cleaning activities until 1963–1964 [RF-P084]
Paint; strippable	Fire cleanup contamination removal [RF-C171]
Shell Vitrea cutting oil	Machining in Building 776 [RF-P084]
Tetrachloroethylene	Cleaning and degreasing [RF-C195, RF-P084]
Texaco Regal Oil	Machining [RF-P084]
Trichloroethylene	1957–1969 cleaning plutonium parts in assembly process [RF-C196, RF-P084]
Metals	
Beryllium (trace amounts)	Metal component [RF-P084, RF-U038, RF-U124, RF-U150]
Chromium (includes chromium trioxide)	Anti-microbial additive to Kathene air drying system [RF-P084]
Gallium	Alloying plutonium [RF-C502]
Lead	Shielding in the form of lead and leaded glass; leaded rubber gloves; welding rods [RF-P047, RF-P084, RF-U124, RF-U167]

Table 4-36. (continued).

Constituent	Generator/Process/Use (if known)
Lithium	Special order work [RF-P064]
Magnesium	Carrier on the conveyor lines [RF-C502]
Silver	Metal component [RF-P084]
Other Chemicals/Constituents	
Calcium fluoride	Mold coating [RF-C502]
Lithium chloride (Kathene)	Solution used for air-drying system [RF-P084]
Magnesium chloride	MSE
Nitric acid	[RF-U143]
Potassium chloride	MSE
Sodium chloride	MSE

4.12.3 Radionuclides

Weapons grade plutonium, EU, and DU were commonly used in the Building 776/777 processes. These radioisotopes and related isotopes that may be present in wastes generated from Building 776/777 are listed in Table 4-37. Radioisotopic content for individual wastes or specific to the RFP buildings cannot be determined; however, radioisotopic content for all RFP waste was estimated and is discussed in detail in Section 7.

Table 4-37. Radioisotopes expected to be present in Building 776/777 wastes [RF-P084, RF-P085, RF-U115].

Radionuclides	
^{241}Am	^{237}Np
^{238}Pu	^{241}Pu
^{239}Pu	^{234}U
^{240}Pu	^{235}U
^{242}Pu	^{238}U

4.13.2 Chemical Constituents

A variety of chemicals were used in Building 779 processes that may be present in the wastes, as shown in Table 4-39.

Table 4-39. Chemicals used in Building 779.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
1,1,1-trichloroethane	Chemistry technology [RF-P040]
Acetone[a]	Unknown—chemical inventory [RF-C215]
Carbon tetrachloride	Chemistry technology, physical metallurgy [RF-C223, RF-P085, RF-U188]
Chloroform	Chemistry technology [RF-P085]
Ethanol[a]	Unknown – chemical inventory [RF-C215]
Freon	Physical metallurgy [RF-P040]
Kerosene	Unknown—chemical inventory [RF-C215]
Methylene chloride	Physical metallurgy [RF-P040]
Oil; lubricant and coolant	Physical metallurgy [RF-C223]
Oil; silicone	Unknown—chemical inventory [RF-C215]
Oxalic acid	Physical metallurgy, joining and coatings [RF-P040]
Trichloroethylene[a]	Unknown—chemical inventory [RF-C215]
Xylene[a]	Unknown—chemical inventory [RF-C215]
Metals	
Chromium	Chemistry technology, physical metallurgy [RF-P085, RF-U208]
Lead	Unknown [RF-P085]
Mercury	Unknown—chemical inventory [RF-C215]
Silver	Unknown—chemical inventory [RF-C215]
Other Chemicals/Constituents	
Ammonium hydroxide	Chemistry technology [RF-P040]
Calcium chloride	Chemistry technology [RF-P040]
Copper sulfate	Joining and coatings [RF-P040]
Dimethylamine	Chemistry technology [RF-P040]
Hydrazine	Chemistry technology [RF-P040, RF-P085]
Hydrochloric acid	Chemistry technology [RF-P040, RF-U208]
Hydrofluoric acid	Joining and coatings [RF-P040]
Lithium perchlorate	Chemistry technology [RF-U208]

Table 4-39. (continued).

Constituent	Generator/Process/Use (if known)
Magnesium chloride	Pyrochemical operations [RF-C502]
Nickel (nickel sulfate crystals)	Chemistry technology [RF-P085]
Nitric acid	Chemistry technology, physical metallurgy, joining and coatings [RF-P040, RF-P085]
Oakite	Unknown [RF-U188]
Perchloric acid	Chemistry technology [RF-U208]
Phosphoric acid	Joining and coatings [RF-P040]
Potassium chloride	Pyrochemical operations [RF-C502]
Potassium chromate	Unknown [RF-P085]
Potassium dichromate	Physical metallurgy [RF-P085]
Soda lime	Chemistry technology [RF-P040]
Sodium chloride	Pyrochemical operations [RF-C502]
Sodium dichromate	Chemistry technology [RF-P085]
Sodium hydroxide	Joining and coatings [RF-P040]
Sulfuric acid	Joining and coatings [RF-P040]
Xenon trioxide	Chemistry technology [RF-U208]

a. Common laboratory solvents.

4.13.3 Radionuclides

Actinide elements, compounds, and other radioactive materials encountered in the process chemistry laboratories included the isotopes listed in Table 4-40 as well as other associated tracer isotopes or radioactive decay products. Radioisotopic content for individual wastes or specific to RFP buildings cannot be determined. Radioisotopic content for all RFP waste is discussed in detail in Section 7.

