

9.0 OPERATIONAL HISTORY OF BUILDING 776/777

9.1 INTRODUCTION

Building 776/777 began operations in 1957 and has undergone several major production changes since that time. These can be divided into three time periods: pre-1969 fire, post-1969 fire to the 1989 production curtailment, and current operations.

Until the 1957 fire in Building 771, the plutonium foundry, fabrication and assembly operations at RFP were housed in Building 771. Beginning in 1958 and continuing through 1969, Building 776 was the main manufacturing facility for plutonium weapons components and housed a plutonium foundry and fabrication operations. Building 777's main function was assembly of parts.

After a major fire in Building 776/777 in 1969, the majority of the foundry and fabrication operations were transferred to Building 707. After several months of clean-up following the fire, limited production operations were resumed in Building 776/777 (EG&G, 1990); however, the main focus of the building turned towards waste and residue handling, disassembly of site returns and special projects. Processes conducted in Building 776 included size reduction, advanced size reduction, pyrochemistry, coatings operations and test runs with a fluidized bed unit (EG&G, 1990). Building 777 operations included machining, product assembly and disassembly functions, testing and inspection, special weapons projects and support operations such as laboratories (EG&G, 1990).

Current operations in Building 776/777 have been vastly reduced compared to operations prior to the 1989 production curtailment. Current operations in Building 776 include waste handling and maintenance activities. Building 777's current activities include a Tritium Surveillance Laboratory and container repacking operations. In addition, nuclear material and waste are currently being stored in the building (EG&G, 1993; EG&G, 1992).

9.2 HISTORICAL TIMELINE

- 1957 Construction of Building 776/777 was completed (Buffer, 1993). The purpose of Building 776 was plutonium components manufacturing, and the purpose of Building 777 was assembly and inspection of the pit for the Part IV weapon design, which used plutonium and other metal components (ChemRisk, 1992).
- 1957-1969 Building 776 was the major user of carbon tetrachloride, and Building 777 was the major user of trichloroethylene (TCE) at Rocky Flats Plant (RFP) (ChemRisk, 1992).
- 1958 The first significant machining of plutonium began. This process used Shell Vitrea cutting oil followed by a washing with carbon tetrachloride (ChemRisk, 1992).
- 1961 The concrete block wall between Buildings 776 and 777 was removed to accommodate additional equipment (USAEC, 1969).



- 1963-1964 Building 777 switched from using isopropyl alcohol in cleaning activities to using TCE (Dingman, 1991). Perchloroethylene (PCE) was also replaced with TCE at this time (Hornbacher, 1994b).
- 1964 The "Campbell incident" occurred involving an explosion between plutonium and carbon tetrachloride in Building 776 during a briquetting operation. This incident resulted in research and development (R&D) projects that examined the interaction of plutonium with a variety of solvents (ChemRisk, 1992).
- 1965 The "glovebox drain line fire" occurred during maintenance on a plugged oil coolant drain line in Building 776/777. The fire was attributed to spontaneous combustion of plutonium chips. The fire spread contamination inside of the building (Buffer, 1993).
- 1966 The canteen, locker room and laundry were relocated to another building in order to provide more operating space in Building 776 (USAEC, 1969).
- 1966 Glovebox 134-24, located in the North Foundry Line in Building 776, was modified to increase storage capacity and to reduce handling damage to heat sensors (USAEC, 1969).
- 1967 The Part V expansion program began. Project goals included rearrangement and expansion of production foundries and installation of additional equipment for fabrication and connecting conveyor lines (USAEC, 1969).
- 1967-68 Actions to reduce penetrating radiation exposure levels to employees were undertaken. These involved installing additional shielding to glovebox systems in Building 776/777. Materials installed included lead, leaded glass, and Benelex and Plexiglas of various thicknesses on the gloveboxes and conveyor lines (USAEC, 1969).
- 1969 A major fire occurred in Building 776/777 on May 11, 1969. This fire released as much as 210 μ Ci of plutonium to the atmosphere with significant property loss. The fire resulted in new safety procedures, including sprinklers, more fire walls and operational modifications such as performance of some plutonium work in inert atmospheres (Buffer, 1993; USDOE, 1980).
- 1969 Waste operations began in Building 776, originally initiated for the purpose of disposing of the 1969 fire contaminated material (EG&G, 1992).
- 1970 Pyrochemistry operations used for plutonium recovery began in Building 776 and continued until 1989 (EG&G, 1992).
- 1971 Clean-up activities for the 1969 fire were completed on October 18 (Buffer, 1993).

- 1972 Plutonium fabrication operations in Building 776 were transferred to Building 707. Building 776 was converted to a waste storage and size reduction facility (ChemRisk, 1992). TCE was replaced with trichloroethane (TCA) (Hornbacher, 1994b).
- Mid-1970s Tritium gettering of site return parts began in Building 777 (Dingman, 1991).
- 1979 The fluidized bed unit (FBU) made its first 108-hour burn of "non-line," low-level transuranic (TRU) wastes (Buffer, 1993).
- 1983 Construction of the Advanced Size Reduction Facility (ASRF) in Building 776 began (Buffer, 1993).
- 1986 The ASRF became operational (Buffer, 1993).
- 1988 The "Hot Laundry" facility began operation in Building 777. Its purpose was to launder radionuclide-contaminated clothing separately from non-contaminated plant laundry for the purposes of decontamination (Buffer, 1993).
- 1989 Plutonium production operations ceased in November (EG&G, 1990).
- 1994 The Supercompactor and Repackaging Facility (SARF) became operational on May 9. Its goal was to reduce up to 80 percent of the volume of TRU waste stored and shipped from RFP (EG&G, 1994).

9.3 PHYSICAL BUILDING DESCRIPTION

The Building 776/777 complex is located in the north-central portion of the plant site (Figure 9-1). Buildings 776 and 777 share a common wall, utilities and maintenance. The building has a structural steel frame, the majority of which has been covered with heat shielding materials. All floors in the building are cast-in-place reinforced concrete slabs. The main floor has an area of 135,000 square feet. Metal facilities occupy 62,000 square feet and waste handling occupies 63,000 square feet. The second floor contains 88,000 square feet and is almost exclusively occupied by utilities. There are two sub-basement areas: a four-bay area of approximately 1,600 square feet and an elevator pit area which is adjacent to the tunnel connecting Buildings 776 and 771.

Building 776/777 contains an extensive glovebox network that historically supported various plutonium production operations. Prior to the 1969 fire, the majority of the building space was in one large open room. Since that time, the building has been compartmentalized into several areas separated by physical barriers to confine any radioactive material releases. The western portion of the building was equipped with storage vaults for plutonium buttons. These vaults are still in use. The northwest corner of the building stored plutonium in cans (Boss, 1994). A ventilation system of negative pressure is used to keep areas of least contamination from becoming contaminated by areas of higher contamination. The building is equipped with a series of High Efficiency Particulate Air (HEPA) filters to control air emissions to the environment (EG&G, 1992).

A laundry facility in Building 777 was used to wash worker protective clothing and respirators with measurable radioactivity levels of 250 to 20,000 counts per minute (EG&G, 1990). Laundry facilities are no longer operational in this building (EG&G, 1993b).

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Utilities are shared between Buildings 776 and 777. These include supply and control of potable water, eye wash and emergency body showers, cooling water, sanitary sewage, building heating and air conditioning, glovebox and vacuum air supply, emergency electrical power and compressed air (EG&G, 1990). In addition, the building had an air drying system that contained Kathene as the drying agent. The Kathene solution was treated with a chromium anti-microbial additive. This air drying system ceased operations in the early 1990s (Bouwer, 1994). The building also has a liquid nitrogen tank system that is used as a secondary source of high purity nitrogen for the glovebox inert atmosphere system. The process drains in the buildings are no longer usable and are filled with concrete. Instead, the liquid waste is collected in sumps and is transferred to tanks and disposed of through liquid waste processing in Building 374 (EG&G, 1992; Bouwer, 1994).

9.4 DESCRIPTION OF OPERATIONS

The operational history of Building 776/777 is organized according to three distinct time periods: from 1957 to the 1969 fire, post-1969 fire to 1989 operations curtailment and current operations since 1989.

9.4.1 OPERATIONS FROM 1957 TO THE 1969 FIRE

In 1957, 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. Thus, more rolling, forming and machining of plutonium was required than in the earlier years of production. As a result of these changes and an increased workload, the Building 776/777 complex was constructed for plutonium casting, fabrication, assembly and quality assurance testing. Building 776's main purpose was the casting and fabrication of plutonium parts, and Building 777's main purpose was assembly of parts and some disassembly of site-return parts (ChemRisk, 1992; USAEC, 1969; Hornbacher, 1994b). Four principal glovebox systems existed in Building 776/777 during 1957 to 1969. These included the North Foundry Line, the South Foundry Line, the Center Line, and the North-South-East Machining Line. All production operations were carried out in gloveboxes which were interconnected by a series of conveyors. The conveyor system was an overhead chain link conveyor on which materials were moved between gloveboxes. In addition, conveyors served the North and South Briquetting Presses and provided a way to return scrap or machining chips to the casting furnaces (USAEC, 1969).

9.4.1.1 CASTING

The original foundry was located in the southwest corner of Building 776 in the approximate area of the current Room 134. The foundry contained 16 furnaces which were crowded into the room (Lombardi and Campbell, 1994). Foundry operations cast plutonium either as ingots suitable for rolling and further wrought processing or into shapes amenable to direct machining operations. Foundry operations also included collecting, reprocessing and remelting of machine turnings and solid scrap. Additional responsibilities included preparation and transfer of samples to the analytical laboratory, operation of a molten salt extraction (MSE) facility and filtration of waste machining oil and turning degreasing solvent (USAEC, 1969).

Foundry equipment consisted of two nearly identical glovebox lines which handled plutonium: the North and South Foundry Lines. Eight furnaces were located on each line. Six of those on the North Line were used for alloyed War Reserve ingot production, one was used to make feed ingots from alloyed turnings, and one was used to burn skull-lid material from the tantalum-ware used in the casting furnaces. Two of the furnaces of the South Line produced alloyed feed ingots from buttons, two produced classified feed ingots, and two were used for alloyed classified feed ingots or to cast the plutonium from units that were returned from the stockpile. One furnace was used exclusively for casting special alloy parts and one was assigned to R&D work (USAEC, 1969).

The foundry received many materials as feed sources. These included fresh reactor feed in the form of buttons from Savannah River and Hanford, buttons of reprocessed RFP residue materials from Building 771, scraps, turnings, stockpile return parts and residues (USAEC, 1969). Button processing took place in the South Line and involved casting all buttons into feed ingots and blending them to produce War Reserve, special job order or preproduction ingots. A large part of the low-americiam fresh feed material went into the alloyed preproduction ingots which were stored in Building 991 in preparation for Part V production requirements (USAEC, 1969).

9.4.1.2 FABRICATION

Fabrication operations involved either direct machining of ingots or cast shapes produced in the foundry or conducting a wrought process which further prepared the ingot for machining operations (USAEC, 1969). The wrought process involved rolling ingots into sheets and cutting them into circle blanks to be passed through the Center Line for pressing. The pressed blanks were then annealed in furnaces prior to machining. Machining operations involved taking cast or wrought parts and performing a sequence of operations including debrimming or removing sprues, contouring, drilling and milling. Machining operations took place on the North-South-East Line (USAEC, 1969).

In 1958, oil was added to the plutonium machining process to enable more rapid machining with less chance of spontaneous combustion. In very early operations, Shell Vitrea cutting oil was used followed by a washing with PCE. Shortly thereafter, PCE was replaced with carbon tetrachloride because PCE caused degradation of the gloves in the gloveboxes and created a gummy residue which interfered with inventory control (Strangfeld, 1994; USAEC, 1969). Later, the Shell Vitrea oil was replaced with Texaco Regal oil because it was less costly (Strangfeld, 1994). Building 776 housed a centralized oil collection system. The oil was filtered and used filters were sent to Building 771 for plutonium recovery. Disposal of the waste oil after approximately 1966 was accomplished through a solidification process in Building 774. However, prior to the operation of the Building 774 solidification process, disposal of the plutonium-contaminated waste oil was a significant problem. The generation of this waste, and the lack of an acceptable treatment system, resulted in the outdoor storage of these waste oils at the "903 Pad" (Putzier, 1970).

9.4.1.3 ASSEMBLY AND TESTING

Assembly operations were located in Building 777 and involved assembling various pit components. The units primarily contained nuclear materials such as plutonium and uranium, however, non-nuclear materials such as steel, beryllium, copper, monel and silver were also assembled. Prior to assembly, all components were thoroughly cleaned with ethyl alcohol or acetone and inspected (Strangfeld, 1994). Assembly activities included drilling, welding, brazing, turning and polishing (USAEC, 1969; ChemRisk, 1992). After assembly, completed units were packed and shipped off-site or to Building 991 for final processing, storage and shipping (USAEC, 1969).

Prior to the introduction of ultrasonic cleaning units in approximately 1960-1961, the plutonium parts were cleaned by dipping them in tanks of TCE (Crisler and Dingman, 1993). Cleaned parts were then moved to the superdry room in the down-draft assembly area where the parts were welded together. Welded assemblies were then baked, filled and sealed, leak-tested, weighed and tested by non-destructive testing. All assemblies were then radiographed, dimensionally inspected, sampled and finally packaged. Similar operations took place for non-nuclear assemblies (USAEC, 1969).

