REPORT OF SURVEY OF OAK RIDGE ISOTOPE ENRICHMENT (CALUTRON) FACILITY BUILDING 9204-3

U.S. Department of Energy
Office of Environmental Management
&
Office of Nuclear Energy

Report of Survey of Oak Ridge Isotope Enrichment (Calutron) Facility Building 9204-3

FINAL

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1. Introduction

1.1 Purpose

The purpose of this document is to report the results of a survey conducted at the Isotope Enrichment Facility (IEF, Calutron, Building 9204-3) on the Y-12 Plant property at the Oak Ridge Site. The survey was conducted during the week of November 29, 1999.

The primary purpose of the survey is to identify facility conditions and to define the characterization, stabilization, and material/waste/equipment removal (if any) requirements that need to be met to transfer responsibility for the facility from the Office of Nuclear Energy (NE) to the Office of Environmental Management (EM). Additionally, estimated post stabilization surveillance and maintenance (S&M) activities and costs are identified for transfer along with the facility. The second purpose is to provide EM with insight regarding the facility's risks and liabilities, which may influence the management of eventual downstream life-cycle activities.

The survey and this report are part of a process for implementing the requirements related to the disposition of excess facilities addressed in **DOE Order 430.1B Chg. 2, REAL PROPERTY & ASSET MANAGEMENT**, using the associated guidance for facility transition, deactivation, surveillance & maintenance, and decommissioning.

1.2 Facility Description

The IEF was constructed in 1943. It is located on the southern edges of the main Y-12 Plant, approximately in the middle of the east-west axis. It is in the extreme southeast corner of the intrusion security area. The main building contains approximately 216,000 sq. ft. (5 acres) of floor space in a basement, 2 main floors, and several mezzanines. The building is of steel superstructure with masonry walls and concrete floors. Heavy reinforced concrete columns support the massive calutron magnets in the large high bay area that dominates the main floor of the building. The building was designed as a

production facility, but has been operated as specialized laboratory for the preparation of milligram to kilogram quantities of hundreds of different isotopes for medical, research, and industrial applications.

The calutron area dominates the main floor of the building. It is a large bay on the main floor running the length of the building extending over two-thirds the width, and extending upwards to the roof. The calutrons themselves are large vacuum chambers surrounded by the magnets used for electromagnetic separation of elemental isotopes. There are 32 calutrons of which 8 used for plutonium processing are enclosed behind a large vertical wall at one end of the building.

The building is divided into eight different functional areas:

- The Operations Area composed of the calutrons and the direct support systems that enrich isotopes by electromagnetic separation.
- The Chemistry Area consisting of standard chemistry laboratories and storage areas that are used to recover, purify, and store the enriched isotopes.
- Maintenance, electrical, and machine shops.
- Utilities consists of general building support systems such as water, heat, ventilation, and three more specialized systems: the mineral oil ("Z-oil") cooling system, the demineralized water system, and the cooling towers located to the south to the building outside of the intrusion boundary.
- The Y-12 Electrical Area includes transformers and circuit breakers that supply power needs of the facility. It is in the process of a Y-12 power upgrade to distribute power to other surrounding buildings.
- The Uranium Processing Area was used for handling and storing of uranium isotopes and contains associated equipment and areas of the building that were contaminated during WWII, and remain contaminated.
- The Plutonium Processing Area is for handling and storage of higher specific-activity alpha-emitters and includes a walled-in section of 8 calutrons of the second floor, a glove box conversion laboratory on the first floor, and an equipment storage vault in the basement. It also includes dedicated exhaust fan system and an emergency generator. (Pu isotopes have been removed, resulting in a "non-nuclear, radiological facility.")
- General Use Area includes hallways, stairwells, offices, lunchrooms, change rooms, bathrooms, janitorial areas, and general storage areas.

The basement area is a complex of water and oil systems, capacitors and motor generators for the magnets, a records storage room, and large numbers of spare parts stored since the early days of the facility (mid 40's).

The boundaries of transfer are expected to include the following facilities (building footprint plus six feet in each direction). Boundaries for utilities associated with the facilities are expected to be the first source connection, exterior to the facility:

1. Building 9204-3, the Calutron Facility.
2. Small support building (9999-1) at the east of the building that contains a motor/generator.
3. Cooling tower (Building 9409-15) on the south side of the security fences that was used for air conditioning cooling, and an associated valve housing and sprinkler supply (Building 9416-9).

1.3 Organization Representatives

Contacts in transferring and receiving organizations are:

Oak Ridge NE	Larry Boyd
Oak Ridge EM	John Michael Japp
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1.4 Survey Participants

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2. Summary, Conclusions & Recommendations

2.1 Transfer Considerations

Building 9204-3 is in good physical condition. Contamination control actions appear to maintain contaminated areas of the facility in a stable condition. The primary prerequisite to transfer is the removal of 35,000 gallons of oil used to cool the calutrons. This is because 1) the oil is a hazard due to its potential mobility (leakage into the facility), 2) removal should be more efficient because of the availability of the current facility staff who are familiar with the systems, and 3) it eliminates a major combustible with regard to the fire protection needs of the facility. Fire protection experts should be consulted as to whether the emptied system with residual oil and oil film presents a hazardous condition requiring further stabilization.