Table 4-40. Radioisotopes expected to be present in Building 779 wastes [RF-P040, RF-P084, RF-P085, RF-U115].

Radionuclides	Additional Radionuclides
^{241}Am	^{60}Co
^{238}Pu	^{3}H
^{239}Pu	^{237}Np
^{240}Pu	^{241}Pu
^{242}Pu	^{232}Th
^{238}U	^{234}U
^{90}Sr (^{90}Y)	^{235}U

The volume of the waste types (I through VII) and noncombustible debris from ^{233}U process and empty drums generated from Building 881 is presented by year of shipment in Appendix D (Table D-21 and Figure D-11). The increases in combustible and noncombustible debris wastes during the late 1960s as EU operations in Building 881 wound down as illustrated in Figure D-11. During clean out, an increase in debris would have been expected.

4.14.2 Chemical Constituents

A variety of chemicals was used in Building 881 waste generating processes. The chemicals and the corresponding process or use, if known, are presented in Table 4-42.

Table 4-42. Chemicals used in Building 881.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
1,1,1-trichloroethane	Laboratory use [RF-C214]
Acetic acid	Unknown—chemical inventory [RF-C227]
Alcohol	Unknown—chemical inventory [RF-C227]
Anchorlube	Unknown—chemical inventory [RF-C215]
Carbon tetrachloride	Laboratory use [RF-C214]
Chloroform	Laboratory use [RF-C214]
Citric acid	EU recovery [RF-P084]
Dibutylcarbitol	EU recovery [RF-P084]
Epoxy glues	Special projects [RF-P084]
Ethanol	Special projects [RF-P084]
Ethylene dibromide	Laboratory use [RF-C214]
Ethylene dichloride	Laboratory use [RF-C214]
Freon; unspecified	EU recovery [RF-P084]
Freon 113	Special projects [RF-P084]
Freon 12	Special projects [RF-P084]
Genesolv-D (trichlorotrifluoroethane)	Unknown—chemical inventory [RF-C215]
Lubricating oil	Special projects [RF-P084]
Malonic acid	EU recovery [RF-P084]
Methylene chloride	Laboratory use [RF-C214]
Nitradd	EU recovery [RF-P084]
Ortho-dichlorobenzene	Laboratory use [RF-C214]
Oxalic acid	Unknown—chemical inventory [RF-C227]
Sani-Phene Disinfectant	Unknown—chemical inventory [RF-C215]
Tetrachloroethylene	EU recovery [RF-P084]
Texaco Soluble D	Unknown—chemical inventory [RF-C215]
Transul Tex 210	Unknown—chemical inventory [RF-C215]
Trichloroethylene	Laboratory use [RF-C214, RF-C227]

Table 4-42. (continued).

Constituent	Generator/Process/Use (if known)
Trichlorotrifluoroethane	Laboratory use [RF-C214]
Winterfene disinfectant	Unknown—chemical inventory [RF-C215]
Metals	
Aluminum oxide	Unknown—chemical inventory [RF-C227]
Beryllium	Unknown—chemical inventory [RF-C227]
Cadmium	EU recovery [RF-P084]
Cadmium oxide	Unknown—chemical inventory [RF-C227]
Chromium (includes chromium trioxide)	Unknown—chemical inventory [RF-C227]
Lithium	EU recovery [RF-P064, RF-P084]
Magnesium oxide	Unknown—chemical inventory [RF-C227]
Other Chemicals/Constituents	
Aluminum nitrate	Unknown—chemical inventory [RF-C227]
Ammonia gas	EU recovery [RF-P084]
Ammonium bifluoride	Unknown—chemical inventory [RF-C227]
Ammonium hydroxide	Unknown—chemical inventory [RF-C227]
Boric acid	Unknown—chemical inventory [RF-C227]
Copper sulfate	Unknown—chemical inventory [RF-C227]
Cyanide plating solution	Plating operations [RF-C420, RF-P260]
Helium	Unknown—chemical inventory [RF-C227]
Hydrazine	Unknown—chemical inventory [RF-C227]
Hydrofluoric acid ($HF-H_2$)	Unknown—chemical inventory [RF-C227]
Hydrogen peroxide 30%	EU recovery [RF-P084]
Magnesium zirconate	Unknown—chemical inventory [RF-C227]
Nitric acid	Unknown—chemical inventory [RF-C227]
Potassium chloride	Unknown—chemical inventory [RF-C227]
Potassium hydroxide	Unknown—chemical inventory [RF-C227]
Sodium bicarbonate	Unknown—chemical inventory [RF-C227]
Sodium hydroxide	Unknown—chemical inventory [RF-C227]
Uranyl nitrate	EU recovery [RF-P084]

4.14.3 Radionuclides

The radioisotopes that may be present in waste generated from Building 881 are listed in Table 4-43; however, specific concentrations of each isotope are unknown [RF-P064, RF-P084]. EU production started in 1953. Beginning in 1964, EU work was curtailed in Building 881 and 883 as the RFP mission of producing EU components was transferred to the Oak Ridge Y-12 Plant. Limited operations associated with shut down and cleanup of residual EU in Building 881 continued through 1967 [RF-P084, RF-P105]. Some radionuclide traces and other radioisotopes were used in Building 881 for

