DO-02-001

Westinghouse

Hematite Former Fuel Cycle Facility Decommissioning

TITLE: **Historical Site Assessment**

USERS: **Decommissioning Staff**

REVISION: **0.2**

Owner : Official Record Electronically Approved in EDMS 2000 Date: See EDMS
Gordon M. Vytlacil

Director: Official Record Electronically Approved in EDMS 2000 Date: See EDMS
H.A. Sepp

Revision #	Change
0	Initial Issuance
0.1	Added figures to EDMS version
0.2	Changed Proprietary Classification from 2(R) to 3 because the document does not Class 2 information. Revised Title page and headers/footers consistent with current Policy/Procedure/Report format.

Are quality records generated? YES or **NO** If yes, list below.

Table of Contents

1.0 GLOSSARY OF TERMS, ACRONYMNS AND ABBREVIATIONS 1
2.0 EXECUTIVE SUMMARY 2
3.0 PURPOSE OF HISTORICAL SITE ASSESSMENT 2
4.0 PROPERTY IDENTIFICATION 3
4.1 Physical Characteristics 3
4.1.1 Name 3
4.1.2 Location 3
4.1.3 Topography 3
4.2 Environmental Setting 3
4.2.1 Geology 4
4.2.1.1 Site Specific Bedrock Stratigraphy 4
4.2.1.2 Unconsolidated Sediments (Pleistocene and Quaternary) 5
4.2.2 Hydrogeology 5
4.2.3 Hydrology 6
4.2.4 Water Supply 7
4.2.5 Meteorology 8
5.0 HISTORICAL SITE ASSESSMENT METHODOLOGY 8
5.1 Boundaries of Site 8
5.2 Documents Reviewed 8
5.2.1 Sanborn Maps 8
5.2.2 Regulatory Database Search 9
5.2.3 Aerial Photography Review 9
5.3 Personal Interviews 11
6.0 HISTORY AND CURRENT USES 11
6.1 History 11
6.1.1 Burial Pits 13
6.1.2 Filtrate Disposal Evaporation Ponds 14
6.1.3 Red Room, Item Plant and Related Areas 15
6.1.4 High Enrichment Storage Areas 16
6.1.5 Spent Limestone 16
6.1.6 Building 101 Tile Barn 16
6.1.7 Building 110 Office Building 17
6.1.8 Building 115 Generator – Fire Pump building 17
6.1.9 Building 120 Wood Barn 17
6.1.10 Building 230 Rod Loading 17
6.1.11 Building 231 Warehouse 17
6.1.12 Building 235 West Vault 17
6.1.13 Building 240 Recycle Recovery (Red Room, Green Room, Blue Room) 17
6.1.14 Well House 18
6.1.15 Building 252 South Vault 18
6.1.16 Building 253 Office 19
6.1.17 Building 254 Pellet Plant 19
6.1.18 Building 255 Erbia Plant 19
6.1.19 Building 256 19

6.1.20 Building 260 Oxide and Oxide Loading Dock 19
6.2 Current Land Usage 20
6.3 Adjacent Land Usage 20
7.0 FINDINGS 20
7.1 Potential Contaminants 20
7.2 Potential Contaminated Areas 20
7.2.1 Impacted Areas 20
7.2.2 Non-Impacted Areas 21
7.3 Related Environmental Concerns 21
7.3.1 Jurisdictional Wetlands and Surface Water Issues 21
7.3.2 Surface Water Issues 21
7.3.3 Threatened and Endangered Species 21
8.0 CONCLUSIONS 22
9.0 REFERENCES 22
10.0 APPENDICES 23

1.0 GLOSSARY OF TERMS, ACRONYMNS AND ABBREVIATIONS

ABB – Asea Brown Boveri

ACOE – Army Corps of Engineers

ADU – Ammonium Diurinate

AEC – Atomic Energy Commission

ASTM – American Society for Testing and Materials

CaF_2 – Calcium Fluoride

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act

CE – Combustion Engineering

CSSG – Clay, Silty, Sandy Gravel

DA – Disassociated Ammonia

DSCC – Deeper, Silty Clay/Clay

EPA – Environmental Protection Agency

HEU – Highly Enriched Uranium

HF – Hydrofluoric Acid

Historical Site Assessment (HSA) – a detailed investigation to collect existing information, primarily historical, on a site and its surroundings.

Impacted Area – any area that is not classified as non-impacted. Areas with a possibility of containing residual radioactivity in excess of natural background or fallout levels.

FFCF – Former Fuel Cycle Facility

MDNR – Missouri Department of Natural Resources

MTR – Materials Test Reactors

N_2 – Nitrogen Gas

NH_3 – Anhydrous Ammonia

Non-Impacted Area – areas where there is no reasonable possibility (extremely low probability) of residual contamination.

NRC – United States Nuclear Regulatory Commission

NSSSC – Near Surface Silt, Silty-Clay

PCE - Perchloroethylene

RI/FS – Remedial Investigation/Feasibility Study

SNM – Special Nuclear Material

TCE – Trichloroethylene

UF_4 – Uranium Tetrafluoride

UF_6 – Uranium Hexafluoride

UO_2 – Uranium Oxide

UO_2F_2 – Uranyl Fluoride

U_3O_8 – Uranium Oxide

UNC – United Nuclear Corporation

2.0 EXECUTIVE SUMMARY

Throughout its history, Hematite's primary function has been to manufacture uranium metal and uranium compounds from natural and enriched uranium for use as nuclear fuel. From it's inception in 1956 through 1974 the facility was used primarily in support of Government contracts that required production of highly enriched uranium products. From 1974 through the plant closure in 2001 the focus changed from Government contracts to commercial fuel production plant. Over the lifetime of the facility there have been six owners. Mallinckrodt, United Nuclear and Gulf United Nuclear owned the plant for the government focused phase of operations. Combustion Engineering, ABB and Westinghouse owned the plant during the commercial phase of operations.

3.0 PURPOSE OF HISTORICAL SITE ASSESSMENT

This Historical Site Assessment (HAS) compiles the existing information about the Hematite Former Fuel Cycle Facility (FFCF) to describe the sites complete history from the start of site activities to the present time. The primary objectives of this assessment are to:

- Identify potential or likely sources of contamination
- Determine if the site poses a threat to human health and the environment
- Differentiate impacted from non-impacted areas
- Provide input into scoping and characterization survey design
- Provide an assessment of the likelihood of contaminant migration

4.0 PROPERTY IDENTIFICATION

4.1 Physical Characteristics

4.1.1 Name

The site is the Hematite Former Fuel Cycle Facility and is now owned by Westinghouse Electric Co.

4.1.2 Location

The Hematite Facility is located at:

3300 State Road P
Festus, MO 63028

4.1.3 Topography

The Pleistocene terrace deposit has a surface topography that slopes gently to the southeast eventually blending with the alluvial floodplain deposits of the Joachim Creek, a tributary of the Mississippi River.

4.2 Environmental Setting

In 1997 general and Site specific information was gathered to create an understanding of the geology and hydrogeology of the area. Major aquifers in the area as well as their uses were identified. The bedrock structure and stratigraphic relations have been determined. The unconsolidated sediments, their depositional environment, lithology and stratigraphic relations have been determined. In 1998, a more thorough understanding of the hydrogeology and geology at the Site was obtained as part of continuing investigations.

This section provides a brief summary of the geology, hydrogeology, hydrology and provides some information regarding public water supply. There is a basic understanding of the hydrogeology at the Site based on previous investigations: Leggette, Brashears & Graham, Inc., 1998, (Ref. 1), Gateway Environmental Associates, Inc., 1997, (Ref. 2); a few points are presented below. In the hydrology sub-section, a gross summary of precipitation and stream characteristics is provided.

The Water Supply sub-section introduces the facts that nearby water users are supplied by ground-water sources (wells) and no nearby public drinking water sources are known to be from surface water sources. According to Westinghouse, Jefferson County Health officials during a community relations interview, indicated they believe that some shallow wells (10-20 feet) in Hematite may be producing from a sandy layer, which in their opinion may be influenced by surface water.

4.2.1 Geology

The Site is on the north, northeast flank of the Precambrian age St. Francis Mountains uplift, which created the Ozark Dome. Cambrian, Ordovician, Silurian, Devonian and Mississippian age sedimentary formations of various depositional environments are draped on the flanks of the Ozark Dome. The Site is situated over these sedimentary formations. Based upon the "Missouri Geologic Map, 1979" (Ref. 3) and the "Bedrock Geologic Map of the Festus 7.5 Minute Quadrangle,Jefferson County, Missouri" (Ref. 4) the uppermost bedrock beneath the Site is the lower Ordovician Canadian series, Jefferson City Dolomite.

The Jefferson City Dolomite is described in Martin et al. (Ref. 5) as mostly light-brown to medium-brown, medium to finely crystalline dolomite and argillaceous dolomite. Chert, which is not abundant, is typically oolitic, banded, mottled or sandy. Lithologic succession within the formation is complex and varies among locations. The Jefferson City Dolomite, typically is 125 to 325 feet thick, is bounded by the overlying Cotter Formation also mostly a dolomite, and beneath by the Roubidoux Formation that is dominantly a sandy dolomite with lesser beds of dolomitic sandstone and dolomite.

The indurated sedimentary rocks in this area dip gently and uniformly to the north, northeast. There are no mapped or suspected faults within several miles of the Site.

4.2.1.1 Site Specific Bedrock Stratigraphy

In 1956, Mallinckrodt Chemical Company installed an industrial water supply well for the Plant, which was logged by a State of Missouri geologist. The "Missouri Geological Survey and Water Resources Log No. 14993, 1956," (Ref. 6) documents the bedrock stratigraphy encountered by the well. Unconsolidated sediments are present to 35 feet below ground surface (bgs). The Jefferson City Dolomite extended from 35 to 125 feet bgs, the Roubidoux Formation from 125 to 255 feet bgs, the Gasconade Formation from 255 to 470 feet bgs, the Gunter Sandstone Member of the Gasconade Formation from 455 to 470 feet bgs and the Eminence Dolomite, from 470 to the total depth of the well, which is 600 feet bgs.

4.2.1.2 Unconsolidated Sediments (Pleistocene and Quaternary)

The Site is positioned in the valley of the Joachim Creek, which has incised into the surrounding Cotter and Jefferson City Formations. During late Pleistocene glacial regression, terrace units were deposited in the Joachim Creek valley. These units are chiefly derived from loess and colluvium. Later during the Holocene, alluvium was deposited in the Joachim Creek valley.

The Reference 4 describes the Holocene alluvium as clay, silt, sand and gravel chiefly derived from local loess and colluvium. Colluvium is described as a mixture of residuum, from fines to cobbles, and loess that is moving down slope as a result of slope wash and gravity. Colluvium accumulates at the base of valley slopes and in large valleys washes onto the floodplain, blending with the alluvium. Terraces typically contain lenticular beds of sand and gravel interbedded with silt and clay.

Several subsurface investigations within the terrace deposit at and near the Plant have produced geotechnical and geologic information, which allows a general stratigraphic interpretation to be made.

The more comprehensive geologic investigation performed in 1998 and 1999 greatly refined the knowledge of the unconsolidated subsurface. The study supported the concept of a sand/gravel unit present in the subsurface above the uppermost bedrock unit. Soil collected during the drilling process was analyzed for physical properties (i.e., permeability, coefficient distribution, etc.) and/or chemical laboratory parameters. Generally, the geologic information collected during this investigation corroborated geologic data obtained during previous studies. Specifically, five unique hydrostratigraphic units are located beneath the Plant portion of the Site:

- a near surface silt, silty-clay (NSSSC);
- a fat clay;
- a deeper, silty clay/clay (DSCC);
- a clayey, silty, sandy-gravel (CSSG) sometimes later in this document is referred to as the sandy-gravel unit; and
- The Jefferson City Dolomite.
- Roubidoux Formation

4.2.2 Hydrogeology

Reference 1 characterized the near-surface hydrostratigraphic units at the Site. In that investigation, two ground-water monitoring wells were generally installed at each location to serve the purposes of discrete geologic unit mapping and sampling and to provide vertical hydraulic gradient information.

As part of the hydrogeologic studies, single-well hydraulic conductivity tests were performed to characterize the horizontal hydraulic conductivity of distinct geologic horizons. From these tests, the average hydraulic conductivities of the unconsolidated materials above bedrock were found to be 3 x 10-5 cm/sec and 8 x 10-4 cm/sec for the NSSSC and DSCC units, respectively. Single-well testing of the Jefferson City Dolomite showed a hydraulic conductivity of 8 x 10-4 cm/sec. Fracturing and other features causing secondary porosity and permeability in the rock affect the hydrogeologic characteristics of the Jefferson City Dolomite and other bedrock formations. The primary permeability of the bedrock (i.e., through the solid rock matrix) is measured to be low, thus, slow ground-water velocity would be predicted. However, ground water flowing discretely through fractures, partings, or other secondary permeability features may do so at a much higher velocity. The size, density, and orientation of these fractures and partings determine the effective hydraulic conductivity of the bedrock.

Potentiometric surface (ground-water elevation) maps were constructed for the NSSSC, DSCC, and Jefferson City units to determine ground-water flow direction and hydraulic gradient. In the NSSSC unit, ground water flows to the northeast and southeast. In the DSCC and Jefferson City units, ground water flows to the southeast. Recent work shows the Roubidoux Fm.'s pieziometric surface as also indicating southeast flow direction. The orientation of the fractures and other secondary permeability features influence ground-water flow directions and gradients in the Jefferson City and other bedrock formations.

In 2002, responding to the need for more hydrogeologic data prompted by the discovery of trichloroethylene (TCE) contaminated private domestic wells, additional drilling and characterization was accomplished, adding to the hydrogeologic body of knowledge. That information is summarized in the Site Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Ref. 7).

4.2.3 Hydrology

The "Missouri Water Atlas, 1986" (Ref. 8) was referenced to determine local stream characteristics. The Atlas shows that Joachim Creek, located along the southeast Site boundary, is a permanent flowing stream. There are several other surface water features present on the Site, including a spring, intermittent perennial and ephemeral streams, a lake and ponds.

- The Site Spring flows an estimated 1 to 10 gallons per minute (gpm) most of the year. The spring is likely a result of fracture flow in the Jefferson

City-Cotter Formation, which receives its source water in the hills northwest of the Site.

- The Site Pond is a small concrete dam impoundment southwest of the Plant. It receives flow from the Site Spring and storm water runoff from the Plant area.
- The Site Creek is the effluent from below the dam of the Site Pond that receives discharge from the sanitary and storm water system. It flows through a culvert beneath the railroad track and joins the effluent from the Lake Virginia drainage basin.
- Lake Virginia/Site Creek combined tributary flows east to the Joachim Creek.
- The Northeast Site Creek flows southeast to the east of the Burial Pits and then east to its confluence with the effluent of East Lake tributary, then to the Joachim Creek.
- East Lake east of the Site is an earth impoundment lake used as a water supply for cattle. It is reported to never have been used in conjunction with Plant operations.
- North Lake Tributary is the effluent drainage from North Lake and North Tributary. This tributary crosses the terrace, west of East Lake.
- North Tributary is an intermittent stream west of North Lake.

Quantitative data regarding flow quantity, duration, peak discharge, etc. is not available for all of these features. However some observations can be made.

- The Site Spring flows virtually continually.
- The ponds and lake on the Site hold water year round. (Flow is measured at the dam of Site Pond and reported quarterly to the Missouri Department of Natural Resources (MDNR) Water Pollution Control Program.)
- The streams flow intermittently.
- The Joachim Creek is perennial.