Building 9204-3 contains approximately 42,000 gallons of transformer/capacitor oil contaminated with PCB's and possibly other hazardous constituents. The oil is contained in transformers and capacitors throughout the building, which are no longer in service. A waste determination must be made for each of these oils to clearly understand the proper waste designation. The action to deal with the oils as a result of this determination should then be taken by Nuclear Energy.

Planning for establishing deactivation and the resulting minimal S&M and other deactivation activities (described below) should be conducted over the next two years so that implementation can occur as soon as possible after transfer to reduce the mortgage costs. Experience at DOE sites has confirmed a continuously increasing S&M requirement and cost over time as facilities degrade; as such, the current S&M estimate is anticipated to increase over time.

2.2 Post-Transfer EM Path Forward & Management Risk

When EM assumes management of the IEF, it will be responsible for conducting a continuous level of S&M to sufficiently maintain Building 9204-3 and its systems capable of containing the existing contamination. Implementation of deactivation will serve to reduce the S&M costs. The cost to decontaminate and demolish Building 9204-3 will be high. The potential for recycling system components and spare parts should be evaluated.

The Building contains electrical distribution switchgear for other nearby facilities fed by large transformers immediately adjacent to the south wall. This situation will require special consideration for deactivation or demolition.

The facility structure and roof are in good condition. The EM path forward should be similar to that for PUREX and B Plant at Hanford: that is, to establish a condition of minimal S&M until resources are available in the future for decommissioning (i.e. perform deactivation).

Establishing a minimal S&M condition will require a substantial planning effort. This is due, in part, to the need to address issues such as the building systems (fire protection, heating, ventilation, and air conditioning, cooling oil, condensate, etc.),

water inflow during storms, separation of the ex-building electrical distribution, continued isolation of contamination, and a myriad of other deactivation considerations. Planning should focus on achieving a reasonable minimum S&M coupled with ongoing efforts to empty the building of equipment and materials over a period of several years. At some time within the next 10 to 15 years, decisions will be required whether to refurbish the roof or proceed to demolition.

While it is recognized that this recommendation needs to be incorporated into the overall site priority list, long term and continuously increasing surveillance and maintenance (mortgage) can and should be avoided by near-term action.

3. Survey Results

Table 1 – Survey Results

Subject of Survey	Summary – These are observations except as otherwise indicated to be statements or presumptions. A detailed worksheet of survey subjects is in Appendix A.
1. Facility Structure	The roof, walls, floors, and foundation are in good condition. Maintaining the building structural integrity for the foreseeable future appears straightforward.
2. Process Systems	The process system of concern for **stabilization** is the calutron cooling oil. The system was stated to contain 35,000 gallons of mineral oil, thought to not be radioactively contaminated; or if so, very mildly with uranium. It also has PCB contamination with an (unconfirmed) average concentration of 7-15 ppm. The calutrons and other systems for their operation, or for the facility itself (demineralized water, DC power, I&C, vacuum, etc.) are shut down. Isolation of parts of these systems will probably be required for deactivation, however, to do so should be relatively straightforward because the systems, while large, do not appear to be overly complex.
3. Infrastructure and Support Systems	Sump pumping – Removal of water in-leakage during storms requires the ability to pump the water from sumps to tanks. This will necessitate maintaining operability of the sump pumping system. Fire Protection & Heating - Wet pipe sprinkler system for fire protection requires maintenance of heat. Steam heat in turn requires the ability to pump condensate from the heating system. A considerable effort would be required to eliminate this. However, savings could be realized by maintaining temperature relatively low during the winter. Ventilation – Exhaust ventilation from the actinide area must be maintained to prevent spread of contamination. It may be possible to eliminate the Pu glovebox ventilation system by sealing up the gloveboxes. Electrical – Complications arise because the building contains switchgear that feeds other facilities. If the building is to go on minimal S&M, modifications will probably be needed for cooling and fire protection of the switchgear and transformers.
4. Nuclear Safety & Materials	The most significant amount is 300 Kg of depleted uranium. There are also gram quantities or less of enriched uranium and thorium. All other materials, including plutonium, are considered to be contamination.
5. Hazardous Material	The primary concern is PCBs, of which there were stated to be 42,000 gallons of PCB contaminated oil in transformers and capacitors, in addition to the calutron oil cooling system. These oils will require sampling and a proper waste designation. The oils will then be dispositioned in accordance with applicable regulations and site/plant procedures. There are transite panels throughout the facility, but they do not appear to pose a hazard. There are a large number of laboratory chemicals and feed material, albeit in limited quantities. The list comprised 54 pages.
6. Radioactive	The primary areas of contamination are 1) the actinide areas consisting of wash lines and

Contamination and Waste	glovebox lines, and 2) the east section of calutrons that were used for plutonium. All contamination appears to be relatively low level, including HEPA filters.
7. Environmental	There do not appear to be any significant issues other than the facility is in close proximity to a site trench/creek.
8. Characterization Information	All radiation and radioactive contamination areas are surveyed. All inventories of chemical and nuclear materials are maintained. However, contamination within the calutron and vent ducting, although believed to be low, is not currently characterized.
9. Surveillance and Maintenance	A fairly extensive review will be required to reduce S&M to a minimum.