ACRONYMS AND ABBREVIATIONS

AEC	Atomic Energy Commission
ANL-W	Argonne National Laboratory-West
AK	acceptable knowledge
ARA-I	Auxiliary Reactor Area-I
ATMX	U.S. Department of Energy acronym used to denote the railroad cars used to ship waste from the RFP to the INEEL
BOR	United States Bureau of Reclamation
BWI	Buried Waste Information
CBFO	Carlsbad Field Office
CH	contact-handled
Ci	curie
Ci/g	curies per gram
CFC	chlorofluoro-hydrocarbon
CPC	Coors Porcelain Company
CPR	cellulosics, plastic, and rubber
CUM	University of Colorado Medical Center
CWS	Chemical Warfare Service
D-38	Tuballoy, a depleted uranium form with less of the fissionable ^{235}U isotope than the approximate 0.7 percent by weight found in natural uranium and rich in the ^{238}U isotope
DOE	Department of Energy
DOR	direct oxide reduction
DOT	Department of Transportation
Dow	Dow Chemical Company
DRI	Denver Research Institute
DU	depleted uranium
EDL	economic discard limit

EU	enriched uranium
EWR	Early Waste Retrieval
ft	foot
ft^2	square foot
g	gram
g/ft^3	gram per cubic foot
g/g	gram per gram
g/L	gram per liter
gal	gallon
GEM	Glovebox Excavator Method
HEPA	high-efficiency particulate air (filter)
hr	hour
HWN	hazardous waste number
IAD	Immediate Action Directive
ICC	Interstate Commerce Commission
IDC	item description code
IDR	initial drum retrieval
in.	inch(s)
INEEL	Idaho National Engineering and Environmental Laboratory
kg	kilogram
L	liter
LAFB	Lowry Air Force Base
lb	pound
LGW	line-generated waste
LLW	low-level waste
LRL	Lawrence Radiation Laboratory

M	molar
m	meter
m^3	cubic meter
mCi	mega curie
MLLW	mixed-low-level waste
mm	millimeter
MOCA	4,4-methylene-bis(2-chloraniline)
mr	millirem
mR/hr	mill roentgen per hour
mrem/hr	millirem per hour
MS	Material Status
MSE	molten salt extraction
MTD	empty drum (used on the empty contaminated lathe coolant [oil] drums)
MTC	empty container
MUD	impure materials contaminated with EU ground to a fine powder for nitric acid leaching (the nitric acid solution was filtered and the solids collected from the process were called MUD)
MUF	material unaccounted for
NDA	nondestructive assay
NOL	normal operating loss
NRTS	National Reactor Testing Station
ORNL	Oak Ridge National Laboratory
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene (perchloroethylene)
ppb	parts per billion
ppm	parts per million
PVC	polyvinyl chloride
R&D	research and development

RCRA	Resource Conservation and Recovery Act
RFETS	Rocky Flats Environmental Technology Site
RFP	Rocky Flats Plant
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area
SNM	special nuclear material
SOM	Colorado School of Mines
SRO	Special Recovery Operation
SRWRT	Solid Radioactive Waste Retrieval Test
SS	special source
SS&C	sand, slag, and crucible
SSNM	strategic special nuclear material
SUN	Sunstrand Manufacturing
TBP	tributyl phosphate
TCA	1,1,1-trichloroethane
TCE	trichloroethylene
TOSCO	The Oil Shale Company
TRU	transuranic
USGS	United States Geological Survey
VA	Veterans Administration
W	watt
WAC	waste acceptance criteria
WILD	Waste Information and Location Database
WIPP	Waste Isolation Pilot Plant
WR	War Reserve
Wt%	weight percent

4.19.2 Chemical Constituents

A variety of chemicals were used in Building 991 that might be present in the wastes. These chemical contaminants are listed in Table 4-55.

Table 4-55. Chemicals used in Building 991.

Constituent	Generator/Process/Use (if known)
Organic Compounds	
140-66 solvent	Nonplutonium physical metallurgy process [RF-P084]
2,2,2-trifluoroethanol	Nonplutonium physical metallurgy process [RF-P084]
2-butoxyethanol	Nonplutonium physical metallurgy process [RF-P084]
3-methylcyclohexanol	Nonplutonium physical metallurgy process [RF-P084]
Acetone	Final assembly [RF-P084]
Alcohols	Alarm maintenance [RF-P084]
Butyl lactate	Nonplutonium physical metallurgy process [RF-P084]
Diacetone	Nonplutonium physical metallurgy process [RF-P084]
Diglyme bis (2-methoxylethyl) ether	Nonplutonium physical metallurgy process [RF-P085]
Dodecane	Nonplutonium physical metallurgy process [RF-P084]
Ethyl acetate	Nonplutonium physical metallurgy process [RF-P084]
Freon 12 or 22	Utilities and maintenance [RF-P084]
Glue/adhesives	Shipping and receiving, alarm maintenance
Hexane	Nonplutonium physical metallurgy process [RF-P084]
Hexanol	Nonplutonium physical metallurgy process [RF-P084]
Isopropyl alcohol	Metallography laboratory [RF-P085]
Lubribrand A	Shipping and receiving [RF-P084, RF-P085]
Methyl acetonacetate	Nonplutonium physical metallurgy process [RF-P084]
Oakite	Inspection testing [RF-P084]
Octanol	Nonplutonium physical metallurgy process [RF-P084]
Oil; lubricant	Utilities and maintenance [RF-P084]
Oil; machining	Nonplutonium physical metallurgy process [RF-P084]
Organic solvents; unspecified	Alarm maintenance [RF-P084]
Oxalic acid	Metallography lab [RF-P084]
Paint	Shipping and receiving [RF-P084, RF-P085]
Polychlorinated biphenyls	Utilities and maintenance [RF-P084]
Tetradecane	Nonplutonium physical metallurgy process [RF-P084]
Trichloroethylene	Final assembly [RF-P084]

Table 4-55. (continued).