4.2.4 Water Supply

Water for the Plant is supplied by a well located north of Building 253 within the fenced manufacturing area. Up to 36,000 gallons were withdrawn from this well daily. Well water is stored in an elevated 200,000-gallon tank and distributed as needed within the plant, primarily for process water.

According to "Water Resources Report 30, 1974" (Ref. 9) domestic and industrial water wells in the vicinity produce water from the Powell - Gasconade aquifer group which includes the Jefferson City Dolomite, the upper most bedrock unit at the Site. Wells in the area, may intersect the Jefferson City Dolomite if it is present, but presumably do not derive significant quantities of water from it due to its poor storativity.

There are no public water supply intakes on Joachim Creek. According to an Environmental Protection Agency (EPA) field investigation report (1990) "Preliminary Assessment, Hematite Radioactive Site, Hematite, Jefferson County, Missouri, 1990" (Ref. 10) most of the residents of Hematite receive their drinking water from Rural Water District #5. The report also states that surface water is not used for drinking within at least a four-mile radius of the Site.

4.2.5 Meteorology

The "Missouri Water Atlas, 1986" (Ref. 8) was referenced to determine local precipitation. The area receives an average of 38 inches of precipitation per year, with 12 inches of average annual runoff. The maximum 10-day event expected precipitation is 9 inches in a given 25-year event.

5.0 HISTORICAL SITE ASSESSMENT METHODOLOGY

5.1 Boundaries of Site

The property consists of approximately 228 acres, of which eight have most recently been used for operations. The facility is located on Missouri State Road P, between the hills to the northwest and a terrace/floodplain of Joachim Creek.

5.2 Documents Reviewed

Specific actions regarding the historical review include:

- Review of the burial area records,
- Review of plant survey data and environmental monitoring data,
- Review of plant files regarding regulatory action and license history,
- Review of plant files regarding spills and leaks,
- Review of pre-construction survey records, and
- Review of historical plant photos taken during construction activities.

In addition to this internal records review, fire insurance maps, environmental regulatory database and aerial photographs were reviewed. Below is a summary of the various sources of public record historical information reviewed in addition to the pertinent information from the review.

5.2.1 Sanborn Maps

Sanborn Fire Insurance Maps are comprised of fire risk information for various years from the late 1880s to present. The maps when available illustrate historic Site features, usage, and potential hazards. An attempt was made to acquire the Sanborn Fire Insurance Maps for the facility however according to Environmental

Data Resources, owner of the Sanborn Map Company, Sanborn Fire Insurance maps were not published for this area.

5.2.2 Regulatory Database Search

Federal and State environmental history records relating to the Site and surrounding properties were reviewed. These records provide information on whether environmentally regulated or hazardous materials may have been improperly handled, stored or disposed at or near the Site.

The Federal and State record review was accomplished through a computer database (EDR, Inc.) search of facilities that appear on lists generated by federal, state and local governments. The review also considered sites surrounding the Site to a distance specified in American Society for Testing and Measurements (ASTM) Standard E 1527-00 (Ref. 11). The database identified no facilities within the specified query area.

5.2.3 Aerial Photography Review

Readily obtainable, high to medium altitude, black and white aerial photographs provided by Westinghouse, the United States Geological Survey and obtained from private sources were reviewed. These include the following years: 1937, 1954, 1956, 1959, 1960, 1962, 1966, 1971, 1973, 1974, 1975, 1978, 1980, 1986, 1990, 1991, 1993 and 1996 (Ref. 12). The available photographs were for a specific day in each of the above-referenced years. The purpose of the review was to discern visible evidence of potential environmental conditions on the Site, or contiguous areas.

In 1937 the Site contained the two existing barns in the northwest portion of the site. At least one residence and related outbuildings were located immediately southwest of the Site Pond, fronting the eastbound lane of State Highway P. Areas north and south of the railway easement, south of State Highway P, were cultivated. The Northeast Site Creek located immediately northeast from the current plant appears to have been straightened. Some trees lined the intermittent tributaries of Joachim Creek, and were dense along those tributaries south of the rail line. A fenceline and unimproved road were noted trending south-southeast from the highway, immediately southeast of current East Lake and northeast of North Lake tributary.

In 1954 one or two small structures were observed immediately south of the north-most barn. A fence was apparent around the south portion of the north-most barn. A south-southeast trending unimproved road located immediately northeast from the existing plant, originating from State Highway P, crossed the rail line and terminated near Joachim Creek. Agricultural activities were noted in the vicinity of the current Plant and immediately south of the rail line. A potential fence line was observed south, and parallel to, the rail line. The southeast-trending unimproved road near the East Lake extended southeast of the rail line terminating near Joachim Creek.

In 1956, grading activities associated with construction of the plant facilities were observed. Disturbed or graded areas were observed northeast of the new plant structure, between the unimproved road and the Northeast Site Creek. Two plant structures were apparent in the 1959 photograph. The unimproved road located northeast from the Plant is no longer discernible in 1959, although a fenceline may have been installed in its place. Scrub vegetation is noted northeast of the Northeast Site Creek. This portion of the Site between the Northeast Site Creek and the Residence (south of Highway P) did not exhibit row crops for the remaining photographs reviewed. A footpath or potential surface drainage channel was noted trending southwest from the plant, toward the Site Pond. Grading or disturbed areas were observed on both sides of the Site Pond. Construction of Lake Virginia was noted north from the Site.

In 1960, the parcel south of the rail line contained scrub vegetation and did not exhibit row crops for the remaining photographs reviewed. A darkened circular area, potentially a small body of standing water, is located east of the Site Pond, southwest of the Site structure. In 1962, three disturbed areas or areas of distressed vegetation were noted immediately northeast of the fence line (former unimproved road), southwest of the Northeast Site Creek.

In 1966, sedimentation or a disturbed area was observed in the north portion of the Site Pond. The Site Pond appeared dry. A disturbed area, larger than that identified in the 1962 photograph, was noted immediately northeast of the fence line located between the Site structure and the Northeast Site Creek. A structure or trailer was noted in the center of the disturbed area. Excavated or disturbed areas consistent with the current locations of the evaporation ponds were noted immediately south of the plant. The East Lake had been constructed and was apparent northeast. In 1971, the four or five structures noted southwest of the barns were no longer visible. An unimproved, northeast-trending path or trail was observed southeast of the rail line. Water was discernible within the evaporation ponds.

In 1973, a disturbed area was noted immediately southwest of the Site Creek, east of the Highway. Disturbed areas were also noted immediately south of the rail line, and near existing monitoring well WS-16. Circular tracks, indicative of cattle feed areas, were evident immediately east of the East Lake. No significant changes or features were observed in 1974. In 1975, distressed vegetation was noted immediately northeast from the plant, southwest of Northeast Site Creek. A small disturbed area was observed south of the Plant, immediately north of Joachim Creek. Construction of Missouri State Highway A was apparent east of the Site.

The 1978, 1980 and 1986 aerial photographs were taken from high altitudes limiting detailed assessment; however, changes or significant features were not observed. In 1990 and 1991, disturbed areas were noted northeast of the Site Plant, southwest of North Site Creek, and southwest of the barns. These areas may be associated with limestone gravel that was reportedly placed in similar locations. An unimproved access road from Highway P to the area northeast of the Plant was discernible. The 1991 photograph shows road and other construction associated with the water storage tank located in the north portion of the Site, north of Highway P. In 1993, the Site and immediate vicinity appear essentially as viewed today. No change was noted in 1996 from the 1993 photo.

5.3 Personal Interviews

Subsequent to the Westinghouse acquisition of the Hematite facility, numerous interviews have been conducted with former employees regarding the historical operations. Information, gathered during these interviews in addition to on-site document reviews of Site conditions, was used to describe the Site's complete history from the start of activities to the present time.

6.0 HISTORY AND CURRENT USES

6.1 History

Throughout its history, Hematite's primary function has been to manufacture uranium metal and uranium compounds from natural and enriched uranium for use as nuclear fuel. Specifically Hematite was primarily used to convert government-owned and leased uranium hexafluoride (UF_6) gas of various U-235 enrichments to uranium oxide, uranium carbide, uranium dioxide pellets and uranium metal. These products were manufactured for use by the federal government and government contractors and by commercial and research reactors approved by the Atomic Energy Commission (AEC). Research and development was also conducted at the Plant, as were uranium scrap recovery processes.

In 1955 Mallinckrodt Chemical Works purchased the parcel of farmland on which the plant sits. The Plant became operational in July of 1956 producing uranium for use in the navy nuclear fuel program. Mallinckrodt Chemical Works operated the facility until approximately May of 1961 at which time ownership was transferred to the United Nuclear Corporation (UNC). UNC provided uranium products to the federal government.

In 1970, UNC and Gulf Nuclear Corporation entered into a joint venture forming, Gulf United Nuclear Fuels Corporation (Gulf) which owned and operated the facility until the spring of 1973 when UNC closed the plant and began decommissioning. Combustion Engineering Inc. (CE) purchased the Property in May of 1974. In 1989 Asea Brown

Boveri (ABB) acquired the stock of CE and began operating the facility as ABB Combustion Engineering. In April of 2000, Westinghouse purchased the nuclear operations of ABB which include the Hematite facility.

During the period prior to CE's purchase of the Facility in 1974, government projects dominated the operations on Site. During this time period the government owned all the national uranium supply and leased it to facilities as needed. In order to obtain uranium, even for government projects, a facility had to submit a request for allocation to the AEC describing the amount and enrichment of uranium needed. A review of the requests for allocation from 1959 through 1966 (the only such documents located to date) indicates that approximately 7,576 kg of uranium was requested for government-related projects and 1,887 kg of uranium was requested for commercial projects.

Much of the work on behalf of the government at the Site was classified, and therefore specific details regarding the exact nature of the processes are not known. Generally, the government work began under Mallinckrodt's supervision and then dominated Hematite production during the ownership and operation of UNC. Examples of government projects during this time include:

- production of uranium metal for nuclear submarines and a D1G destroyer reactor;
- the supply of specialized uranium oxides for the Army Package Power Reactor;
- the supply of high enriched oxides for a General Atomics' gas-cooled reactor in Fort St, Vrain, Colorado;
- the production of highly enriched metal for materials test reactors (MTR) utilized by the Navy;
- the supply of uranium-beryllium pellets for use in the "SL-1" reactor;
- the production of high enrichment uranium zirconia pellets for the Shippingsport naval reactor under contract to Bettis Laboratory;
- and the production of highly enriched oxides to General Atomics for use in the NERVA nuclear rocket projects.

Hematite also contracted directly with Oak Ridge AEC office and other government contractors for the recovery of uranium from scrap materials. Scrap recovery projects at Hematite included the recovery of uranium from scrap generated by a variety of Navy projects and CUNO filter scrap generated by the Aircraft Nuclear Propulsion program.

Although the physical design of the Plant was modified over the years, certain areas of the Plant were dedicated to particular production processes as well as certain types of work (i.e., low enrichment processes versus high enrichment processes). For example, Building 240 was historically dedicated to the chemical conversion of uranium into compounds, solutions, and metal. Building 240 was further divided into areas for high enriched and low enriched uranium processes: the "Red Room" (area 240-2) containing high enriched conversion processes and the "Green Room" (area 240-3) containing low enriched conversion processes and high enriched scrap processing. The Red Room was specifically used for the reduction of UF_6 to uranium tetrafluoride (UF_4), the conversion of UF_4 to uranium metal, high enriched uranium scrap recovery, and other chemical conversion processes using high or fully enriched uranium.

Building 255 of the Plant was used for the fabrication of uranium compounds into physical shapes. Again, this building was segregated into areas of high enrichment and low enrichment, with area 255-2 containing the low enrichment pellet plant and area 255-3 containing the "Item Plant." The Item Plant work was classified and products coming out of the Plant were referred to only as "items," and thus, the area received its name as the Item Plant. The Item Plant was dedicated solely to classified government-related work and specifically Navy fuel production work. The Item Plant was specifically designed to process uranium dioxide into a Navy fuel product. Other activities within the Plant included the blending of uranium oxide (UO_2) with other chemical compounds.

Other areas of the Hematite Facility were used for storage, and again were separated primarily by degree of enriched material or product stored. High enrichment storage areas included Buildings 235, 250, and 252. Also, high enriched scrap was held in an outdoor, fenced 75' x 120' area to the south of the Plant.

6.1.1 Burial Pits

Beginning no later than 1965, and perhaps as early as 1958 or 1959, and continuing at least until November of 1970, on-site burial was used as a means of disposal of contaminated materials and wastes at Hematite. From 1965 until 1971 up to 40 large unlined pits were dug east of the Plant buildings. These pits were used to dispose of materials and waste generated by the Plant processes. This on-site burial was a formally authorized activity, conducted pursuant to a policy and memoranda describing the size and spacing of the pits, the thickness of the cover, and the quantity of radioactive material that could be buried in each pit. Copies of two United Nuclear Corporation Memoranda regarding burial of residues and contaminated material are attached in Appendix A.

UNC and Gulf maintained detailed logs of burials for the period of July of 1965 through November of 1970. A copy of excerpts of the Hematite burial logs is attached hereto as Appendix B. Each entry contains a date, a verbal description of the waste buried, the weight of the uranium measured for that waste and a cumulative total of the uranium buried in that particular pit. Some entries also list percent enrichment for the uranium.

The logs show a wide variety of wastes being buried in the pits. Although the number of entries is too great to include, some examples of entries include: Tile (Red Room floor); Contam. 5 gal. Endshake oil; B.D. Chlorotherm; 97% Acid H_2); R.S. oil; UO_2 THO_2 Paper Towels; Unknown Oil; R.S. Acid Insoluable; Mixed Acid Residues; MB Rafinate Sample bottles; Bottle unknown organics; Pickling Solution; 1 Drum of TCE #930 unknown enr; vac. Oil; KOH Insoluables; press oil; pentachloride from vaporizer; Used Magnorite; Perclene;

TCE u. metal wash; chlorothene – can cleanup; TCE Rags; Oily rags from Item floor; $NbCl_5$ vap. Cleanout; Item 51 Poison equipt.; and TCE-Oil-Rags.

No records of burials exist prior to July of 1965. However, an untitled memorandum has been located indicating that burial pits may have been used as early as 1958 or 1959, and that as many as three or four pits were used each year prior to 1965 (Appendix C). Accordingly, it is estimated that an additional 20-25 pits may exist for which there are no records. There is no information to indicate the nature of the material buried in these other pits.

On-site burial of radioactive material was terminated in November of 1970 as a result of an AEC citation issued for failure to adhere to revised AEC regulations concerning the quantity of material which could be buried on-site. It appears though that Gulf did not cover the final pit until 1974 when it sold the property.

There has been no substantial investigation or analysis of the extent of the contamination of the pits and the surrounding area. Rather, the pits remain in substantially the same condition as when Gulf ended on-site burial activity in November of 1970.

6.1.2 Filtrate Disposal Evaporation Ponds

The Hematite Plant has two former filtrate disposal evaporation ponds that were also used for on-site disposal of low-level contaminants and both high enrichment and low enrichment uranium materials. The two ponds consisted of a primary pond and a larger secondary/overflow pond. When constructed, the ponds were excavated to a depth of 3 feet, 4 inches and the soil removed was used to construct a 1 ½ foot high berm around each pond. The ponds were then lined with a 6 inch bed of 3 inch diameter rock, followed by a 4 inch bed of ½ inch diameter rock. The original size of the primary pond was 30 feet by 40 feet and the secondary pond was 30 feet by 85 feet. Twelve feet separated the two ponds.