4. Stabilization and other Actions Required for Transfer

Characterization

- An up-to-date report of an appropriately graded Pre-Transfer Review is required to ensure that the facility's condition, contents, regulatory status and hazards have been identified and documented. This documented review establishes a baseline at the time of transfer, to provide EM with an adequate understanding of the facility, and includes an assessment and graded characterization of the facility. With agreement between NE and EM, this survey report may serve as documentation of an appropriately graded Pre-Transfer Review.
- 42,000 gallons of PCB containing oil in transformers and capacitors will require sampling and a proper waste designation/disposition.

Stabilization

- Removal of 35, 000 gallons of mineral oil used for calutron cooling (the "Z oil").
- Closure of the TSCA storage area.
- NE needs to decide what to do with records related to isotope transfer that are in storage.
- NE needs to decide what, if any, spare parts and equipment is of value and remove them.
- Repair the enclosure on the roof around exhaust fans for Pu hoods.
- Removal of materials:

  - Chemicals and Feed Stock, including tracer samples some of which need to have their disposition path determined
  - Stored Uranium, Thorium, Lithium
  - Gasses transferred from Mound Labs

- Remove and dispose of all contaminated unattached items.
- Remove all chemicals, and compressed gas cylinders.

Other

Inform the Y-12 utilities group of the possible need to provide fire protection and room environmental control from other locations for the new electrical distribution system upgrades that feed other facilities (switchgear, transformers, controls).

5. Surveillance & Maintenance After Transfer

If EM begins deactivation planning prior to transfer, participation by the current facility staff should be requested, especially for deriving the detailed post-deactivation Surveillance and Maintenance Plan.

After transfer to EM, the annual cost of surveillance and maintenance activities for the IEF that are needed to properly manage the facility prior to its deactivation are estimated in Table 2. Part of the surveillance and maintenance program must include assessments for worker hazards and the appropriate actions taken to assure worker safety. A detailed worksheet by which this estimate was derived is in Appendix B. The bases for this estimate are:

- Assumes entire building has been vacated--no occupants. All chemicals (reagents, bulk powders, Calutron Z-oil,

TSCA storage area, etc.) and SNM have been removed from the facility. No security will be required. Very little work is being conducted within the building: Radiation zones are not being disturbed, no accumulation of miscellaneous wastes is occurring; no facility specific training will be required.

- Changes to facility operating, maintenance, administrative, etc. procedures are minimal. Corrective maintenance consists of straightforward steam leaks and HVAC control system corrections.
- This estimate is activity based. It may be customary for the site to pay for many of these activities out of overhead. However, until such a determination is made, they are included here. Note that this estimate does not include utility costs or overhead charges.

The site generated cost estimates are also shown in Table 2.

Table 2 - S&M Cost Estimate Worksheet for Activities After Transfer[1]

Surveillance & Maintenance Costs	Basis for Estimate	Annual Estimated Hours & Capital		Annual Estimated Cost	
		By NFDI	By Site	By NFDI	By Site[2]
1. Nuclear Safety	See worksheet in Appendix B	400 hours	400 hours	$ 40,000	$44,569
2. Occupational Safety Health	See worksheet in Appendix B	500 hours	500 hours	$ 50,000	$40,834
3. Fire Protection	See worksheet in Appendix B	600 hours	600 hours	$ 60,000	$54,353
4. Radiation Protection	See worksheet in Appendix B	2,200 hours	2,200 hours	$220,000	$152,450
5. Emergency Management	See worksheet in Appendix B	350 hours	350 hours	$ 35,000	$30,826
6. Control, Accountability, Security for SNM		0		0	0
7. Training and Qualification	See worksheet in Appendix B	300 hours	300 hours	$ 30,000	$31,159
8. Quality Assurance	See worksheet in Appendix B	250 hours	250 ours	$ 25,000	$24,165
9. Engineering, Configuration Control	See worksheet in Appendix B	750 hours	750 hours	$75,000	$77,898
10. Environmental & Waste Management	See worksheet in Appendix B	600 hours	600 hours	$ 60,000	$48,077
11. Administration	See worksheet in Appendix B	2,240 hours	2,240 hours	$ 224,000	$232,654
12. Facility Structural S&M	See worksheet in Appendix B	2,000 hours	2,000 hours	$200,000	$132,007
13. Facility Systems & Components Surveillance	See worksheet in Appendix B	2,250 hours	2,250 hours[3]	$225,000	$148,500
			Subtotal	$1,244,000	$1,017,492
Other Direct Costs associated with S&M	Allow 20% of the S&M labor cost for consumables (HEPA filters, equipment repair parts, paint, absorbent, etc.)			$249,000	
Site Overheads					$342,884

Site Assessment Costs					
- Utilities					$292,000
- Security					
- Site Services					
			Subtotal		$634,884
			Overall Total		$1,652,000

6. Other Transfer Details

Table 3 is a generic list of other considerations for transfer to EM.

