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Appendix A to Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation, Sandia National Laboratories, Albuquerque, New Mexico

U.S. Department of Energy

Sandia National Laboratories

Appendix A
Mixed Waste Landfill Inventory

The following inventory by pit and trench was compiled from classified and unclassified disposal records, interviews with current and retired employees, solid waste information sheets, and nuclear material management records. Considerable effort was made to maintain consistency in nomenclature and units. Commonly used acronyms are as follows:

1) *MFP—multiple fission products: the nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragment's radioactive decay.*

2) *DU—depleted uranium*

3) *Activation—the process of making a material radioactive by bombardment with neutron, protons or other nuclear radiation.*

4) *Induced activity—radioactivity that is created when stable substances are bombarded by neutron e.g., the stable isotope Co-59 becomes the radioactive isotope Co-60 under neutron bombardment.*

Trench A

Differential amplifiers; thermocouples; compressors; MFP- and tritium-contaminated fume hoods, ducting, motors, fans, and plenums; TV cameras, tripods, and telemetry components; MFP-contaminated cooling systems, coils, surge tanks (5 ft diameter X 11 ft long), piping, pumps, couplings, and valves; experimental stainless steel canisters; 17 each 55-gallon drums containing MFP-contaminated demineralizer resin; 2 each 55-gallon drums of MFP-contaminated concrete; empty oxygen cylinders; boxes of fluorescent light bulbs; roll-up door and associated equipment from TA-5 KIVA; shield door from reactor pit; voltage-controlled oscillators, calibrators, and gyros; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; tritium luminary dials; military radium altimeters and gauges; Ni-63 tube; parachute; Sr-90 nuclear cells; flash heating equipment and associated parts; MFP-contaminated L-shaped aluminum chassis; DU in graphite matrix; stainless steel ducting; 61 each spark gap tubes (100 mrem/hr on contact); aluminum sleeve with lead ballast; tritium beds and valves; shock jigs with tubes; 31 each 0.5 Ci Kr-85 tubes and cells; one each 20 ft long X 2 ft diameter heat exchanger, coolant pumps, piping, and valving; air conditioners; tritium targets (10 Ci each) and tubes (100 mCi each); wooden ladder; MFP-, DU-, and tritium-contaminated vacuum cleaners; vacuum pumps and skids; stainless steel sample tubes; irradiated metal samples (5 rem/hr on contact); ion generators; 5-gallons of oil absorbed on vermiculite in sealed A/N can; 128 ft^2 of sheet metal; skid loaded with 300 lbs. of paraffin; 12 each skids of MFP-contaminated concrete blocks, MFP-contaminated lead bricks; 2,600 kg DU.

943 ft^3 of TA-5 routine operational and miscellaneous decontamination waste.

Trench B

HEPA filters, fiberglass filters, final and prefilters; MFP-, DU-, and tritium-contaminated vacuum cleaners; cables; ultra-sonic air samplers; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; MFP- and tritium-contaminated fume hoods, ducting, motors, fans, and plenums; boxes of fluorescent light bulbs; sanding disks; neutron generator tubes; backing plates from TA-5 experimental apparatus; packing materials and wooden shipping crates; metal drums from Nevada Test Site containing DU; alpha-contaminated gas bottles; empty liquid scintillation vials; Ta-182 contaminated platinum-tungsten scrap; heater elements; 10 Ci tritium targets; neutron generator magnets; 14 each empty steel gas cylinders contaminated with DU; 9 each MFP-contaminated ceramic tubes; 1.5-gallons of solvents absorbed on vermiculite in sealed A/N cans; 6 each small storage cabinets; vacuum system components including water circulators, valves, diffusion pumps, fittings, gas analyzers, and vacuum pumps; gas sample bottles from Nevada Test Site; tritium-contaminated tools; DU metal shavings and cuttings; Victoreen Sr-90 ion chambers; glove box and work bench; demineralizer vessel from reactor; neutron radiograph equipment; thermal reflecting rings; micro scales; Kr-85 light sources; 11 kg deuterium containing 0.25 Ci of tritium; 1-gallon toluene absorbed on vermiculite in sealed A/N can; static meter; Ta-182 pellets; demineralization and radiography tubes.

1326 ft^3 of TA-5 routine operational and miscellaneous decontamination waste.

Trench C

Nuclear fuel shipping cask cleanup debris; tritium and C-14 labeled amino acids and tritium labeled uridine; scrap metal contaminated with DU from burn test; 7.1 Ci tritium pellets; uranyl nitrate; dining car test hardware; MFP-, DU-, and tritium-contaminated vacuum cleaners; vacuum hose contaminated during cleaning of thorium cloth and thorium cloth debris; concrete crucibles used in reactor safety studies; Kr-85 particle size analyzer; 1,000 lead bricks contaminated with tritium and Na-22; 43 MFP-contaminated lead bricks; 73 each integrated circuits; Ba-133 reactor bolts; flexible glove box ducting; 2 each mechanical vacuum pumps; Sr-90 contaminated carpet; Cs-137 spark gaps; Na-22 cleanup materials, source holders, and shield (1.5 rem/hr on contact); DU-contaminated waste containers; tritium-contaminated vacuum system and power supply; DU billet, hemisphere, and sphere; Pu-238 contaminated hood exhaust hose; Co-60 debris from trailer used to support nuclear fuel shipping cask; MFP-contaminated hot exhaust system prefilters, HEPA filters, and absolute pressure filters; containerized DU residue, turnings, metal workings, and cuttings; surge voltage arrester; tritium-contaminated pump; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; wooden shipping crates; 13 each Po-210 contaminated static eliminators; one each 62 mCi Se-75 source and one each 1.0 mCi Ta-182 source in sealed A/N can; tritium-contaminated fume hood and exhaust plenum; 2.0 kg deuterium absorbed on vermiculite in sealed A/N can; 12 each 55-gallon drums of MFP-contaminated spent demineralizer resin; DU-contaminated lucite table; 4 each TV cameras; tritium-contaminated ion pump; 1-gallon tritium-contaminated acetone solidified with Safe-T-Set; 24 kg lithium-6 fluoride; 4 each irradiated high speed cameras, lenses, and one

telescope; one each 0.1 mCi Ra-226/Be source encapsulated in concrete-filled A/N can; 2 each DU-contaminated glove boxes; 32.1 Ci tritium; 377 kg DU.