The Evaporation Ponds were primarily used for the disposal of low level liquid wastes containing insoluble uranium bearing precipitates and other solids. The precipitates and solids were allowed to settle and the water evaporated naturally. As additional liquids were added to the primary pond, the overflow flowed through a pipe into the secondary pond. The ponds were originally built to receive filtrates from the low enriched ammonium diurinate (ADU) conversion facility, but were later used for the disposal of both high and low enrichment recovery waste liquid. The logs from the burial pits also contain a number of entries reflecting disposal of various materials in the Ponds. Examples of such entries include: Filtered Perclene; Liquid from Sump; TCE from Metal Wash; Filtered Reactor Cleanout; Filtered KOH Solution; Acid Water Cleanup; HCl Solution; TCE Cleanup; Oil from Vac. Pump; Mop Water; TCE and Oil; TCE (u. Metal Wash); Acetic Acid & H_2O; H_2O and Perclene; Filtrate; Nitric Acid Wash

Water; and Pickling Hood Cleanup. Entries documenting this disposal are located in the logs in Appendix B.

Immediately after CE purchased the Plant in 1974, use of the Ponds was curtailed so as to allow only disposal of spent potassium hydroxide scrubber solution from the uranium dry recycle process and liquids from startup testing of the wet recovery process. Use of the ponds was discontinued altogether in September 1978. Following the discontinued use of the ponds, 700 ft^3 of sludge was pumped out of the primary pond on October 1979. The sludge was dried and shipped to licensed burial during 1982, 1983 and early 1984.

Formal decommissioning and decontamination efforts were undertaken in 1984, as specified and ordered by the U.S. Nuclear Regulatory Commission (NRC) in a March 8, 1984 letter (Ref. 13). In response, CE submitted a decommissioning plan to the NRC by letter dated May 31, 1984 (Ref. 14) (Appendix D). The NRC approved the plan by letter dated October 3, 1984 (Ref. 15). As a result of the 1984 decontamination approximately 2,800 ft^3 of sludge, rock and dirt was removed from the primary pond in August 1985. Detailed sampling of the primary pond was performed during the period of August through October 1986. Additional sampling, following the remediation effort, determined the average contamination of the soil in the ponds was below the 250-pCi/g decontamination limit set by the NRC. However, contamination levels in excess of the average limit remained.

In a status report dated May 20, 1988 (Ref. 16) to NRC, CE provided further information concerning the remediation of the ponds. CE reported that core samples from the sides and bottom of the primary pond were taken and analyzed. The samples revealed an average contamination of approximately 60 pCi/g, with one sample as high as 674 pCi/g. Approximately 1,200 cubic feet of soil and rock was also removed from the secondary pond during 1987, and detailed surface soil samples were taken. The average contamination from these 150 samples was 173 pCi/g, and the highest reported level was 745 pCi/g.

During the period of 1991-1992 CE commissioned a contractor to plan and execute a soil and water study of residual contamination in the ponds. The results of this study were not consistent with the previous analyses. Rather, in this testing, the near surface soil samples from both ponds showed higher total uranium activity and further remediation of this area appears likely.

6.1.3 Red Room, Item Plant and Related Areas

Because these areas were used for high enrichment fuel production processes from at least the 1950's to the early 1970's they are highly likely to contain nuclear contamination above currently applicable limits. In fact, these areas were identified as contaminated or "hot" areas during the transition of ownership of the

Plant from Gulf to CE in 1974. At that time, partial decontamination was undertaken. Specifically, equipment was removed, duct work and exhaust fans were removed, the floors were scarified and both rooms were vacuumed, steam cleaned and painted. In the Red Room, three inches of concrete was added to the floor and the roof was removed and supposedly buried on-site. However, these decontamination efforts, although acceptable at the time are probably not in compliance with current regulations for free release. Moreover, additional contamination has been identified in the areas under the Red Room floor and immediately outside the Red Room.

6.1.4 High Enrichment Storage Areas

Three buildings, as well as an outside area at the Plant, have been identified as potentially contaminated storage areas. Specifically, Building 250 (159 ft. by 20 ft., housing up to 600 storage units) in the center of the Plant was used for high enriched filter storage and high enriched UF_6 cylinder storage. Building 252 (41 ft. by 50 ft), to the south, contained up to twelve sets of storage racks, five shelves high, used to store high enriched finished products and waste. Building 235 (20 ft. by 37 ft.) was also used to store high enriched product and waste in a similar fashion. The outside storage area (75 ft. by 120 ft.) was used as a high enriched scrap holding area.

6.1.5 Spent Limestone

The Hematite plant used crushed limestone rock chips in dry scrubbers to facilitate the removal of hydrogen fluoride from off gas streams associated with the UF_6 to UO_2 conversion process. The limestone chips are partially converted to calcium fluoride in the scrubbers and the waste limestone chips are referred to as "spent limestone." After removal from the scrubbers, the spent limestone was tested to determine the level of radiological activity.

Prior to 1979, all spent limestone with radiological activity below 100 dpm/100 cm^2 was quarantined in a pile located in the southeast corner of the current fenced in area of the plant. Since 1979, all spent limestone with radiological activity below 100 dpm/100 cm^2 has been used, with NRC approval, as onsite landfill, while spent limestone with activity greater than 100 dpm/100 cm^2 has been quarantined in piles in the southeast corner. All spent limestone with greater than 1,000 dpm/100 cm^2 activity has been sent to a licensed burial facility. Sampling and testing of the material has been performed periodically, revealing uranium contamination concentrations in the piles and the soils adjacent to and/or beneath the piles.

6.1.6 Building 101 Tile Barn

The Tile Barn formerly functioned as the emergency operations center. The building has been used to store both clean and radiologically contaminated equipment.

6.1.7 Building 110 Office Building

No work with radioactive or chemical compounds was reportedly undertaken in this building.

6.1.8 Building 115 Generator – Fire Pump building

A diesel-powered emergency generator was located in this building. No work with radioactive materials was performed in this building. A 600 gpm diesel fire water pump currently remains in the building.

6.1.9 Building 120 Wood Barn

The wood barn has been used to store both clean and contaminated equipment. The floor is dirt and may have residual contamination in low concentrations.

6.1.10 Building 230 Rod Loading

Finished pellets (standard, erbium and gadolinium) were loaded into fuel rods and assemblies for shipment offsite from Building 230. This building was built circa 1992.

6.1.11 Building 231 Warehouse

Building 231 was used to store shipping containers. Some shipping container refurbishment was performed in this area. A small potential for UO_2 contamination exists.

6.1.12 Building 235 West Vault

The West Vault was most recently used to store depleted and natural uranium. It was historically used to store high-enriched uranium. The interior of the building was painted in 1994 and contamination may be present under the paint.

6.1.13 Building 240 Recycle Recovery (Red Room, Green Room, Blue Room)

This building contains laboratory and maintenance areas, a recycle recovery area, a waste incinerator area and the former Health Physics laboratory. Support-operations were conducted for conversion, pelletizing and fuel assembly including material recycle, scrap recovery, cylinder heel recovery, quality control and analytical laboratory, maintenance, waste consolidation and disposal preparation.

This building was integral to the historic operations of the facility. Past operations included the conversion of HEU using a wet conversion process and wet recovery of scrap. The effluent streams were piped to the retention ponds for settling and evaporation. The pipe system is likely to contain HEU. Numerous spills and leaks likely occurred in these areas and parts of the slab were repoured in 1974 over some existing contaminated flooring. Additionally, sub slab contamination was found during the 1989 construction of Building 253.

Building 240-1 currently houses the Health Physics and production laboratories, lunchroom and laundry for radiologically contaminated PPE. It historically housed the lunchroom, offices, locker rooms and laundry.

Building 240-2 (Red Room) was used for recycle and recovery operations. It historically included high enriched powder and metal operations, including recycle and recovery.

Building 240-3 (Green Room) is currently used for the incinerator and associated support operations. It historically included low-enriched powder operations, including ADU and oxidation/reduction furnaces.

Building 240-4 (Blue Room) currently houses the maintenance shop. It also housed the production laboratory until 1993 when it was moved to 240-1. It formerly housed low-enriched powder operations.

6.1.14 Well House

The Well House is the block building attached to the potable water tank by the double doors into the laundry room. Currently, chlorinating of potable water occurs in the building using sodium hypochlotite (bleach), and the tank marked "potable water" is used to ensure appropriate contact time. This building and the attached tank are connected to the 200,000-gallon gravity tank on the hill across State Road P, whose elevation creates a 50-psig static head throughout the system. A pressure switch in the well house automatically activates the well pump when static pressure drops below 50-psig.

Formerly, the existing chlorine contact tank was used as a pressure tank to create the static head by adding nitrogen as necessary. That operation ended when the gravity tank was built in 1991. The Well House formerly contained a mop water boil-down tank immediately east of the chlorinating tank with a storm drain under the tank for overflow. The boil-down tank was eliminated around 1993 and the storm drain was capped with concrete.

6.1.15 Building 252 South Vault

The South Vault was used for storage of low and high enriched nuclear material. It was most recently used for storage of chemicals and low level radioactive wastes.

6.1.16 Building 253 Office

This building contains offices, various Site utilities, storage of uranium, processing areas and decontamination facilities. Within building 253 is an inner building 250 that was formerly a stand alone structure used for storage and housed the boiler, cooling tower pumps, and recycle hopper make-up.

6.1.17 Building 254 Pellet Plant

In the pelletizing buildings granules of UO_2 or uranium oxide (U_3O_8) were fed into a mill (micronizer) that produced fine powder for pressing. A starch and die lubricant were added and blended into a batch and subsequently pressed into pellets. The "Green" fuel pellets were processed through a dewaxing furnace to remove the additives and then passed through a sintering furnace where they were made into a ceramic. These furnaces were electrically heated and used disassociated ammonia to provide a reducing atmosphere.

6.1.18 Building 255 Erbia Plant

Most recent use of this building was for the special product line making erbium pellets. It was the main pellet plant from 1974 through the opening of Building 254 in 1989. This process area included agglomeration, which used cranko and freon, instead of the slugging presses, to increase particle size between the micronization/blending and pellet pressing. Additionally, Building 255-3, the current erbium recycling area, was historically called the Item Plant in which high-enriched shot to be used as reactor fuel was sized and coated.

6.1.19 Building 256

Building 256-1 was used for Pellet Drying. Pellet trays were loaded into pans, dried in an electric oven using disassociated ammonia (DA) as a cover gas and either stored or transferred to Building 230. This structure was originally used as warehouse space.

Building 256-2 was the main site warehouse for shipping pellets and powder and for receiving site supplies.

6.1.20 Building 260 Oxide and Oxide Loading Dock

The Oxide Building was built in approximately 1968 and is a four-story Butler type building. This building was used for the conversion of uranium compounds into uranium oxide granules.

6.2 Current Land Usage

Westinghouse has started environmental remediation and decommissioning activities at the Plant. This includes investigation into the groundwater contamination issues and preparing the Plant for the start of decommissioning.

In addition to the building descriptions provided previously, Building 230 is now being used as office space to house the Decommissioning Team. The Tile Barn functions as the emergency operations center and is being used to store both clean and radiologically contaminated equipment. The wood barn is also currently being used to store both clean and contaminated equipment. Building 240 currently contains laboratory and maintenance areas, a recycle recovery area, a waste incineration area and the Health Physics laboratory.

In addition, Westinghouse also leases part of its property to residents and farmers. This property is located outside of the main Plant boundaries.

6.3 Adjacent Land Usage

Adjacent to the Westinghouse property is residential homes, woods and farmland.

7.0 FINDINGS

7.1 Potential Contaminants

The primary known contaminants of concern are uranium and technetium. Due to the unknowns associated with government activities, thorium, Americium and Neptunium should be considered isotopes of concern until proven otherwise.

TCE was used in the Navy process and later as thinner for a binding agent in pellet manufacturing. Perchloroethylene (PCE) was used at the facility in a historic uranium processing operation. Both of these contaminants have been found as contaminants in the soil and groundwater and are being dealt with through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

7.2 Potential Contaminated Areas

7.2.1 Impacted Areas

The process buildings and surrounding land are to be considered impacted area. The actual extent of the land area shall be determined but is presently assumed within the central 7-acres of the site. Class 1, 2 and 3 impacted areas will be determined based on future characterization efforts.

The ground water in the overburden has historical contamination of Tc-99. Characterization efforts will be developed to further determine the extent of the water contamination in the overburden. The aquifers have shown no detectable levels of contamination.

7.2.2 Non-Impacted Areas

The area land outside the burial pits shows no documented evidence of activities that could possibly have contaminated these areas. As such, they are expected to be classified as non-impacted but will be tentatively included in site characterization for further investigation..

7.3 Related Environmental Concerns

7.3.1 Jurisdictional Wetlands and Surface Water Issues

Jurisdictional wetlands and surface water issues would need to be considered in operations and actions related to executing the decommissioning effort. Wetlands are believed to be present on the Site and the surrounding properties. This natural resource is under the jurisdiction of the federal government, jointly administered by the United States (U.S.) Army Corps of Engineers (ACOE) and the U.S. EPA. At the state level, jurisdiction is administered by participating state agencies including the MDNR and the Missouri Department of Conservation Wetlands Management Program.

7.3.2 Surface Water Issues

Five intermittent tributaries (North Lake Tributary, East Lake Tributary, Northeast Site Creek, Site Creek, and Lake Virginia/Site Creek Tributary) and one perennial stream (Joachim Creek) flow across or run adjacent to the Site. Two ponds/lakes, including East Lake and Site Creek Pond are also on the property. These water resources, just as wetlands, are under the jurisdiction of the federal government and the State of Missouri.

7.3.3 Threatened and Endangered Species

An evaluation of the potential effects of the Plant's decommissioning may have on threatened and endangered species is an important aspect of the project. Threatened and endangered species are protected under federal and state statute and threatened and endangered species are often key indicators to the overall health of an ecosystem.

8.0 CONCLUSIONS

Based on the HSA the potential sources of contamination are the burial pits, the lagoons, and soil contamination remaining after years of operation. TCE from the site is migrating off site and does pose a threat to human health and the environment. The approximately eight (8) acres surrounding the site are considered impacted with the remaining property classified as non-impacted.

There are numerous unknowns associated with the burial pits. This HSA provides a detail description of the site history and has provided valuable insight for the decommissioning planning; however, the detailed information on the pits for safe and effective remediation planning is not available. Further site characterization is needed to determine the content and extent of contamination associated with the burial pits.

9.0 REFERENCES

1. Leggette, Brashears and Graham, Inc., *"Hydrogeological Investigation and Groundwater, Soil and Stream Characterization,"* 1998.

2. Letter from Christopher Neustadt of Gateway Environmental Associates, Inc., to Robert Sharkey of ABB, "Exploratory Probehole Investigation for the Evaporation Ponds at the ABB Combustion Engineering Hematite Facility," April 17, 1997.

3. "Missouri Geologic Map," 1979.

4. MDNR, Division of Geology and Land Survey, *"Bedrock Geologic Map of the Festus 7.5 Minute Quadrangle, Jefferson County, Missouri."*

5. Martin, J.A, et. al, *"The Stratigraphic Succession of Missouri: Missouri Geological Survey and Water Resources, " 2nd Series, V. 40, p. 20-32.*

6. *"Missouri Geological Survey and Water Resources Log No. 14993,"* 1956.

7. Westinghouse Electric Co., *"Remedial Investigation Feasibility Study Work Plan."*

8. *"Missouri Water Atlas,"* 1986.

9. *"Water Resources Report 30,"* 1974.

10. *"Preliminary Assessment, Hematite Radioactive Site, Hematite, Jefferson County, Missouri,"* 1990.

11. ASTM Standard E 1527-00, *"Standard Practice for Environmental Site Assessments:Phase 1 Environmental Site Assessment Process,"* 2000.