Table 3 - Staff Considerations and Information Required for Transfer

Subject	Pre-Transfer Requirement/Survey Report Statement
Staffing	It is recommended that staff knowledgeable of the facilities systems, structures, components, and S&M program be made available to EM by appropriate administrative means.
Authorization Basis/Safety Regime	Provide a list of facility-specific Authorization Basis or other Safety Documents, if any, that govern the operation of the facility.
Nuclear & Fissionable Materials Inventory	Provide the inventory of Nuclear and Fissionable materials that will remain in the facility after transfer.
Prior Commitments	Provide a list and description, or supporting documents, of facility specific commitments, if any, for which EM will be responsible after transfer.
Agreements - Permits, Licenses, Purchase Orders, Contracts, etc.	Provide a list and description, or supporting documents, of facility specific permits, licenses, purchase orders, contracts, and other agreements, if any, for which EM will be responsible after transfer.
Assets and Property Management	Provide a list of government owned capital assets, *if any*, (as defined in 41 CFR 109, Department of Energy Property Management Regulations) for which custody will be transferred to EM along with the facility.

7. Attachments & References

1. ORNL-TM-4013, Radiation Safety and Control for the Electromagnetic Isotope Separation of Heavy Elements in Building 9204-3, March 1973.
2. 54 page listing, Building 9204-3 Hazardous Material Accountability Report, 11/30/99.
3. HS/9204-3/F/IT-13/R0, Phase 1 Safety Analysis Report Update Program Hazard Screening, November 24, 1992.
4. IEF Limiting Conditions Document Surveillance Requirements Procedure, 11/24/97.
5. Surveillance and Monitoring of Controlled Areas and Equipment in the IEF.
6. Radiation Survey Sheets.
7. Various other documents that address operation of the facility for isotope enrichment.

Appendix A - Detailed Survey Notes

This section contains working notes and observations of the survey and as such they are not edited. The results in Section 3 constitute the formal summary of these observations.

Subject of Survey		Notes
1.0	**Exterior Structure**	

1.01	Roof Condition (Integrity)	Roof condition is excellent. Replaced in 1998 with 10-year life roof.
1.02	Roof Leakage	Only current roof leakage is around roof drain penetrations.
1.03	Foundation (cracks, crumbling)	Visual look – seems to be in good shape. A few settling cracks.
1.04	Walls (air and water tight)	Walls are primarily tile block and in good shape. Building is not a sealed building. Some foundation water leakage on south end where external construction.
1.05	Doors	Doors are satisfactory except doors on the rooftop ventilation shack for Pu hood exhausters.
1.06	Hatches	Only hatches observed were on the roof and to inside the calutrons.
1.07	Windows	Windows have mostly been replaced as of 1998. A few still exists that are "falling out" and are covered with plastic sheeting. One new window on west end observed to be broken.
1.08	Loading Docks	Appear to be functional.
1.09	Ladders and Stairs	Good condition.
1.10	Piping Supports	Nothing observed.
1.11	Power Poles	Satisfactory.
1.12	Transmission lines	External to scope of transfer.
1.13	Transfer piping	Generally satisfactory. Heavy rusting on some exterior lines.
1.14	Walkways and Roadways	Satisfactory.
1.15	Tanks and piping	External tanks for mineral oil, sump pumping station, demineralized water systems. Severe rusting on demineralized water tank and heating pipes. Fiberglass chemical waste tank appears in good condition.
1.16	Piping insulation	Poor condition in several locations.
1.17	Valve boxes or pits	Not observed.
1.18	Manholes and Drains	Not observed.
1.19	Cribs, ditches and trenches	None are within scope of transfer.
1.20	Waste sites	NA.
1.20	Animal Nesting	None observed.
1.21	Paint chipping	Observed in uranium wash area walls where paint was not replaced from original 60’s installation. Generally, facility paint is satisfactory, minimal chipping is localized.
1.22	Paved or Painted Contamination	Parking lot paved over very low level Pu contamination from evaporator many years ago.
2.0	**Interior Structure**	
2.01	Ceilings	Generally satisfactory. Many Transite ceilings throughout, although appear to be in good condition.
2.02	Floors	Generally satisfactory. Many stains in basement (PCB oil, water, steam). Some cracking on south end of basement. Cracks on north end of 1st floor had been repaired.
2.03	Walls (load bearing)	Satisfactory. Localized cracking in a few areas.
2.04	Foundations	Satisfactory. Localized cracking in a few areas.
2.05	Mezzanines	Used for office space and platforms. Condition satisfactory.
2.06	Cat Walks	Condition satisfactory and safe.
2.07	Ladders and Stairs	Good condition.
2.08	Doors	Good condition.
2.09	Fire Doors & Air Locks	Good condition.
2.10	Vaults	Two vaults. Uranium storage (approx. 300 kg of depleted) in basement. Upstairs is gram quantities of U-235, Th. Also a vault for isotope transaction records.
2.11	Cells	8 calutrons behind the "green wall" contaminated with Pu requires full sets of PPC and respirator for access.
2.12	Hot Cells	None.
2.13	Pits and Crawl spaces	None observed.
2.14	Sumps	4 sumps. Two for water, two for oil.