The assembly process for plutonium parts after approximately 1960-1961 involved washing the parts in an ultrasonic cleaning unit using Alk-Tri-grade TCE followed by a visual inspection for physical damage. The cleaned parts were then wrapped in aluminum foil and moved to the assembly glovebox storage area. Plutonium parts were re washed using the ultrasonic vapor-degreaser system, again using TCE (USAEC, 1969).

Special assembly operations included the Zero Power Plutonium Reactor (ZPPR) project. This project involved assembly and welding of stainless steel to plutonium-molybdenum-uranium alloy plates (ChemRisk, 1992). Other special assembly operations included assembly of special order pits and parts which were tested at the Nevada Test Site (Hornbacher, 1994b).

9.4.1.4 DISASSEMBLY

Disassembly operations were also conducted in the Building 777 assembly area. The first site-return work performed in Building 777 took place in 1958 (Dingman, 1994). Increased site-return disassembly activities began in the late 1960s as old weapon designs were retired and disassembled to recover valuable materials (Hornbacher, 1994b; USAEC, 1969). After disassembly, parts were inspected for unusual conditions and segregated according to material type. Plutonium materials were returned to the Building 776 foundry where they were cast into feed ingots. Depending on assay specifications, the ingot was then sent to the MSE facility for americium removal. Otherwise, the ingot was sent to Building 771 for chemical purification and returned to the foundry as a fresh button. Enriched uranium parts were shipped to Building 881 for recovery, and depleted uranium and inert components were packaged for disposal at off-site disposal sites (USAEC, 1969).

9.4.1.5 RECOVERY

Several recovery operations were conducted in conjunction with fabrication operations in Building 776. These focused on processing plutonium scrap, turnings and residues.

Alloyed scrap from rejected parts, Center Line scrap, other classified scrap, and alloyed turnings were degreased with carbon tetrachloride, briquetted and recast directly into ingots (USAEC, 1969; Lombardi and Campbell, 1994). The briquetting operations were conducted on the North and South Briquetting Presses which were located towards the center of Building 776/777. These briquetting presses were located in gloveboxes which ran east-west. Briquetting presses took machine turnings and scrap plutonium which had been degreased with carbon tetrachloride and pressed the metal into a hockey-puck type shape. The presses located in the gloveboxes were hydrostatic presses (Boss, 1994). In addition, Building 776 contained an isostatic press located outside of the glovebox line which utilized oil for pressing (Lombardi and Campbell, 1994).

Various operations in Building 776 produced residue material that was reprocessed and recovered (USAEC, 1969). In some cases, dirty materials were oxidized in furnaces or hot-plates to convert plutonium to an oxide form which could be recovered by dissolution in Building 771 (Weaver, 1994).

9.4.2 OPERATIONS FROM THE 1969 FIRE TO 1989 PRODUCTION CURTAILMENT

On May 11, 1969, a major fire in Building 776/777 resulted in relocation of some of the foundry, fabrication and assembly operations into Building 707 (Hornbacher, 1994a). Cleanup of areas following the fire resulted in the disposal of some equipment including the hydroform press, the briquetting presses, the rolling mill, casting furnaces and gloveboxes associated with this equipment (Dingman, 1994). As a result of the fire, additional walls were constructed within Building 776/777 for better fire safety (Hornbacher, 1994a). After the fire, the major production operations in the building were reduced to machining operations on the South Line in Building 776, and disassembly of site returns and assembly operations in Building 777. Special order and R&D work became more common than the pre-fire War Reserve production (Dingman, 1994). In Building 776, the empty spaces resulting from the fire were mostly filled with waste-related operations which focused on waste reduction (Hornbacher, 1994a). Other operations conducted in the

complex included plutonium recovery operations in Building 776 and support operations such as storage and laboratory work in both buildings. These operations continued until production curtailment in 1989 (EG&G, 1993b).

9.4.2.1 CASTING

After the 1969 fire, Building 776 casting operations ceased, its casting furnaces were removed, and its casting operations were assumed by Building 707 (Dingman, 1994; Bouwer, 1994). The spaces within the foundry area were largely replaced by waste-related operations

9.4.2.2 FABRICATION

Parts cast in the Building 707 foundry were machined in Rooms 131 and 134A in Building 777. Equipment used was contained in eleven gloveboxes and included a dry lathe, eight oil-cooled lathes, a five-axes mill and a jig borer. Prior to machining, parts were cleaned with carbon tetrachloride and Freon 113. After machining, the parts were sent for further processing and the remaining scrap metal was returned to the briquetting process located in the South Foundry Line (EG&G, 1990). This process is no longer in operation (EG&G, 1993b).

In addition, shortly after the fire, the South Machining Line in Building 776 resumed operations which focused on special order work and one War Reserve program (Dingman, 1994).

9.4.2.3 ASSEMBLY

After the fire, the main source of parts to be assembled in Building 777 changed from Building 776 to Building 707 (Dingman, 1994). Rooms 430, 432, 432B, 433, and 440 were down draft rooms used for assembly and cleaning activities. These "superdry rooms" were virtually moisture-free and enclosed in an airlock chamber. The rooms were connected to a glovebox and received parts which had passed through electron beam welding and non-destructive testing. In Glovebox 465 in Room 430, inspected parts from Building 777 were cleaned in a 10-gallon TCA bath to remove oil, grime and dirt. Next, the ultrasonic vapor degreaser, which was also located in Room 430, used a 90-gallon TCA bath split into two compartments to further clean the parts. After rinsing, the part was placed on a down draft table and the TCA was evaporated and the parts were assembled and cleaned with lint-free wipes and TCA or ethyl alcohol. The parts were then sent to the superdry electron beam welding unit in Building 707 (EG&G, 1990). When the TCA baths used for cleaning became dirty, they were piped directly to the Building 777 waste TCA collection system (EG&G, 1990). The TCA used in these baths replaced the TCE cleaning system which was used prior to 1972. This change was made in response to the 1972 Clean Air Act in order to reduce hydrocarbon emissions (Hornbacher, 1994b).

An additional ultrasonic cleaning system was located in Room 440 and operated similarly to the system in Room 430, except it cleaned metal filters from Module H in Building 707 (EG&G, 1990).

9.4.2.4 DISASSEMBLY

Disassembly operations in Building 777 continued from the late 1960s throughout the 1970s and 1980s. These operations involved the disassembly of site return plutonium parts for further processing in the MSE operation on the Building 776 side. Two lathes inside gloveboxes in Room 430 were used to disassemble parts. One lathe was used for beryllium components and the other was used for aluminum and stainless steel components. For some parts, the outer portion of the part would be partially cut outside of the glovebox and then disassembled within the glovebox (Hornbacher, 1994b). Following disassembly, the plutonium parts were transferred to the MSE process. Ethyl alcohol and 1,1,1-TCA were used in small quantities to clean parts in this operation (EG&G, 1990). In addition to the site return

disassembly operations, samples from the weapons stockpile were also disassembled as part of quality assurance/quality control (QA/QC) operations (Hornbacher, 1994b).

Because tritium was generated from the disassembly of some types of contaminated parts, a tritium gettering system was installed. This system removed tritium from gas sampling and glovebox exhaust by converting it to tritiated water and desiccating the air stream. The tritium gettering process has not been used since approximately 1988 (EG&G, 1990).

9.4.2.5 INSPECTION AND TESTING

Pre-assembly testing of the plutonium parts and inspection of assembled components were conducted in Building 777 until production curtailment (EG&G, 1993b). These activities included non-destructive testing, inspection and density balance operations. Component integrity testing was also conducted on non-production parts.

Non-destructive Testing (NDT). NDT included radiography and weighing. Radiography used X-rays to examine plutonium parts for structural flaws. Freon 12 was used in one type of X-ray device, and sulfur hexafluoride was used in another type of X-ray device. The X-ray development process used fixer solution which was sent to Building 774 for silver recovery after use. Developer was also used and washed down the process drain after use. Small quantities of TCA were used for general cleaning purposes. Weighing activities involved cleaning parts with TCA and then weighing them in a glovebox on a gram balance (EG&G, 1990). NDT is no longer conducted in this building (EG&G, 1993b).

Inspection. Inspection activities took place in Rooms 130 and 430 and involved dimensional non-destructive testing of parts and assemblies. Part surfaces were cleaned with carbon tetrachloride and Freon 113 on abrasive pads. Oil was sometimes applied to the part surface for testing and then was removed using Freon 113 (EG&G, 1990).

Density Balance Operations. The density of plutonium metal parts was determined by immersing the part into a 15-gallon Freon 113 bath and measuring the density relative to Freon 113. These activities were conducted in a nitrogen inerted glovebox. Provided that the part was determined to have the proper density, it was sent on for further processing (EG&G, 1990).

Component Integrity Testing (Nuclear Assembly Technology). Rooms 445, 453, 454, 459, 459A and 460 were used to conduct component integrity testing. This process involved stress, vibration, strain, tensile strength and gravity force analyses. Gloveboxes 494, 495, 499, 500, 501 and 502 were located in the process area. Process equipment consisted of pressure chambers, tensile testers, welders, an environmental chamber, a gravity-inducing machine and vibration and shaker machines (EG&G, 1993). Small amounts of aqueous detergent sprays were used for general cleaning (EG&G, 1990).

9.4.2.6 RECOVERY

The main recovery operations in the building were briquetting and pyrochemistry operations located in Room 154 in Building 776. The major pyrochemical processes for recovery of site return materials and scraps were molten salt extraction (MSE) and electrorefining. Prior to undergoing MSE or electrorefining, the plutonium components from retired weapons were reduced in size using a pneumatic sizer (EG&G, 1990; EG&G, 1993). Other recovery operations were used to recover plutonium residues and oxides. These included direct oxide reduction (DOR) and the salt scrub process. All of these operations ceased by 1989 (Bouwer, 1994).

Briquetting. Post-fire briquetting operations involved the pressing of plutonium metal machine turnings into pucks using a hydraulic press. The turnings were first conveyed to Room 131 in Building 777 where they were cleaned in perforated

metal baskets which were dipped into a series of four identical carbon tetrachloride baths. The scraps were then air-dried and pressed into pucks which were conveyed to the foundry in Building 707. The carbon tetrachloride baths were changed frequently. Waste bath solutions potentially contained Freon 113 and machining oils (EG&G, 1990). These were eventually disposed of in liquid waste processing in Building 774 (Bouwer, 1994). These operations ceased with production curtailment, but the process equipment remains in the building (EG&G, 1993b; Bouwer, 1994).

MSE. The purpose of the MSE process was to remove americium contamination from site return plutonium metal parts. Six furnaces dedicated to MSE were installed in the building in 1972 (McKaig et al., 1983). The process involved placing the plutonium metal in an argon-inerted crucible with an oxidant salt and a solvent salt in an electrically heated furnace. Beginning in approximately 1986/1987, dicesium hexachloroplutonate (DCHP) was used as the oxidant salt and calcium chloride was used as the solvent salt. The process produced a purified plutonium "button" and a contaminated chloride salt. Americium chloride and plutonium chloride were removed from the contaminated chloride salts in the salt scrub process (EG&G, 1990; EG&G, 1993). The plutonium button was sampled for purity, and if it was pure enough, it was sent to Building 707; otherwise, it was sent through electrorefining as an additional purification step (Dingman, 1994).

Electrorefining. In the early 1960's, an *in situ* electrorefining process was developed in which non-specification plutonium metal was electrorefined to produce purified plutonium (III). A production-scale electrorefining facility consisting of six furnaces was established in Building 776 in 1966 (McKaig et al., 1983; Crisler, 1992). In late 1970, electrorefining was discontinued because 70 to 75 percent plutonium yields from the process were deemed unacceptable compared to the aqueous process in Building 771 which could produce 90 to 95 percent yields. However, electrorefining research continued and resulted in the development of the tilt-pour furnace which was placed in Building 371. In May 1987, the tilt-pour electrorefining furnace was shut down in Building 371, and the decision was made to implement an electrorefining production with stationary furnaces in Building 776. Electrorefining activities resumed in Building 776 in 1988 (Crisler, 1992). The electrorefining process at that time involved purifying non-specification plutonium metal by placing the metal in a magnesium oxide crucible with magnesium chloride, sodium chloride and potassium chloride. The crucible was placed in an electric furnace and a cathode and anode/stirrer were added to create a reaction which resulted in salts, anode heel and plutonium metal (EG&G, 1990). The anode alloy subprocess combined the anode heel from electrorefining with aluminum to produce an alloy that was suitable for recovery at the Savannah River site. Anode alloy used the same furnaces as MSE (EG&G, 1993).

Salt Scrub Process. This process concentrated actinide metals into a metal alloy from residue salts such as those produced in the MSE process. The resulting metal alloy was suitable for recovery at the Savannah River site. The salt scrub was performed in the same furnaces as MSE in Gloveboxes 496 and 503. The salt scrub process was first conducted in Building 776 in 1976 using a magnesium/zinc extractant in a tilt-pour furnace (Crisler, 1992). Later, two other salt scrub processes were used. In the first process, aluminum and magnesium were used as the alloying agent and the reductant, respectively. In the second process, gallium was used as the alloying agent and calcium was used as the reductant (EG&G, 1990; EG&G, 1993).