Trace Eu-152, Ba-133, I-129, Na-22, Sr-90, Ni-63, Tc-99, Gd-153, Ag-110m, Pm-147, Sr-85, Sb-125, Ta-182, Ge-68, Mn-54, and Fe-55.

1,159 ft^3 of TA-5 routine operational and miscellaneous decontamination waste.

Trench D

Compensator and cables from TA-1; tritium-contaminated water and erbium tritide powder; DU-contaminated rocket motors; broken Ra-226 source in plastic holder; corroded and broken 6-ft aluminum step ladder; 13 each 55-gallon drums containing MFP-contaminated spent demineralizer resin; DU residue, turnings, metal workings, and cuttings; MFP-contaminated tape recorders, transmitters, and video cameras; MFP-contaminated compensated ion chamber; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; 4 each aluminum TA-5 KIVA doors from reactor; PEG housing and lid from Nevada Test Site; MFP-contaminated fuel holsters; ultra filters and ultra filter plenums; MFP-contaminated hot exhaust system prefilters, absolute pressure filters, and plenums; HEPA filters; MFP-contaminated conduit and sheet metal; 2 each sealed Cr-57 sources; TA-1 bldg. 802 construction materials and scrap; MFP-, DU-, and tritium-contaminated vacuum cleaners; TA-5 liquid waste disposal system drain pipes; Cypress packaging material from Nevada Test Site; Ming Vaso rad test debris from Nevada Test Site; Snap 27 test debris; Hudson Moon cleanup and packaging materials from Nevada Test Site; Mint Leaf packaging and cleanup materials from Nevada Test Site; Diana Mist packaging and cleanup materials from Nevada Test Site; Thoria cleanup and packaging materials from Nevada Test Site; old KIVA floor including sheet-rock, wood, and miscellaneous waste from installation of new KIVA floor; MFP-contaminated spent demineralizer columns and cartridges; thoria crucibles and tubing; old reactor boiler with associated radiators, piping, and valves; activated reactor stainless steel support tower, cryostat tube and head; empty thorium impact capsules; empty wooden shipping crates for fuel elements; tritium-contaminated power supply, balance, volt meter, ammeter, bridge, vacuum pump, microscope mount, plug-in units, and glass tubes; neutron radiography tube and beam catcher; ultra-sonic bath and power unit; obsolete Bell Labs experimental core tube (10 rem/hr on contact).

2,315 ft^3 of TA-5 routine operational and miscellaneous decontamination waste.

Trench E

38 each 55-gallon drums of MFP-contaminated spent demineralizer resin; 7 each 55-gallon drums from Three Mile Island containing MFP-contaminated cables, instruments, and electronic components; 11 each Po-210 contaminated static eliminators; 10-gallons Cs-137 solution solidified with Safe-T-Set in sealed A/N can; oil from lapidary shop solidified with soil in sealed A/N can; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; 6 each irradiated 9 ft 10 in. long X 9 in. dia. stainless steel storage tubes and holding rings; activated top and bottom reactor vessel sections;

motor assembly; gattling gun cask; hydraulic pumps; ion pumps; steel frame and motor assembly from TA-5 KIVA door; burned wood from weapons experiment; 2 each burned empty 55-gallon drums; MFP-contaminated vacuum pumps; obsolete and old test equipment and materials used in reactor fuel tests; DU-contaminated glove box; HEPA filters from hot exhaust plenum; DU-contaminated vacuum and filtering system bracket and assembly; DU-contaminated machine shop cabinets, work tables, filters, and ground cloths; 4 each TV cameras; 45 Ci neutron generator tubes; DU-contaminated crucibles; janitorial barrels; vacuum pumps; file cabinets; 70 lbs. thoria-contaminated soil; tritium-contaminated ion pump; one damaged DU-contaminated shake table or vibrator for sieving powdered DU; 10,000 lbs. of decommissioned reactor debris from extensive modifications to the reactor including ventilation ducts, conduit, PVC, nuts and bolts, hot water radiators, metal support parts, concrete, insulation, cable, air blowers, camera equipment, light bulbs, metal stands, electronic equipment, vacuum cleaners, pumps, coveralls, lumber, scaffolding, tables, chairs, gauges, regulators, valves, glove boxes, and stainless steel; 2,500 ft^3 of DU-contaminated soil; plywood ventilation duct; Mettler balance; Sartorius balance; fume hood; Magniwhirl bath; lab furnace; obsolete fire alarm system and associated electrical equipment; scrap wire; 11 each 55-gallon drums numbered 1 through 11: drums 1 through 3 contain 18 nanocuries/gram alpha emitters, drums 4 through 11 contain 8 nanocuries/gram alpha emitters; 2 kg thorium; 8 kg DU; 122 Ci tritium.

Trace amounts of Ce-144, K-40, Zr-95, Nb-95, Sr-85, Eu-152, Eu-155, Ni-63, and Po-210.