Constituent	Generator/Process/Use (if known)
Trifluoroacetic anhydride	Nonplutonium physical metallurgy process [RF-P084]
Trim Sol cutting oil	Metallography lab [RF-P084]
Triple C Cleaner	Shipping and receiving [RF-P084]
Ultrasonic coupling gel	Nondestructive testing [RF-P084]
Metals	
Beryllium	Final assembly [RF-P085]
DU	Final assembly [RF-P085]
EU	Final assembly [RF-P085]
Lead (paints)	Utilities and maintenance, alarm maintenance [RF-P084, RF-P085]
Plutonium	Final assembly [RF-P085]
Other Chemicals/Constituents	
Acids; unspecified	Alarm maintenance [RF-P084]
Alumina grinding paper	Metallography lab [RF-P084]
Developer solutions and cleaner	Nondestructive testing [RF-P084]
Diamond paste	Metallography lab [RF-P084]
Dye penetrant	Nondestructive testing [RF-P084]
Dye penetrant cleaner	Nondestructive testing [RF-P084]
Film	Nondestructive testing [RF-P084]
Fluorescent light bulbs	Utilities and maintenance [RF-P084]
Hydrochloric acid	Metallography lab [RF-P084]
Nitric acid	Metallography lab [RF-P084]
Phosphoric acid	Metallography lab [RF-P084]
Photographic fixer	Nondestructive testing [RF-P084]
Polishing solutions, nonhazardous	Metallography lab [RF-P084]
Silicon carbide grinding paper	Metallography lab [RF-P084]
Sodium bicarbonate	Shipping and receiving [RF-P084, RF-P085]

4.19.3 Radionuclides

The radioisotopes that may be present in wastes generated in Building 991 processes are listed in Table 4-56. Radioisotopic content for individual wastes or specific to the RFP buildings cannot be determined; however, radioisotopic content for all RFP waste is discussed in detail in Section 7.

Table 4-56. Radionuclides expected to be present in Building 991 [RF-P041].

Radionuclides	
^{241}Am	^{242}Pu
^{238}Pu	^{235}U
^{239}Pu	^{238}U
^{240}Pu	^{234}U
^{241}Pu	^{236}U

4.20 Building 995

Building 995 was originally constructed in 1953 as the main structure supporting the sanitary sewer system at the RFP and has served that function since then. The building has two additions since 1953. The first, built in the late 1980s, housed upgraded monitoring instrumentation and increased the size of the onsite laboratory. The second, built in the mid-1990s, provided an additional onsite laboratory, office space, and restroom facilities [RF-P096].

4.20.1 Physical Waste Matrices Generated

A total of 89 containers (574 ft^3) were generated from activities conducted in Building 995. These numbers were compiled from the WILD [RF-U1070] and grouped into the seven waste types as described in Section 3.4 and presented in Table 4-57. Appendix A contains a more detailed presentation of the original waste type assignments entered into the WILD as well as delineation into the seven final waste types. See Appendix D (Table D-27) for a timeline showing volume of waste by year shipped to the INEEL as compiled from the WILD [RF-U1070].

Table 4-57. Waste volumes shipped to the INEEL designated 995 [RF-U1070].

	Building 995, Sewage Treatment Plant		
Waste Type	Waste Description	Container Count	Volume (ft^3)
I	Combustibles	0	0
I and V	Combustibles and noncombustibles	47	265
II	Filter paper	0	0
III	Filters	0	0
IV	Inorganic sludges	42	309
V	Noncombustibles	0	0
VI	Organic wastes	0	0
VII	Beryllium-contaminated debris	0	0
	Total	89	574

Between 1962 and 1965, expansion and changes occurred to some of the recovery processes in Building 771 that allowed for substantial increase in production rates for plutonium recovery [RF-P091]. Although the molten salt extraction (MSE) process was developed in Building 771, the production furnaces were located in Building 776. The addition of dissolution lines, filtrate recover, batching, calcination and fluorination operations allowed for an increase in plutonium recycling production. The various recovery processes available (i.e., the slow and fast cycle recoveries and later MSE in Building 776) allowed plant operators to select the optimal recovery technology for residues bearing plutonium above the EDL.

Waste generating operations in Building 771 included plutonium part fabrication, plutonium recovery, plutonium purification, anion exchange processing, chemical recovery, americium recovery, and various support activities, as follows:

- Plutonium part fabrication in Building 771 included foundry, casting, machining, coating, inspection and testing, radiography, holding, and shipping. Plutonium casting and machining operations generated the following line-generated residues: casting skull; split copper molds; drybox gloves; worn or obsolete equipment; cutting oil and solvent; glovebox filters; CWS filters; combustible materials such as paper, plastic, and rags; and spent cutting oil and solvent. These residues were processed through the recovery processes on the north side of the facility. The spent cutting oil and solvent were drummed, originally for shipment and later for storage [RF-C055, RF-P047, RF-P085, RF-P091, RF-P108, RF-P265].

- Recovery operations in Building 771 focused on recovery of fissionable radioisotopes. The plutonium recovery and purification process is illustrated in Figure 4-4. The recovery operations were composed of essentially two processes termed the fast recycle or fast side process and slow recycle or slow side process [RF-P084, RF-P085, RF-P091, RF-P099, RF-P103, RF-P108, RF-P116, RF-P162, RF-P262, RF-P264, RF-U157].