Direct Oxide Reduction. DOR research at RFP began in 1967 with pilot-scale operations conducted from 1981 through 1983. In 1983, the process began being used on a production-scale basis in Building 776 (Crisler, 1992). DOR produced plutonium metal from plutonium oxide without aqueous processing. It eliminated the potentially high radiation exposure step of hydrofluorination that occurred in Building 771. It involved batch processing plutonium oxide feed through a high temperature calciner to remove moisture and drive off volatiles. The charge consisted of plutonium oxide, calcium metal and cast calcium chloride salt (EG&G, 1993; Crisler, 1992). The resulting plutonium button was sampled for purity. If it was pure, it was sent to Building 707, if not, it was sent to electrorefining for additional refining

(Dingman, 1994). The residual calcium salts were sampled for plutonium and stored for possible aqueous recovery (Crisler, 1992).

9.4.2.7 WASTE HANDLING

Waste handling operations included collection of waste solvents such as carbon tetrachloride and TCA and reduction of wastes.

Carbon Tetrachloride System. This system was located in Glovebox 207-642 in Rooms 131 and 134A of Building 776. Its purpose was to collect, filter and distribute waste carbon tetrachloride for eventual treatment. Carbon tetrachloride was used to clean machine turnings in the briquetting process and in several machining operations in Building 777. In addition, fluids such as Freon TF from the density balance, coolant oil, vacuum pump oil and sight gauge oil were put into this system. Waste carbon tetrachloride was collected in a series of five pencil (small diameter) tanks. When the tanks were full, the carbon tetrachloride was pumped through the Ful-flo filtration system to a large storage tank. The liquid was then pumped through another filtration unit and sampled to ensure that the sample was below the radioactive discard limit and then transferred to Building 774 for waste treatment (EG&G, 1990; EG&G, 1993).

TCA Collection and Filter System. The TCA collection and filtration system was located in Room 430 and collected TCA from various storage systems in Buildings 707, 776 and 777 and stored it in Tank T-1. Tank T-1 was sampled regularly for plutonium, americium and uranium. If it was below the transfer limit, it was pumped to Tank T-2. Otherwise, it was circulated through a filter system and sent back to Tank T-1. The wastes were then pumped to the Building 774 waste treatment system (EG&G, 1990). Tanks and associated piping are scheduled for Resource Conservation Recovery Act (RCRA) closure and the tanks are operationally empty at this time (EG&G, 1993).

Baler. The low-level waste baler was located in Room 144 of Building 776 and was used to reduce the volume of low-level combustible waste. The baler was a hydraulic, single chamber, downstroke press with a compressive force of 50 tons, equipped with a hydraulic bale eject system. Combustible waste forms were unpacked from drums, fed into the baler and compressed into a cardboard box lined with plastic and layered with Oil Dri to absorb any free liquid. The box was then strapped shut and transferred to a wooden crate for low-level waste disposal. The process reduced the volume of waste by a ratio of 5:1, increasing the capacity for on-site waste storage.

Although the baler is not currently in use, there is a possibility that it may be used at some time in the future for low-level and low-level mixed combustible waste, provided that the appropriate RCRA permit is obtained (EG&G, 1990; Aguilar, 1994). If used for low-level mixed combustible waste, the baled waste would be classified as hazardous due to solvent contamination and/or the presence of lead-lined gloves present in low-level mixed waste (EG&G, 1990).

Advanced Size Reduction Facility (ASRF). This facility in Building 776 was used to disassemble or cut plutonium-contaminated gloveboxes and miscellaneous large equipment down to a size that was easily packaged in approved waste containers. The ASRF process consisted of five subprocesses enclosed in one glovebox in Room 134. These included an air-locked manual disassembly area, a remote disassembly area, a cutting area, a steam cleaning area and a packaging area (EG&G, 1993). The ASRF produced TRU, TRU-mixed, low-level and low-level mixed wastes (EG&G, 1990). This facility has not been operational since production curtailment but may operate again in the future (Bouwer, 1994). Other size reduction operations conducted in Building 776 during this time are still operating and are described in Section 9.4.3.1.

Fluidized Bed Unit (FBU). Building 776 housed both a pilot-scale FBU in Room 135 and a full-scale, two-story, 3,000 square-foot FBU in Room 118 (Bouwer, 1994; Aguilar, 1994; EG&G, 1993). The FBU system design involved a series of shredding and sorting processes prior to screw-feeding shredded waste into a primary reactor. The fluidized bed material in the reactor consisted of heated sodium carbonate granules and an oxidation catalyst comprised of aluminum oxide and chromium oxide. These materials were fluidized by a flow of compressed air and nitrogen gas. In addition to solid waste, liquid waste could also be fed into the unit. All emissions from the unit passed through an afterburner, a cyclone separator and a bank of HEPA prefilters and filters (EG&G, 1990; EG&G, 1992).

Development of the FBU began in 1975 and involved a bench-scale unit followed by installation of a pilot-scale unit which underwent testing through approximately 1981 (Aguilar, 1994). On May 19, 1981, a trial burn of one gallon of polychlorinated biphenyls (PCBs) mixed with four gallons of kerosene was conducted in the pilot-scale unit and considered to be a success (Buffer, 1993; Aguilar, 1994). In 1978, the full-scale FBU, or demonstration unit, came on line for testing. EPA-approved test burns were conducted in this unit from 1979-1988 on both liquid and solid waste forms. The trial-basis operations burned non-line combustibles, office trash, crankcase oil and compressor oils (EG&G, 1993). Material from the test burns remains in the feed tanks to those units (EG&G, 1992). Although the full-scale unit was designed and built for thermal treatment of low level radioactive and hazardous mixed solid and liquid waste, the unit never gained operational status due to difficulties with the RCRA permitting process (Aguilar, 1994; EG&G, 1993). The FBU has not been tested or otherwise operated since 1988 (EG&G, 1993).

9.4.2.8 SPECIAL PROJECTS

After the 1969 fire, Building 776/777 production-related activities generally shifted from full-scale War Reserve production activities to special order work and R&D activities. Available information on special projects in the complex includes: coatings operations in Building 776, coatings operations in Building 777, "special weapons projects" in Building 777 and joining operations in Building 777. These operations are described below.

Coatings in Building 776. The coatings facility in Building 776 was an R&D operation which began operation in the 1970s (EG&G, 1990; Crisler and Dingman, 1993). Functions included the evaluation and development of chemical coatings for a variety of ceramic and metal substrates (EG&G, 1990). The coating materials included rare earth oxides and nitrates, especially erbium nitrate (Dingman, 1994). Other materials used for coating included chromates, manganese and stainless steel. Nearly all elements in the periodic table were candidates for coating materials. The substrates to which the coatings were applied were roughened or abraded using glass beads or aluminum oxide grit. They may also have been etched with any or all of the common mineral acids. Typical substrates included magnesium oxide, aluminum and numerous other metals. A curing furnace was used in the experimental process. Erbium nitrate was used to coat molds which were placed in the electric furnace (EG&G, 1990).

Coatings in Building 777. This coatings facility was a research facility for the development of substrates to be coated with plutonium (EG&G, 1990; Crisler, 1991). This process occurred in gloveboxes with nitrogen-inerted atmospheres in Rooms 437 and 463. Substrates were first etched with sulfamic acid and cleaned with wire brushes. The substrates were then grit-blasted and cleaned with a combination of vapor degreaser and ultrasonic cleaner, which contained TCA, to remove oils. The TCA in the degreaser was changed out when it became visibly dirty or contaminated with waste and during bimonthly inventories. Freon 113 and ethyl alcohol were also used for cleaning the substrates (EG&G, 1990).

Special Weapons Projects. This operation involved R&D in Building 777 for fabricating classified parts and fitting specialty parts and material. Surveillance parts were also disassembled for analytical testing. Cleaning of parts involved ultrasonic cleaning with TCA and some cleaning with ethyl alcohol. Some machining, which used cutting oils, was performed in a glovebox (EG&G, 1993b).

Joining. The joining process was located in Rooms 418, 430 and 475 of Building 777 and involved a variety of R&D-scale welding and cutting operations on non-plutonium metal parts. The process received aluminum, titanium, depleted uranium, vanadium and stainless steel parts from machining operations in the 400-, 700-, and 800-series buildings. During the most recent operations, the process used two laser welders and one electron beam welder (EG&G, 1993b). Prior to those operations, an additional electron beam welder and a pressurized inert gas metal arc (Pigma) welder were also used (EG&G, 1990; EG&G, 1993). The two laser welders included a Neodymium-Yttrium Aluminum Garnet (Nd-YAG) laser and a carbon dioxide laser. The Nd-YAG laser used argon, helium, oxygen and nitrogen gases for cutting and welding non-nuclear metal parts. The carbon dioxide laser welded non-production parts using compressed gases. The electron beam welding involved fusion welding in a vacuum chamber in a glovebox; these units were used only a few times per year (EG&G, 1990). Most of the welding processes used acetone, ethyl alcohol and isopropyl alcohol for cleaning purposes. Welding processes are no longer active in Building 777 (Bouwer, 1994).

9.4.2.9 SUPPORT OPERATIONS

Support operations included a Calibration Laboratory and a Plutonium Metallography Laboratory. The Calibration Laboratory calibrated gauges from around the plant site but is no longer operational (EG&G, 1990; EG&G, 1993). The Plutonium Metallography Laboratory was used to prepare and examine metal specimens. Specimens were cut, embedded in plastic, ground and polished. Specimens could also be etched or electropolished. Evaluations were performed by optical microscopy and hardness testing. Diamond polishing paste, which was thinned with kerosene, was used during the process and was then removed with wipes. Ethyl alcohol was used to clean samples prior to analysis. The cutting agent 1,1,1-TCA was used for grinding with carbide grit. The electrolyte solution used in the electronic etching process was neutralized with sodium hydroxide prior to disposal or further plutonium recovery processing in Building 771 (EG&G, 1990). The plutonium metallography laboratories are no longer in operation (EG&G, 1993b).

9.4.3 CURRENT BUILDING OPERATIONS DESCRIPTION (1989-1994)

Currently, the Building 776/777 facility is used for waste handling and several support operations. Waste handling operations including size reduction, supercompaction and low specific activity counters (LOSAC) in Building 776. Support activities including general maintenance in Building 776, and a Tritium Surveillance laboratory and container repacking in Building 777.

9.4.3.1 WASTE HANDLING

Current waste handling operations conducted in Building 776 focus on volume reduction and proper control of activity levels in waste drums. These activities include size reduction, supercompaction and drum activity counting.

Size Reduction Vault. The size reduction vault in Room 146 is used to repackage drums and crates containing mostly metal, lead, filters, Raschig rings and combustibles. These materials potentially contain radioactive contamination from several processes within the Protected Area (PA). The low-level, non-hazardous wastes are sent to Building 664 for storage and eventual shipment off-site. TRU, TRU-mixed and low-level mixed wastes are stored on-site awaiting an approved off-site disposal (EG&G, 1990; EG&G, 1993). Gas samples from wastes are also collected in this air-locked vault (Bouwer, 1994).

Supercompactor and Repackaging Facility (SARF). The SARF, located in Room 134, sorts and compacts transuranic, low-level and mixed wastes. It began full-scale operation on May 9, 1994 (EG&G, 1994). The wastes processed may originate in any RFP building which generates radioactive and mixed waste (EG&G, 1993). The purpose

of the operation is to reduce the volume of waste as much as 75 percent to better use storage space at RFP prior to waste shipment for permanent disposal (EG&G, 1994).

Low Specific Activity Counter (LOSAC). Assay machines are located in Room 134 and are used to count activity levels of drums of low level waste and light weight drums. In Room 159, a HEPA LOSAC counts the activity level of HEPA filters. (Bouwer, 1994).

9.4.3.2 SUPPORT OPERATIONS

Various support operations currently conducted in the complex include the Tritium Surveillance Laboratory and container repacking activities in Building 777 and maintenance activities housed in Building 776.

Tritium Surveillance Laboratory. The Tritium Surveillance Laboratory in Building 777 is used for analysis of solid, liquid and gas samples from throughout the plant site for tritium content. This laboratory uses Rooms 429, 431 and 431A. The laboratory also analyzes gas samples which do not require tritium content determination. The process involves sample dissolution, filtration and radioactivity counting. Process equipment includes a mass spectrometer and a liquid scintillation counter. Chemicals used in these processes may include nitric acid, sodium hydroxide, potassium permanganate and Opti-Fluor scintillation cocktail. Following analysis, Micro-Cel E is added to eliminate all free liquids in samples (EG&G, 1993).

Container Repacking. In this process, shipping containers from Building 991 are repacked to meet current packaging requirements of the DOT (EG&G, 1993). This process is located in Rooms 462 and 465 of Building 777.

Maintenance. Maintenance activities located in Building 776 include preventive maintenance, paint, carpenter, machine, sheet metal, pipe and general area maintenance shops (Weston, 1986; EG&G, 1993). Preventive maintenance is based in Room 154 and includes primarily changing oil in pumps and other equipment and replacing batteries (EG&G, 1993).