Radioactive waste from the Inhalation Toxicology Research Institute (ITRI): ITRI typically disposed of their radioactive waste at the commercial radioactive waste disposal site in Beatty, Nevada. The state of Nevada closed this radioactive disposal site in 1979. SNL/NM accepted a shipment of 119 each 55-gallon drums and 13 plywood boxes of radioactive waste from ITRI in October 1979. A copy of the ITRI radioactive shipment record dated 4/28/80 is provided herein.

1,093 ft^3 of routine operational waste and miscellaneous decontamination waste.

Trench F

Tritium- and DU-contaminated glove boxes; 11 concrete blocks from U-238 melt; U-contaminated concrete blocks and large steel plates used in penetrator test; ducting; stainless steel; steel plates from penetration tests; 6 each 55-gallon poly drums containing MFP-contaminated spent demineralizer resin; aircraft engine; weapons components; MFP-contaminated electronics components; 4 each drums from White Sands Missle Range; soil from cask site; DU-contaminated crushed gravel; lathe; wooden shipping crates; steel cladding and zirconium insulation; dilute nitric acid neutralized with $CaCO_3$, Na_2CO_3, and $NaHCO_3$ and solidified with yellow powder material; Electro-glo electropolishing agent solution with concentrated phosphoric acid neutralized with Na_2CO_3 and NaOH and solidified with yellow powder material; lab benches; metal table; two each glove boxes; resin beds; oscillatron scope cameras with thorium lenses; HEPA and prefilters.

There are 5 nuclear fuel-shipping casks of various sizes in Trench F. They include the Hallam cask, the Helicopter cask, the IF-100 cask, the IF-200 cask, and the Yankee cask. These casks were subject to various destructive tests in the mid-1970's to meet Nuclear Waste Policy Act

certification requirements for shipping spent nuclear fuel assemblies. These casks, soon to be retired, were removed from active service for destructive testing. The casks were equipped with fuel mock-ups for destructive testing.

The Hallum Nuclear Power Facility provided the Hallum cask to SNL/NM for torch fire tests. The Hallum cask is 19 ft long x 3 ft in diameter and weighs 40 tons. The cask consists of two stainless steel cylinders separated by 8.5 inches of lead shielding in the annulus.

Pratt and Whitney provided the Helicopter cask for drop tests from 2,000 ft above ground surface. The Helicopter cask is a pot-type cask weighing 3 tons. The interior cavity is 4 inches in diameter and 17.5 inches high surrounded by 10 inches of lead.

The Yankee cask and its Atlas railcar were provided by Westinghouse for sled-track impact tests. The Yankee cask is 13 ft long x 5 ft in diameter and weighs 37 tons. The cask consists of two stainless steel cylinders separated by 8.5 inches of lead shielding in the annulus.

The IF-100 and IF-200 casks were provided by General Electric for sled-track impact tests. The IF-100 cask is 13 ft long x 32 inches in diameter and weighs 22 tons. The cask consists of two stainless steel cylinders separated by 8.5 inches of lead shielding in the annulus. The IF-200 cask is 13 ft long x 3 ft in diameter weighing 25 tons. The cask consists of two stainless steel cylinders separated by 8.5 inches of lead shielding in the annulus.

A semi-tractor trailer or "carriage" used for transporting nuclear fuel shipping casks is buried in Trench F. The trailer was contaminated with Cs-137. The trailer was contaminated due to a leaking shipping cask that contained a spent nuclear fuel assembly destined for SNL/NM. The cask that contained the spent fuel assembly leaked water during shipment. The cask was decontaminated and returned to Savannah River via another trailer, however, the contaminated trailer was designated non-recoverable and buried. A color picture of the trailer buried in Trench F is provided herein.

792 ft^3 of routine operational and miscellaneous decontamination waste.

Trench G

Trench G was the last operational disposal trench. It contained very little waste, as shown by the geophysical survey in the MWL Phase 2 RFI Report, when the MWL was closed in December 1988.

GAP II disassembly room including uni-strut, filter housings, filters; one vacuum cleaner; DF I, II, III, and IV experimental packages without fuel sections; thorium and uranium alloyed aluminum Polaris missile sections; aircraft engine; 1 kg Th-232 as Mg-Th from crash test at small sled track; 3 each glove boxes; one Mettler balance and fume hood contaminated with fission products; MFP-contaminated concrete; 2 each 55-gallon poly drums containing MFP-contaminated spent demineralizer resin; 3 each resin beds with trace Co-60; fluorescent light bulbs; HEPA and prefilters; MFP-contaminated TV camera; 25 each 55-gallon 17H drums with

Ir-192 tracer in sand; 3 each 54 inch diameter cylinders in (2 in wooden crates and 1 in cardboard) with HK-31 skin material; 1,000 cubic yards of dirt from the reactor berm removal.

581 ft^3 of routine operational wastes and miscellaneous decontamination waste.

Pit SP-1

Two each depleted tritium beds; 3-gallons NaOH; 3-gallons acid waste; 1 poly bottle uranium solution; out-dated standard solutions; 30-gallons tritium water; miscellaneous chemicals with beta/gamma contamination; 4 kg enriched lithium; 4 kg Li-6; 408 grams U-235.

Pit SP-2

A plutonium arc tunnel is buried in SP-2. The plutonium arc tunnel was used to simulate ballistic missile re-entry into the earth's atmosphere. Pu-238 microspheres, ranging from 2 to 20 micrometers in diameter, were injected into the arc tunnel under the influence of plasma to determine temperature and pressure effects on nuclear weapon components. The apparatus is 4 ft x 4 ft x 10 ft long with a 2 ft x 2 ft x 5 ft central section. Glove boxes are attached at each end. Approximately 20 microspheres remained in the tunnel when it was buried in 1968.