  The feed to the fast recycle process was residues having high plutonium concentrations, such as casting skull, impure metal, plutonium oxide, and site-return plutonium metal. The materials were dissolved in a series of dissolution steps and treated to produce a final plutonium metal "button." Recovery liquid wastes generated by fast cycle recovery were either transferred over to slow cycle recovery or sent to Building 774 for treatment, provided sampling of the liquid wastes demonstrated that radioactivity concentrations were within acceptable levels for release and subsequent treatment.

  Slow recycle recovery operations involved different types of processes depending on the nature of the feed wastes to be handled. Examples of the feed waste used in the slow cycle process are:

  - Metal contaminated with plutonium was processed through a metal leach process.

  - Combustible residues except glovebox gloves, graphite molds, and used ion exchange resin were incinerated to reduce the volume and convert the plutonium to an oxide.

  - The incinerator ash, some graphite, graphite scarfings, incinerator firebrick scarfings, SS&C, insulation, tantalum, glass, and filter sludge were leached with a nitric-hydrofluoric acid mixture.

Table 4-12. Wastes generated from Building 444 activities [RF-U1070].

Waste Type	Building 444 A-Plant, DU, and Beryllium Metallurgy		
	Waste Description	Container Count	Volume (ft^3)
I	Combustibles	4,327	31,473
I and V	Combustibles and noncombustibles	4,614	561
II	Filter paper	1,008	182
III	Filters	1,171	6,918
IV	Inorganic sludges	126	836
V	Noncombustibles	10,878	95,610
VI	Organic wastes	38	276
VII	Beryllium-contaminated debris	2,517	20,526
	Total	24,679	211,481

Waste Type I consists of combustible debris including large quantities of sandpaper and emery cloth; butcher paper used to cover worktables during coating; and other paper, plastic, and rubber materials. To estimate the amount of CPR contained in the waste generated from Building 444 activities, the following assumptions were made:

- Because the Type I waste consists of combustibles including paper products, plastics, and rubber items, the contents of the drums identified as Type I are assumed to be predominantly CPR.

- Type II filter paper is also combustible debris waste, as are the Type III CWS filters generated prior to 1957; these are, therefore, CPR waste [RF-D001]. After the 1957 fire in Building 771, all combustible-type CWS filters in all buildings across the RFP were replaced with fire-resistant HEPA filters [RF-P265, RF-U057].

- As a conservative measure, one half of the wastes identified under the combined I and V waste types will be assumed to be Type I combustible debris and predominantly composed of CPR materials.

All aqueous and organic liquids and solid wastes generated in Building 444 were contaminated with uranium and beryllium. Liquid wastes contaminated with uranium were sent to Building 774 for processing, and solid debris wastes (Types I, I and V, II, III, and V) were directly packaged as wastes. Building 444 equipment and/or apparatus that moved air and/or displaced air had CWS and/or HEPA filtering system(s), including furnace vacuum pump exhausts. The spent filters were contaminated with beryllium or beryllium oxide and disposed of as Type III waste [RF-D001, RF-P084, RF-U115].

Metal bricks that were used to line the furnaces were contaminated with DU and were discarded as Type V waste. Graphite molds were sent for cleaning to remove residual metal, powdered graphite, and yttrium oxide. Wastes from the cleaning process were [RF-U115]:

- Graphite dust disposed of onsite in the RFP landfill.

- Spent graphite molds, generally disposed of as whole molds [RF-P105].

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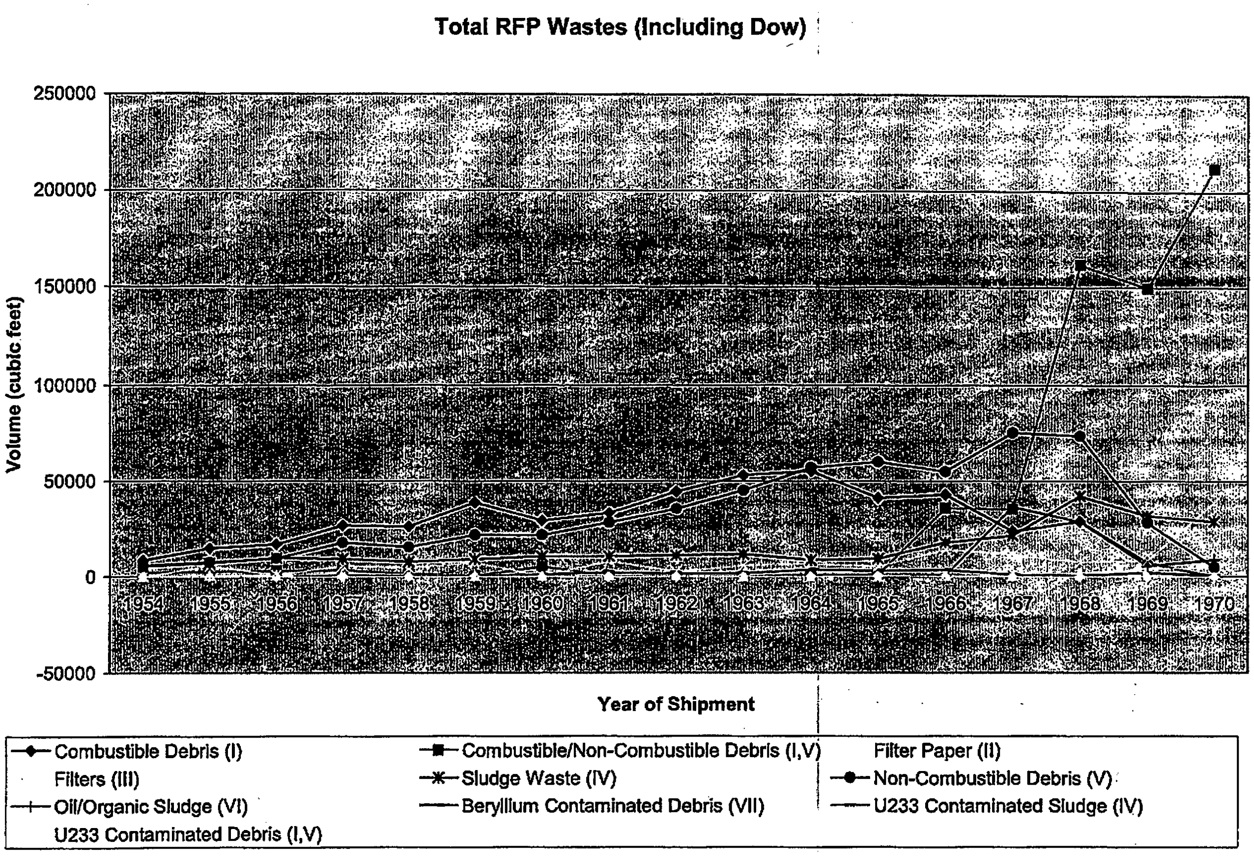