9.5 CURRENT CONTAMINATION STATUS

Building 776/777 is currently considered to be a high hazard facility due to the large amounts of plutonium and uranium metal and plutonium oxides and residues stored in the building. Radiation hazards include the Special Nuclear Material (SNM) storage vaults, small specific areas in some gloveboxes and associated duct-work and FBU ash storage areas (EG&G, 1992).

As of 1992, the building contained 31 RCRA tanks (including raschig ring, pencil and annular), 55 room storage sites, 1 FBU, 8 gloveboxes, 8 vaults, 1 baler, 1 washer, 1 open top collection pan and 3 fenced areas (EG&G, 1992). The building also housed a chemical material inventory of approximately 1,500 individual chemical containers. This inventory was typical of an industrial metal processing facility and included solvents (halogenated and non-halogenated), corrosives, oils and lubricants, and laboratory reagents and standards. Most of the materials were present in quantities of 10 gallons or less. The inventory included 257 containers between 10 and 55 gallons, with most of those materials used to support utility and maintenance operations in the building (EG&G, 1992). In addition, five pencil tanks that historically stored a mixture of machining oil contaminated with plutonium, carbon tetrachloride and freon (compound unspecified) were recently drained (Bouwer, 1994). The remainder of the 2,659 drums of stored material included transuranic, low-level mixed, transuranic mixed and low-level wastes in addition to low-mixed and non-mixed residues and non-fully characterized waste (EG&G, 1992).

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Contamination hazards in the building include both loose and fixed contamination, much of which resulted from the 1969 plutonium fire. Despite extensive decontamination efforts, approximately 75 percent of the building and equipment surfaces have fixed contamination in localized areas. Levels of contamination may exceed 10^6 disintegrations per minute per 100 square centimeters in localized areas. The fixed contamination has in most cases been controlled by paint or other fixatives. Contamination of the original roof of the building has been contained by the addition of a false roof over the facility (EG&G, 1992; EG&G, 1992b).

Soil contamination underneath the building is expected from at least three sources. Water was used to control and extinguish the 1969 fire and is believed to have seeped through cracks and seams in the concrete slab floor. Secondly, at least three pieces of contaminated equipment were placed in a below-grade heavy machinery pit in the basement of the building and encapsulated in concrete as an acceptable method of disposal during the decontamination of the building following the fire. The largest pour of concrete consisted of approximately 280 cubic yards of concrete and burial depths in the machinery pit may be as much as 35 feet. Finally, seasonal fluctuations in groundwater result in seepage of groundwater into at least one contaminated metal press pit and one sub-basement (EG&G, 1992; EG&G, 1992b; DOE, 1994).

Finally, the building is known to have asbestos insulation in numerous locations as well as in the Transite siding that constitutes the outer skin of the facility. The extent and condition of the asbestos has not been fully characterized (EG&G, 1992; USAEC, 1969).

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Adjacent IHSSs, PACs and UBC Information

PAC REFERENCE NUMBER: 000-121

IHSS Number: 121, Operable Unit 9

Unit Name: Original Process Waste Lines

Location: RFP Main Production Facility (Figure 000-5)

Date(s) of Operation or Occurrence

1952 - 1983 (approximate)

Description of Operation or Occurrence

Background Information

The Original Process Waste Lines (OPWL) are a network of tanks and underground pipelines constructed to transport and temporarily store aqueous chemical and radioactive process wastes from point of origin to on-site treatment and discharge points. The system handled process wastes from Building 123, Building 444, Building 707, Building 771, Building 776, Building 779, Building 865, Building 881, Building 883, and Building 889.¹ Minor amounts of waste from Building 122 and Building 441 were also handled.² These wastes were analyzed prior to transfer. Depending on the level of radioactivity and chemical composition, process wastes were routed to Building 774 for treatment, Pond B-2 (PAC NE-142.6), or the Solar Evaporation Ponds (PAC 000-101).¹ Process waste held in Pond B-2 was also pumped to Pond A-2 for storage during the mid-1970s.^{3,4}

The OPWL was placed in service when the RFP began production activities in 1952.¹ Repairs and additions were made to the system through 1975.² The OPWL system was replaced beginning in 1975 by a double-contained, fully inspectable process waste system.¹ This new process waste system was completed in the summer of 1984.⁵ Some tanks and pipelines from the OPWL were incorporated into the new process waste system and into the RFP exhaust plenum fire deluge system.²

As defined in the 1988 OPWL Closure Plan, the OPWL consists of approximately 35,000 feet of pipeline and 39 separate tank locations which house a total of 73 tanks. OPWL tanks and pipelines exist in RFP areas 100, 400, 500, 600, 700, 800, and 900, the Solar Evaporation Ponds, and the northeast buffer zone between the 900 Area and holding Pond B-2.²

Pipeline Network

OPWL pipelines vary in age, usage history, and construction.¹ The pipelines range from one to ten inches in diameter and are constructed of a variety of materials, including cast iron, stainless steel, vitrified clay, polyvinyl chloride, teflon, plastic and pyrex glass. They are buried in trenches averaging three feet wide and three to eight feet deep, and are bedded in sand and/or native soil backfill.^{1,6} Approximately 13,000 feet of OPWL pipeline are located beneath buildings, and approximately 7,000 feet are beneath concrete or asphalt pavement. Roughly 13,000 feet, or more than half of the 22,000 feet not located beneath buildings, are located in areas highly congested with other active and inactive utility lines.²

Most OPWL pipelines which were not converted to the new process waste system are believed to have been abandoned in place. Pipelines beneath buildings were flushed with water until significant residues appeared to have been removed, then sealed at wall and floor penetrations with six to twelve inch plugs of "non-shrinking cement sealant". Small segments of pipelines within buildings (e.g., riser pipes) were removed.² The OPWL Closure Plan indicates that underground pipelines outside of buildings were abandoned in place without sealing or decontamination;² however, other references indicate that most or all of the system was flushed, sealed, and left in place.^{7,8} Portions of some of the pipelines have been removed during the installation of the new process waste system, or during other RFP construction activities. Most of the OPWL drained by gravity. Waste in selected lines was pumped under low pressure.¹ The service pressure of the pipelines when in use varied from approximately 20 to 50 pounds per square inch (psi).⁹

Tanks

The OPWL tanks were used for temporary storage of process waste at the point of origin prior to transfer, at the point of destination prior to treatment and/or disposal, and at intermediate points. The OPWL Closure Plan identifies 73 OPWL tanks at 39 separate locations.² A 1990 OPWL tank investigation indicated that five of these 39 tank locations are spurious; that is, they have never contained tanks or they contain tanks which have never been used for process waste handling and are not associated with the OPWL.¹⁰

The current status of OPWL tanks falls into the following categories:¹⁰

- Incorporated into the new process waste system as permitted hazardous and mixed radioactive waste tanks under the RCRA Part B Hazardous and Mixed Waste Operating Permit Applications for RFP;
- Incorporated into the new process waste system as 90-day transuranic mixed waste storage tanks under the RCRA Part B Transuranic (TRU) Mixed Waste Operating Permit Application for RFP;
- Incorporated into the RFP exhaust plenum fire deluge system as emergency temporary holding tanks for potentially contaminated fire water;
- In active use but not RCRA-permitted (includes floor sumps and foundation drainage sumps used for incidental spill control which discharge to the new process waste system);
- Physically removed; or,
- Abandoned in place.

A number of the tanks were cleaned and painted prior to abandonment or incorporation into the plenum deluge system.¹ The paint was intended as an alpha radiation barrier.²

Releases

Numerous accidental releases of process waste occurred during the operating history of the OPWL. Information and references found for the HRR on OPWL releases are summarized in Table 000-2. Included in this table are a leak testing program conducted on the OPWL pipelines in 1971,⁹ and a 1976 inventory and historical data compilation on the pipelines.¹ Information gathered for the HRR indicates that OPWL releases occurred as a result of the following:

- Leakage of tank and pipeline fittings, including tank/pipeline connections, pipeline joints, elbows and reducers, junction boxes, and valves;
- Pipeline breakage due to construction activities, soil settling, and building foundation settling;
- Overflows of tanks and pipeline junction boxes and valve vaults; and,
- Tank and pipeline corrosion and deterioration.

Past OPWL studies and accounts of specific OPWL releases suggest that most OPWL pipeline leaks have occurred at structural features such as joints, elbows, and junctions between pipeline sections, rather than through deterioration of the pipeline segments.^{1,9}

Although the entire OPWL network has been designated as IHSS 121, a number of other RFP IHSSs target known or suspected OPWL release sites. Table 000-3 lists these OPWL-related IHSSs.

Physical/Chemical Description of Constituents Released

The OPWL is known to have transported and stored various aqueous process wastes containing low-level radioactive materials, nitrates, caustics and acids. Small quantities of other liquids were also introduced to the system, including pickling liquor from foundry operations, medical decontamination fluids, miscellaneous laboratory wastes and laundry effluent.² Certain process waste streams also contained metals, volatile organic compounds (VOCs), oils and greases, and cleaning compounds. The composition of individual process waste streams handled by the OPWL varied widely, and some OPWL components were not exposed to all potential process waste compounds.¹⁰

Low-level radioactive aqueous wastes with high concentrations of nitrate were a primary OPWL waste stream. Radionuclides present in the wastes include Uranium-234 (U-234), U-235, U-238, Plutonium-239 (Pu-239) and Americium-241 (Am-241), with lesser amounts of Pu-240 and trace amounts of Pu-238, Pu-241, and Pu-242. Major VOCs used in RFP processes, and therefore likely present in process wastes, include 1,1,1 trichloroethane, trichloroethene, and carbon tetrachloride.²

A 1976 study of the OPWL indicates that the OPWL wastes contained the following primary constituents:¹

- U-238;
- U-235;
- Plutonium;
- Nitrate;
- Acids;
- Bases; and,
- Hexavalent chromium.

Constituents also mentioned in the 1976 study are:¹

- Chromium (other than hexavalent);
- Beryllium;
- Iron;
- Iodine;
- Phosphate; and,
- Tritium.

This study also provides analytical results for soil samples collected in 1976 from nine locations likely to have been affected by OPWL releases. These samples were analyzed for nitrate and Pu-239 only. Results suggested elevated nitrate concentrations in all samples and elevated Pu-239 activity in six of the nine samples.¹

Documentation of known OPWL releases sometimes includes an estimate of the quantity of waste released. Available information is summarized by specific release in Table 000-2.

Responses to Operation or Occurrence

Table 000-2 summarizes documented responses to specific OPWL releases. The documents referenced in this table indicate that pipeline release locations often were excavated for assessment and repaired as necessary. In some instances, contaminated soil was removed from the release sites for disposal. Because radioactive contamination was of primary concern at these historical release sites, contaminated soil generally was identified using field radiation detection equipment rather than by sample analysis.

Documented OPWL tank releases were responded to in similar fashion. Surface releases sometimes were flushed with water until radiation readings were within an acceptable range. Contaminated soil and pavement were removed for disposal from

some release sites. In 1971, wells were drilled around many OPWL tanks located adjacent to and exterior to buildings to monitor plutonium, pH, nitrate, and fluoride in groundwater.¹¹ No data have been found regarding groundwater analyses from these wells.

Fate of Constituents Released to Environment

The level of detail provided in documentation of known pipeline releases is not sufficient to define the lateral and vertical extent of the individual releases. Soil sampling data collected in 1976 suggests that measurable quantities of nitrate and Pu-239 can persist in subsurface soils affected by OPWL releases for years after the last known release to the soil has occurred.¹

This IHSS is being studied in accordance with the Interagency Agreement (IAG) schedule for Operable Unit No. 9. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by September 6, 1994.

Comments

Table 000-3 lists RFP IHSSs which target known or suspected OPWL release sites. The HRR contains individual descriptions of each of these IHSSs under the appropriate PAC numbers.

The OPWL is one of several interim status hazardous waste units for which RFP has submitted Closure Plans. The OPWL Closure Plan was prepared in 1986 and revised in 1988.² Under the IAG, the revised Closure Plan was incorporated in 1990 into a draft Phase I RFI/RI Work Plan.¹⁰ This Work Plan is undergoing revision and is to be finalized in January 1992 under the IAG schedule for OU9.