Pit SP-3

A beryllium catcher is buried in SP-3. The Be-catcher was used to "catch" projectiles fired from various guns and howitzers. Experimental projectiles containing Be and DU were retrieved and studied in tests. The BE-catcher contained fine particles of Be and DU when buried in 1968.

Pit SP-4

Nuclear reactor vessel plates from a decommissioned nuclear reactor are buried in SP-4. The vessel plates came from a nuclear reactor in the San Fernando Valley. The reactor, when decommissioned in 1978, was cut to pieces and shipped to Beatty, Nevada for disposal. Six-foot sections of the outer vessel were salvaged and shipped to Sandia for fission product and Co-60 activation studies. The sections were stored in SP-4 and never tested and remain there to this day. The vessel plates, at the time of burial, measured 2 rem/hour on contact. SP-4 is lined with concrete culvert and concrete bottom-cap making it the only lined pit at the MWL.

Pit SP-5

A 10,000 Ci Co-60 source is buried in SP-5. The 10,000 Ci Co-60 source was manufactured by Oak Ridge National Laboratories in 1960 and delivered to SNL/NM for deployment in the gamma irradiation facility. The source consists of 12 stainless steel rods, 12 inches long x 0.5 inches in diameter, each containing 8 cobalt metal pellets. Each cobalt pellet is 0.5 inches long. The cobalt metal pellets are located in the center of each rod with 4 inches of lead as shielding filling each end. Each cobalt rod contained approximately 840 Ci in September 1961. The Co-60 source was removed from service and transferred to SP-5 in June 1987. The Co-60

source was buried in a 6.7 ft^3 lead burial cask, which was in turn encased in a 24 yd^3 concrete burial cask. The original 10,000 Ci source will have decayed to 76 Ci as of September 1998, or 6.4 Ci per rod.

Pit 1

DU-contaminated weapons components; mass of DU unknown.

Pit 2

DU-contaminated debris bed; DU-contaminated weapons components; mass of DU unknown.

Pit 3A

DU-contaminated weapons components; 22 kg DU.

Pit 3B

DU-contaminated Mark III missile sections; mass of DU unknown.

Pit 4

DU-contaminated weapons components; mass of DU unknown.

Pit 5

DU-contaminated weapons components; mass of DU unknown.

Pit 6

DU-contaminated weapons components; mass of DU unknown.

Pit 7

DU-contaminated weapons components; 846 kg DU.

Pit 8

DU-contaminated weapons components; mass of DU unknown.

Pit 9

DU-contaminated weapons components; mass of DU unknown.

Pit 10

DU-contaminated weapons components; 178 kg DU.

Pit 11

7 Nevada Test Site test shapes; 42 kg DU.

Pit 12

Neutron generator tubes; 1 kg thorium; 103 kg DU.

Pit 13

One each 1,800 Ci Co-60 source sealed in a lead and steel burial cask encapsulated in two truckloads of concrete; one each 98 microCi Ra-226 source, one each 1.3 microCi Ra-226 source, two each 5.0 microCi Ra-226 sources, and one each 1.0 microCi Ra-226 source encapsulated in concrete-filled A/N can.

Pit 14

One each sealed 5.0 microCi Po-210 source and source holder; one each sealed 1.0 microCi Po-210 source; miscellaneous uranium and beryllium waste; Cypress test debris from Nevada Test Site; DU-contaminated vacuum cleaner; 3 Ci tritium water; 100 mCi tritium oxide; Pu-238, Po-210, and tritium-contaminated miscellaneous operational and lab waste; tritium-contaminated pumps and valves; Pu-238 contaminated air sampler; neutron generator tubes; a large weapon shell (18 megaton WWII vintage); DU-contaminated weapons components; 178 kg DU.

Pit 15

One each 102.1 microCi Ra-226/Be source and one each 5.5 microCi source in a encapsulated in concrete-filled 55-gallon drum; fume hood filters and filter housings; reactor fuel element ends (5 rem/hr on contact); Cypress test debris from Nevada Test Site; neutron generator tubes and targets; DU-contaminated weapons components; Pershing missile debris; 167 kg DU; 49 grams U-235; 30 Ci tritium.

Pit 16

One each sealed 2.5 Ci Co-60 source encapsulated in a concrete-filled lead cask; two each non-functional 1.5 mCi Ra-226 ionization alphatron gauges encapsulated in a concrete-filled A/N can; nine each Ba-133 reactor bolts; 2 each 52 Ci Co-60 pencils encapsulated in a lead-lined concrete-filled 55-gallon drum; 2 each 10.0 microCi Ra-226/Be sources in lead container encapsulated in a concrete-filled 5-gallon A/N can; one each 1,000 Ci Co-60 source encapsulated in a lead-lined, concrete-filled 55-gallon drum; ionization chambers and current regulators; one each 0.8 mCi Kr-85 source encapsulated in a concrete-filled A/N can; one each 40 mCi Am-241

source encapsulated in a concrete-filled A/N can; one each 18.9 Ci Kr-85 nuclear battery in a steel tube encapsulated in concrete-filled A/N can; SER control rod guides encapsulated in a lead-lined, concrete-filled A/N can (50 rem/hr on contact); thorium metal scrap; one each Sb-124 source projectile (10 rem/hr on contact); 20 each 5.0 microCi Ra-226/Be sources in lead container encapsulated in concrete-filled A/N can; 2 kg thorium oxide; 2,390 kg DU; 75 Ci tritium.