12. Photographs for years 1937, 1954, 1956, 1959, 1960, 1962, 1966, 1971, 1973, 1974, 1975, 1978, 1980, 1986, 1990, 1991, 1993 and 1996.

13. Letter from NRC to CE, March 8, 1984.

14. Response letter from CE to NRC, May 31, 1984.

15. Letter from NRC to CE, October 3, 1984.

16. CE Status Report, May 20, 1988.

10.0 APPENDICES

Appendix A: Memoranda for Burial

Appendix B: Burial Log Excerpts

Appendix C: Memorandum

Appendix D: 1984 Evaporation Ponds Decommissioning Plan

Appendix A

Memoranda for Burial

ᵣFICE MEMO

UNITED NUCLEAR
CORPORATION

TO E. F. SANDERS AT HEMATITE DATE JULY 19, 1965

FROM L. J. SWALLOW AT HEMATITE COPY TO D. F. CRONIN, D. G. DARR, R. M. HAMMOND, J. A. RODE, J. P. ROSSER, F. G. STENCEL

SUBJECT BURIAL OF RESIDUES AND CONTAMINATED MATERIAL

THE FOLLOWING IS A SUMMARY OF THE CRITERIA WE AGREED TO FOR THE BURIAL OF LOW LEVEL WASTES AND CONTAMINATED EQUIPMENT.

I. AEC REGULATIONS

MAXIMUM QUANTITY PER BURIAL PIT: 50 MICROCURIES

ENRICHMENT	GRAMS U
>50 - 100%	790
>25 - <50	2000
>20 - <25	5000
>15 - <20	6000
>10 - <15	8000
> 6 - <10	12000
5	22000
4	26000
3	32000
2	40000
1	59000
NATURAL AND DEPLETED	150000
THORIUM	450000

IF MORE THAN ONE ENRICHMENT IS INVOLVED IN THE BURIAL THEN THE QUANTITY OF URANIUM OF EACH ENRICHMENT BURIED MUST BE LIMITED SUCH THAT:

$$\frac{X_1}{Ax_1} + \frac{X_2}{Ax_2} + \cdots + \frac{X_N}{Ax_N} = 1.00$$

WHERE: X_1, X_2, X_N IS THE QUANTITY OF U (IN GRAMS) OF EACH ENRICHMENT TO BE BURIED. Ax_1, Ax_2, Ax_N IS THE ALLOWABLE QUANTITY TO BURY OF THE CORRESPONDING ENRICHMENT.

BURIAL DEPTH: ALL MATERIAL BURIED IS A MINIMUM OF 4 FEET BELOW GRADE.

BURIAL FREQUENCY: NOT MORE THAN 12 PER CALENDAR YEAR.

B

.DUES AND
MATERIAL

SEPARATION OF BURIAL PITS: A MINIMUM OF SIX FEET BETWEEN PITS.

RECORDS: EACH ITEM SHALL BE TAGGED SHOWING ENRICHMENT, TOTAL U CONTENT.

A WRITTEN RECORD SHALL BE MAINTAINED BY THE RESPONSIBLE SUPERVISOR OF EACH BURIAL. THIS RECORD WILL LIST THE INDIVIDUAL ITEMS BURIED, TOTAL CONTENT AND DATE OF BURIAL.

NOTE: THERE IS NO REGULATION ON THE SIZE OF THE PIT.

II. UNC REGULATIONS

A. CONTAINERS: PROCESS RESIDUES (SUCH AS ACID INSOLUBLES), MSA FILTERS, CONTAMINATED TRASH, ETC., WILL BE PACKAGED IN SUITABLE CONTAINERS TO PREVENT THE SPREAD OF RADIOACTIVE CONTAMINATION DURING THE BURIAL PROCESS.

VISIBLE CONTAMINATION: VISIBLE CONTAMINATION ON EXTERNAL SURFACES OF ALL CONTAINERS OR EQUIPMENT SHALL BE REMOVED.

DETERMINING U CONTENT: THE URANIUM CONTENT OF EACH ITEM BURIED SHALL BE DETERMINED BY EITHER SAMPLE AND CHEMICAL ANALYSIS, GAMMA COUNTING OR ENGINEERING ESTIMATE.

III. SOP FOR PARTICULAR TYPES OF MATERIAL

A. GENERAL TRASH FROM PLANT AREA

THIS INCLUDES PAPER, RAGS, EMPTY BOTTLES, ETC.

PACKAGE IN POLY BAGS AND GAMMA COUNT.

LESS THAN OR EQUAL 4 GM 93% ENRICHED U (OR EQUIVALENT) PER BAG: BURY

GREATER THAN 4 GRAMS 93% U PER BAG:

1. IF CONCENTRATED — LOCATE AND REMOVE.
2. IF DISPERSED: BURY.

B. PROCESS EQUIPMENT

1. REMOVE VISIBLE EXTERNAL CONTAMINATION.
2. REMOVE INTERNAL ACCUMULATIONS AS PRACTICAL.

.S AND
.TERIAL

3. Make "engineering estimate" of total U or gamma count.

4. Dispose of through AEC <u>licensed</u> commercial burial facilities or scrap dealers.

C. Non-Process Equipment from Plant Areas (piping, furnace coils, insulation from non-process piping, etc.)

1. Remove visible contamination and bury. Assume no U value.

D. Glass from Chem Lab

1. Rinse and collect in 55 gallon drum. Keep separate from other trash.

Bury assuming no U value.

E. Acid Insolubles, MSA Filters, Other Solid Process Residues

1. Determine U content and bury within AEC limits listed in Section I above or forward to licensed commercial burial facilities.

F. Other

Items not specifically fitting the above listed catagories will be dispositioned as they occur by the Health Physics Department.

LJSwallow/JB

UNITED NUCLEAR CORPORATION	NO. I
	PAGE 1 OF 3
	EFFECTIVE 10/17/69
SUBJECT: Burial of Residues and Contaminated Material	ISSUED 10/17/69
	SUPERSEDES 7/19/65

The following is a summary of the criteria for burial of low level wastes and contaminated equipment.

I. Burial Pit Requirements

A. Maximum quantity per burial pit: (50 millicuries)

Enrichment			Grams U
>50	-	100%	790
>25	-	<50	2000
>20	-	<25	5000
>15	-	<20	6000
>10	-	<15	8000
> 6	-	<10	12000
5			22000
4			26000
3			32000
2			40000
1			59000
Natural and Depleted			150000
Thorium			450000

If more than one enrichment is involved in the burial then the quantity of uranium of each enrichment buried must be limited such that:

$$\frac{X_1}{Ax_1} + \frac{X_2}{Ax_2} + --- + \frac{X_n}{Ax_n} = 1.00$$

Where: X_1, X_2, X_n is the quantity of U (in grams) of each enrichment to be buried. Ax_1, Ax_2, Ax_n is the allowable quantity to bury of the corresponding enrichment.

B. Burial Depth: All material buried must be a minimum of 4 feet below grade.

C. Burial Frequency: 12 pits per calendar year, maximum. (no size restriction).

D. Separation of Burial Pits: A minimum of six feet between pits.

II. Material Requirements

A. Each item buried shall be tagged showing enrichment, total U or U-235 content.

PRODUCTION	TECHNICAL	Q.C.	SAFETY	ACCOUNTABILITY
[signature]	[signature]	[signature]	[signature]	[signature]

SUBJECT: Burial of Residues and Contaminated Material

II. Material Requirements (continued)

B. All burials must be documented. This record will list the individual items buried, total U or U-235 content and date of burial.

C. Process residues (such as acid insolubles), MSA filters, contaminated trash, etc., will be packaged in suitable containers to prevent the spread of radioactive contamination during the burial process.

D. Visible contamination on external surfaces of all containers or equipment shall be removed.

E. The uranium content of each item buried shall be determined by either sample and chemical analysis, gamma counting or engineering estimate.

III. SOP for Particular Types of Material

A. General Trash from plant area.

This includes paper, rags, empty bottles, etc. Package in poly bags and gamma count. Less than or equal 1 gm. 93% enriched U (or equivalent) per bag: bury. Greater than 1 grams 93% per bag:
1. If concentrated - locate and remove.
2. If dispersed - bury.

B. Process Equipment

1. Remove visible external contamination.

2. Remove internal accumulations as practical.

3. Make "engineering estimate" of total U or gamma count.

4. Dispose of through AEC licensed commercial burial facilities or scrap dealers.

C. Non-Process Equipment from Plant Areas (piping, furnace coils, insulation from non-process piping, etc.)

1. Remove visible contamination and bury. Assume no U value.

D. Glass from Chem. Lab

1. Rinse and collect in 55 gallon drum. Keep separate from other trash. Bury assuming no U value.

PRODUCTION	TECHNICAL	Q.C.	SAFETY	ACCOUNTABILITY
[signature]	[signature]	[signature]	[signature]	[signature]

/ G. Sanders

UNITED NUCLEAR CORPORATION

NO.	I
PAGE	3 OF 3
EFFECTIVE	10/17/69
ISSUED	10/17/69
SUPERSEDES	7/19/69

SUBJECT: Burial of Residues and Contaminated Material

E. Acid Insolubles, MSA Filters, other Solid Process Residues

1. Determine U content and bury within AEC limits listed in Section 1 above or forward to licensed commercial burial facilities.

F. Other

Items not specifically fitting the above listed catagories will be evaluated as they occur and dispositioned by the scrap engineer.

PRODUCTION	TECHNICAL	Q.C.	SAFETY	ACCOUNTABILITY
E. F. [signature]	[signature]	B. [signature]	[signature]	[signature]

Appendix B

Burial Log Excerpts

#3-2

Date	Description	Res.	No.	G/U	Cumu. G/U
11.22.69	Oil & Ice - Filtered	H33	1003	<1.0	Pond
"	" " "	"	1012	<1.0	"
"	" " "	"	1004	2.5	"
"	" " "	"	1001	1.0	"
"	" " "	"	1002	1.4	"
"	" " "	"	?	<1.0	"
"	" " "	"	1005	<1.0	"
"	" " "	"	50	<1.0	"
"	" " "	"	1006	2.3	"
"	" " "	"	1007	2.4	"
"	" " "	"	1008	<1.0	"
"	" " "	"	1013	<1.0	"
"	" " "	"	1014	<1.0	"
"	" " "	"	1011	<1.0	"
"	" " "	"	1010	<1.0	"
"	" " "	"	1009	<1.0	"
"	" " "	"	1016	<1.0	"
"	" " "	"	1022	<1.0	"
"	" " "	"	1020	<1.0	"
"	" " "	"	1015	<1.0	"
"	" " "	"	1017	<1.0	"
"	Vac. Pump Oil	"	?	<1.0	"
"	" " " + KOH	H34	?	<1.0	"
11.23.69	Glove Liners, Rags	H47	155	<1.0	1.0
"	Metal Trash From Incin.	"	125	4.0	5.0
"	" " " "	"	147	1.5	6.5
"	" " " "	"	?	3.5	10.0
"	" " " "	"	140	3.2	13.2
"	Acid Insolubles	"	143	5.4	18.6
"	" "	"	150	9.0	27.6
"	" "	"	149	7.8	35.4
"	" "	"	160	7.7	43.1
"	" "	"	161	4.5	47.6
"	Green Room Trash	"	?	2.6	50.2
"	TB 4 - Burned Trash	"	122	2.0	52.2
"	TB 3 " "	"	68	3.2	55.4
"	Cleanup Rags	"	175	<1.0	56.4

#32

DATE	DESCRIPTION	RES.	NO	G/U	CUMU G/U
11-25-69	HEAT TAPES	213	–	<1.0	57.4
"	COPPER TUBING		–	<1.0	58.4
"	GLOVE LINERS		–	<1.0	59.4
"	" "		–	1.2	60.6
"	RED ROOM TRASH		–	1.3	61.9
"	REACTOR GASKETS		–	5.4	67.3
"	SAMPLE - BOTTLES		–	1.3	68.6
"	T.C.E.		–	<1.0	POND
"	ACID INSOLUBLES	218	1001	2.9	71.5
"	" "	K44	2	1.8	73.3
"	PRE-FILTERS	206	1027	<1.0	74.3
"	RAGS		–	<1.0	75.3
"	ACID INSOLUBLES	206	1026	<1.0	76.3
"	HOOD CLEANUP		–	<1.0	77.3
"	RUBBER GLOVES		–	1.4	78.7
"	PRE-FILTERS		–	<1.0	79.7
"	PLASTIC BAG	H33	1019	<1.0	80.7
"	PRE-FILTERS #2 H.D.	"	1030	<1.0	81.7
"	LAB. TRASH		–	<1.0	82.7
"	" "		–	<1.0	83.7
"	" "		–	<1.0	84.7
"	" "		–	<1.0	85.7
"	" "		–	<1.0	86.7
"	" "		–	<1.0	87.7
"	" "		–	1.4	89.1
"	RECYCLE ROOM TRASH	H61	46	2.3	91.4
"	PLASTIC BAG FROM 2B HOOD	"	39	<1.0	92.4
"	RAGS FROM DECLAD	H62	44	1.9	94.3
"	WASH STATION FILTERS	"	36	<1.0	95.3
"	" " "	"	8	<1.0	96.3
"	" " "	"	7	<1.0	97.3
"	KOH SOLUTION	"	018	<1.0	POND
"	" "	"	033	<1.0	"
"	" "	"	029	<1.0	"
"	" "	"	030	<1.0	"
"	" "	"	03[illegible]	<1.0	"
"	" "	"	017	<1.0	"

#32 (37)

DATE	DESCRIPTION	REC. NO.		G/U	CUMU. G/U	
11.25.69	KOH Solution	H62	016	<1.0	Pond	
"	"	"	015	<1.0		
"	NaCl₂ Cleanout	"	35	<1.0	98	3
"	Reactor Cleanup H_2O	"	04	<1.0	Pond	
"	TCE & Oil From End Shake	H33	1027	<1.0		
"	" " " "	"	1026	2.4		
"	" " " " "	"	1024	<1.0		
"	N_2 Residues		—	<1.0	99	3
11.26.69	Trap Cleanout	H62	18	1.6	100	9
"	" "	"	17	1.7	102	6
"	F.B.R. Filters	"	014	<1.0	103	6
"	" "	"	012	<1.0	104	6
"	" "	"	013	<1.0	105	6
"	Wash Station Filters	"	37	<1.0	106	6
"	Acid Insolubles	L06	1025	1.7	107	3
"	" "	K44	?	1.6	109	9
"	" "	H60	1003	4.3	114	2
"	Pre-Filters From D.C.	L28	1	4.0	118	2
"	" " " #2 H.D.	H33	?	2.2	120	4
"	TCE	K47	?	2.9	Pond	
12.4.69	Reactor Cleanup Filters	H62	036	<1.0		
"	" " "	"	034	<1.0		
"	" " "	"	037	<1.0		
"	Trap Cleanup	"	60	<1.0	121	4
"	NaCl₂ Vap. Cleanup	"	62	<1.0	122	4
"	KOH Declad Solution	H72	1	<1.0	Pond	
"	Poly Bags	?	105	<1.0	123	4
"	Acid Insolubles	K55	1003	<1.0	124	4
"	" "	H36	1056	<1.0	125	4
"	" "	L18	1011	1.9	127	3
"	Filtered TCE	H36	1035	<1.0	Pond	
"	Pre. Filters #2 D.C.	"	1031	<1.0	128	3
"	Vac. Pump Oil		—	<1.0	Pond	
"	Used Drill		—	3.1	131	4
"	Heat Tape - #1 D.C.	L13	148	<1.0	132	4
12.5.69	Red Room Trash		—	2.1	134	5
"	" " "		—	<1.0	135	5

