Enclosure 5 – Decommissioning Cost Estimate for License SNM-95 (Special Nuclear Materials)

Section A.3.4 Facility Description

License Numbers and Types

The Pennsylvania State University maintains license number SNM-95 issued by the Nuclear Regulatory Commission a Special Nuclear Materials (SNM) license.

Types and Quantities of Materials Authorized

The following are the licensed materials and quantities permitted under SNM-95:

Table 1 – SNM-95 License Summary

Line Item	Isotope	Form	Allowed Quantity
A	Uranium enriched in the U-235 isotope	[redacted]	
B	Uranium-233		
C	Plutonium-239		
D	Plutonium-239		
E	Plutonium – (238-242) Requested to be deleted in License Renewal Submission dated November 5, 2014		
F	Fission product samples		

Description of How Licensed Materials Are Used

The SNM material [redacted] is [redacted] used for teaching, research, and the operation of the Radiation Science and Engineering Center [redacted] It is assumed that a majority of these will be transferred back to the DOE upon decommissioning.

At present Penn State does not have any U-233 [redacted]

Discrete Pu-Be sources [redacted]

The sources [redacted] emit alpha radiation for

teaching, research, and for use with alpha detection instruments.

No sources are possessed [redacted]

[redacted] small liquid samples of fission products used for teaching and research.

The materials under this license are securely stored or managed [redacted]. The current number of individual rooms or labs covered by this license is six.

Routine surveys are performed by Radiation Protection staff once per calendar quarter to assure that safe working conditions are maintained. Normal operating procedures require that radioisotope laboratories minimize contamination. Typically, surveys show no removable contamination above background (approximately < 50 dpm/100cm^2) on surfaces and equipment using liquid scintillation counting (LSC) and Geiger meters. Penn State maintains a "*no contamination*" policy and any finding above background is promptly addressed and decontaminated.

Because of this continuous characterization of the radiation environment, normal decommissioning typically requires only the removal of radioactive materials, or solutions, and radioactive waste consisting of paper, plastic, and glass lab ware followed by appropriate surveys of the facility and equipment. Decommissioning surveys are a routine part of the radiation safety program when authorized users either relocate or terminate.

Description of Facilities

The Pennsylvania State University is a large educational institution serving more than 45,000 students and more than 2500 faculty. Research under this license currently takes place in two (2) buildings exclusively at the University Park (UP) campus. Some buildings share both educational and research missions; others are designed as research laboratory buildings. Within a building, the use of radioactive material can be in many or just a few locations as approved by the University Isotopes Committee. As the type and emphasis of research changes over time, the occupancy of a building may also change and interior spaces are often remodeled.

Currently, there are six (6) laboratories [redacted] utilized for SNM radioactive materials use [redacted] The following is a list of currently active buildings at Penn State:

Table 2 – Buildings and Rooms			
Campus	**Building**	**Use**	**Number of Unsealed Rooms**
UP	[redacted]		
UP			
		TOTAL Rooms	**6**

Within any given approved laboratory space, researchers are encouraged to limit work with radioactivity to as small an area as possible, e.g. one bench top. Individual instruments and equipment that are used to store or process radioactive samples are labeled with a Caution Radioactive Material label.

In summary, standard operating procedure is to protect the bench surfaces from contamination with absorbent material. Generally, no liquids are disposed of by means of laboratory sinks but, rather, are collected for disposal by Radiation Protection staff. Only accidental or incidental (e.g. secondary glassware washing, etc.) discharge via a laboratory sink is permitted unless sink disposal is approved by the University Isotopes Committee (UIC).

Currently all SNM radioactive material use at UP is in traditional laboratory setting (i.e. dedicated rooms or spaces with rooms having walls and doors). To simplify estimating the decommissioning costs, a Reference Laboratory (RL) will be defined. This generic laboratory consists of a single room used for performing research with radioactive materials as well as non-radiological research. Actual room sizes vary between approximately 100 ft^2 to 1500 ft^2 and the RL will be assumed to be 600 ft^2 (20 ft wide by 30 ft deep by 10 ft high). Section A.3.5 contains more detail as to the contents of a RL.