Figure D-16. Total RFP waste by year of shipment.

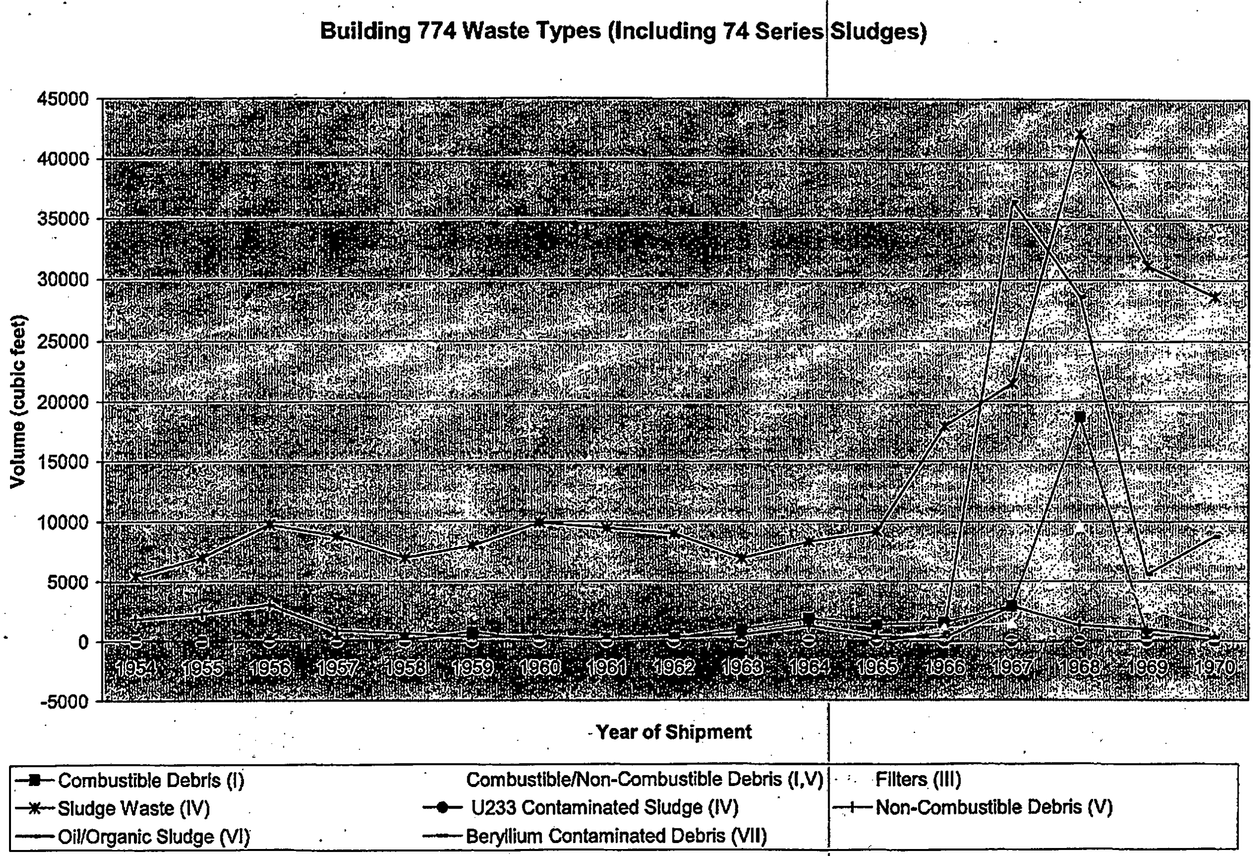

Figure D-6. Volume of Building 774 waste types (including 74 sludges) by year of shipment (Type V and I,V wastes do not include roaster oxide, graphite, line generated waste, fire waste, and empty drums).

Table D-33. DOW Construction specific Type V and I,V wastes by year of shipment.