2.15	Office and Maintenance Shops	Clean. Lots of equipment and spare parts.
2.16	Elevators	8-ton hydraulic elevator is functioning.
	General Appearance/Conditions	
2.17	Housekeeping	Good except basement. Lots of old parts in storage. Also, torn paper step-off pads on floor outside of access to wash area had been left for months.
2.18	Maintenance	Appears generally satisfactory. Leaks inside. Exterior metal is rusting on fan and housing filters, condensate tanks.
2.19	Lighting	Generally satisfactory.
2.20	Signage	Generally satisfactory.
2.21	Access Control	Generally satisfactory.
3.0	**Environmental Compliance**	
	Liquid Effluents	
3.01	Liquid Discharge Points	Buried pipes are not active and have been blanked. Historically contaminated.
3.02	Cribs, Ditches, Ponds	Not in scope.
3.03	Sampling and monitoring	None.
3.04	Abandoned systems	Buried pipes, old Z-oil transfer lines, motor-generator sets, and chloride oven.
3.05	Marking and Mapping	Not observed.
3.06	Characterization info	Steam condensate and chemical tanks are sampled prior to transfer to waste treatment plant.
3.07	Storm water Management	Roof drains to storm drains go to the creek. Storm water can intrude via the facility truck doors.
3.08	Records Retention	Not observed.
	Gaseous Effluents	
3.09	Discharge Points (stacks, louvers in outside walls, etc.)	Of the order of 50 to 100 total. 5 active radiologically contaminated stacks of a total of 10 to 15 potentially contaminated. Separate ventilation for actinide area rooms and for Pu gloveboxes.
3.10	Fugitive Emission sources	None.
3.11	Sampling and monitoring	None.
3.12	Abandoned systems	Approximately 10.
3.13	Records Retention	No monitoring.
3.14	Characterization info	None.
3.15	Filter calibration	Current.
3.16	Filter loading info	HEPAs have characteristically been replaced on DP, not radiation, and last several years.
	Chemical Management	
3.17	Spills and Releases	Oil spills throughout the facility. Absorbent throughout the basement.
3.18	Chemical Storage	Basement – bulk storage of thallium and feed stock. Lab has hundreds of small quantities of chemicals in storage. 54 page listing of chemicals and materials.
3.19	Underground Tanks	None.
3.20	Records Retention	Maintained current.
	Regulatory	
3.21	Permitted Area boundary	Satellite RCRA accumulation areas within the facility. Chemical waste tank belongs to waste treatment plant and is part of that permit.
3.22	TSCA –PCB Labels	TSCA/PCB storage area in basement.
3.23	Hazard Labels	Satisfactory.
3.24	Calibration records/stickers	Not observed.
4.0	**Process Systems**	
4.01	Process Control Room	Two, one old, one new. Neither in current operation.

4.02	Exhaust Systems	See 3.09-3.16.
4.03	Fans	Ditto.
4.04	Motors	None required during shutdown.
4.05	Stacks	Five operating stacks. See 3.09-3.16.
4.06	Ductwork	Potentially contaminated. No holdup of significance, if any.
4.07	HEPA Filters	HEPAs on all stacks. Maintained current.
4.08	Off Gas Scrubber	None.
4.09	Stack Monitoring	None.
4.10	Glove Boxes	Three glovebox lines in Pu lab approximately 20-30 ft in length. Approximately 12 gloveboxes in conversion lab.
4.11	Lab Hoods	Several lab hoods, mostly low level contamination except in U lab (room 111).
4.12	Fume Hoods	Wash tanks fume hoods still operating.
4.13	Vacuum Pumps	Many associated with process operations. None needed for transfer.
4.14	Vessels or tanks	Evaporator glovebox, oil storage, 4 Pu lab floor drain tanks, chemical waste tank, condensate tanks.
4.15	Pumps	Several associated with various systems.
4.16	Motors	Ditto.
4.17	Piping	Copious water and oil pipe throughout the facility.
4.18	Level Detection	Not observed.
4.19	Inert Gas Systems	None. Plant argon system abandoned.
4.20	Heat Detection Systems	Deactivated.
4.21	Compressed Air Systems	Centrally supplied.
4.22	Containment Systems	None.
4.23	Conveyer Systems	None.
4.24	Waste Handling Systems	Chemical waste tank.
4.25	Waste Assay Systems	Process knowledge. Verified at waste sites upon receipt.
4.26	Reactor	None.
4.27	Storage Pool or basins	None.
4.28	Manipulators	None.
4.29	Water Filtration	Demineralized water.
4.30	Water Treatment	None.
4.31	Assay Requirements	None.
5.0	**Infrastructure & Support Systems**	
5.01	Electrical Distribution	Major power supply throughout the facility. 13.8 KVA, 480, 220, 110. Large switchgear room to feed other facilities is an integral part of the building on the south end of the 1st floor. Part of the Y-12 electrical distribution system upgrade. Responsibility of Y-12 utilities group.
5.02	Normal Power	Difficult to isolate just the facility lighting.
5.03	UPS	Emergency notification system.
5.04	Emergency Generators	For actinide facility only. Emergency power for exhaust ventilation fans.
5.05	Steam Turbines	Water turbine for backup cooling of calutron on loss of power.
5.06	Switchgear	See 5.01.
5.07	Breaker Panels	Standard.
5.08	General Wiring	Not observed.
5.09	Emergency Lighting	Battery.
5.10	Security Power	NA.
5.11	Steam and Water Systems	Heating steam. Water = service, potable, demineralized, fire system.
5.12	Potable Supply	Yes.
5.13	Process Supply	Demineralized.