At this writing, the OPWL is undergoing investigation to better define and characterize the unit. The 39 tank locations identified in the 1988 Closure Plan were reinvestigated in 1990 as part of the OPWL RFI/RI to identify gaps or discrepancies in available information. As a result of this investigation, the information on a number of OPWL tanks was revised.¹⁰

**TABLE 000-2
SUMMARY OF KNOWN OPWL RELEASES**

DATE(S)	LOCATION	DESCRIPTION
100 AREA		
09/59	Building 122	Water levels in process waste tank at Building 122 indicated a possible leak. No surface contamination was found. ¹²
06/60	Building 122	The process waste tank at Building 122 overflowed. No contamination was detected in the area. ¹³
300 AREA		
09/71	Building 334	Four water or waste samples were collected after a leak in a Building 334 process waste line. Radiation levels in three of the samples ranged from 9.54 - 10.22 counts per minute. ¹⁴
400 AREA		
05/29/53 - 06/01/53	Building 441	The 6,000-gallon process waste tank behind Building 441 overflowed 1,200 gallons of process waste from Building 123 and Building 441. The waste was contained in a collecting pit which housed the tank. The waste contained less than 1×10^{-8} grams of uranium per milliliter, which made it acceptable for discharge without treatment at the time. ¹⁵ This tank is targeted by PAC 400-122.
1960 - 1962(?)	North of Building 663 (near driveway)	A break in the line close to the driveway of Building 663 occurred around 1960 to 1962 when trucks backed over the shallow pipeline cover material. The leak was detected when waste bubbled to the ground surface. A small portion of the pipeline was replaced and no further leaks were reported. A soil sample collected in 1976 near this location showed: Pu-239 = 0.037 d/m/g; nitrate = 62 parts per million. ¹
06/66	North of Building 444	A process waste line north of Building 444 was broken during excavation of steam line trenches. Liquid released into the excavation was only slightly contaminated and presented no problems. ¹⁶
1952 - 07/71	Several locations near Building 444	Leak testing of the process waste line between Building 883 and Building 441 and Building 444 detected leakage of 2.5 gallons per hour at 37 pounds per square inch gauge (psig). The following leaks were subsequently identified: ⁹ (1) In ditch north of Building 444 exclusion fence (excavated and repaired); (2) 8 ft. inside Building 444 exclusion fence (excavation revealed concrete casement--not repaired); (3) 6 ft. north of Building 444 (not repaired); (4) 30 ft. east of driveway south of Building 441 (two joints leaking--repaired); (5) South of transformer bank between Building 441 and Building 443 (excavated, repaired); (6) South of Building 443 (excavated, repaired); and, (7) South of tank 221 (excavated, repaired). Repairs to the line consisted of repacking joints. The line itself appeared to be intact. ¹
11/79	Building 443	A leak was found in a steam condensate line between Building 443 and a valve pit north of a gasoline storage tank. Analysis of the released water indicated 0.135 ppm of amines. The line was abandoned and the condensate rerouted. ¹⁷
500 AREA		

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TABLE 000-2 (continued)
SUMMARY OF KNOWN OPWL RELEASES

DATE(S)	LOCATION	DESCRIPTION
1968 - 1982	Building 559	Leaks occurred from pyrex glass process waste lines beneath and around Building 559 which broke in numerous locations due to soil and building foundation settlement. These lines are targeted by PAC 500-159.
07/71	East of Building 559	Leak testing of the process waste line between Building 559 and the manhole east of Building 557 indicated no leaks. ⁹
600 AREA		
07/71	North of Building 662	Leak testing of the process waste line between Building 883 and Building 441 and Building 444 detected leakage of 2.5 gallons per hour at 37 pounds per square inch gauge (psig). A leak was determined to exist north of Building 662 in the utility pole storage area. This leak was not excavated or repaired. ⁹
700 AREA		
1952 - 1989	East of Building 774	Three underground concrete process waste tanks exist immediately southeast of Building 774. These tanks were installed in 1952 and taken out of service in 1989. ² The three tanks are targeted by PAC 700-124 and PAC 700-125.
1952 - 1968	Beneath/adjacent to Building 707	A Building 881 process waste line ran diagonally to the northeast beneath Building 707, then to the north under Building 777. Leaks occurred at 45 degree elbow connections in this line which were corroded by acidic waste. A leak occurred in 12/58, when 1,350 gallons of waste were received at Building 774 out of a total 5,400 gallons sent from Building 881. The line was repaired and used for another ten years after this incident. In 1968, the line was abandoned. Most of the line probably was removed for construction of Building 707 and 777. A soil sample collected in 1976 at the southwest end of the diagonal pipeline segment (west of Building 707) showed: Pu-239 = 0.145 d/m/g; nitrate = 54 parts per million. A second sample collected at the northeast end of the diagonal pipeline segment (between Building 777 and Building 778) showed: Pu-239 = 0.485 d/m/g; nitrate = 148 parts per million. ¹ The original valve vault no. 7 at the southwest end of the diagonal pipeline segment is targeted by PAC 700-123.2.
1952 - 1975	Between Building 883 and Building 707	The main process waste line between the 400 and 800 Areas and Building 774 leaked numerous times and required many repairs during its operational history. ¹ This line is targeted by PAC 700-147.1.
1952 - 05/84	Building 728 (north of Building 771)	Two underground concrete process waste tanks exist at Building 728, immediately north of Building 771. These tanks were installed in 1952 and taken out of service in May 1984. ² The two tanks are targeted by PAC 700-126.1 and PAC 700-126.2.
1955 - 1984	Building 730 (north of Building 776)	Four underground concrete laundry waste tanks exist at Building 730, immediately north of Building 776. These tanks were installed in 1955 and taken out of service in 1982 and 1984. ² The four tanks are targeted by PAC 700-132.
09/55	Adjacent to Building 774	Soil samples were collected from various points throughout the excavation of a process waste line adjacent to 774. ¹⁸ It is not known whether the excavation was prompted by a release from the line.
03/56	Building 771 process waste line (location not specified)	Four soil samples were collected during digging near a Building 771 process waste line. The samples showed radiation ranging from 2.0×10^4 - 1.3×10^5 d/m/kg. ¹⁹

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**TABLE 000-2 (continued)
SUMMARY OF KNOWN OPWL RELEASES**

DATE(S)	LOCATION	DESCRIPTION
06/56	Near Building 774	Process waste from a pipeline break near Building 774 was sampled and found to contain 1.08×10^{-5} microcuries per liter of radioactivity. ²⁰
12/56	South of Building 776	Monitoring was done by the Site Survey group during repair of a break in a process waste line south of Building 776. No personnel contamination was found. ²¹
10/14/57	South of Building 774	The pipeline between Building 774 and the 200,000-gallon storage tank leaked from an improperly packed joint. The joint was excavated and repaired and the excavation backfilled. ²² The 200,000-gallon storage tank is Tank 207, an OPWL tank located between Building 774 and Building 777. ² This pipeline may be targeted by PAC 700-127.
02/60	Near Building 777	The process waste line from Building 881 ruptured, releasing process waste in the construction area near Building 777. ²³
01/62	South of Building 777	Construction south of Building 777 necessitated relocation of a process waste line. During excavation of the line, a flange was broken, releasing liquid into the excavation. The break was repaired. ²⁴
11/63	Northwest of Building 777	A process waste line northwest of Building 777 was repaired after a leak developed in one of the flanged joints. ²⁵
11/63	Northeast of Building 777	While relocating a fire hydrant and pressure valves, radioactive contamination of approximately 50,000 d/m/l was discovered on the ground near the northeast corner of Building 777. Excavation revealed leaks in a stainless steel process waste line flange. Approximately 50 feet of the pipeline were exposed in the excavation. The flange was repaired, the fire hydrant and pressure valves were decontaminated, and the waste line was placed back in service almost immediately. Through 12/63, no other areas of contamination had been detected during construction of Building 779. ²⁶
11/63	Building 779	The process waste line between Building 774 and the process waste outfall below Building 995 was relocated and replaced with 10 inch tile pipe because of Building 779 construction. ²⁵ No documentation was found which detailed releases related to this activity.
Unknown - 01/64	Solar Evaporation Ponds area	Defective flange joints and destruction of flange gaskets caused leaks in a process waste transfer line near the Solar Evaporation Ponds. The leaks typically remained undetected for some time because the pipeline was buried beneath the frost line. ²⁷ This may be the pipeline targeted by PAC 700-149.
1969 - 1972	Beneath south wing of Building 774	Six underground concrete process waste tanks existed in the area immediately south of Building 774. These tanks were installed in 1969 and removed in 1972 during construction of a south wing to Building 774, which covers the former tank location. These tanks are targeted by PACs 700-146.1 - 146.6.
07/71	Various locations in 700 Area	Leak testing of process waste lines was conducted. No leaks were detected in pipelines between the following locations: ⁹ <ul style="list-style-type: none"> - the manhole east of Building 557 and the valve pit northeast of Building 707 (direct alpha readings of 2,000 counts per minute were detected inside a check valve and gasket); - the Building 707 process waste tanks and the valve pit northeast of Building 707;

TABLE 000-2 (continued)
SUMMARY OF KNOWN OPWL RELEASES

DATE(S)	LOCATION	DESCRIPTION
		<ul style="list-style-type: none"> - the valve pit near Building 702 and the valve pit northeast of Building 707; - the valve pit near Building 702 and Building 774; and, - the valve pit near Building 702 and the valve pit west of Solar Evaporation Pond 207A.
07/71	Between Building 771 and the valve pit north of Tank 207	<p>Leak testing of process waste lines was conducted. Leakage of 22 gallons per hour at 20 psig was detected in the line between Building 771 and the valve pit north of Tank 207. Valve leakage accounted for 7 gallons per hour. Further leakage was found:⁹</p> <ul style="list-style-type: none"> - north of Building 771 and Building 774, where a new 3 inch line was connected to an older 6-inch line; - north of the valve pit north of Tank 207, west of propane tanks; and, - two feet north and ten feet north of the valve pit north of Tank 207. <p>The primary leakage was from the junction between the 3 inch and 6 inch pipelines. The 3 inch steel line was replaced with a 3 inch stainless steel line in 1972. A soil sample collected in 1976 adjacent to the pipeline intersection showed: Pu-239 = 3.385 d/m/g; nitrate = 44 parts per million.¹</p>
07/71	Between Building 774 and the valve pit north of Tank 207	<p>Leak testing of process waste lines was conducted. Leakage of 14 gallons per hour at 20 psig was detected in the 3 inch line between Building 774 and the valve pit north of Tank 207. Leakage of 45 gallons per hour at 20 psig was detected in the 4 inch line which parallels the 3 inch line. Accurate location of the leaks was not possible.⁹ These lines were replaced in April 1982.¹ These pipelines may be targeted by PAC 700-127.</p>
07/71	Between Building 776 and the valve pit north of Tank 207	<p>Leak testing of process waste lines was conducted. Leakage of 25 gallons per hour at 20 psig was detected in the line between Building 776 and the valve pit north of Tank 207. Further tests indicated that the leakage originated from valves southwest of Tank 207. No leaks were detected along the pipeline itself.⁹ A valve pit was constructed in May 1974 at the valves southwest of Tank 207. A soil sample collected in 1976 just northeast of the valve pit showed: Pu-239 = 0.05 d/m/g; nitrate = 105 parts per million.¹</p>
07/71	Between Building 779 and the valve pit north of Tank 207	<p>Leak testing of process waste lines was conducted. Leakage rates in the line between Building 779 and the valve pit north of Tank 207 were consistent with leaking valves. No leaks were detected along the pipeline itself.⁹</p>
07/71	Between the valve pit west of Solar Evaporation Pond 207A and the valve pit north of Tank 207	<p>Leak testing of process waste lines was conducted. Leakage rates in the line between the valve pit west of Solar Evaporation Pond 207A and the valve pit north of Tank 207 were consistent with leaking valves. No leaks were detected along the pipeline itself.⁹</p>
07/71	Between Solar Evaporation Pond 207B and the valve pit west of Solar Evaporation Pond 207A	<p>Leak testing of process waste lines was conducted. Very low leakage was detected at 20 psig in two lines between Solar Evaporation Pond 207B and the valve pit west of Solar Evaporation Pond 207A. These lines are open to the atmosphere at the east end, and plugs necessary to conduct the leak test could not be kept in place. Direct alpha radiation of 200,000 counts per minute was detected in valves in these pipelines.⁹</p>
08/71	Between Building 771 and Building 774	<p>A concrete tunnel containing process waste lines was exposed during construction between Building 771 and Building 774. Three exposed cracks in the tunnel were</p>

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TABLE 000-2 (continued)
SUMMARY OF KNOWN OPWL RELEASES

DATE(S)	LOCATION	DESCRIPTION
		found to be contaminated. The cracks were sealed and eight drums of soil contaminated with low levels of plutonium were removed. ²⁸
01/72	Between Building 771 and Building 774	A process waste line between Building 771 and Building 774 was broken during construction activities. Samples of the waste showed radioactivity of 1,000 pCi/l. Soil samples from the area were found to be slightly contaminated. ²⁹
07/73	Between Solar Evaporation Ponds and Building 774	A plastic line used to transfer wastes from the Solar Evaporation Ponds to Building 774 was broken. The line was repaired. ³⁰ This may be the pipeline targeted by PAC 700-149.
08/73	Between Building 776 and Building 778	Twenty feet of drain line between Building 776 and the laundry were found to be contaminated. This line was to be removed. ³¹ The laundry referred to in this document was most likely Building 778 immediately south of Building 776.
02/75	Between Central Avenue and the pipeline expansion pit inside the Building 707 fenced area	During routine inspection of the process waste system, a leak was found between Central Avenue and the pipeline expansion pit inside the Building 707 fenced area. The leakage was contained inside the pit, with no evidence of contamination to the environment. The pipeline was temporarily repaired by sealing the end of the secondary containment pipe and allowing it to act as the primary carrier. Repair of the primary line was scheduled for March 1975. ³² This line is targeted by PAC 700-147.1.
09/23/75	Building 776 concrete holding tanks	A slight spill occurred during removal of contaminated process sludge from the underground concrete holding tanks near Building 776. The spill was cleaned up. ³³ The tanks referred to in this document are believed to be the four underground concrete laundry waste tanks in Building 730, immediately north of Building 776. ² These tanks are targeted by PAC 700-132.
07/76	East of valve pit north of Tank 207	A soil sample collected east of the valve pit north of Tank 207 showed: Pu-239 = 1.83 d/m/g; nitrate = 76 parts per million. ¹
07/76	Immediately east of Tank 207	A soil sample collected immediately east of Tank 207 showed: Pu-239 = 0.185 d/m/g; nitrate = 70 parts per million. ¹
12/15/77	North of Building 774	Water found seeping onto asphalt north of Building 774 was traced to a leak in a flange joint of a stainless steel process waste line. Repairs were scheduled to be completed on 12/16/77. Preliminary results from samples of the water were: Total alpha = 310 pCi/l; total beta = 160 pCi/l; pH = 7.9; nitrate as N = <1 part per million; americium = detectable. ^{34,35}
01/78	Building 771 process waste line (location not specified)	Results from samples of waste from a Building 771 process waste line break were: Alpha = 3,100 pCi/l; beta = 1,600 pCi/l; nitrate as N = <1 milligram per liter; pH = 7.9. ³⁶ Three splits from a soil sample collected in the area of the break were also analyzed. Results were: Pu (dry weight) ranged from 1.99 to 5.3 d/m/g; Am ranged from 0.91 to 2.4 d/m/g; U-238 ranged from 2.61 to 4.93 parts per million; U-235 ranged from 0.014 to 0.024 part per million. ³⁷
04/11/78	Near Solar Evaporation Pond 207B	A process waste line at Solar Evaporation Pond 207B was broken during excavation of the line. A water sample was collected for analysis. ³⁸ This may be the pipeline targeted by PAC 700-149.
07/21/80	Southeast of Building 774	A leak occurred in the three-inch underground line used to transfer treated process waste from Building 774 to the Solar Evaporation Ponds. The water reached the