Pit 17

Casseto and Triga parts from Nevada Test Site; one each 0.5 mCi Ra-226/Be source, one each 36 Ci Co-60 source, and one each 6.0 Ci Sr-90 source each in a lead container encapsulated in concrete-filled 55-gallon drum; 11 each Kr-85 cells (8.1 mCi total); 2 each uranium carbide nose cones; uranium and zirconium scrap in a 55-gallon drum; 30 Ci tritium lab waste in brass tube; neutron generator tubes; dummy DU reservoir; DU scrap and machine parts; test specimens; brazed to aluminum; fusing and firing assemblies; DU-contaminated weapon components; 3 kg thorium oxide; 457 kg DU.

Pit 18

Pu-238 contaminated paper, gloves, small equipment, components, wire, and sockets; 12 each spark gap tubes; 7 each 10 microCi Ra-226/Be sources in a lead container encapsulated in concrete-filled 55-gallon drum; Pu-238 contaminated vacuum pump; radioactive rock; electrical cables from junction box; reactor fuel element ends (5 rem/hr on contact); neutron generator tubes; Pershing missile test debris; DU-contaminated weapons components; 155 mm gun projectile with a Sb-124 source; 762 kg DU; 45 Ci tritium.

Pit 19

Tritium-contaminated buckets, clothing, swipes, rags, paper, work gloves, vacuum cleaner, and decontamination materials; reactor fuel element ends (5 rem/hr on contact); one each Sb-124 source projectile (10 rem/hr on contact); neutron generator tubes; scrap metal, DU-contaminated muffle furnace; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; one each 3.5 microCi Co-60 source and one each 4.1 microCi Co-60 source in a lead container encapsulated in concrete-filled 55-gallon drum; Pershing missile test debris; tritium bed; scrap iron; Pu-238/239 contaminated filters; 621 kg DU; 60 Ci tritium.

Pit 21

Two each 3.4 microCi Co-60 sources, one each 31.8 microCi Sr-90 source, one each 100 microCi Co-60 source, one each leaking Sb-124 source, and one each spent Cs-137 source in a lead container encapsulated in concrete-filled 55-gallon drum; Nevada Test Site irradiated material; DU-contaminated paper, towels, and poly bottles; plutonium oxide-contaminated filters, towels, tape, paper, cleaning and decontamination materials; 4 each irradiated thermal batteries; oil diffusion pump and baffle; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; neutron generator

tubes; Pershing missile test debris; DU-contaminated weapons components; 16 kg thorium; 1,731 kg DU; 0.1 grams Pu-238; 30 Ci tritium.

Pit 24

Hudson Moon and Mint Leaf test debris from Nevada Test Site; 3 each 500 microCi Ra-226 ionization alphatron gauges encapsulated in a concrete-filled A/N can; one each 45 Ci Co-60 source in a lead shield housing; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; reactor fuel element ends (5-rem/hr on contact); tritium-contaminated General Electric vacuum system, trigger gauge, transducers, hoods, vacuum pump, and panels; Pu-238, Pu-239, U-235, and U-238 contaminated glove box, gamma probe, and stereo microscope; neutron generator tubes; Pershing missile test debris; DU-contaminated weapons debris; 140 kg DU; 60 Ci tritium.

Pit 25

Stainless steel sample cylinders; tritium-contaminated flexible vent; Pu-239 contaminated microscope slide and slide clamps; Hudson Moon test debris from Nevada Test Site; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; one each 3.5 Ci Ir-192 source encapsulated in concrete-filled 5-gallon A/N can; Ta-182 wire, needles, and foil in lead pigs; 4 each 10 microCi Ra-226/Be sources in a lead container encapsulated in concrete-filled 55-gallon drum; one each 30 Ci Ir-192 source encapsulated in concrete-filled 10-gallon A/N can; Ba-133 reactor bolts; DU ballast, machine chips, cuttings, and turnings; head filters and prefilters; DU-contaminated penetration vehicles; one each Pu-238 contaminated stereo microscope, glove box, balance, and manipulator arm; reactor fuel element ends (5 rem/hr on contact); DU-contaminated ceramic base plates and electric furnace; irradiated scrap nickel and reactor material; DU-contaminated sputtering shield, O-rings, and steel wool; 15 each irradiated fission chambers; Be-contaminated glove box and balance; irradiated floor and exhaust hood coverings; tritium-contaminated ion pump; MFP-contaminated transistors, diodes, resistors, circuits, paper, and plastic; one each iridium iriditron, one each 11.6 microCi Ra-226 dew pointer in brass cylinder, one each DU aft simulator; neutron generator tubes; SRAM missile test debris; DU-contaminated weapons components; 1,431 kg DU; 76.5 Ci tritium.

Pit 26

Co-57 contaminated cleanup debris; DU machine chips, turnings, and cuttings; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; 5 each carbon rings; DU-contaminated cloth, towels, and paper; MFP-contaminated machining wastes; 4 each 4.0 Ci Co-60 sources in a lead container encapsulated in concrete-filled 55-gallon drum; 100 microCi Na-22; DU-contaminated Pershing missile debris; DU-contaminated Sierra Army Depot debris; 18 each 1.8 microCi Ra-226 ionization alphatron gauges encapsulated in concrete-filled 32-gallon A/N can; Ta-182 wires in a lead pig; 3 each Victoreen Sr-90 ion chambers; DU-contaminated penetration ballast, noses, and aft simulators; 5 each sealed 389 microCi Ba-133 sources; 5 each sealed 160 microCi Ra-226 sources; 2 each sealed 10 microCi Ra-226 check sources; 2 each sealed 2.2 microCi Cs-137 check sources;

3 each sealed 4.6 microCi Co-60 solution in glass ampules; one each sealed 1.0 microCi Sr-90 solution in a glass ampule; and one each sealed 0.6 microCi Kr-85 gas in a glass ampule; firing and fusing sets; DU-contaminated weapons components; 5,525 kg DU; 88.5 Ci tritium.