5.14	Distiller	Out of service.
5.15	Floor and Sanitary Drains	Drains in basement all drain to four to common sumps (two for water, two for oil). Floor drain sumps are pumped to steam condensate tanks and to tanker trucks. The oil sumps stay within the building.
5.16	Process Drains	Ditto.
5.17	Cranes	Two operable bridge cranes – 20 ton with 5 ton auxiliary hooks.
5.18	Moving Platforms	None.
5.19	Elevators	8 ton hydraulic.
5.20	Security	External.
5.21	Communication Systems	Emergency Notification System (ENS), PAX.
5.22	Phone and Computer Networks	Standard.
5.23	Fire Systems	Wet pipe sprinkler system.
5.24	Fire Detection	Ditto.
5.25	Fire Suppression	Ditto.
5.26	Fire Maintenance	Equipment is X10, maintenance is Y-12.
5.27	Criticality Alarms	Deactivated.
5.28	Industrial Alarms	ENS.
5.29	Emergency Broadcasting	ENS.
5.30	HVAC Supply	Fans.
5.31	Air filtering	Inlet supply normal filtering.
5.32	Building Heat	Steam coils and local warehouse type electrical units.
5.33	Building A/C	Cooling tower water to coils.
5.34	Freon Systems	Local office A/C units. One TRANE system with freon.
5.35	Shop systems	Electrical and mechanical machine shops.
5.36	Supply Storage	Lots.
5.37	Change Rooms	Yes.
5.38	Emergency Response Org	Not observed.
5.39	Temporary Structures	None.
5.40	Site Services/Support i.e. Rigging	None.
6.0	**Nuclear Safety & Materials**	
	Plutonium	
6.01	Material in Storage	None.
6.02	In Solution	NA.
6.03	In Equipment	None.
6.04	In Glove Boxes	Contamination only.
6.05	In Hot Cells	NA.
6.06	In Cells, Sumps	None.
6.07	In Ducts	Not expected.
6.08	In HEPA Filters	Minor.
6.09	Sump or Pool Sludge	NA.
	Uranium or Thorium	
6.10	Material in Storage	300 kg depleted uranium, see inventory list. Also micro gram quantities of Thorium and grams of U235.
6.11	In Solution	NA.
6.12	In Equipment	No bulk, contamination only.
6.13	In Glove Boxes	Contamination only.
6.14	In Hot Cells	NA.
6.15	In Cells, Sumps	None.
6.15	In Ducts	Not expected.
6.16	In HEPA Filters	Minor.

6.17	Sump or Pool Sludge	NA.
	Nuclear Fuel	
6.18	New in Storage	None.
6.19	In Reactor	
6.20	In Wet Storage	
6.21	In Dry Storage	
	TRU – (am, cm, bk, cf)	
6.22	Material in Storage	
6.23	In Solution	
6.24	In Equipment	Minor contamination only.
6.25	In Glove Boxes	
6.26	In Hot Cells	
6.27	In Cells, Sumps	
6.28	In Ducts	
6.29	In HEPA Filters	
6.30	Sump or Pool Sludge	
	Other Nuclear Materials	
6.31	Deuterium, Tritium, Lithium 6	Approx 1 kg lithium metal.
6.32	Sealed Sources	
6.33	Source Accountability	
6.34	Neutron Monitors	
6.35	Neutron Absorbers	
6.36	In line Neutron Source	
7.0	**Hazardous Material**	
	Process Chemicals	See 54-page inventory list.
7.01	Acids	
7.02	Caustics	
7.03	Sodium	
7.04	Hydrazine	
7.05	Lab Reagents	
7.06	Misc. Chemicals or Explosives	
	Environmental Hazards	
7.07	Lead, Heavy Metals	Lead isotopes only. Mercury?
7.08	Potassium Chromate	
7.09	PCBs	Copious. 35 thousand gallons of Z oil approximately 15 ppm. 42 thousand gallons in transformers and capacitors.
7.10	Solvents and thinners	
7.11	Freon, CFC’s	
7.12	Paints, Sealants, Adhesives	
7.13	Decontamination Agents and Cleaners	
7.14	Pesticides and Herbicides	
	Industrial Hazards	
7.15	Asbestos	Lots of Transite, minor amounts of piping insulation, floor tiles.
7.16	Beryllium	See 54-page inventory list.
7.17	Magnesium	Ditto.
7.18	Chlorine	Ditto.
7.19	Toxic/Air Deficient Atmospheres	NA.
7.20	Carcinogens	See 54-page inventory list.