#32

DATE	DESCRIPTION	RES. NO.	C/U	CUMU C/U
12.5.29	LAB TRASH		-	<1.0	136.5
"	" "		-	<1.0	137.5
"	" "		-	<1.0	138.5
"	" "		-	<1.0	139.5
"	ITEM TRASH	H61	63	<1.0	140.5
"	SAMPLE BOTTLES	"	64	<1.0	141.5
"	ITEM TRASH	H62	55	2.7	144.2
"	POT GASKETS	"	71	<1.0	145.2
"	NITRIC ACID WASH WATER	"	67	<1.0	POND
"	" " "	"	66	<1.0	"
"	CLEANUP H2O. FAR	"	0.39	<1.0	"
"	KOH FROM FBR	H72	3	<1.0	"
"	GREEN ROOM TRASH	H47	173	1.6	146.8
12.11.69	LAB TRASH		-	<1.0	147.8
"	" "		-	<1.0	148.8
"	" "		-	<1.0	149.8
"	FILTRATE VIALS		-	<1.0	150.8
"	" "		-	<1.0	151.8
"	BOX FILTER	H56	-	<1.0	152.8
"	" "	"	-	<1.0	153.8
"	" "	L18	-	<1.0	154.8
"	GASKETS		-	3.2	158.0
"	"		-	2.7	160.7
"	RED ROOM TRASH		-	<1.0	161.7
"	" " "		-	<1.0	162.7
"	" " "		-	<1.0	163.7
"	GLOVE LINERS		-	<1.0	164.7
"	" "		-	1.0	165.7
"	PAPER TOWELS		-	<1.0	166.7
"	PICKLING HOOD CLEANUP		-	1.0	POND
"	H2O. CLEANUP		-	<1.0	"
"	ACID INSOLUBLES	K44	-	2.3	169.0
"	PRE-FILTERS		-	<1.0	170.0
"	RUBBER GLOVES & TAPE		-	<1.0	171.0
"	SAMPLE BOTTLES		-	<1.0	172.0
"	" "		-	<1.0	173.0
"	" "	H6	75	<1.0	174.0

DATE	DESCRIPTION	REF.	NO.	G/U	CUMU. G. TOTAL
12.11.6[illegible]	SAMPLE BOTTLES	H61	74	<1.0	175.0
"	BRUSH FROM 2B HOOD	"	71	<1.0	176.0
"	ITEM TRASH	"	72	1.8	177.8
"	GASKETS & TAPE	H62	78	<1.0	178.8
"	TRASH FROM FBR	"	5	2.2	181.0
"	POT ROOM RAGS	"	79	<1.0	182.0
"	" [illegible]	"	74	<1.0	183.0
"	PRESS CLOTHS	H44	-	2.1	185.1
"	" "	H47	-	2.1	187.2
"	PRE-FILTERS		-	<1.0	188.2
12.16.69	SAMPLE BOTTLES		-	<1.0	189.2
"	" "		-	<1.0	190.2
"	" "		-	<1.0	191.2
"	" "		-	<1.0	192.2
"	" "		-	3.6	195.8
"	" "		-	3.7	199.5
"	" "		-	1.6	201.1
"	GLOVE LINERS		-	<1.0	202.1
"	" "		-	<1.0	203.1
"	" "		-	<1.0	204.1
"	RED ROOM TRASH		-	2.8	206.9
"	" " "		-	<1.0	207.9
"	" " "		-	1.3	209.2
"	" " "		-	<1.0	210.2
"	TAGS FROM SAMPLE BOTTLES		-	<1.0	211.2
"	" " " "		-	<1.0	212.2
"	ACID INSOLUBLES	L11	1004	<1.0	213.2
"	" "	H44	29	<1.0	214.2
"	" "	"	27	1.2	215.4
"	GLOVE LINERS & RAGS	H47	147	<1.0	216.4
"	LAB TRASH		-	2.0	218.4
"	" "		-	<1.0	219.4
"	" "		-	<1.0	220.4
"	ITEM TRASH	H61	5	4.2	224.6
"	" "	H62	86	<1.0	225.6
"	POT ROOM RAGS	"	77	<1.0	226.6
"	WASH STATION FILTERS	"	114	<1.0	227.6

#32

DATE	DESCRIPTION	RES.	NO.	c/u	CUMU. c/u	D.
12.16.69	Glove Liners	H62	75	<1.0	228.6	12.2
"	Mty Bottles & Cans	H72	4	2.9	231.5	
"	Pre-Filters	H36	1041	<1.0	232.5	
"	" "	"	?	1.6	234.1	
"	TCE	"	1048	<1.0	Pond.	12/30
"	Mty Bottles		-	<1.0	235.1	"
"	$Al(NO_3)_3$ From Cleanup	L28	21	<1.0	Pond	
"	Used Tags		-	<1.0	236.1	
"	Filter From Pickling Hood		-	<1.0	237.1	"
"	Filtrate Vials		-	<1.0	238.1	"
12.19.69	Acid Insolubles	H36	1040	1.9	240.0	"
"	" "	"	1051	1.3	241.3	
"	" "	"	1052	<1.0	242.3	
"	" "	K33	?	1.3	243.6	
"	" "	"	?	1.5	245.1	
"	Pre-Filters	H36	1038	2.5	247.6	
"	" "	"	1050	1.3	248.9	
"	" "	"	1043	1.0	249.9	
"	Filtered TCE	L18	1022	<1.0	Pond	
"	Red Room Trash		-	1.9	251.8	
"	" " "		-	2.5	254.3	
"	" " "		-	3.3	257.6	
"	Sample Bottles & Tags		-	<1.0	258.6	
"	Lab. Trash		-	<1.0	259.6	
"	Pot Lid Gaskets	H62	88	<1.0	260.6	
12.22.69	Lab. Trash	-	-	<1.0	261.6	
"	" "	-	-	<1.0	262.6	
"	" "	-	-	<1.0	263.6	
"	" "	-	-	<1.0	264.6	
"	Recycle Room Trash	H61	87	1.2	265.8	
"	Glove Liners	H62	91	1.0	266.8	
"	Green Room Trash	H44	?	1.1	267.9	
"	Metal Scrap		-	1.8	269.7	
"	Mty Bottles	H47	180	1.0	270.7	
"	Glove Liners	L13	97	<1.0	271.7	
"	Pre-Filters	H36	1049	<1.0	272.7	
"	Mty Bottles - Tags - Tape	-	-	1.0	273.7	

#32 81

Date	Description		Res	No.	G.U.	Cumul. G.U.	
12.22. 9	MTY BOTTLES - TAGS - TAPE			-	<1.0	274	7
"	" " " "			-	<1.0	275	7
"	" " " "			-	<1.0	276	7
"	" " " "			-	<1.0	277	7
12/30/69	TRASH RED ROOM			96	1.2	278	9
"	TRASH LAB.			-	1.8	280	7
"	GLOVE LINERS		MIXED	98	2.5	283	2
"	" "		"	97	<1.0	284	2
"	RUBBER GLOVES		"	99	1.6	285	8
"	TRASH ITEM PLANT	97%	H62	89	<1.0	286	8
"	RAGS ITEM POT ROOM	97%	H62	94	<1.0	287	8
"	MIXED SAMPLE BOTTLES & TRASH		-	-	<1.0	288	8
"	ITEM TIN PIPE		H61	-	<1.0	289	8
"	ACID INSOLUBLES	97%	L-18	1028	1.6	291	4
"	" "	93%	K35	1005	4.0	295	4
"	" "	97%	H36	1057	1.4	296	8
"	" "	97%	H36	1054	2.7	299	5
"	" "	97%	H36	1053	2.8	302	3
"	POLY BAGS	97%	H36	1056	<1.0	303	3
"	ZR RESIDUES	97%	H61	-	2.2	305	5
"	PRE-FILTERS FROM PUMPING STATION	97%	L-18	1029	<1.0	306	5
"	PLASTIC BAGS FROM REACTOR TRAYS	97%	L-13	-	1.1	307	6
"	TCE. FROM WASHING U-METAL	93%	L-06	129	<1.0	308	6
"	MIXED FILTRATE VIALS		-	-	<1.0	309	6
"	TRASH LAB.		-	-	<1.0	310	6
"	" "		-	-	<1.0	311	6
"	GLOVE LINERS RED ROOM		-	-	<1.0	312	6
"	RUBBER GLOVES ITEM	97%	H62	93	<1.0	313	6
	END OF 1969 RESIDUE DISPOSAL						

SEE NEXT PAGE

Hole # 32

1970 DATE	DESCRIPTION	%	Job Symbol	Residue Number	G/U	Accum. G/U	1970 Date
					Forwarded	316.6	
1-7-70	Trash from Item Plant	.97	H-61	96	<1.0	317.6	1/12/
"	Trash from Lab.	—	—	—	2.5	320.1	"
"	Tape from Item shipping Cans	97	L-18	1024	<1.0	321.1	"
"	KOH filtrate frozen	97	H-36	1061	<1.0	322.1	"
"	Prefilters from #2 dunker	97	H-36	1058	<1.0	323.1	"
"	Insulation from Fluid Bed	97	H-62	058	2.1	345.2	"
"	Trash Lab	—	—	—	<1.0	346.2	"
"	Plastic Bags	97	H-36	1063	<1.0	347.2	"
"	Trash Lab.	—	—	—	<1.0	348.2	"
"	Glove liners Item	97	H-61	93	2.6	350.8	"
"	Trash P.P. incinerator	mixed	—	20048	1.9	352.7	"
"	Plastic bottles	97	H-62	97	1.3	354.0	"
"	Trash incinerator	mixed	—	20049	<1.0	355.0	"
"	Glass wool Item	97	H-62	102	<1.0	356.0	"
"	Plastic bags	97	H-62	100	<1.0	357.0	"
"	Trash Item	97	H-61	90	<1.0	358.0	"
"	Trap element Item	97	H-62	99	<1.0	359.0	"
"	Trash P.P.	mixed	—	20047	1.6	360.6	
"	Trap element Item	97	H-62	98	<1.0	361.6	
"	Rags Pot Room Item	97	H-62	95	<1.0	362.6	"
"	Rags Pot cleanup	97	H-62	96	<1.0	363.6	"
"	Trash Red Room	—	—	100	<1.0	364.6	
"	Prefilters from Packing Hood Red Room	97	L-13	170	<1.0	365.6	"
"	Labels, towels + Rags - can Item cleanup	97	H-62	113	<1.0	366.6	"
"	Heat tape from D.G. Red Room	97	H-63	56	<1.0	367.6	"
"	M.T. cut off poly bottles Item	97	H-61	95	<1.0	368.6	1/13
"	KOH insolubles	97	H-36	1064	<1.0	369.6	"
"	Rags - Pot Lid cleanup	97	H-62	103	<1.0	370.6	"
"	Filter from Packaging Hood Red Room	97	L-13	98	<1.0	371.6	"
"	Glove liners Red Room	—	—	101	<1.0	372.6	"
"	Trash Red Room	—	—	—	<1.0	373.6	"
"	Trash Lab.	—	—	—	<1.0	374.6	"
1/12/70	Trash Lab.	Mixed	—	—	1.8	376.4	"
"	FBR Insulation	97%	H62	061	<1.0	377.4	"
"	Tags Item	97%	H61	106	<1.0	378.4	"
"	Tags Item	97%	H62	105	<1.0	379.4	"
"	Tags Item	97%	H61	103	<1.0	380.4	"

1970 Date	Description	%	Job	Residue No.	G/U	Accu. G/U
1/12/70	Plastic bottles	97%	H62	116	<1.0	381.4
"	Trash, Lab.	Mixed			<1.0	382.4
"	Trash, Red R.	"			1.2	383.6
"	Trash, Lab.	"			<1.0	384.6
"	Tags, Item	97%	H61	104	<1.0	385.6
"	Trash, Green R.	20%	H44	42	<1.0	386.6
"	Trash, H.P.	Mixed			<1.0	387.6
"	Glove liners, Red R.	"			<1.0	388.6
"	Poly bottles, Green R.	97%	H36		<1.0	389.6
"	Filters from H2O	97%	H62	060	1.2	390.8
"	" " "	97%	H62	059	1.5	392.3
"	" " "	97%	H62	056	1.2	393.5
"	MT bottles	Mixed			<1.0	394.5
"	Trash, Item	97%	H62	56	3.3	397.8
"	Trash, Item	97%	H62	111	2.7	400.5
"	Pot Gaskets, Item	97%	H62	117	<1.0	401.5
"	Leco Crucibles				<1.0	402.5
"	Acid insolubles, Green R.	97%	K35	1010	<1.0	403.5
"	[illegible] Cleanup of hood	97%	Mixed		<1.0	404.5
"	Rags, Pot cleanup	97%	H62	120	<1.0	405.5
"	Cleanup of Vac. [illegible]	Mixed			<1.0	406.5
"	Filter from H2O, Item	97%	H62	051	<1.0	407.5
"	Acid insolubles	93%	K35		2.0	409.5
"	" "	97%	H60	1004	<1.0	410.5
"	" "	93%	K35	1006	<1.0	411.5
1/13/70	Filters from H2O, Item	97%	H62	057	<1.0	412.5
"	" " " "	97%	H62	055	<1.0	413.5
"	" " Wash sta.	97%	H68	005	1.1	414.6
"	Filters from H2O, Item	97%	H62	053	<1.0	415.6
"	" " " "	97%	H62	052	<1.0	416.6
"	Acid insolubles.	97%	L18	1033	<1.0	417.6
"	Seal line #2 dunker		unk		<1.0	418.6
"	Acid insolubles	97%	L18		2.5	421.1
"	Prefilter #2 dunker	97%	H36	1073	<1.0	422.1
"	[illegible]	93%	K35	1016	<1.0	423.1
"	" "	93%	K35	1017	<1.0	424.1
"	Prefilters #2 dunker	97%	H36	1062	<1.0	425.1

Hole #32

Date		Description	%	Job Symbol	Residue No.	G/U	425.1 Accu. GU	Date
1/13/70		Plastic bags	93%	K35	1015	<1.0	426.1	1/14/70
"		Acid insolubles	93%	K35	1004	4.3	430.4	"
"		Glove liners Red R.	mixed	mixed	107	1.7	432.1	1/15/70
"		Rubber Gloves "	"	"	108	2.3	434.4	"
"		Reactor box gaskets	97%	H60	62	4.9	439.3	"
"		Reactor Cleanout, Green R.	97%	H61		<1.0	440.3 [?]	
"		Plastic bags	93%	K35	1011	1.1	441.4	"
"		Acid insolubles	97%	H36	1071	<1.0	442.4	"
1/14/70		Rags from duct cleanout	97%	HZ		<1.0	443.4	"
"		Plastic bags	97%	K25		<1.0	444.4	"
"		Acid insolubles	93%	K35	1019	3.0	447.4	"
"		" "	93%	K35	1013	<1.0	448.4	"
"		Oil, TCE, H_2O	mixed	mixed	[illegible]	<1.0	449.4 [?]	
"		Acid insolubles	97% [?]	L18 [?]	1034 [?]	<1.0	450.4 [?]	
"		Towels, Hood cleanup	93% [?]	BU		[illegible]	451.4 [?]	
"		Paper towels, #2 dunker	93% [?]	K47	1076	<1.0	452.4	
"		Poly bags - reactor trays	93%	K35	100	<1.0	453.4 [?]	
"		Trash, recycle room	97%	H61	124	<1.0	454.4	
"		Acid insolubles -	97%	L18	1039	2.4	456.8	"
"		Oily TCE, washing metal	93%	L06		1.4	458.2	
"		Acid insolubles	97%	L18	1037	<1.0	459.2	
"		" "	97%	L18	1038	2.4	461.6	1/20/-
"		" "	97%	L18	1036	<1.0	462.6	"
"		" "	97%	L18	1017	<1.0	463.6	"
"		" "	97%	L18	1035	2.3	465.9	"
"		Poly Bags	93%	K35	103	<1.0	466.9	"
"		Trash, Lab.	mixed			<1.0	467.9	"
"		Rags, Pot cleanup	97%	H62	124	1.1	469.0	"
"		Trash, Lab.	mixed			<1.0	470.0	"
"		Trash, R.R.	mixed		142	<1.0	471.0	"
"		Poly Bags, R.R.	93%	K35	102	<1.0	472.0	"
"		Trash, Item	97%	H61	127	1.3	473.3	"
"		" "	"	"	128	1.7	475.0	"
"		Trash, R.R.			141	2.6	477.6	"
"		176 Item screen	97%	H61		<1.0	478.6	"
"		Trash, Lab.				<1.0	479.6	"
"		" "				<1.0	480.6	"