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TABLE 000-2 (continued)
SUMMARY OF KNOWN OPWL RELEASES

DATE(S)	LOCATION	DESCRIPTION
		ground surface and flowed north across the unpaved access road to a boggy area north of Building 774 (PAC 700-1108). Field radiation measurements indicated that the flow did not go past the boggy area and enter Walnut Creek. The volume of the release was estimated at 1,000 gallons. Samples of the released waste showed: Total alpha = 2,500 pCi/l; gross beta = 4,000 pCi/l; nitrate = 10,000 mg/l; pH = 12. Excavation on 07/24/80 showed that flange bolts had loosened during the eight years the line had been in service. The flange was repaired, and the pipeline passed a tightness test. On 07/28/80, soil contaminated by the leak was excavated and removed. Air monitoring suggested that the release did not impact air quality in the area of the release. Vegetation killed by the release was to be replaced by reseeding if natural recovery did not occur by summer 1981. ³⁹ This release is believed to be associated with PAC 700-149.
Unknown - 04/81	Beneath Building 771	A meeting was held to discuss process waste line deterioration beneath Building 771. It was decided that no action would be taken until the 1982 project to replace the process waste system as long as groundwater samples collected around Building 771 were acceptable. ⁴⁰
800 AREA		
04/57	Near Building 883	A sample from a line leak puddle near Building 883 showed 2.4×10^5 d/m/l. Samples of mud from the puddle showed 6.0×10^4 and 1.6×10^5 d/m/kg. ⁴¹
02/61	Process sewer line from Building 881 (location not specified)	A break in a process sewer line from Building 881 released laundry water to the surface. ⁴² It is not known whether the pipeline involved was a sanitary sewer line or a process waste line.
Unknown - 03/71	Building 881 process waste and sanitary sewage lift station	A liquid waste overflow outfall for the Building 881 process and sanitary sewage lift station existed immediately south of the lift station. One overflow, involving ureal contaminated waste, was known to have occurred at this location. ^{43,44} May 1971 soil samples from the outfall area showed radioactivity of 0.3 and 1.05 d/m/g. ⁴⁵
07/71	Various locations in 800 Area	Leak testing of several process waste lines was conducted. The following was determined: ⁹ (1) No leaks were indicated in the line between Building 887 and the valve pit west of Building 884; (2) No leaks were indicated in the line between Building 883 and the valve pit west of Building 884; (3) No leaks were indicated in the line between Building 865 and the valve pit west of Building 884; and, (4) Leakage of 27 gallons per hour at 20 psig was detected in the pipeline between the manhole east of Building 557 and the valve pit west of Building 884. A leak was determined to exist north of the valve pit west of Building 883.
10/74	West side of Building 883	Samples of groundwater from excavations on the west side of Building 883 showed total long-lived alpha ranging from 14 to 37 pCi/l, nitrate ranging from 64 to 96 parts per million, and pH ranging from 7.7 to 8.2. The nitrate concentrations were attributed to process waste line leaks in the vicinity of the excavation. ⁴⁶
01/78	Near Building 865 guard post	A faulty vacuum breaker on a process waste line vent pipe resulted in release of several gallons of liquid over an area of approximately 16 square feet. The liquid contained predominantly depleted uranium activity. A FIDLER survey did not

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**TABLE 000-2 (continued)
SUMMARY OF KNOWN OPWL RELEASES**

DATE(S)	LOCATION	DESCRIPTION
		indicate any radiation readings above background levels. The day after the release, roughly three inches of moist gravel were removed as a precautionary measure. ^{47,48}
10/89	West of Building 886	The portable process waste tank at Building 886 was found to be dripping liquid from a flange joint. The tank was empty and had been awaiting disposal for several years. Residual liquid in the tank and soil near the tank were sampled for uranium analysis. ⁴⁹ Analysis of the three soil samples indicated only naturally occurring uranium. ⁵⁰
900 AREA		
06/65	East of "G" Road and north of "A" Road	High nitrate concentrations in sanitary sewer system waste was attributed to infiltration of nitrate from soil surrounding the sanitary sewer lines. The source of the nitrate was determined to be leaks and breaks in the process waste line which paralleled the sanitary system. Soil samples from the area indicated nitrate concentrations exceeding 100 times the expected background concentration. Samples from the sewer line and manholes in the area confirmed that the nitrate infiltrated the sanitary system through imperfections in the sewer tile and manhole pits. ^{51,52}
10/74	Between Building 991 and Building 995	High nitrate concentrations were found in a storm drain between Building 991 and the sanitary waste water treatment facility. It was believed that the nitrate leached out of nearby soil. ⁵³ No indication of the source of the nitrate was found in available documents.
07/85	East of Protected Area and west of Building 995	An abandoned process waste line was uncovered and broken during excavation for the sanitary sewer system replacement project. Contamination was found and removed. Both ends of the broken pipe were plugged. ⁵⁴
BUFFER ZONE		
04/75	East of Building 995	A leak was found in the process waste line leading to pond B-2 just east of Building 995, where the line passed through a metal culvert buried under the outside perimeter fence road. ⁵⁵ The leak was detected by excess water in the culvert. The pipeline apparently was damaged by heavy earth moving equipment. The pipeline was repaired on 05/02/75 and returned to service on 05/05/75. Because contamination at the leak site was minimal, no soil removal was deemed necessary. ⁵⁵
UNKNOWN LOCATIONS		
09/55	Unknown	A leak and later break in the process waste line from the main production area to the process waste treatment plant (Building 774) required certain wastes to be released to the sanitary sewer system. Several sections of the process waste line were replaced before the line was restored to service. ⁵⁶
10/75	Unknown	Unauthorized digging for safeguards instrumentation ruptured a waste line. ⁵⁷
05/19/77	Unknown	Sludge samples taken in the "apricot pit" suggested that the process waste line and the outside jacket of the line were broken. Excavation was scheduled for 05/23/77. ⁵⁸

**TABLE 000-3
RFP IHSSs TARGETING KNOWN OR SUSPECTED OPWL RELEASE SITES**

IHSS NAME	IHSS NO.	PAC NO.	DESCRIPTION
Underground Concrete Tank(s)	122	400-122	Abandoned OPWL tanks behind Building 441
Valve Vault West of Building 707	123.2	700-123.2	Site of OPWL valve vault (Original Valve Vault #7) removed in March 1973
Radioactive Liquid Waste Storage Tanks	124	700-124	Three abandoned OPWL tanks east of Building 774; tank 66 (IHSS 124.2), tank 67 (IHSS 124.3), and tank 68 (IHSS 124.1)
Holding Tank	125	700-125	Tank 66 east of Building 774; same tank as IHSS 124.2
Out-of-Service Process Waste Tanks	126	700-126	Two abandoned OPWL tanks (IHSS 126.1 and IHSS 126.2) in process waste pit (Building 728) north of Building 771
Low-Level Radioactive Waste Leak	127	700-127	OPWL pipeline between Building 774 and Building 995 broken during construction activities near Building 774
Radioactive Site - 700 Area Site #4	132	700-132	Four abandoned OPWL tanks in laundry waste pit (Building 730) north of Building 776
Concrete Process Waste Tanks	146	700-146	Six removed OPWL tanks (IHSS 146.1 - 146.6) beneath the south wing of Building 774
Maas Area	147.1	700-147.1	Main OPWL pipelines from 400 and 800 Areas to Building 774; focuses on section north of Central Avenue which leaked numerous times
Effluent Pipe	149	700-149	OPWL pipeline between Building 774 and Solar Ponds which leaked due to gasket failure in July 1980
Radioactive Site - Building 559	159	500-159	Multiple releases from broken pyrex glass OPWL pipelines beneath and around Building 559

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PAC REFERENCE NUMBER: 000-162

IHSS Reference Number: 162, Operable Unit 14

Unit Name: Radioactive Site - 700 Area Site #2

Approximate Location: N749,000; E2,083,500 - Along Eighth Street from about Building 881 to the south end of Building 771

Date(s) of Operation or Occurrence

1974(?)

Description of Operation or Occurrence

Only indirect information exists for the area referred to as Radioactive Site - 700 Area Site #2 (see Comments). This area is located along Eighth Street from about Building 881 to the south end of Building 771. According to the CEARP Phase I report, during 1974, monitoring activities of pavement on Eighth Street identified several radioactively contaminated spots.¹

In January 1981, an excavation was conducted to find a process waste inner pipeline leak. The excavation was located along Eighth Street and Central Avenue near Building 881 (PIC 15). During the excavation, one total long lived alpha activity concentration from a portable air sampler at the excavation site was above the shut down level.² This may be indicative of residual contamination (see Comments).

It is possible that the contamination detected during these two episodes is the result of one or more of the occurrences related to other previously identified PACs (IHSSs) or newly identified PACs (see Comments).

Physical/Chemical Description of Constituents Released

No documentation was found which provided a detailed description of the constituents detected in 1974. It is known that radioactive contamination was detected.¹

No documentation was found which provided a detailed description of the constituents detected in the January 1981 incident. It is known that one total long lived alpha activity concentration from an air sample was above the shut down level.²

Responses to Operation or Occurrence

According to the CEARP Phase I report, Eighth Street was paved over in response to the contamination detected in 1974.¹

Operating personnel were requested to dampen the soil before backfilling excavated areas in response to the contamination detected in January 1981.²

Fate of Constituents Released to Environment

No direct documentation was found which detailed the fate of the constituents detected.

This IHSS is being studied in accordance with the IAG schedule for OU14. The IAG activities will include site investigations, site characterizations, and possible remediation. The Final Phase I RFI/RI Report is to be completed by May 23, 1995.

Comments

Documentation of radioactive contamination was found associated with this PAC. However, documentation was not found which identifies a release of radioactive material associated with it.

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In regard to the January 1981 excavation, if it is assumed that the process waste inner pipeline leak was contained and did not result in contamination in the vicinity of the excavation, the air sample datum is indicative of residual contamination.

The boundary of this PAC overlaps, or is in close proximity to, numerous other previously identified PACs (IHSSs) or newly identified PACs (see Plate 2 and Plate 3). There are at least 10 existing PACs (IHSSs), which involve radioactive contamination, that overlap or are in close proximity to this IHSS. These include the following: PAC 000-121, PAC 600-164.1 (see newly proposed location), PAC 800-164.3 (see newly proposed location), PAC 700-147.1, PAC 700-150.5, PAC 700-123.1, PAC 700-123.2, PAC 500-159, PAC 700-150.7, PAC 700-150.2 and PAC 700-139.1. It is probable that one or more of these PACs have caused contamination within this IHSS.

PAC REFERENCE NUMBER: 700-118.1

IHSS Reference Number: 118.1, Operable Unit 8

Unit Name: Multiple Solvent Spills West of Building 730

Approximate Location: N750,600; E2,083,750

Date(s) of Operation or Occurrence

Prior to 1970s^{1,2} - June 18, 1981^{2,3,4}

Description of Operation or Occurrence

A 5,000-gallon underground carbon tetrachloride storage tank was located adjacent to the west side of Building 730.^{1,3} In the 1970s, tank overflows occurred during filling operations. Persons interviewed for the CEARP report recalled a spill of 100 to 200 gallons of trichloroethylene north of Building 776 prior to 1970. These persons did not recall any clean-up operations.^{1,2,3} It has been postulated that this spill may have been carbon tetrachloride.^{1,2}

On February 26, 1976, corroded piping leaked carbon tetrachloride into the tank's sump pit. A "considerable" quantity leaked and was subsequently pumped out of the pit onto the ground.⁵ Another document indicates this leak was the result of a leaking valve.⁶

In March 1976, a small amount of leakage from the pipes in the tank pit was evident.⁷ At that time, Health Sciences was continuing soil-gas monitoring beneath the end tank.⁸ Industrial Hygiene reported air samples were typically averaging 10 mg/l carbon tetrachloride. During the month prior to April 15, 1976, the average concentration rose to near 2,000 mg/l. It was postulated that the tank or its associated pipes in the sump could have been releasing the carbon tetrachloride into the ground.⁹

On June 18, 1981, the tank failed, releasing carbon tetrachloride into the sump. The sump subsequently pumped some of the liquid out onto the ground surface. Temporary storage tanks were to be obtained to collect the liquid.⁴ No documentation was found which details the actual use of the temporary storage tanks.