Pit 27

One each DU nose ballast; one each tritium-contaminated shipping container; DU plates; 3 each empty steel gas cylinders; tritium targets; 2 each DU penetrators; enriched uranium tensile bars alloyed with Fe-50; 1 kg thorium oxide; neutron generator tubes; 155 mm gun debris; 3,246 kg DU; 81 Ci tritium.

Pit 28

6 each 55-gallon drums containing DU debris; Cs-137 contaminated debris in sealed A/N can; one each 100 microCi Victoreen Sr-90 ion chamber; 10 each irradiated headers; DU-contaminated tapered cantilever and double cantilever; neutron generator tubes.

Pit 30

20 each 0.4 Ci neutron activated aluminum reflector plates encapsulated in concrete; 4 each 187 Ci Co-60 neutron activated stainless steel tubes encapsulated in concrete; activated stainless steel pipe containing reactor instrumentation (1,000 rem/hr on contact); thoria capsules and fragments.

Pit 31

Cs-137 contaminated reactor waste in sealed A/N can; 8 each DU ballast plugs; DU machine chips, turnings, and cuttings; 19 each highly oxidized DU plates; miscellaneous operational and cleanup wastes including towels, paper, packing material, wire, gloves, and tape; one each 10 microCi Ra-226 ionostat; one each 45 mCi Kr-85 ion generator; prefilters from exhaust systems; one each 4 mCi Ra-226/Be source, 4 each DU plates; 3 each uranium/zirconium samples; one each 16 mCi Se-75 source in steel block; 2 each 55-gallon drums contaminated with DU oxide; quartz cloth contaminated with thorium; 1-gallon toluene absorbed on vermiculite in sealed A/N can; neutron generator tubes and targets; DU-contaminated weapons test debris; Pershing missile test debris; 2,460 kg DU; 27.7 Ci tritium.

Pit 32

Two pints deuterium water absorbed on vermiculite in sealed 2-gallon A/N can; one each 150 mCi Ta-182 source in lead pig; 2 each Ta-182 plugs removed from a rain erosion rocket in sealed A/N can; neutron generator tubes and targets; DU-contaminated inner shield assembly; Ra-226, Na-22, Ba-133, Co-60, Co-57, Mo-54, mixed isotopes (1.0 mCi) in lead pig; 6 each 1.0 mCi Se-75 sources in lead pig; 6 kg DU-contaminated lithium tetra-borate; 10 each Po-210 static eliminators; 25 each obsolete 240 mCi Po-210 static eliminators; one each 300 mCi Ba-226 source in sealed A/N can; one each 1.0 microCi Sm-151 source in sealed A/N can; one each

0.1 mCi Pm-147 source in a sealed A/N can; tritium-contaminated glove box; 549 kg DU; 55.6 Ci tritium.

Trace Gd-153, Eu-152, Ce-144, Sr-85, Ba-133, Ag-110m, Tc-199, Ni-63, Na-22, and Pm-147.

Pit 33

One each 24 kg DU sphere; one each 86 Ci Co-60 source in 4,000 lb. lead cask; 15 each 70 mCi Co-60 sources, one each 1.0 mCi Pm-147 source, one each 350 mCi Se-75 source, 15 each 85 mCi Cs-137 sources, and 10 each 25 mCi Ra-226 sources encapsulated in concrete-filled 55-gallon drums; thorium-contaminated quartz cloth; 200 grams uranium hydride; one each 50 Ci Kr-85 source encapsulated in a concrete-filled A/N can; activated stainless steel roller plate; TA-5 hot cell decontamination debris; one each irradiated balance; fuel element cladding and associated parts from reactor instrumented fuel elements, vacuum system, filters, and tools (2 rem/hr on contact); irradiated, disassembled pressure vessel and crucible; tritium targets and tubes; Three Mile Island radiation detector; 1.6 kg Be; 2,125 kg DU; 822 Ci tritium; 1kg thorium.

Pit 34

One each 110 Ci Co-60 radiography source encapsulated in concrete-filled A/N can; one each ultra-sonic thermometer consisting of a stainless steel tube loaded with copper, cobalt, tantalum, thoria, nickel, and iron (15 rem/hr on contact); activated stainless steel tubing (2 rem/hr on contact); obsolete experimental equipment and parts (3 rem/hr on contact); one each Cs-137 contaminated WESF capsule; neutron generator tubes and targets; U-238 contaminated soil from burn test; 200 grams activated silver; firing sets; uranyl nitrate coatings of foil; trough assembly used in fuel element cleanup; 1,676 kg DU; 328 Ci tritium.

Pit 35

Neutron generator tubes and targets; neutron activated brass; 4 each 55-gallon drums DU from White Sands Missile Range; one each activated stainless steel containment canister; Be-contaminated weapon components; 3 each sources for Beta scope; crucible; stainless steel ion sources and tubes; 686 kg DU; 203 Ci tritium.

Pit 36

Neutron generator tubes and targets; STI experiment package; GAP II upper can; DF 4 outer can; 1 each 55-gallon drum containing ST-2 hardware without fuel section; one each microcomputer; irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components; thermocouple wire from the ACRR core; 3 each activated stainless steel containment canisters wrapped in polyethylene sheeting; one each weapon shipping and handling container; thorium-contaminated Polaris missile sections; rings from reactor fuel elements (1.7 rem/hr on contact); 4 each 55-gallon drums containing wastes contaminated with fission products; 2 each large wooden boxes; 673 kg DU; 13.1 kg lithium.

Pit 37

Empty, no contents.

Pit U-1

1,589 kg DU in chips, machine turnings, shavings, cuttings, residue, and scrap.