Hole #32

Date	Description	%	Job Symbol	Residue No.	G/U	Accu G/U (480.6)
11/14/70	Trash - G.R.	—	—	—	<1.0	481.6
"	Trash - Lab.	—	—	—	<1.0	482.6
11/15/70	Cans - Item	97%	H61	100	<1.0	483.6
"	Trash - R.R.				<1.0	484.6
"	Trash - Lab.				<1.0	485.6
"	Trash - R.R.	mixed		93	3.3	488.9
"	" "		"	143	<1.0	489.9
"	Trash - Lab.				<1.0	490.9
"	Gaskets & sandpaper	97%	H62	139	<1.0	491.9
"	Glove liners	97%	H61	123	<1.0	492.9
"	Poly Bags	93%	K25		1.9	494.8
"	Acid insolubles	92%	K35	1018	2.2	497.0
"	Prefilter - #2 O.G.	70%	L28	13	<1.0	498.0
"	Heat tape - O.G.	93%	K36	37	<1.0	499.0
"	Acid insolubles	97%	L18	1041	1.4	500.4
"	" "	97%	L18	1040	<1.0	501.4
"	Filters - wash. etc.	97%	H62	89	<1.0	502.4
"	Vap. cleanout	97%	H62	093	<1.0	503.4
"	Filter - Package hood	mixed		73	<1.0	504.4
"	Cleanout of reactor	2.85%	H53	61	1.3	505.7
"	Trash - Item yard				2.5	509.2
11/20/70	Trash - packing area			197	<1.0	510.2
"	Labels from cans	97%	H61	114	<1.0	511.2
"	Rags - Pot cleanup	97%	H62	128	<1.0	512.2
"	Poly bags	93%	K25	101	<1.0	513.2
"	Pot room cleanup	97%	H62	118	<1.0	514.2
"	Gaskets & sandpaper	97%	H62	119	<1.0	515.2
"	Item - Tags	97%	H61	102	<1.0	516.2
"	Rags - Pot cleanup	97%	H62	114	<1.0	517.2
"	Filter - Packaging hood	97%	L13		<1.0	518.2
"	Trash - G.R.	1.65%	H23		<1.0	519.2
"	Acid insolubles	97%	L18	1046	1.5	520.7
"	" "	97%	L18	1043	2.5	523.2
"	" "	97%	L18	1042	1.8	525.0
"	" "	93%	K35		1.1	526.1
"	" "	97%	L18	1045	1.6	527.7
	" "	97%	L18	1048	1.7	529.4

Hole #32

Date	"	Description	%	Job Symbol	Residue No.	G/U	Accu. G/U (529.4)	Date
1/20/70		Acid insolubles	97%	L18	1047	1.5	530.9	1/21/70
"		" "	97%	L18	1051	3.4	534.3	"
"		" "	97%	L18	1050	1.5	535.8	"
"		" "	97%	L18	1049	2.4	538.2	"
"		Rubber glove & Tape	93%	K35	1021	<1.0	539.2	"
"		Vap cleanout	97%	H62	084	<1.0	540.2	"
"		Tags-Item	97%	H61	101	<1.0	541.2	"
"		Filter	97%	L13	174	<1.0	542.2	"
"		Press cloths	1.65%	H23	25	<1.0	543.2	1/22/
"		Trash-Lab				<1.0	544.2	"
"		" "				<1.0	545.2	"
"		Reactor Box Gaskets	97%			7.5	552.7	"
"		Metal Scrap	1.65%	H23	901	4.9	557.6	"
"		Press cloths	2.08%	H44	47	1.8	559.4	"
"		Acid insolubles	2.54%	H47	159	2.4	561.8	"
"		Press cloths	1.65%	H23	28	2.3	564.1	"
"		Broken Filter	2.54%	H47	133	7.0	571.1	"
"		Oil from sulfate hood pump	97%	Misc	110	<1.0	572.1	"
"		Acid insolubles	2.08%	H44	Dog Tag 229	7.5	579.6	"
"		" "	2.54%	H47	Dog Tag 582	5.4	585.0	
"		" "	2.54%	H47	Dog Tag 695	7.6	592.6	"
"		" Press cloths	2.54%	H47	Dog Tag 837	4.1	596.7	"
"		Acid insolubles	2.08%	H44	Dog Tag 624	12.0	608.7	
"		" "	2.08%	H44	Dog Tag 748	6.3	615.0	
"		" "	2.54%	H47	Dog Tag 25	8.8	623.8	
"		" "	2.54%	H47	Dog Tag 969	10.6	634.4	
1/21/70		" "	97%	L18		<1.0	635.4	
"		Prefilter - #2 HD	97%	H34	1075	1.4	636.8	
"		Acid insolubles	97%	L18	1054	4.9	641.7	
"		H_2O Filters - FBR	97%	H62	0113	<1.0	642.7	
"		" " "	97%	H62	0112	<1.0	643.7	
"		" " "	97%	H62	0114	<1.0	644.7	
"		Vap cleanout - FBR	97%	H62	0105	<1.0	645.7	"
"		Acid insolubles	97%	L18	1044	1.1	646.8	
"		Filters - Finish wash sta.	97%	H62	149	<1.0	647.8	
"		Trash - Lab				1.4	649.2	
"		" "				1.7	650.9	"

Hole #32

Date	Description	%	Job Symbol	Residue No.	G/U	Accu. G/U
						650.9
1/21/70	Filters - wash sta.	97%	H62	146	<1.0	651.9
"	Heating Blanket #2 D.G.	93%	K36	105	3.9	655.8
"	Trash - recycle room	97%	H61	133	<1.0	656.8
"	Insulation - FBR	97%	H62		4.6	661.4
"	Acid insolubles	2.5%	H44	48	7.2	668.6
"	Poly bags - reactor trays	93%	K35	104	2.3	670.9
"	Acid insolubles	93%	K35		<1.0	671.9
"	" "	93%	K35	1024	1.0	672.9
1/22/70	Pot lid Gaskets	97%	H62	147	<1.0	673.9
"	MT Poly Bottles	97%	L13		1.6	675.5
"	Acid insolubles	1.65%		165	2.2	677.7
"	Rags - Pot cleanup.	97%	H62	144	2.7	680.4
"	MT Poly Bottles	93%	H20		<1.0	681.4
"	Trash - Item	97%	H62	171	<1.0	682.4
"	Trash - G.R.				<1.0	683.4
"	Trash - Lab.				<1.0	684.4
"	Glove liners & rags	1.65%	H23	26	<1.0	685.4
"	Trash - Lab.				<1.0	686.4
"	" "				<1.0	687.4
"	" R.R.				<1.0	688.4
"	" "				<1.0	689.4
"	" "				<1.0	690.4
"	" Item	97%	H61	150	2.1	692.5
"	Trash - Lab.				2.2	694.7
"	Acid insolubles		H36		1.1	695.8
"	Trash - Item	97%	H61	151	<1.0	696.8
"	" R.R.				<1.0	697.8
"	" Lab.				<1.0	698.8
"	" "				<1.0	699.8
"	Insulation - FBR	97%	H62		<1.0	700.8
"	Prefilter - FBR hood	97%	H62	106	<1.0	701.8
"	Trash - Lab.				1.6	703.4
"	Gaskets - Pot area	97%	H74	7	<1.0	704.4
"	Rags - Pot area				<1.0	705.4
"	Trash - Lab.				<1.0	706.4
"	" R.R.				1.4	707.8
"	Plastic Bag.	97%	H33		<1.0	708.8

Hole #3-2

Date		Description	%	Job Symbol	Residue No.	G/U	708.8 Accu. G/U	Da
1/23/70		Acid insolubles	93%	K35		<1.0	709.8	1/26
"		Poly Bags	97%	H74	3	<1.0	710.8	"
"		Poly Bottles	97%	H36	1032	<1.0	711.8	"
"		Poly Bags	93%	H77	115	<1.0	712.8	
"		Fluid Bed insulation	97%	H62	054	<1.0	713.8	
"		Glove liners	mixed		109	<1.0	714.8	
"		Prefilter from FBR hood	97%	H62	0107	<1.0	715.8	"
"		Metal Scrap	1.65%	H59	6	<1.0	716.8	
"		Acid insolubles	1.65%	H59		5.0	721.8	
"		Press cloths	1.65%	H23		1.2	723.0	
"		Prefilter from mixer settler	97%	H36	1081	<1.0	724.0	
"		Acid insolubles	97%	L18		3.1	727.1	
"		" "	97%	L18		2.6	729.7	
"		" "	97%	H36	1077	1.3	731.0	
"		" "	97%	H36	1078	<1.0	732.0	
"		Prefilter from #2 Dunker	97%	H36	1080	1.2	733.2	

STOP! – Dig new hole

1/2

140

HOLE #38

DATE	SHEET	DESCRIPTION	%	FOR SYMBOL	RESIDUE NO.	G/U	ACC. G/U
7-29-70	1	COUNTING VIALS	HI-ENR MIXED	MIXED	0727-08	1.3	1.3
"	1	WORKED UP PRE-FILTERS	97	H-44	363	1.9	3.2
"	1	ACID INSOLUBLES	1.77	H-86	111	4.1	7.5
"	1	" " & PRESS CLOTHS	2.34	H-91	117	1.6	8.9
"	1	GD_2O_3 MOP WATER	2.34	H-92	660	<1.0	9.9
[redacted]							
[illegible]	1	GR TRASH	LO-ENR MIXED	MIXED	121	<1.0	11.9
"	1	FBR PRE FILTERS	[illegible]	[illegible]	[illegible]	<1.0	12.9
"	1	FBR PRE FILTERS	97	H-88	2116	<1.0	13.9
"	1	HOSE FROM PRESS	2.34	H-92	670	<1.0	14.9
"	1	IP RAGS	[illegible]	[illegible]	[illegible]	<1.0	[illegible]
"	1	GD_2O_3 CLEAN UP RAGS	[illegible]	[illegible]	[illegible]	<1.0	[illegible]
"	1	GASKETS & SANDPAPER	97	[illegible]	[illegible]	<1.0	17.9
"	1	IP TRASH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1	LAB TRASH	[illegible]	MIXED	[illegible]	<1.0	19.9
"	1	GASKETS & SANDPAPER	[illegible]	[illegible]	26[illegible]	<1.0	[illegible]
"	1	I.P. TRASH	[illegible]	[illegible]	[illegible]	<1.0	[illegible]
"	1	LAB TRASH	HI-ENR MIXED	MIXED	[illegible]	<1.0	22.9
"	1	LAB TRASH	HI-ENR MIXED	MIXED	0727-04	<1.0	23.9
"	1	LAB TRASH	[illegible]	[illegible]	[illegible]	<1.0	24.9
"	1	RR TRASH	HI-ENR MIXED	MIXED	404	<1.0	25.9
"	1	MT. BOTTLES	1.72	H-86	756	<1.0	26.9
"	1	MT. BOTTLES	2.34	H-91	738	<1.0	27.9
"	1	MT. BOTTLES	2.34	H-91	[illegible]	<1.0	28.9
[redacted]							
7-29-70	1	GASKETS & SAND PAPER	97	H-88	260	<1.0	10.9
7-29-70	1	" "	97	H-88	269	<1.0	11.9
7-30-70	1	RR TRASH	HI-ENR MIXED	MIXED	405	2.7	14.6
"	1	FBR TRASH	97	H-88	2115	1.1	15.7
"	1	POT LID RAGS	97	H-88	268	1.1	16.8
"	1	IP TRASH	97	H-88	270	2.4	19.2
"	1	GR TRASH	2.34	H-91	127	2.4	21.6
7-31-70	1	GRANULATOR SCREEN	LO-ENR MIXED	MIXED	702	<1.0	22.6
7-31-70	1	GRANULATOR SCREEN	LO-ENR MIXED	MIXED	774	<1.0	23.6
8-3-70	1	METAL PREFILTER	HI-LO MIXED	MIXED	816	<1.0	24.6
"	1	METAL PREFILTER	"	"	820	<1.0	25.6
"	1	METAL PREFILTER	"	"	818	<1.0	26.6

DRUM #C1

HOLE #38

DATE	SHEET	DESCRIPTION	%	JOB SYMBOL	RESIDUE No.	G/U	ACC.	G/U
8-4-70	1	DRUM #C-1	HI-LO MIXED	MIXED	—	24.0	50	.6
8-4-70	1	SCREEN FILTERS	2.34	H-91	498	7.0	57	.6
"	1	GD_2O_3 TRASH (METAL)	2.34	H-92	768	1.1	58	.7
"	1	INSULATION	2.34	H-91	429	4.7	63	.4
"	1	NATURAL UO_2	NAT.	NATURAL	0803-02	4.9	70	.3
"	1	R-2 PREFILTER	2.34	H-91	421	1.4	71	.7
"	1	GD_2O_3 TRASH	2.34	H-92	776	1.2	72	.9
"	1	GASKETS & SANDPAPER	97	H-88	280	1.3	74	.2
"	1	GRANULATOR SCREEN	2.34	H-91	872	1.4	75	.6
"	1	INCINERATOR FILTER	HI-LO MIXED	MIXED	814	1.8	77	.4
"	1	INCINERATOR FILTER	"	"	810	2.1	79	.5
"	1	GRANULATOR SCREEN	2.34	H-91	824	1.0	80	.5
8-10-70	1	" "	2.34	H-91	886	<1.0	81	.5
"	1	FBR HOOD FILTER	97	H-88	0124	<1.0	82	.5
"	1	GASKETS & SANDPAPER	97	H-88	299	<1.0	83	.5
8-11-70	1	ELECTRIC DRILL MOTOR	HI-ENR MIXED	MIXED	415	1.6	85	.1
8-11-70	1	ACID INSOL.	2.34	H-91	127	5.0	90	.1
8-12-70	1	GRANULATOR SCREEN	2.34	H-91	982	<1.0	91	.1
8-12-70	1	DRUM #C-2	HI-LO MIXED	MIXED	—	22.0	113	.1
8-13-70	1	GLOVES FROM D.G.	97	H-81	422	<1.0	114	.1
8-13-70	1	GRANULATOR SCREEN	2.34	H-91	1012	1.6	115	.7
8-13-70	1	METAL PANS	97	H-87	186	2.1	117	.8
8-17-70	1	GASKETS & SANDPAPER	97	H-88	313	<1.0	118	.8
8-24-70	1	GR FILTER	2.34	H-91	147	<1.0	119	.8
8-24-70	1	ACID INSOL. & PRESS CLOTHS	2.34	H-91	137	<1.0	120	.8
8-24-70	1	IP FILTER	97	MIXED	0131	<1.0	121	.8
8-24-70	1	GASKETS & SANDPAPER	97	H-88	334	<1.0	122	.8
8-24-70	1	SCRAP METAL	97	H-88	338	<1.0	123	.8
8-24-70	1	SCRAP METAL	97	H-88	337	<1.0	124	.8
8-24-70	1	IP FILTER	97	H-88	335	<1.0	125	.8
8-25-70	1	DRUM #C-3	HI-LO MIXED	MIXED	—	32.5	158	.3
"	1	ACID INSOL.	97	H-81	432	3.6	161	.9
"	1	ACID INSOL.	97	H-81	435	4.3	166	.2
"	1	ACID INSOL.	97	H-81	436	1.1	167	.3
"	1	ACID INSOL.	1.77	H-86	142	5.2	172	.5
"	1	GD_2O_3 CLEAN UP H_2O	2.34	H-92	1234	1.3	173	.8
"	1	FILTER BOARDS	2.34	H-91	150	4.0	177	.8