This underground tank had its long axis running north-south, with the south head of the tank exposed in a valve pit.¹⁰ The north end of the tank was buried directly in soils. The base of the tank was located at an approximate elevation of 5978 feet (approximately 9.1 feet below grade) and the base of the valve pit was at an elevation of 5976.0 feet (approximately 10.25 feet below grade). The east side of the carbon tetrachloride tank valve pit was approximately 10.1 feet west of the exposed portion of the Building 730 pump house.¹¹

The carbon tetrachloride tank was later removed, but no written documentation of this removal has yet been found.

Physical/Chemical Description of Constituents Released

The underground carbon tetrachloride tank was used to store raw carbon tetrachloride for use in plant operations. Trichloroethylene has also been described as the constituent released to the environment in the incident prior to 1970.^{1,2,3} Other sources indicate carbon tetrachloride rather than trichloroethylene was released to the environment.^{1,2}

Responses to Operation or Occurrence

Persons interviewed for CEARP recalled no mitigation efforts to control the spill prior to 1970.^{1,2,3} No documentation was found which detailed response to spills which occurred during filling operations in the 1970s.

In the winter and spring of 1976, there were efforts to stop the leakage from the pipes.^{5,6} Documentation was found which detailed the cleanup of spilled liquid, including that pumped onto the ground.

In February 1976, Industrial Hygiene showed interest in having the underground storage tank replaced with an above ground tank.⁵ At this time, Health Sciences was monitoring a pipe installed below the end of the tank for airborne

carbon tetrachloride and found no indications of problems with the tank itself.⁶ No documentation was found which detailed response to high concentrations of carbon tetrachloride detected during April 1976 soil-gas monitoring.

The tank was removed following its failure in 1981.⁴ One Building 776 employee present at the time of the tank's removal recalled that it appeared sound with no obvious leaks or significant corrosion.¹

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment. This IHSS is being studied in accordance with the IAG schedule for OU8. However, the information developed on this unit for this study indicates that the location of IHSS presented in the IAG is inaccurate. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by July 12, 1994.

Comments

HRR information indicates that the tank was located adjacent to the west of Building 730. It has been proposed that IHSS 118.1 be redefined as a 20 by 40 foot area centered around the former tank location adjacent to the west of Building 730.¹ It is unclear if the release of trichloroethylene prior to 1970, detailed in references 1, 2 and 3, is related to the carbon tetrachloride tank.

PAC REFERENCE NUMBER: 700-131

IHSS Reference Number: 131, Operable Unit 14

Unit Name: Radioactive Site - 700 Area Site #1

Approximate Location: N 751,500; E 2,084,000

Date(s) of Operation or Occurrence

June 1964¹ and May 1969^{2,3}

Description of Operation or Occurrence

As a result of an explosion in Building 776 in June 1964, an area of approximately 1,500 square feet of soil at the exit of the gas bottle dock was contaminated with plutonium; some areas had activities greater than 200,000 dpm/67cm².¹ A later account states that 40 square feet of soil north of Building 776 was contaminated with plutonium due to the June 1964 explosion incident.⁴ An area 20 by 100 feet on the west end of the north side of Building 776 was radioactively contaminated during the course of firefighting activity in May 1969 (PAC 700-150.2).² Tracking by personnel around Door 17 of the dock area resulted from use of the door as a major access to the building at the time of the May 1969 fire.³

Physical/Chemical Description of Constituents Released

Plutonium was released to the environment.^{1,4}

Responses to Operation or Occurrence

In June 1964, following the removal of spots of high level soil contamination, a seal coat of oil and about two inches of gravel were placed over the contaminated soil.¹ The area around Door 17 was paved twice and in the fall of 1971 the asphalt was removed and placed in barrels.³ In November 1971, the paving of a gravel-covered contaminated area north of Building 776 compressor shed was pending.^{5,6}

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents. This IHSS is being studied in accordance with the IAG schedule for OU14. However, the information developed on this unit for this study indicate that the location for IHSS 131 presented in the IAG is inaccurate. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by May 23, 1995.

Comments

No documentation was found which detailed the final disposition of the asphalt removed from the site. The removed material could have been buried in trenches or moved to a fill area to the west of Building 881 (PAC 900-130), as was contaminated material removed from the west side of Building 776.^{7,8}

A french drain which may have provided a pathway for migration of contamination from this site is discussed as PAC 700-1100.

Based on information from documents reviewed for this study, it is proposed that the area of IHSS 131 defined in the IAG be enlarged to extend to the northwest corner of Building 776 (PAC 700-131).

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PAC REFERENCE NUMBER: 700-139.1(N); 700-139.1(S)

IHSS Reference Number: 139.1, Operable Unit 8

Unit Name: Caustic/Acid Spills: Hydroxide Tank Area

Approximate Location: N750,800; E2,083,950 (KOH Tank);
N751,100; E2,084,150 (NaOH Tank);
N751,200; E2,084,150 (West Condensate Tank)

Date(s) of Operation or Occurrence

Approximately 1953¹ - Present²

Description of Operation or Occurrence

The potassium hydroxide (KOH) tank is located to the south of Building 771. This is an aboveground tank which has a capacity of 5,400 gallons and has been diked since some time before 1973.³ There was an overfill of the potassium hydroxide tank south of Building 771 prior to 1973. As a result of this incident, it is likely that the caustic seeped through the soil and infiltrated beneath the building.² During the week ending May 5, 1978, a spill occurred at the caustic tank near Building 771. The spill occurred during a routine filling operation and was contained by the dike surrounding the tank.⁴ This occurrence is believed to have involved the potassium hydroxide tank south of Building 771. On November 13, 1989, the potassium tank was overfilled. Approximately 5 gallons of liquid spilled into an earthen berm which surrounds the tank.⁵

The sodium hydroxide (NaOH) tank is located to the north of Building 774. This is an aboveground tank with a capacity of 6,500 gallons and has been diked since some time before 1973.³ In April 1985, a pinhole leak was discovered in the piping from the sodium hydroxide tank near Building 774. Although the leak was inside Building 774, the caustic was found to have seeped along the pipe outside the building. In late April or early May of the same year, a small leak was discovered on a fitting for a thermocouple for this tank. The released caustic had solidified on the tank, never reaching the secondary containment. Caustic observed in the pit in this time frame was suggested to be the result of a poor sampling technique allowing the valve to drip. In October 1986, it was estimated that 80 to 100 gallons of sodium hydroxide were released over the history of the tank due to this problem.⁶

Interviews for the CEARP indicated small leaks and spills at the caustic receiving area north and south of Building 774.¹

There is an additional area of concern related to the sodium hydroxide tank north of Building 774. There are two steel 8,000-gallon aboveground condensate receiving tanks located approximately 100 yards to the north of the sodium hydroxide tank. The two tanks are located on a concrete slab and have badly corroded bottoms. The tanks held "clean" condensate from an evaporative waste concentration system formerly used in Building 774. The condensate was tested for the absence of radioactive contamination and then released to the north or to the west of the tanks depending on the valve positions. The swampy area to the west of the tanks, where the condensate could be released was known as Bowman's Pond. See the narrative on PAC 700-1108 for more details regarding Bowman's Pond. The tanks have been out of service for condensate receiving since approximately 1980. The western condensate tank presently receives overflow and precipitation runoff from the bermed area surrounding the sodium hydroxide tank. The berm area directs flow through a pipe and into the western condensate receiving tank.²

On June 22, 1987, during a routine delivery transfer from a tanker truck to the Building 774 sodium hydroxide supply tank, approximately 100 gallons of the liquid caustic soda overflowed. The caustic which spilled inside the bermed area of the tank drained to the caustic catch tank (western condensate receiving tank). Approximately one to two gallons of caustic leaked out of the bermed area onto the roadway in front of Building 774.⁷

Some time around 1988, the sodium hydroxide tank north of Building 774 was overfilled.² No documentation was found which further detailed this event.

Physical/Chemical Description of Constituents Released

These tanks contained potassium hydroxide and sodium hydroxide.^{1,2,3,4,6} The November 13, 1989 spill incident involved approximately 5 gallons of twelve molar potassium hydroxide solution.⁵

Responses to Operation or Occurrence

Interviewees for the CEARP indicated small leaks and spills from the hydroxide tanks were flushed with water to dilute the caustic and carry it away from the buildings and into the storm sewers.^{1,2}

In response to the June 22, 1987 incident, the one or two gallons of sodium hydroxide were diluted and rinsed off the roadway immediately following the occurrence. A work order was initiated to repair and seal the cracks in the berm on the same day of the occurrence. Waste Operations Engineering submitted an Engineering Job Order to replace the deteriorating caustic catch tank T-108 (western condensate receiving tank). The accumulation of rain water and caustic in the caustic western condensate tank was sampled and it was determined to pump the solution to the sanitary sewer system or to Building 774 for processing, depending on the results of the sample analysis. The faulty gasket on the level indicator system of the caustic supply tank was replaced. It was determined to install a high-level alarm on the caustic supply tank.⁷

In response to the November 1989 overflow of the potassium hydroxide tank, approximately 100 pounds of "oil dry" were used to absorb the potassium hydroxide within the bermed area. Contaminated soil and "oil dry" were removed and placed into drums. The Fire Department HAZMAT team verified the contaminated area was adequately cleaned-up by taking soil samples and performing pH tests.⁵ Additionally a RCRA Contingency Plan Implementation Report (89-020) was made on this incident.

There was no documentation found of response to the incidents in 1978 and 1988, nor was there documentation found of response to the leak in 1985 from Building 774.

Fate of Constituents Released to Environment

In the case of the overflow of the potassium hydroxide tank south of Building 771 prior to 1973, it is likely that the caustic seeped through the soil and infiltrated beneath the building.² No documentation was found which further detailed the fate of the constituents released to the environment.

This IHSS is being studied in accordance with the IAG schedule for OU8. However, the information developed on this unit for this study indicates that the IHSS location presented in the IAG is inaccurate. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by July 12, 1994.

Comments

HRR information indicates that the potassium hydroxide tank had been mislocated as IHSS 139 in the IAG. The location of the sodium hydroxide tank has not been defined on previous IHSS maps.

It has been proposed that PAC 700-139.1 be separated into two units, PAC 700-139.1(N) consisting of both the sodium hydroxide and condensate tanks and PAC 700-139.1(S) consisting of the potassium hydroxide tank. It has been proposed that PAC 700-139.1(N) be comprised of two discrete sites: a 25 by 25 foot area around the sodium hydroxide tank which is adjacent to the north wall of Building 774, and a 30 by 40 foot area centered around the west condensate receiving tank approximately 100 yards to the north of the sodium hydroxide tank. It has been proposed that PAC 700-139.1(S) consist of an "L"-shaped area 25 feet wide and 140 feet long that includes the potassium hydroxide tank which is southeast of Building 771 (immediately east of Building 714) and the line that transfers that hydroxide into Building 771.²

PAC REFERENCE NUMBER: 700-137

IHSS Reference Number: 137, Operable Unit 8

Unit Name: Cooling Tower Blowdown Buildings 712 and 713
(IAG Name: Cooling Tower Blowdown Building 774)

Approximate Location: N750,750; E2,084,150

Date(s) of Operation or Occurrence

Late 1950s - Present.¹

Description of Operation or Occurrence

Building 712 and Building 713 are both cooling tower facilities associated with Building 776.¹ Interviewees for CEARP mentioned a release of cooling tower water south of Building 774 that flowed north into Walnut Creek. It is speculated that they were recalling a release from the Building 779 cooling tower in December 1976.² The Building 779 cooling towers are covered in greater detail in PAC 700-138.

The Building 776 cooling towers blowdown water is treated in the wastewater treatment plant. It is thought the blowdown water drains from the cooling towers through underground pipes outside the south ends of the buildings.¹

A leak in a cooling tower within the PA was reported to have occurred between August 20 and September 6, 1990. A memorandum was sent to utilities personnel expressing the need to fix the leaks caused by corroded metal sides.³ Contact with the author of the document has verified that the leak came from either Building 712 or Building 713. The leak has been estimated at a flow rate between 5 and 20 gallons per minute. The duration of the leak is unknown but could have occurred over several months prior to reporting.⁴

In the past, utilities workers have cleaned out the sump and scraped slime off the cooling tower slats. The material removed in these operations was placed on the ground immediately adjacent to the cooling towers. Similarly, the area immediately adjacent to the cooling towers can become wetted from the water used in the towers during windy conditions. Chromium had been used in the past as a biocide for cooling tower operations.⁵

Physical/Chemical Description of Constituents Released

The released water contained 50 mg/l total chromium.²

Responses to Operation or Occurrence

The release that occurred during the summer of 1990 was stopped after the memorandum was sent to utilities. No environmental cleanup occurred in response to this occurrence.⁴

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment. This IHSS is being studied in accordance with the IAG schedule for OU8. However, the information developed on this unit for this study indicates that the IHSS location presented in the IAG is inaccurate. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by July 12, 1994.