Pit U-2

5,119 kg DU in chips, machine turnings, shavings, cuttings, residue, and scrap; one each irradiated melt chamber; one each copper crucible containing DU scrap.

Pit U-3

1,114 kg DU in chips, machine turnings, shavings, cuttings, residue, and scrap; 1,000 lbs. of Burn Site DU-contaminated soil and debris; one each DU-contaminated 300 lb. crucible.

INHALATION TOXICOLOGY RESEARCH INSTITUTE

LOVELACE BIOMEDICAL AND ENVIRONMENTAL RESEARCH INSTITUTE, INC.

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Item No.	Rad. Level (mr/hr) Surface	Rad. Level (mr/hr) at 3 feet	External Contamination Survey (CPM)	Isotope(s)	Container Type	Radioactive Millicuries	Physical State	Contents	Container Cubic Feet
1	BKG.	BKG.	<100	^{238}Pu ^{239}Pu	55 Gal. Drum	.5	Solid	Plastic, glass, Paper	7.5
2	"	"	"	^{238}Pu ^{144}Ce	"	"	"	"	"
3	"	"	"	^{238}Pu ^{239}Ce ^{239}Pu	"	"	"	"	"
4	"	"	"	^{238}Pu	"	"	"	"	"
5	"	"	"	^{238}Pu	"	"	"	"	"
6	"	"	"	^{238}Pu	"	"	"	"	"
7	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
8	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
9	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
11	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
12	"	"	"	^{238}Pu ^{241}Am	"	"	"	"	"
13	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
14	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
15	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
16	"	"	"	^{144}Ce ^{238}Pu	"	"	"	"	"
17	"	"	"	^{144}Ce ^{238}Pu	"	"	"	"	"
18	50	5	"	^{144}Ce	"	100	"	"	"
19	BKG.	BKG.	"	^{144}Ce ^{238}Pu	"	.5	"	"	"
25	"	"	"	^{134}Cs ^{239}Pu	"	"	"	"	"
26	"	"	"	^{134}Cs ^{239}Pu	"	"	"	"	"
27	"	"	"	^{134}Cs ^{241}Am	"	"	"	"	"
28	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
29	"	"	"	^{134}Cs ^{239}Pu	"	"	"	"	"
30	"	"	"	^{134}Cs ^{241}Am	"	"	"	"	"
31	"	"	"	^{134}Cs ^{239}Pu	"	"	"	"	"
32	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
33	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
34	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
35	"	"	"	^{239}Pu ^{241}Am	"	"	"	"	"
36	10.	0.4	"	^{238}Pu ^{169}Yb	"	50 (^{169}Yb)	"	"	"
37	BKG.	BKG.	"	^{144}Ce ^{238}Pu	"	.5	"	"	"
38	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
39	"	"	"	^{134}Cs ^{239}Pu	"	"	"	"	"
40	"	"	"	^{238}Pu ^{241}Am	"	"	"	"	"
TOTALS						166			255

All of the waste described above contains no free liquids and no transuranic elements with a radioactivity concentration greater than 10 nanocuries per gram.

G. J. Thompson 4/30/80

Carrier's Signature Date

INHALATION TOXICOLOGY RESEARCH INSTITUTE

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41	BKG.	BKG.	<100	^{144}Ce ^{239}Pu	55 Gal. drum	.5	Solid	Glass, paper, plastic	7.5
42	"	"	"	^{147}Pm ^{238}Pu	"	"	"	"	"
44	22	2	"	^{134}Cs ^{144}Ce	"	50	"	"	"
45	190	10	"	^{144}Ce ^{137}Cs	"	500	"	"	"
46	BKG.	BKG.	"	^{144}Ce ^{238}Pu	"	.5	"	"	"
47	15	1	"	^{147}Pm	"	15,000	"	"	"
48	BKG.	BKG.	"	^{144}Ce ^{239}Pu	"	.5	"	"	"
49	"	"	"	^{144}Ce ^{241}Am	"	"	"	"	"
50	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
51	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
54	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
55	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
56	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
57	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
58	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
59	5	.5	"	^{144}Ce ^{238}Pu	"	10(^{144}Ce)	"	"	"
60	BKG.	BKG.	"	^{238}Pu ^{239}Pu	"	.5	"	"	"
61	"	"	"	^{239}Pu ^{241}Am	"	"	"	"	"
62	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
63	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
64	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
65	"	"	"	^{169}Yb ^{238}Pu	"	"	"	"	"
66	"	"	"	^{239}Pu ^{241}Am	"	"	"	"	"
67	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
68	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
69	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
70	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
71	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
72	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
73	50	6	"	^{134}Cs ^{144}Ce	"	50	"	"	"
74	60	7	"	^{134}Cs ^{144}Ce	"	50	"	"	"
75	40	5	"	^{134}Cs ^{144}Ce	"	50	"	"	"
76	BKG.	BKG.	"	^{144}Ce	"	.5	"	"	"
77	"	"	"	^{144}Ce ^{238}Pu	"	"	"	"	" RD
						15724			255

TOTALS

All of the waste described above contains no free liquids and no transuranic elements with a radioactivity concentration greater than 10 nanocuries per gram.