Hole # 38

DATE	Sheet	DESCRIPTION	%	JOB SYMBOL	RESIDUE NO.	G/U	ACC. G/U	D
8-26-70	1	ACID INSOL.	2.34	H-91	141	1.1	178.9	9
"	1	FILTER BOARDS	2.34	H-91	145	1.6	180.5	
"	1	FBR SCRAP.	97	H-88	0140	1.9	182.4	
"	1	FILTER BOARDS	2.34	H-91	149	1.6	184.0	9
"	1	GRANULATOR SCREEN	2.34	H-91	1054	1.3	[illegible]	
"	1	FILTER BOARDS	[illegible] MIXED	[illegible]	148	1.2	[illegible]	
"	1	SCRAP METAL FROM INCINERATOR	2.34	H-91	1072	6.0	192.5	
"	1	OP TRASH	2.01	L-60	519	3.1	195.6	
"	1	FILTER BOARDS	2.34	H-91	151	3.6	199.2	
"	1	GRANULATOR SCREEN	2.34	H-91	1032	1.3	200.5	
"	1	ACID INSOL.	2.34	H-91	135	7.4	207.9	
"	1	R-2 FILTER	2.34	H-91	525	[illegible]	209.0	
"	1	FILTER BOARDS	2.34	H-91	146	3.3	212.3	
"	1	FILTER BOARDS	2.34	H-91	144	1.0	213.3	
"	1	SCRAP METAL	2.34	H-91	1178	1.2	214.5	
8-27-70	1	GASKETS & SANDPAPER	97	H-88	353	<1.0	215.5	5
"	1	GRANULATOR SCREEN	2.34	H-91	1232	<1.0	216.5	
"	1	GRANULATOR SCREEN	2.34	H-91	1198	<1.0	217.5	
"	1	GRANULATOR SCREEN	2.34	H-91	918	<1.0	218.5	
"	1	ACID INSOL.	2.34	H-91	154	<1.0	219.5	
"	1	PRESS CLOTHS - ACID INSOL.	[illegible]	H-91	155	<1.0	220.5	
8-28-70	1	DRUM # C-4	[illegible]	[illegible]	—	17.0	237.5	
"	1	ACID INSOL.	97	H-81	440	<1.0	238.5	
"	1	CLEAN UP H_2O & OIL	2.34	H-92	1298	5.2	243.8	
"	1	CLEAN UP H_2O	2.34	H-92	1300	1.7	245.5	
"	1	ACID INSOL.	2.34	H-91	158	4.9	250.4	
"	1	BAGS & RAGS - 5 gal. pail	2.34	H-92	1296	2.0	252.4	
"	1	BROKEN BOATS	97	H-82	205	6.3	258.7	
8-31-70	1	GRANULATOR SCREEN	2.41	H-92	1316	<1.0	259.7	
"	1	Gd_2O_3 CLEAN UP H_2O	2.34	H-92	1322	<1.0	260.7	
"	1	GASKETS & SANDPAPER	97	H-88	380	<1.0	261.7	
"	1	Gd_2O_3 CLEAN UP H_2O	2.34	H-92	0831-02	<1.0	262.7	
"	1	" " " "	2.34	H-92	0831-03	<1.0	263.7	
"	1	" " " "	2.34	H-92	0831-04	<1.0	264.7	
"	1	" " " "	2.34	H-92	758	<1.0	265.7	
9-1-70	1	BOX FILTER	2.34	H-92	553	<1.0	266.7	
"	1	RAGS, BAGS, ETC.	2.34	H-92	1354	1.1	267.8	

HOLE #38

DATE	SHEET	DESCRIPTION	%	JOB SYMBOL	RESIDUE No.	G/U	ACC.	G/U
1-1-70	1	ACID INSOL.	2.34	H-91	161	2.4	270	.2
"	1	ACID INSOL.	2.34	H-91	162	2.0	272	.2
"	1	ACID INSOL.	2.34	H-91	163	11.4	283	.6
9-4-70	1	CLEAN UP H2O	2.34	H-92	1220	<1.0	284	.6
"	1	CLEAN UP H2O	2.34	H-92	1222	<1.0	285	.6
"	1	GRANULATOR SCREEN	2.01	H-97	1378	<1.0	286	.6
"	1	BROKEN FILTERS & SGAL PAIL	2.34	H-91	577	<1.0	287	.6
"	1	GASKETS & SANDPAPER	97	H-88	384	<1.0	288	.6
"	1	FILTER BOARDS	2.34	H-91	167	<1.0	289	.6
"	1	FURNACE GASKETS	2.34	H-91	170	<1.0	290	.6
"	1	GRANULATOR SCREEN	2.01	H-97	1426	<1.0	291	.6
"	1	FILTER BOARDS	2.34	H-91	166	<1.0	292	.6
"	1	ACID INSOL.	10	HK	719	13.4	306	.0
"	1	FF LID CLEAN OUT	97	H-88	371	<1.0	307	.0
"	1	TRASH	20	WP/CL	448	<1.0	308	.0
9-14-70	2	GASKETS I.P.	97%	H88	404	<1.0	309	.0
"	2	R.R. TRASH R.R.	92%	MIX	453	<1.0	311	.0
"	2	SCREENS I.P.	97%	H87	243	1.3	311	.3
"	2	" I.P.	97%	H87	245	2.0	313	.3
"	2	GRAN. SCREENS O.P.	2.01	H97	1518	<1.0	314	.3
"	2	ITEM 51 BISON EQUIPT.	97%	H32	"A"	<1.0	315	.3
"	2	SCREEN I.P.	97	H87	"AA"	<1.0	316	.3
"	2	LID FOR SCREEN / LID FOR PEB. MILL	97%	H87	242	<1.0	317	.3
"	2	SCRAP SCREEN I.P.	97%	H87	244	<1.0	318	.3
"	2	GLOVE LINERS I.P.	97%	H87	246	2.2	320	.5
"	2	PLASTIC BAGS	97	H87	237	<1.0	321	.5
"	2	SCREEN I.P.	93	L51	31	<1.0	322	.5
"	2	M.T. SAMPLE BOTTLES R.R.	92	MIX	452	<1.0	323	.5
"	2	PRE-FILTERS R.R.	90	L59	244	1.1	324	.6
"	2	PRESS CLOTHS G.R.	2.34	H91	181	<1.0	325	.6
"	2	POLY BAGS I.P.	2.34 / 97	MIX	1456	2.5	328	.1
"	2	Rags I.P.	97	H88	393	1.0	329	.1
"	2	METAL FROM [illegible] G.R.	2.34	H91	177	<1.0	330	.1
"	2	LAB. TRASH	92	MIX	LAB	<1.0	331	.1
"	2	"	92	"	"	<1.0	332	.1
"	2	TRASH I.P.	97	H87	236	<1.0	333	.1
"	2	VALVE P.P.	2.01	H97	1472	<1.0	334	.1

HOLE #38

DATE	SHEET	DESCRIPTION	%	J.O.D. SYMBOL	RESIDUE NUMBER	G/U	ACC. G/U
						FORWARDED	334.1
9-14-70	2	TRASH LAB.	92	mix	LAB.	<1.0	335.1
"	2	GRAN. SCREEN P.P	2.01	H97	1498	<1.0	336.1
"	2	PRE-FILTER FRAME G.R	2.34	H91	176	<1.0	337.1
"	2	GRAN. SCREEN P.P.	2.01	H97	1476	<1.0	338.1
"	2	RAGS & GLOVES G.R.	2.34	H91	169	1.1	339.2
"	2	Rubber Gloves I.P	97	H88	395	<1.0	340.2
"	2	RAGS I.P.	97	H88	394	<1.0	341.2
"	2	PRE FILTER G.R.	2.34	H91	175	1.5	342.7
"	2	Gd_2O_3 P.P.	2.34	H92	436	1.7	344.4
"	2	Acid InSolu. G.R.	2.34	H91	172	1.1	345.5
9-16-70	2	Acid Insolu. G.R.	2.34	H91	164	3.1	348.6
"	2	Acid Insolu G.R	2.34	H91	182	4.7	353.3
"	2	Vac. Filter P.P	2.01	L60	601	1.8	355.1
"	2	Acid Insolu & Press Cloths G.R	2.34	H91	183	3.7	358.8
9-17-70	2	Poly bags Granulator Screen P.P	2.01	H97	1570	<.1	359.8
"	2	Poly bottles P.P.	2.0	Mix	1546	<.1	360.8
"	2	Granulator Screen P.P.	2.01	H97	1590	<.1	361.8
"	2	Granulator Screen P.P.	2.01	H97	1554	<.1	362 8
"	2	INCEN. Cleanout P.P.	2.01	H97	1555	1.3	364 1
"	2	Acid Insol. & Press Cloths G.R.	2.01	L61	184	1.7	365 8
"	2	Ball Mill Balls I.P.	97	L51	30	<.1	366.8
"	2	Acid Insolubles R.R.	97	H-81	454	3.9	370.7
"	2	Washed Pre-Filter R.R	97	H-81	457	<1.0	371.7
"	2	Acid Insol. R.R	97	H-81	449	4.5	376.2
"	2	Washed Pre-Filter R.R	97	H81	458	1.8	378.0
"	2	Acid Insol. R.R	97	H81	455	<1.0	379.0
"	2	Pentachloride Vap. Clean-up. I.P.	97	H88	385	<1.0	380.0
9-18-70	2	Drum # C-5	Mixed	Mixed	—	19.5	399.5
9-23-70	2	Granulator screen PP	2.01	H91	1690	2.0	401.5
"	2	" " PP	2.01	H97	1660	<1.0	402.5
"	2	Reactor Gaskets GR	2.0	Mix.	195	<1.0	403.5
"	2	TRASH LAB	92	mix	0923-04	<1.0	404.5
"	2	Granulator Screens PP	2.01	H97	1646	1.7	406.2
"	2	" " PP	2.01	H97	1648	<1.0	407.2
"	2	" " PP	2.0	mix	1642	<1.0	408.2
"	2	" " PP	2.01	H97	1622	<1.0	409.2
"	2	Ball Mill Balls I.P.	93	L57	29	<1.0	410.2

HOLE #38

DATE	SHEET	DESCRIPTION		%	300 SYMBOL	RESIDUE NUMBER	G/4	ACC	G/4
								FORWARDED 410	2
9-23-70	2	Granulator Screen	P.P.	2.01	H97	1610	<1.0	411	2
"	2	Bearings	I.P.	97	H87	263	<1.0	412	2
9-29-70	2	Incinerator Cleanout	I.P.	2.01	H97	1794	1.4	413	6
"	2	Trash	LAB	92	mix	0929-01	2.1	415	7
"	2	Trash	I.P.	97	H88	270	2.7	418	4
"	2	Trash	R.R.	92	Mix	470	1.3	419	7
"	2	acid insolubles & [illegible]	R.R.	2.01	H91	194	2.1	421	8
"	2	Reactor Gaskets	R.R.	92	mix	471	2.2	424	0
"	2	Hood filters (clean)	I.P.	97	H88	0131	<1	425	0
"	2	Trash	I.P.	97	H88	424	3.0	428	0
"	1	Pit - trench	I.P.	97	H97	249	<1.0	429	0
"	1	Milk from vacuum pump	R.R.	92	mix	463	<1.0	430	0
"	1	HCL + H2O	I.P.	97	H88	0165	<1.0	431	0
"	1	TCE-OIL-RAGS	R.R.	92	mix	461	<1.0	432	0
"	1	Acid insolubles	RR	97	H36	464	2.8	434	8
"	1	TCE-OIL-RAGS	RR	92	MIX	462	<1.0	435	8
"	1	Acid insolubles	RR	97	H36	452	4.2	440	0
"	1	Granulator Screen	PP	2.01	H97	1752	<1.0	441	0
"	1	" "	PP	2.01	H97	1749	<1.0	442	0
"	1	" "	PP	2.01	H97	1812	<1.0	443	0
"	1	" "	PP	2.01	H97	1236	<1.0	444	0
"	1	M.T. Sample Bottles	L.F.E.	1.77	H86	0927-12	<1.0	445	0
"	1	[illegible] + Seal gage	IP	97	H88	423	<1.0	446	0
"	1	Granulator Screen	PP	2.01	H97	1848	<1.0	447	0
"	1	Trash	LAB.	92	mix	0930-01	<1.0	448	0
"	1	[illegible]	IP	97	H88	433	<1.0	449	0
"	1	[illegible]	PP	2.01	[illegible]	[illegible]	<1.0	450	0
"	1	[illegible]	PP	2.01	H97	1332	<1.0	451	0
"	1	Trash	LAB	92	Mix	0930-02	<1.0	452	0
"	1	[illegible] trash	I.P.	97	H88	0190	<1.0	453	0
"	1	[illegible]	I.P.	97	H88	0189	<1.0	454	0
10-6-70		DRUM #C-6 Contaminated trash		HI-LO MIXED	Mixed		42.0	496	0
10-10-70	1	Trash	Lab	92	Mixed	10-8-1	<1.0	497	0
"	1	Rags + Pot cleanup	IP	97	H88	436	<1.0	498	0
"	1	M.T. Sample Bottle	LAB.	2.0	Mix	10-8-2	<1.0	499	0
"	1	Granulator Screen	PP	2.01	H97	1962	<1.0	500	0
"	1	" "	PP	2.01	H97	1926	<1.0	501	0