Radioactive Waste On-Hand Before Decommissioning

At the present time there is no SNM waste on hand. Due to the limited quantities in possession currently, SNM waste On-Hand at the time of decommissioning will be treated as zero. The information provided below is almost entirely other byproduct waste disposal. The information provided below is included as reference only and consideration as to typical types, volumes, and cost of disposal.

All wastes with less than or equal to 120 day half-life are held for decay for at least 10 half-lives, then surveyed and released as non-radioactive waste. All long lived wastes are shipped to an appropriate waste disposal facility.

There are no SNM wastes on-hand prior to decommissioning. Since some wastes will be generated during decommissioning, the wastes costs are based on the prior six years of waste shipment data provided in Table 3 below:

Table 3 – Waste History						
Year	**Number, Type of Container (Waste Type)**	**Isotopes**	**Total Activity (mCi)**	**Total Volume (Unit Volume)**	**Weight**	**Cost**
2018	9, Cardboard Boxes (DAW)	H-3, C-14, U-Nat, Fe-55, Co-60, Eu-151, Na-22, Mn-56, Ca-45	7.9 mCi	140.4 ft^3 (15.6 ft^3/box)	693	$5,094
	5, 30-gal Fiber Drum (LSC Vials)	Fe-55, Ca-45, Na-22, Ra-226	0.9 mCi	20.5 ft^3 (4.1 ft^3/drum)	351	$3,580
					Total	**$8,674**
2019	4, Cardboard Boxes (DAW)	H-3, C-14, U-nat, Fe-55, Na-22, Co-60, Cs-137, Th-Nat, Ra-226	2.48 mCi	62.4 ft^3 (15.6 ft^3/box)	337	$2,477
	3, 30-gal Fiber Drum (LSC Vials)	Ra-226, Fe-55, Na-22	0.09 mCi	12.3 ft^3 (4.1 ft^3/drum)	188	$1,931
	1 LSC Standard	Ra-226	0.01 mCi			$575
	1 ECD Source	Ni-63	15.0 mCi			$575
	2 Alnor Dewpointers	Ra-226	0.014 mCi			$2,900
	12, Cardboard Boxes (Biological)	H-3	0.17 mCi	18.0 ft^3 (1.5 ft^3/box)	178	$4,948
2020	4 Cardboard Boxes (DAW)	H-3, C-24, U-Nat, Zn-65, Co-60, Mn-54	67.4 mCi	62.4 ft^3 (15.6 ft^3 / box)	228 lb.	$2,115

Table 3 – Waste History						
Year	**Number, Type of Container (Waste Type)**	**Isotopes**	**Total Activity (mCi)**	**Total Volume (Unit Volume)**	**Weight**	**Cost**
	9 Cardboard Boxes (biological)	H-3	0.7Ci	7.2 ft^3 (0.80 ft^3/box)	135 lb.	$3,753
	1 5-gal metal drum U/Th acetates	U-Nat, Th-Nat	498.6 grams	0.68 ft^3	16 lb.	$130.40
	1 5-gal metal drum U/Th nitrates in concrete	U-Nat, Th-Nat	960.4 grams	0.68 ft^3	62 lb.	$505.30
					Total	**$6,503.70**
2021	3 Cardboard Boxes (DAW)	C-24, H-3, Co-60, CS-137, Fe-55, U-Nat, Zn-65	93.1 mCi	46.9 ft^3 (15.6 ft^3/box)	183 lb.	$1,482.30
	1 30-gal fiber drum (LSC vials)	Fe-55, Ra-226	0.015 mCi	4.10 ft^3	65 lb.	$681.20
	1 Cardboard Box (biological)	H-3	0.01 mCi	3.89 ft^3	21 lb.	$583.80
	1 55-gal metal drum (metal)	C-14, Co-57, Co-60, Cs-137, Fe-55, Ni-63	0.33 mCi	7.5 ft^3	176 lb.	$1,434.40
	4 10-gal poly drums (sludge)	Ra-226	3.1 x 10-5	5.44 ft^3 (1.4 ft^3 each)	40 gal. (320 lb.)	$2,000
	1 LSC standard	Cs-137	0.030 mCi			$1,389
	1 30-gal poly drum	C-14, Ca-45, H-3, Ra-226	0.69 mCi	4.10 ft^3	20 gal (160 lb.)	$7,828