J. J. Mangan 4/30/80

Generator's Signature Date

Carrier's Signature Date

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78	BKG.	BKG.	< 100	$^{144}Ce^{238}Pu$	55Gal.drum	.5	Solid	Glass,paper,plastic	7.5
79	"	"	"	$^{144}Ce^{238}Pu$	"	"	"	"	"
81	"	"	"	$^{238}Pu^{239}Pu$	"	"	"	"	"
82	"	"	"	$^{238}Pu^{239}Pu$	"	"	"	"	"
83	"	"	"	$^{238}Pu^{239}Pu$	"	"	"	"	"
84	"	"	"	$^{239}Pu^{241}Am$	"	"	"	"	"
85	"	"	"	$^{137}Cs^{239}Pu$	"	"	"	"	"
86	20	.5	"	$^{144}Ce^{238}Pu$	"	50(^{144}Ce)	"	"	"
87	BKG.	BKG.	"	$^{169}Yb^{238}Pu$	"	.5	"	"	"
88	"	"	"	$^{134}Cs^{238}Pu$	"	"	"	"	"
91	"	"	"	$^{134}Cs^{238}Pu$	"	"	"	"	"
92	"	"	"	$^{134}Cs^{238}Pu$	"	"	"	"	"
93	"	"	"	$^{134}Cs^{238}Pu$	"	"	"	"	"
94	40	5	"	^{106}Ru	"	20	"	"	"
95	110	7	"	^{106}Ru	"	60	"	"	"
96	BKG.	BKG.	"	$^{238}Pu^{239}Pu$	"	.5	"	"	"
97	"	"	"	$^{238}Pu^{239}Pu$	"	"	"	"	"
98	"	"	"	$^{238}Pu^{241}Am$	"	"	"	"	"
99	"	"	"	$^{144}Ce^{239}Pu$	"	"	"	"	"
100	"	"	"	$^{14}C\ ^{134}Cs$	"	"	"	"	"
101	"	"	"	$^{239}Pu^{241}Am$	"	"	"	"	"
102	25	1	"	$^{169}Yb^{238}Pu$	"	50 (^{169}Yb)	"	"	"
103	BKG.	BKG.	"	$^{169}Yb^{238}Pu$	"	.5	"	"	"
104	"	"	"	$^{169}Yb^{238}Pu$	"	"	"	"	"
107	3	0	"	$^{169}Yb^{238}Pu$	"	10 (^{169}Yb)	"	"	"
108	BKG.	BKG.	"	$^{144}Ce^{238}Pu$	"	.5	"	"	"
109	"	"	"	$^{144}Ce^{238}Pu$	"	"	"	"	"
110	"	"	"	$^{238}Pu^{239}Pu$	"	"	"	"	"
111	"	"	"	$^{106}Ru^{238}Pu$	"	"	"	"	"
112	"	"	"	$^{106}Ru^{238}Pu$	"	"	"	"	"
113	"	"	"	$^{238}Pu^{239}Pu$	"	"	"	"	"
114	7	1	"	$^{134}Cs^{238}Pu$	"	10 (^{134}Cs)	"	"	"
115	BKG.	BKG.	"	$^{238}Pu^{239}Pu$	"	5	"	"	"
117	"	"	"	$^{238}Pu^{239}Pu$	"	"	"	"	"
TOTALS						214			255

All of the waste described above contains no free liquids and no transuranic elements with a radioactivity concentration greater than 10 nanocuries per gram.

J. J. Mongan 4/30/80

Shipper's Signature Date

Carrier's Signature Date

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118	BKG.	BKG.	< 100	^{106}Ru ^{238}Pu	55 Gal.drum	.5	Solid	Glass,plastic,paper	7.5
119	"	"	"	^{106}Ru ^{238}Pu	"	"	"	"	"
120	"	"	"	^{90}Sr ^{144}Ce	"	"	"	"	"
121	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
122	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
123	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
124	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
125	"	"	"	^{169}Yb ^{238}Pu	"	"	"	"	"
128	"	"	"	^{169}Yb ^{238}Pu	"	"	"	"	"
131	"	"	"	^{239}Pu ^{241}Am	"	"	"	"	"
132	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
134	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
135	"	"	"	^{238}Pu ^{239}Pu	"	"	"	"	"
136	"	"	"	^{238}Pu ^{241}Am	"	"	"	"	"
137	"	"	"	^{238}Pu ^{241}Am	"	"	"	"	"
242	"	"	"	^{238}Pu ^{241}Am	"	"	"	"	"
247	"	"	"	^{144}Ce ^{239}Pu	"	"	"	"	"
D	BKG.	BKG.	<100	^{137}Cs ^{238}Pu	Plywood Box	.5	Solid	Glass,paper,plastic,	121
G	"	"	"	^{134}Cs ^{144}Ce	"	"	"	metal	91
B	"	"	"	^{144}Ce ^{238}Pu	"	"	"	"	154
H	"	"	"	^{90}Sr ^{137}Cs	"	"	"	Manipulator cell	411
J	"	"	"	^{137}Cs ^{144}Ce	"	"	"	Metal,paper,glass,	121
K	"	"	"	^{137}Cs ^{144}Ce	"	"	"	" plastic	91
M	"	"	"	^{137}Cs ^{144}Ce	"	"	"	"	91
L	"	"	"	^{137}Cs ^{144}Ce	"	"	"	"	121
F	"	"	"	^{144}Ce ^{238}Pu	"	"	"	"	91
N	"	"	"	^{137}Cs ^{144}Ce	"	"	"	"	121
A	"	"	"	^{144}Ce ^{238}Pu	"	"	"	"	121
E	"	"	"	^{144}Ce ^{238}Pu	"	"	"	"	91
I	"	"	"	^{169}Yb ^{238}Pu	"	5.0	"	Glove Box, paper, glass and plastic	441
TOTALS						19.5			2193.5

All of the waste described above contains no free liquids and no transuranic elements with a radioactivity concentration greater than 10 nanocuries per gram.

J. J. Thompson 4/30/80

Date

Carrier's Signature Date

Cs-137-Contaminated Shipping Cask and Semitractor Trailer (Trench F)
(only the trailer was buried)