	Biological Hazards	
7.21	Animal and Rodent Feces	None.
7.22	Bird Droppings	Infrequent bird intrusion.
7.23	Snakes	Infrequent snake.
7.24	Spiders & Insects	
7.25	Molds and Mildew	
	Hazardous Waste	
7.26	Profiles/Types	
7.27	Packaged	
7.28	Not Packaged	
7.29	Disposal Path Availability	
7.3	Excess Material	
7.31	90 Day Pad w/material*	None.
7.32	Satellite Area	Several RCRA areas.
7.33	Containment	NA.
7.34	Shipping Records	External.
8.0	**Radioactive Contamination & Waste**	
	Radioactive Contamination/Materials	
8.01	Surface contamination Alpha	Survey sheets for most radiation areas.
8.02	Surface contamination B/G	Ditto.
8.03	Airborne Contamination	Behind green wall and Pu wash area are declared airborne, although they are probably not so.
8.04	PPE (Mask, Fresh Air etc)	
8.05	Boundary	
8.06	Postings	All areas posted.
8.07	Mapping	
8.08	Fixed Contamination	Yes.
8.09	Fixative Information	None specifically identified.
8.10	Work Place Air Sampling	2 CAMs in Pu lab and 1 in conversion lab.
8.11	High Radiation Area’s	Possibly one area.
8.12	Key Control	
8.13	Log Books	Daily.
8.14	Radon	
8.15	Decontamination Stations	None.
8.16	Laundry (SWPs)	All disposable.
	Outside Contamination Areas	
8.17	Boundary	None.
8.18	Postings	
8.19	Mapping	
8.20	Fixed Contamination	
8.21	Fixative Information	
8.22	Work Place Air Sampling	
	Radioactive Waste	
8.23	TRU Waste	Packaged at plant with process knowledge and NDAs performed at X-10.
8.24	Mixed Waste	Packaged at Beta-3.
8.25	Resins, Sludge or others	Not routine.
8.26	Packaged	Yes.
8.27	Not Packaged	NA.

8.28	Disposal Path Availability	No path for some tracer samples. This will need to be resolved.
8.29	Excess Material	Process exists to excess materials.
8.30	90 Day Pad	None.
8.31	Satellite Area	Several.
8.32	Containment	TSCA area has surrounding dikes.
8.33	Shipping Records	Small file.
8.34	Assay Requirements	At X-10.

Appendix B – Details of S&M Estimate

S&M Category	Activities	Hours/yr.
1. Nuclear Safety	Maintain Nuclear Safety Management & Administration	200
	Maintain Safety Basis Documentation	200
	Maintain Nuclear Criticality Safety	
	Maintain Operational Safety Requirements (Technical Safety Requirements)	
	Conduct USQs	
	Hours Per Category	400
2. Occupational Safety Health	Maintain O/H/S Management & Administration	100
	Implement O/H/S Hazards Identification Maintenance & Control	100
	Maintain O&H Employee Program	
	Maintain O/H/S Records Reporting	100
	Maintain Lock & Tag Program	200
	Hours Per Category	500
3. Fire Protection	Maintain Fire Protection Management & Administration	400
	Maintain FHA	100
	Perform Facility/Program Assessment	100
	Hours Per Category	600
4. Radiation Protection	Maintain Radcon Administration	400
	Develop & Implement Radiation Protection Program	200
	Perform Radcon Assessments	400
	Perform Radcon Audits	
	Maintain ALARA Program	
	Maintain Personnel Exposure Monitoring	
	Provide for Personnel Monitoring	
	Provide for Exposure Limits	
	Provide for Dosimetry Program	200
	Maintain Radiation Protection Equipment, Instruments & Supplies	200

	Maintain Laundry Support Activities	
	Provide Positive Mask Issuance, Control & Maintenance	
	Maintain Rad Area Access Control	200
	Provide for Restrictions & Posting	
	Provide for Posting of Rad Areas	
	Provide for Rad Work Permits	
	Maintain Contamination Control Program	
	Maintain Personnel, Equipment & Area Contamination Control	200
	Manage Radiological Problems	200
	Maintain Rad Records Management	200
	Maintain Radiation Protection Program	
	Hours Per Category	2,200
5. Emergency Management	Maintain EP Program Management & Administration	50
	Maintain Emergency Plans & Procedures	50
	Maintain EP Equipment & Supplies	50
	Maintain/Demonstrate Response Capability Through Drills and Exercises	200
	Hours Per Category	350
6. Control, Accountability, Security for SNM	Maintain SNM Oversight/Assessments	
	Maintain Safeguards of SNM Equipment	
	Custodian Material Control and Accountability	
	Respond to SNM Container Anomalies	
	Provide Security Patrol	
	Hours Per Category	0
7. Training and Qualification	Provide and Maintain Management Oversight of Training Program	50
	Maintain All Training Records and Documentation	50
	Attend Site Specific Training	200
	Provide Facility Specific and Facility General Training	
	Review, Revise & Implement Facility Specific and Facility-General Courses	
	Maintain Facility-Specific and Facility-General Courses	
	Attend Facility Specific and Facility-General Courses	
	Update and Implement Qualification Program and Facility Specific Training	
	Provide and Implement Continuing Training/Requalification Programs	
	Develop and Implement New Training	
	Hours Per Category	300
8. Quality Assurance	Manage and administrate the Quality Assurance Program	100