DOW Construction Specific Type V and I,V Wastes

(Not included in Non-combustible or Combustible/Non-combustible debris tabulations)

Volume (cubic feet)

Year of Shipment	Empty Drums (V)	Line Generated Waste (I,V)	Roaster Oxide (V)
1954	0	0	0
1955	0	0	0
1956	0	0	0
1957	0	0	0
1958	0	0	0
1959	0	0	0
1960	0	0	0
1961	0	0	0
1962	0	0	0
1963	0	0	0
1964	0	0	0
1965	0	0	0
1966	0	132	0
1967	0	0	0
1968	665	0	0
1969	0	0	1117
1970	0	0	0
TOTAL (ft^3)	665	132	1117

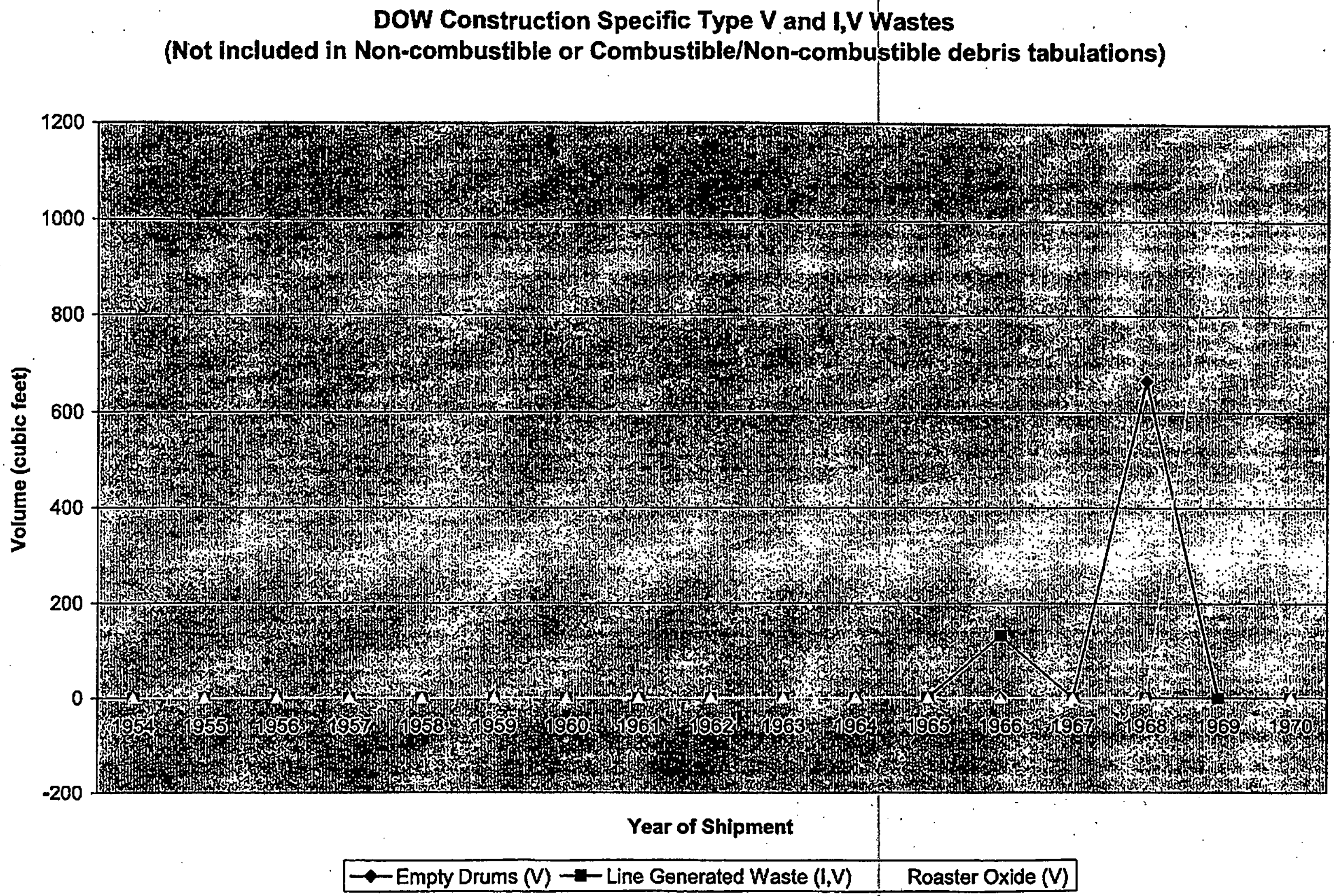

Figure D-15. DOW Construction specific Type V and I,V wastes by year of shipment.

Table D-34. Lowry Air Force Base waste types by year of shipment.

Lowry Air Force Base (LAFB) Waste Types
Volume (cubic feet)

Year of Shipment	Combustible Debris (I)	Combustible/ Non-Combustible Debris (I,V)	Filter Paper (II)	Filters (III)	Sludge Waste (IV)	Non-Combustible Debris (V)	Oil/Organic Sludge (VI)	Beryllium Contaminated Debris (VII)
1954	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0
1957	59	0	0	0	0	1	0	0
1958	60	0	0	0	0	0	0	0
1959	15	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0
1961	14	0	0	0	0	14	0	0
1962	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0
TOTAL (ft^3)	148	0	0	0	0	15	0	0

A chart was not created for this building due to the small volume of waste and/or few waste types

Table D-35. Lawrence Radiation Lab waste types by year of shipment.

Lawrence Radiation Lab (LRL) Waste Types
Volume (cubic feet)

Year of Shipment	Combustible Debris (I)	Combustible/ Non-Combustible Debris (I,V)	Filter Paper (II)	Filters (III)	Sludge Waste (IV)	Non-Combustible Debris (V)	Oil/Organic Sludge (VI)	Beryllium Contaminated Debris (VII)
1954	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0
1963	309	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0
TOTAL (ft^3)	309	0	0	0	0	0	0	0

A chart was not created for this building due to the small volume of waste and/or few waste types

Table D-36. Martin Aircraft waste types by year of shipment.