Comments

Reference 1 indicates the cooling tower blowdown pipes leave the towers on their south sides. These pipes are considered the most probable source of any blowdown water contamination around the cooling towers. It has been proposed that the boundaries of IHSS 137 be redefined to encompass the south ends of Building 712 and Building 713 (PAC 700-137). It has also been proposed to change the dimensions to a 50 by 120 foot area from the existing 50 by 150 foot area.¹ The proposed location for IHSS 137 (PAC 700-137) is approximately 150 feet to the south and 50 feet to the west of the location presented in the IAG.

PAC REFERENCE NUMBER: 700-139.2

IHSS Reference Number: 139.2, Operable Unit 8

Unit Name: Caustic/Acid Spills: Hydrofluoric Acid Tank Area

Approximate Location: N750,800; E2,083,940

Date(s) of Operation or Occurrence

Prior to May 1971¹ - Present

Description of Operation or Occurrence

Two 1,200-gallon hydrofluoric (HF) acid supply tanks are located to the southwest of Building 771 in a small shed known as Building 714. Hydrofluoric acid has reportedly infiltrated the soil in the vicinity of the storage area.² Numerous small spills and leaks are reported to have occurred during routine filling and transfer operations. The hydrofluoric acid is delivered in portable tanks that replace the empty tanks, thus requiring no open transfer.³ Actually, these "portable tanks" are sealed cylinders with a weight of approximately 1,300 pounds fully loaded.

In May 1971, a leak in a hydrogen fluoride connection outside Building 771 was reported. A small amount of vapor was released but no personnel exposures occurred.¹ No further details of this incident were presented in the reference.

Physical/Chemical Description of Constituents Released

Hydrofluoric acid is the constituent of concern.

Responses to Operation or Occurrence

No documentation was found which detailed responses to hydrofluoric acid incidents at this site.

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of constituents released to the environment.

This IHSS is being studied in accordance with the IAG schedule for OU8. However, the information developed on this unit for this study indicates that the location of IHSS 139.2 presented in the IAG is inaccurate. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by July 12, 1994.

Comments

Information developed on this unit indicates that the HF tanks are located in Building 714. It has been proposed that the location of IHSS 139.2 be redefined to represent the location of the hydrofluoric acid storage shed, Building 714 (PAC 700-139.2).² Building 714 is 40 feet south and 10 feet east of the southeast corner of Building 771. This is approximately 350 feet south and 250 feet west of the location presented in the IAG as IHSS 139.2.

PAC REFERENCE NUMBER: 700-144

IHSS Reference Number: 144, Operable Unit 8

Unit Name: Sewer Line Overflow (IAG Name: Sewer Line Break)

Approximate Location: N750,500; E2,084,000

Date(s) of Operation or Occurrence

June 7, 1972¹

Description of Operation or Occurrence

On approximately June 1, 1972, a revision of a Building 776 radiography vault floor drain was completed. Apparently, previous transfers of laundry waste water from Tanks 776 A and B (located in Building 730) resulted in backflow into the vault. The revision to the floor drain, involving relocation of the drain pipe connection, would allow the waste to be transferred at higher pressures.¹ The increased pressure in the sanitary waste transfer line from laundry waste holding tanks 776A and 776B to the sanitary waste treatment plant (Building 995) pressurized the line, causing a toilet and sink in Building 701 to overflow. The pressurization of the sanitary waste transfer line also caused the failure of a patch in the line allowing the release of sanitary waste which contaminated a considerable amount of soil east of the holding tanks.¹ Another source indicates that pressurization of the transfer line caused sanitary waste to back-up and overflow at a clean-out plug. Maintenance personnel were working at the clean-out near Building 701 at the time the transfer line was pressurized.²

Interviewees for the CEARP report indicated there was a sewer line break between Building 779 and Building 777. The break was discovered when contamination was found in a restroom commode.³

A pipe header at the tanks located in Building 730 allowed alternatives of pumping the laundry water to the sanitary sewer system, the Solar Evaporation Ponds, or Building 774.⁴ The tanks in Building 730 were taken out of use for laundry water in the 1980s, and are currently used as plenum deluge tanks.⁵

Physical/Chemical Description of Constituents Released

Radioactive laundry wastewater was released to the environment. Samples of sanitary waste backflow taken from the toilet bowl in Building 701 were analyzed and found to contain 136,000 pCi/l of total alpha-emitting radionuclides. High-level radioactive sediment from the laundry waste holding tanks was entrained when the sanitary waste transfer line was pressurized. The presence of black sludge was noted in the samples taken from the toilet bowl.¹

Responses to Operation or Occurrence

Approximately 50 drums of contaminated soil were removed east of the holding tanks and shipped to an undescribed location.¹ It was determined that the pump line for the transfer of the laundry waste would be physically separated from the sanitary sewer line.²

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment. This IHSS is being studied in accordance with the IAG schedule for OU8. However, information developed on this unit for this study indicates the location of IHSS 144 presented in the IAG is inaccurate. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by July 12, 1994.

Comments

The sewer line break between Building 777 and Building 779 recounted by CEARP interviewees is suspect in that no documentation was found which corroborates this location. It is proposed that the location of IHSS 144 (PAC 700-144) be reduced and redefined to include the location of the clean-out plug overflow cited in reference 1 as east of

Building 730. The location now shown for PAC 700-144 is based on the written descriptions of the release and a review of engineering drawings.

PAC REFERENCE NUMBER: 700-150.2

IHSS Reference Number: 150.2, Operable Unit 8

Unit Name: Radioactive Site West of Buildings 771 and 776 (IAG Name: Radioactive Leak West of Building 771)

Approximate Location: N751,000; E2,084,000

Date(s) of Operation or Occurrence

September 11, 1957¹ and May 11, 1969⁴

Description of Operation or Occurrence

On September 11, 1957, a fire was discovered in Room 108 of Building 771. Fires in the box exhaust booster filters and main filter plenum were discovered soon after. An explosion in the main exhaust duct probably contributed to the release of plutonium from the stack.¹ The September 1957 fire in Building 771 released radioactive contamination primarily north and southwest of the building.²

In September 1957, during firefighting and decontamination activities at Building 771, access to the main filter plenum was gained through a hatchway on the west side of the building. This activity was the main cause of the spread of contamination on the west side of Building 771 at the time of the September 1957 fire.³

On May 11, 1969, a fire occurred in Building 776-777. Plutonium was tracked outside of Building 776 by firefighting and support personnel and was detectable on the ground around the building.⁴ The tracking of contamination was confined to an area of 20 by 100 feet adjacent to the west of the building.⁵ Another source states that the contaminated area extended from the south wall of Building 778 to the north wall of the maintenance addition to Building 776 in a strip about 30 feet wide along the west wall of Building 776. Following the fire, rain carried the contamination into the soil.⁶ Airborne contamination from the May 1969 fire was carried predominately to the west-southwest, the average wind direction at the time.⁷ Contamination was found outside the building to a maximum of 200 feet following the fire.⁸

Physical/Chemical Description of Constituents Released

Soil and asphalt removed from the west side of Building 776 contained 7 dpm/g when analyzed in August 1969.⁸ Contamination was from plutonium. In May 1971, a study of the steps, dock, and ramp areas on the west side of Building 776 showed radioactive contamination as high as 6,000 c/m.⁹

Responses to Operation or Occurrence

In June 1969, an estimated 320 tons of asphalt and soil contaminated by plutonium at the time of the May 1969 fire were removed and buried in trenches.¹⁰ In December 1969, contaminated soil and asphalt were removed from behind Building 776 to fill an area to the east of Building 881 (PAC 900-130).¹¹ In May 1971, contaminated steps, dock and ramp areas on the west side of Building 776 were covered with an epoxy paint.⁹ Areas of contamination outside Building 776 were covered with asphalt.¹² In June 1980, contaminated asphalt was removed from the west side of Building 776 and boxed as hot waste.¹³

Fate of Constituents Released to Environment

No documentation was found which details the fate of the constituents released to the environment. This IHSS is being studied in accordance with the IAG schedule for OU8. However, the information developed on this unit for this study indicates the location of IHSS 150.2 presented in the IAG is inaccurate. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by July 12, 1994.

Comments

It has been proposed that IHSS 150.2 be redefined as a 75 by 600 foot area west of Building 776 and Building 771 (PAC 700-150.2).³ This area is approximately equivalent to that shown in the IAG IHSS map; however, this area differs from the extent of IHSS 150.2 described in the text of the IAG.

PAC REFERENCE NUMBER: 700-150.7

IHSS Reference Number: 150.7, Operable Unit 8

Unit Name: Radioactive Site South of Building 776 (IAG Name: Radioactive Leak South of Building 776)

Approximate Location: N750,000; E2,084,000

Date(s) of Operation or Occurrence

May 11, 1969

Description of Operation or Occurrence

On May 11, 1969, a fire occurred in Building 776/777. Plutonium tracked outside of Building 776 by firefighting and support personnel was detectable on the ground around the building.¹ Following the fire rain carried the contamination into the soil.² The spread of contamination south of Building 776 can also be attributed to the rinsing down of the building with fire hoses.³ Sand and gravel between Building 777 and Building 778 were also contaminated before the rain.⁴ Airborne contamination from the May 1969 fire was carried predominately to the west-southwest, the average wind direction at the time.⁵ Contamination was found outside the building to a maximum of 200 feet following the fire.⁶

Physical/Chemical Description of Constituents Released

Contamination was caused by plutonium released to the environment.

Responses to Operation or Occurrence

Oil and gravel were placed over the contaminated soil as a temporary measure following the May 1969 fire. The contaminated soil, oil, and gravel were removed on July 19, 1969. An asphalt roadway was completed in the area on July 22, 1969.² No documentation was found which further details response to this occurrence.

Fate of Constituents Released to Environment

No documentation was found which details the fate of the constituents. This IHSS is being studied in accordance with the IAG schedule for OU 8. The IAG activities will include site investigations, site characterizations, and possible site remediation. The Final Phase I RFI/RI Report is to be completed by July 12, 1994. Information reviewed for this study indicates that the location of this PAC as identified in the IAG documents is inaccurate.

Comments

No documentation was found which provides information on the final disposition of the soil, oil, and gravel removed from the site. The removed material could have been buried in trenches or moved to a fill area to the west of Building 881 with contaminated material removed from the west side of Building 776.^{7,8} The boundaries of this site have been moved to the north approximately 90 feet to correspond with the area between Buildings 776/777 and Building 778 (as discussed in the incident descriptions). The boundaries for the IHSS presented in the IAG were too far to the south (being between Building 778 and 707).

PAC REFERENCE NUMBER: 700-1100

IHSS Reference Number: Not Applicable

Unit Name: French Drain North of Building 776/777

Approximate Location: N750,000; E2,084,000

Date(s) of Operation or Occurrence

Prior to 1963 - After 1971¹

Description of Operation or Occurrence

A french drain which was in use from about 1963 until at least 1972 leads north from Door 17T of Building 776, crosses the alleyway, then heads eastward where its effluent leaches into the soil.¹ Radioactive contamination in the area of this site is the result of the June 1964 explosion incident in Building 776.² The area was again contaminated at the time of the May 1969 fire in Building 776 (PAC 700-131). This drain may have provided a pathway for the migration of radioactive contamination.¹ Another source indicated the french drain leads north from Door 14T of Building 776.

Physical/Chemical Description of Constituents Released

Plutonium contamination present in the area of this site as a result of the 1964 and 1969 incidents was possibly redistributed below the ground surface although no surface expression was noted.²

Responses to Operation or Occurrence

No documentation was found which detailed response to this occurrence.

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment.

Comments

The french drain could not be located on the RFP Utility Drawings.

The June 1964 explosion incident and the May 1969 fire, both in Building 776, are discussed as PAC 700-131.

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Historical Information on Under Building Contamination

701 Building 701 is a maintenance shop.

Process waste backed up into a stool and sink.¹

776 This building houses general plutonium fabrication and foundry operations. Use of this building began in 1957.

A fire on May 11, 1969 released plutonium to all of Building 776 and Building 777 and areas of Building 771, Building 778, and Building 779.¹

In June 1964 a glove box explosion resulted in an extensive release of plutonium to the interior and exterior of the building.¹

In October 1964 a tagged out valve was opened allowing contaminated carbon tetrachloride to overflow a lathe box and flow through a crack in the floor, contaminating the room below.²

On October 23, 1989, personnel in the Non-Destructive Analyses group noticed a liquid from the process waste tanks T-1A&B and T-2A&B on the floor and in the bermed area.²³ This incident resulted in the filing of a RCRA Contingency Plan Implementation Report (89-016).

779 This building houses general plutonium research and development activities. Use of this building began in 1965.

Building 779 was erected over the site of one of the original solar evaporation ponds. During excavation in September 1962, radioactive readings from 11-75 dpm/l were noted, and later, pools of water in these excavations reached levels of 150 dpm/l. The radioactive material involved was mostly uranium.¹

In June 1969 an improperly opened waste drum resulted in the spread of radioactive material throughout the building and adjacent grounds.¹