	Maintain Quality Assurance Program Plan (QAPP)	100
	Maintain a Mngmnt. Assessment Program and Corrective Action Mngmnt.	
	Maintain a Management Assessment Program	
	Maintain Corrective Action Management	50
	Hours Per Category	250
9. Engineering, Configuration Control	Provide Management Direction & Oversight	100
	Conduct RBSM Review	
	Maintain Plant Physical Configuration	200
	Manage Material Condition & Aging	50
	Maintain Essential Engineering Information	
	Maintain Document Control Process	200
	Maintain Engineering Documents	200
	Maintain Requirements Baseline	
	Manage/Maintain S/RID Program	
	Perform S/RID Annual Update	
	Perform Inventory of Essential Materials	
	Hours Per Category	750
10. Environmental & Waste Management	Maintain Environmental Programs	200
	Environmental Program Management & Administration	100
	Emissions & Effluents (Air & Water)	
	Regulated Substances/Underground Storage Tanks	
	Spill & Release Reporting	
	Solid Waste Management/RCRA	
	NEPA/Cultural & Ecological Resources	
	Chemical Management System/EPCRA	50
	Pollution Prevention/Waste Minimization	50
	Inactive Waste Sites	
	Maintain/Manage Waste Management Program	200
	Maintain Waste Certification & Acceptance Program	
	Hours Per Category	600
11. Administration	Maintain Administrative Management Systems	
	Provide/Maintain Minsafe Project Management	1,000
	Perform other Management Assessments	
	Maintain Policies, Procedures, & Records Management Program	
	Maintain Operating Procedures	

	Maintain Maintenance Procedures	
	Maintain Facility Support Procedures	
	Maintain Administrative Procedure	
	Maintain Record Management Program	200
	Provide & Maintain Mngmnt. of Policies, Procedures, & Records Mngmnt.	
	Provide Business Management Support	
	Manage Baseline Control & Administration	200
	Provide Short & Long Range Schedule Integration, Database Mgmt., and Maintain the Current Approved MYWP	200
	Provide Future Technical Baseline Planning, MYWP & Basis of Estimate Planning and Scheduling	
	Provide/Maintain Issues Management/Reporting & Tracking	
	Maintain Price Anderson Amendment Act Compliance	
	Maintain Occurrence Reports	200
	Conduct Lessons Learned	
	Maintain Facility Administration	
	Provide/Maintain Office Supplies, Computers, Plotters, etc.	40
	Maintain ISMS Program	200
	Provide DOE Stakeholder Tour Support	200
	Hours Per Category	2,240
12. Facility Systems & Components Maintenance	Maintain Maintenance Management	
	Maintain Maintenance, Scheduling, Plan of the Day & Plan of the Week	
	Maintain Work Control	200
	Provide for Training & Qualification of Maintenance Personnel	
	Conduct Facilities Maintenance	
	Conduct Preventative Maintenance	
	Conduct Safety Envelope Maintenance	400
	Balance of Plant Calibration and Preventative Maintenance	400
	Conduct Corrective Maintenance	400
	Conduct Facility Condition Inspections	
	Procure Parts, Materials, & Services	200
	Maintain Maintenance Tool & Equipment Control	200
	Maintain Program for Control and Calibration	200
	Maintain Spare Parts System	
	Maintain Spares Inventory Procurement	
	Maintain Spares Tracking System - Inventory Change	
	Maintain Special Projects	

	Provide & Maintain Support for Facility Upgrades & Modifications	
	Maintain Facilities, Equipment, & Tools	
	Hours Per Category	2,000
13. Facility Systems & Components Surveillance	Perform Process Related Surveillance's	
	Perform Fire Extinguisher Inspection	
	Inspect Emergency Cabinets	
	Perform Winterization Surveillance	200
	Perform Routine Surveillance	400
	Perform Criticality Alarm System Surveillance	
	Perform Wastewater Systems Surveillance	50
	Perform Inventory of Hazardous Materials	100
	Perform First Aid Cabinet Inspection	
	Perform Safety Shower and Eye Wash Station Test	
	Inspect and Fill Drain Traps	
	Perform Utility Systems Surveillance	400
	Perform Power and Ventilation Equipment Surveillance	400
	Perform Fire Protection Water Supply System Surveillance	
	Perform Exhaust Filter/Glovebox DP Surveillance	
	Perform Steam Trap Surveillance	50
	Change Filter Media	200
	Conduct Facility Radcon Monitoring & Surveillance's	
	Maintain Radcon Surveillance and Monitor Management	
	Conduct Facility Radcon Surveillance and Dose Rate Surveys	
	Conduct Monitoring Surveillance's and Maintain Monitors and Alarms	
	Conduct Surveillance on Monitors and Alarms	
	Perform Solid Waste Operator Routines and Surveillance's	
	Maintain Waste Packaging & Handling	200
	Maintain Waste Container Storage	200
	Maintain Waste Transportation & Disposal	50
	Hours Per Category	2,250
	Total Hours per year	12,440

*Assumes entire building has been vacated--no occupants. All chemicals (reagents, bulk powders, Calutron Z-oil, TSCA storage area, etc.) and SNM have been removed from the facility. No security will be required. Very little work is being conducted within the building: Radiation zones are not being disturbed, no accumulation of miscellaneous wastes is occurring; no facility specific training will be required.

Changes to facility operating, maintenance, administrative, etc. procedures are minimal. Corrective maintenance consists of straightforward steam leaks and HVAC control system corrections.

This estimate is activity based. It may be customary for the site to pay for many of these activities out of overhead. However, until such a determination is made, they are included here. Note that this estimate does not include utility costs or overhead charges.

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[1] Budget estimate based on $100/hr labor rate - fully loaded
[2] Based on FY02 Y-12 labor rates
[3] Based on discussion with Mike Keck 5/9/00 - See email from T. Blaine to A. Szilagyi