HOLE #38

DATE	SHEET	DESCRIPTION		%	JOB SYMBOL	RESIDUE NUMBER	G/U	ACCU.	G/U	DAT
						FORWARDED		501	0	
10-9-70	1	POT. LID CLN. up	IP	97	H88	341	<1.0	502	0	
"	1	RED VALVE	OP	2.01	L-60	757	<1.0	503	0	
"	1	GLOVE LINERS	IP	97	H88	449	<1.0	504	0	
"	1	Rags	IP	97	H88	454	<1.0	505	0	
"	1	Insulation from	OP	2.0	MIX	735	<1.0	506	0	
"	1	GRANULATOR SCREENS	PP	2.01	H97	1886	<1.0	507	0	
"	1	INCINERATOR FILTER	PP	2.01	H97	1896	<1.0	508	0	
"	1	M.T. SAMPLE BOTTLES	OP	2.01	L60	717	<1.0	509	0	
"	1	" " "	LAB.	2.0	MIX	10-8-3	<1.0	510	0	
"	1	GRANULATOR SCREENS	PP	2.01	H97	1916	<1.0	511	0	
"	1	GASKETS + SANDPAPER	I.P.	97	H88	453	<1.0	512	0	
"	1	TRASH	LAB.	92	MIX	10-8-4	<1.0	513	0	
"	1	TRASH	LAB	92	MIX	10-8-5	<1.0	514	0	
"	1	GASKETS + SANDPAPER	IP	97	H88	434	<1.0	515	0	
"	1	TRASH	LAB.	92	MIX	10-8-6	<1.0	516	0	
"	1	GRANULATOR SCREEN	PP	2.01	L60	1868	<1.0	517	0	
"	1	INCINERATOR FILTER	PP	2.01	H97	1894	<1.0	518	0	
"	1	" "	PP	2.01	H97	1892	<1.0	519	0	
"	1	TRASH	IP	97	H88	435	<1.0	520	0	
"	1	"	IP	97	H87	282	<1.0	521	0	
"	1	"	LAB	92	MIX	10-8-7	<1.0	522	0	
"	1	"	PP	2.01	H97	1870	<1.0	523	0	
10/20/70	1	Rags	IP	97	H87	455	<1.0	524	0	
"	1	Trash	SHIP	92	MIX	1016-02	<1.0	525	0	
"	1	Trash	LAB.	92	MIX	10-16-03	<1.0	526	0	
"	1	Trash	LAB.	92	MIX	10-16-04	<1.0	527	0	
"	1	Insulation from OP	OP	2.01	L60	779	<1.0	528	0	
"	1	Trash	IP	97	H88	1016-05	<1.0	529	0	
"	1	Trash	LAB	97	MIX	1016-06	<1.0	530	0	
"	1	Trash	PP	2.01	L60	775	<1.0	531	0	
"	1	Trash	OP.	2.01	L60	773	<1.0	532	0	
"	1	Trash	LAB.	92	MIX	101607	<1.0	533	0	
"	1	Broken multi filters	OP	2.01	L60	777	<1.0	534	0	
"	1	Trash	GR	2.0	MIX	212	<1.0	535	0	
"	1	Insulation + Paper	OP	2.01	L60	771	<1.0	536	0	
"	1	Trash	LAB	92	MIX	10-16-08	<1.0	537	0	
"	1	Rock cement	RR	90	L28	478	<1.0	538	0	

G/U	DATE	SHEET	DESCRIPTION		% O	JOB SYMBOL	RESIDUE NUMBER	G/U	ACCU.	G/U
0								FORWARDED	538	0
0	10-20-70	1	Trash	LAB.	92	mix	10-20-01	<1.0	539	0
0	"	1	"	"	92	"	10-20-02	<1.0	540	0
0	"	1	"	"	92	"	10-20-03	<1.0	541	0
0	"	1	"	"	92	"	10-20-04	<1.0	542	0
0	"	1	"	"	92	"	10-20-05	<1.0	543	0
0	"	1	"	"	92	"	10-20-06	<1.0	544	0
0	"	1	"	"	92	"	10-20-07	<1.0	545	0
0	"	1	"	"	92	"	10-20-08	<1.0	546	0
0	"	1	Trash Recycle Room	IP	97	H87	300	<1.0	547	0
0	"	1	Rags, Pot cleanout	IP	97	H88	478	<1.0	548	0
0	"	1	Rags + insulation	FB	97	H88	0207	<1.0	549	0
0	"	1	[illegible]	PP	2.01	H97	2022	<1.0	550	0
0	"	1	[illegible] + [illegible]	IP	97	H88	479	<1.0	551	0
0	"	1	Rags, Pot cleanout	IP	97	H88	473	<1.0	552	0
0	"		[illegible]	O.P.	2.01	L60	781	<1.0	553	0
0			"	C.P.	2.01	L60	783	<1.0	554	0
0	"	1	Rags	IP	97	H87	295	<1.0	555	0
0	"	2	[illegible]	RK	93	H06	477	2.0	557	0
0	"	2	Acid Insoluble [illegible]	RK	1.77	H86	205	2.5	559	5
0	"	2	Trash	LAB.	92	mix	[illegible]	1.2	560	7
0	"	2	"	IP	97	H88	457	1.7	562	4
0	"	2	[illegible] cleanout	PP	2.01	L61	1952	1.5	563	9
0	"	2	" " "	PP	2.01	L61	2076	1.6	565	5
0	"	2	[illegible] + Rags + Paper	HR	2.01	L61	211	1.1	566	6
0	"	2	M.T. Sample [illegible]	LAB	92	mix	354	1.6	568	2
0	"	2	[illegible]	P.P.	2.01	H97	1590	1.4	569	6
0	"	2	[illegible]	KK	92	H97	10-20-09	2.7	572	3
0	10-23-70	1	Acid Insoluble	RK	93	H77	491	4.8	577	1
0	"	1	Reject [illegible]	IP	97	H87	307	<1.0	578	1
0	"	1	Acid [illegible]	RK	97	H31	475	<1.0	579	1
0	"	1	Rags [illegible]	IP	97	H87	573	<1.0	580	1
0	"	1	Acid [illegible]	RK	93	[illegible]	[illegible]	<1.0	581	1
0	"	1	" "	RK	93	H77	[illegible]	<1.0	582	1
0	[illegible]	2	[illegible]	C.P.	2.01	[illegible]	[illegible]	1.3	583	4
0	11-3-70	1	~~FILTERS FROM TOCCO~~	IP	97	H88	0202	<1.0	584	4
0	"	1	~~FILTERS FROM TOCCO~~	~~IP~~	~~97~~	~~H88~~	~~0203~~	~~<1.0~~	~~585~~	~~4~~
	"	1	ACID INSOL		93	H77	491	4.8	590	2

DATE	SHEET	DESCRIPTION		%	JOB	SAMPLE/RESIDUE #	G/L	ACCU G/L
								590.2
11-2-70	1	TRASH	IP	97%	H-87	303	<1.0	591.2
"	1	NON BURN MAT'L	PP	2.01	H-97	2230	<1.0	592.2
"	1	REJECT POWDER CANS	IP	97	H-87	307	<1.0	593.2
"	1	GRANULATOR SCREEN	PP	97	H-97	2154	<1.0	594.2
"	1	INSULATION + TRASH	OP	2.01	L-60	831	<1.0	595.2
"	1	RAGS	IP	97%	H-88	504	<1.0	596.2
		RAGS	IP	97	H-88	505	<1.0	597.2
		ACID INSOL	RR	97	H-81	475	<1.0	598.2
		TRASH	LAB	92%	MIX	1026-01	<1.0	599.2
		TRAP CLEAN OUT	IP	97	H-88	503	<1.0	600.2
		ACID INSOL	RR	93	H-77	487	<1.0	601.2
		~~ACID INSOL~~	~~RR~~	~~93~~	~~H-77~~	~~488~~	~~<1.0~~	~~602.2~~
		TRASH	LAB	92	MIX	1026-04	<1.0	603.2
		TRASH	LAB	92	MIX	1026-05	<1.0	604.2
		GLOVE LINERS	IP	97	H-88	0215	<1.0	605.2
		TRASH	LAB	92	MIX	1026-06	<1.0	606.2
		GASKETS & SAND PAPER	IP	97	H-88	487	<1.0	607.2
		GRANULATOR SCREENS	PP	2.01	H-97	2200	<1.0	608.2
		GASKETS + SANDPAPER	IP	97	H-88	492	<1.0	595 609.2
11-4-70		DRUM M #C-7					12.5	596.0
	1	TRAP CLEAN OUT	IP	97	H-88	497	<1.0	597.0
	1	ACID INSOL	RR	97	H-81	512	<1.0	598.0
	1	ACID INSOL	RR	97	H-77	507	<1.0	599.0
		ACID INSOL	RR	97	H-81	522	<1.0	600.0
		ACID INSOL	RR	97	H-81	516	<1.0	601.0
		BUSTED FILTER	OP	2.01	L-60	85.3	<1.0	602.0
		DRUM C-8					12.0	614.0
		DRUM C-9					16.0	630.0
		5 GAL PAIL		2.01	H-97	2634	<1.0	631.0
		INSULATION		2.01	H-97	889	<1.0	632.0
		INCENERATOR METAL		2.01	L-61	2368	<1.0	633.0
		POLY BAGS		2.01	L-61	228	<1.0	634.0
		ACID INSOL		52	K-47	357	<1.0	635.0
11-5-70		ACID INSOL		97	H-81	563	4.9	639.9
		ACID INSOL		90	BO	556	2.9	642.8
		FLEX LINES		97%	H-88	538	<1.0	643.8

Void

DATE	SHEET #	DESCRIPTION	M/C	LB	SYMBOL	RESIDUE #	B/U	ACC Q/Y	
1-6-70	1	WOOD FROM FILTER	29	L-61	234	C10	644	8	✓
	1	FILTER BOARDS	29	L-61	265	L10	645	8	✓

Appendix C

Memorandum

Subject: Burial Pits

The approximate area within which the pits are located is shown on drawings D-5020-2023 and D-5020-2015.

On site burials occurred since 1958 or 1959. Detail records were maintained only for the period July 1965 thru November 1970 when burial was halted.

Burial was terminated in November 1970 when an AEC non-compliance citation was received. This resulted from a May 1970 revision of the regulation which had not been recognized by United Nuclear Corporation. The change in the regulation severely limited the SNM quantity that could be buried making on site burial impracticable.

All burials in the July 1965 through November 1970 period were made in accordance with written procedures originated in July 1965 (memo Swallow to Sanders dated July 19, 1965). This memo was formalized as an SOP issued October 17, 1969. (Copies attached).

A review of the burial record discloses the following:

Date of Record:	July 19, 1965 thru November 6, 1970
Total Number of Pits:	40
Total U^{235} Buried:	27.4 Kgs

50% of all items contained less than 1 gram U^{235}
30% of all items contained 1 to 4 grams U^{235}
20% of all items contained 4 to 8 grams U^{235}
A few items contained more than 8 grams U^{235} but no significant large quantites.
The type of material buried consisted of:

- 16% - metals, cans, non-uranium solids, acid insolubles
- 2% - liquids - mostly oil, water and clean up residues
- 82% - Combustibles - wood, filters, general trash (rags, paper towels, gloves, etc.)

A record was not made of burials preceeding July 1965. Discussions with plant personnel indicate that only 3 or 4 pits per year where used. It is therefore estimated that 20-25 additional pits exist that are not recorded. Items buried are similar to those on the record.

/wg

Appendix D

1984 Evaporation Ponds Decommissioning Plan

POWER SYSTEMS

Interoffice Correspondence

NIS/84/2025

May 31, 1984

Mr. R. G. Page, Chief
Uranium Fuel Licensing Branch
Division of Fuel Cycle and Material Safety, NMSS
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Docket No. 70-36

Dear Mr. Page:

Enclosed is the proposed plan for decommissioning the evaporation ponds. This plan is required by license condition No. 10 of SNM-33, as amended.

Please advise if there are any questions, or if additional information is required.

Very truly yours,

COMBUSTION ENGINEERING, INC.

H. E. Eskridge
H. E. Eskridge
Supervisor, Nuclear Licensing,
Safety and Accountability

eg

cc: H. V. Lichtenberger
J. A. Rode

PROPOSED DECOMMISSIONING PLAN

FOR EVAPORATION PONDS

COMBUSTION ENGINEERING, INC.

HEMATITE PLANT

MATERIALS LICENSE NO. SNM-33

MAY, 1984

I. PURPOSE

The purpose of this plan is to describe the course of action to be completed by Combustion Engineering, Inc. to decontaminate and decommission the primary and secondary evaporation ponds located in the southwest corner of the fenced manufacturing area. The object of this action is to prepare the evaporation pond areà for eventual relèase for unrestricted use, or release with necessary use convenants in the manner required by State law.

II. DECONTAMINATION REQUIREMENTS

A reasonable effort shall be made to achieve residual contamination concentrations as far below acceptable levels as is practical. It is anticipated that this effort will result in residual contamination concentrations of below 250 picocuries per gram, and thus correspond to option 2 of the Uranium Fuel Licensing Branch Technical Position for disposal or onsite storage of residual uranium from past operations. Should the 250 picocuries per gram concentration not be practically achieveable, the 2500 picocuries per gram limit, option 4 of the Branch Technical Position, will apply. In either case, residual concentrations will be covered with a minimum of 4 feet of clean overfill.

III. DECONTAMINATION OPERATIONS

Decontamination and decommissioning of the evaporation ponds will include the following steps:

1. Discontinue use of ponds for disposal of low level liquids.

2. Remove pumpable portion of sludge (down to the underlying layer of crushed rock) from the primary pond.

3. Dry sludge from primary pond, consolidate into new drums and ship to licensed burial.

4. Remove layer of carryover sludge from secondary pond and ship to licensed burial.

5. Cut trench north of ponds to intercept ground water flow upstream of ponds and to suppress ground water table in area of ponds.

6. Pump liquid from primary pond and evaporate.

7. Remove remaining sludge from primary pond.

8. Sample both ponds on grid pattern to determine residual activity concentrations. Obtain depth profile of activity for each pond.

9. Remove any residual activity above decontamination requirements and resample.

10. Submit survey report to NRC Uranium Fuel Licensing Branch.

11. After obtaining NRC approval, cover both ponds with a minimum of 4 feet of clean overfill.

IV. SAMPLING RESIDUAL ACTIVITY

After removal of the remaining sludge from the primary pond, samples will be taken to characterize and map residual activity in the underlying soil (step 8 above). This sampling will be conducted as follows:

> Samples will be taken by superimposing a 2 ft. X 2 ft. horizontal grid pattern on the primary (small) pond and a 3 ft. X 3 ft. grid pattern on the secondary (large) pond. A representative sample will be obtained from each grid cell. Samples will be crushed, blended and counted for gross alpha and gross beta activity. A depth activity profile at one-foot intervals will be taken at the center of each pond.

V. DECONTAMINATION SCHEDULE

Steps 1 through 5 of the above decontamination operations have been accomplished. Use of the evaporation ponds for disposal of low level liquids, primarily spent potassium hydroxide scrubber solution from the uranium dry recycle process and liquids from startup testing of the wet recovery process, was discontinued in September 1978. After an extended dry weather period, 21,000 liters of sludge was pumped out of the primary pond in October 1979. The resulting 136 drums of material were individually dried, consolidated into 74 new drums (17 H) and shipped to licensed burial during 1982, 1983 and early 1984. A thin layer of carryover sludge was removed from the secondary, or "overflow" pond in November 1983. This sludge was placed in 3 metal shipping boxes (B-25) having a combined volume of 294 cubic feet and shipped to licensed burial in January 1984. During the summer of 1983, an 8-foot deep trench was cut parallel to the ponds in the uphill gradient of area ground water flow. The purpose of this trench was to intercept ground water flow to the ponds and to suppress the ground water table in the general area of the ponds. Although water has been repeatedly pumped from the trench, no effect on the water level in the ponds has been observed.

Step 6 of the decontamination operations, pumping water from the primary pond into a steam-heated tank for evaporation, is currently in progress. Once this step is completed, we will be dependent on an extended dry weather period to complete drying of the primary pond and complete Step 7, which is removal of the remaining sludge, including the 6-inch thick crushed rock lining. An estimated 2,450 cubic feet of material remains to be removed from the primary pond.

Although removal of the remaining sludge and completion of the residual activity sampling is scheduled for the summer and fall of 1984, an extremely wet period, as has been experienced in some previous years, could delay completion of those steps for a year. It is not practical to handle the heavy water intrusion during extremely wet weather (covering the ponds would only prevent accumulation of direct rainwater, a relatively minor problem).

V. CONTINUED

A survey report will be submitted to NRC within 6 months of completion of Steps 7, 8 and 9. Completion of the entire decontamination and decommissioning project is scheduled prior to the expiration date of License SNM-33, which is December 31, 1988.