Martin Aircraft (Martin) Waste Types

Volume (cubic feet)

Year of Shipment	Combustible Debris (I)	Combustible/ Non-Combustible Debris (I,V)	Filter Paper (II)	Filters (III)	Sludge Waste (IV)	Non-Combustible Debris (V)	Oil/Organic Sludge (VI)	Beryllium Contaminated Debris (VII)
1954	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	65	0	0
1958	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0
TOTAL (ft^3)	0	0	0	0	0	65	0	0

A chart was not created for this building due to the small volume of waste and/or few waste types

Table D-37. Colorado School of Mines waste types by year of shipment.

Colorado School of Mines (SOM) Waste Types

Volume (cubic feet)

Year of Shipment	Combustible Debris (I)	Combustible/ Non-Combustible Debris (I,V)	Filter Paper (II)	Filters (III)	Sludge Waste (IV)	Non-Combustible Debris (V)	Oil/Organic Sludge (VI)	Beryllium Contaminated Debris (VII)
1954	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0
1964	22	0	0	0	0	7	0	0
1965	36	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0
TOTAL (ft^3)	58	0	0	0	0	7	0	0

A chart was not created for this building due to the small volume of waste and/or few waste types

Table D-38. Sunstrand waste types by year of shipment.

Sunstrand (SUN) Waste Types

Volume (cubic feet)

Year of Shipment	Combustible Debris (I)	Combustible/ Non-Combustible Debris (I,V)	Filter Paper (II)	Filters (III)	Sludge Waste (IV)	Non-Combustible Debris (V)	Oil/Organic Sludge (VI)	Beryllium Contaminated Debris (VII)
1954	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	139	0	0
1959	0	0	0	0	0	183	0	0
1960	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	8	0	0
1962	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0
TOTAL (ft^3)	0	0	0	0	0	330	0	0

A chart was not created for this building due to the small volume of waste and/or few waste types

Table D-39. The Oil Shale Corporation waste types by year of shipment.

The Oil Shale Corporation (TOSCO) Waste Types

Volume (cubic feet)

Year of Shipment	Combustible Debris (I)	Combustible/ Non-Combustible Debris (I,V)	Filter Paper (II)	Filters (III)	Sludge Waste (IV)	Non-Combustible Debris (V)	Oil/Organic Sludge (VI)	Beryllium Contaminated Debris (VII)
1954	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	183	0
TOTAL (ft^3)	0	0	0	0	0	0	183	0

A chart was not created for this building due to the small volume of waste and/or few waste types

Table D-40. U.S. Geological Survey waste types by year of shipment.

U.S. Geological Survey (USGS) Waste Types
Volume (cubic feet)

Year of Shipment	Combustible Debris (I)	Combustible/ Non-Combustible Debris (I,V)	Filter Paper (II)	Filters (III)	Sludge Waste (IV)	Non-Combustible Debris (V)	Oil/Organic Sludge (VI)	Beryllium Contaminated Debris (VII)
1954	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0
1965	7	0	0	0	0	0	0	0
1966	0	0	0	0	0	7	0	0
1967	0	7	0	0	0	15	0	0
1968	0	0	0	0	0	7	0	0
1969	0	66	0	0	0	0	0	0
1970	0	66	0	0	0	0	0	0
TOTAL (ft^3)	7	139	0	0	0	29	0	0

A chart was not created for this building due to the small volume of waste and/or few waste types

Table D-41. Total RFP waste by year of shipment.

Total RFP Wastes (including Dow*)
Volume (cubic feet)

Year of Shipment	Combustible Debris (I)	Combustible/ Non-Combustible Debris (I,V)	Filter Paper (II)	Filters (III)	Sludge Waste (IV)	Non-Combustible Debris (V)	Oil/Organic Sludge (VI)	Beryllium Contaminated Debris (VII)	U233 Contaminated Sludge (IV)	U233 Contaminated Debris (I,V)
1954	8554	2034	0	0	5527	5873	0	0	0	0
1955	14924	2803	760	5502	7103	7621	0	0	0	0
1956	17008	3073	754	1026	9885	9649	0	0	0	0
1957	26749	3363	1683	5608	9364	17860	274	0	0	0
1958	26221	1417	957	4424	7687	15445	429	102	0	0
1959	38769	483	388	7287	9138	21828	0	307	0	0
1960	29352	5247	390	478	10506	21878	338	1079	0	0
1961	33388	781	786	8005	10531	28309	160	2200	0	0
1962	44561	367	719	2937	11140	35529	153	1494	0	0
1963	63182	146	154	5713	11707	45136	65	1680	0	0
1964	55367	572	0	6656	8646	57170	0	3748	0	0
1965	41240	1047	7	5335	9429	60282	0	3299	7	418
1966	42936	35853	313	14077	17986	55265	675	3628	0	139
1967	23874	35224	419	11484	21535	75678	38528	1026	0	0
1968	28952	161588	1831	7429	42222	73928	28637	514	0	15
1969	7313	149499	4287	8386	31769	28288	5561	2035	0	0
1970	29	212227	4646	38745	28946	5129	8729	581	0	0
TOTAL (ft^3)	492420	615725	17996	133070	253121	564870	81549	21694	7	572

* Wastes designated under the RFODOW generator have been included because it is believed the majority of this waste is RFP waste.