Table 3 – Waste History						
Year	**Number, Type of Container (Waste Type)**	**Isotopes**	**Total Activity (mCi)**	**Total Volume (Unit Volume)**	**Weight**	**Cost**
	(mixed waste)					
	1 5-gallon poly drum (mixed waste)	C-14, H-3	0.001 mCi	0.68 ft^3	5 gal (40 lb.)	$480
					Total	**$15,878.30**
2023	4 Cardboard Boxes (DAW/Sharps); 1 55-gal Metal Drum (Metal); 2 Boxes (Biological)	H-3, C-14, Fe-55, Co-60, U-Nat	5.02	~45 ft^3	509 lb	$6,167.52
					Total	**$6,167.52**
2024	4 55-Gallon drums (Dewatered Resins)	Sb-124, Cr-51, Co-60, Cs-137	0.325	29.4	1587 lbs.	$14,359.00
					Total	**$14,359.00**
2025	4 Boxes (DAW/Lab Waste); 1 1-gal Pail (Biological); 2 30-gal Fiber Drums (LSC Vials)	H-3, C-14, Fe-55, Co-60, U-Nat	8.92	~65 ft^3	522 lb	$6,110.36

* Dry Active Waste (DAW)

The cost per waste type is provided in Table 4:

Table 4 – Waste Cost History			
Year Waste Broker	**Waste Type**	**Cost per Cubic Foot**	**Cost per Pound**
2018	Dry Active Waste	$36.28	$7.35
Ecology Services, Inc.	LSC Vials	$175.00	$10.00
2019	Dry Active Waste	$39.70	$7.35
Ecology Services, Inc.	LSC Vials	$157.00	$10.27
	LSC Standard/ECD Source	$575 / each	$575 / each
	Biological	$274.88	$27.80
2020	Dry Active Waste	$33.90	$7.50
Ecology Services, Inc.	Source material – acetates	$743.10	$8.15
	Source material – nitrates	$191.76	$8.15
	Biological	$521.25	$27.80
2021	Dry Active Waste	$31.60	$8.10
Ecology Services, Inc.	LSC Vials	$166.15	$10.48
	Biological	$150.85	$27.80
	Metal	$191.25	$8.15
2023	Dry Active Waste		$8.10
Ecology Services, Inc.	LSC Vials		$10.50
	Biological		$27.80
	Metal		$8.30
Chase Environmental	Resins		$7.00
2025	Dry Active Waste		$8.20
Ecology Services, Inc.	LSC Vials		$10.75
	Biological		$27.80
	Metal		$9.00
2023	Dry Active Waste		$8.10
Ecology Services, Inc.	LSC Vials		$10.50
	Biological		$27.80

For easier analysis, the unit costs table above has been rearranged as follows:

Table 5 – Cost per Cubic Foot								
Year	**DAW**	**Metals**	**LSC Vials**	**Biological**	**Mixed Waste**	**Lead**	**LSC Standards**	**Asbestos**
2018	$36.28		$175.00					
2019	$39.70		$157.00	$274.88				
2020	$33.90							
2021	$31.60	$191.25	$166.15	$150.85				
2022							$1395 ea.	

Table 6 – Cost per Pound								
Year	**DAW**	**Metals**	**LSC Vials**	**Biological**	**Mixed Waste**	**Lead**	**LSC Standards**	**Asbestos**
2018	$7.35		$10.00					
2019	$7.35		$10.27	$27.80			$575/each	
2020	$7.50							
2021	$8.10	$8.15	$10.48	$27.80				
2022	$8.10	$8.15	$10.50	$27.80	$130.00	$12.00		
2023	$8.10	$8.30	$10.50	$27.80				
2024	$8.20	$9.00	$10.75	$27.80				
2025	$8.20	$9.00	$10.75	$27.80	$130.00	$12.00		

The projected cost of disposal for waste 'On-hand' will be based on the market rates currently in effect as quoted by the University's LLRW disposal contractor, Ecology Services, Inc. (January 2025):

Table 7 – Waste Costs per Pound for DCE			
	DAW	**Metals**	**LSC**
Cost per Pound	$8.20	$9.00	$10.75

Volume of Contaminated Subsurface Materials

There are no known areas with subsurface contamination associated with this DCE.

Section A.3.5 Number and Dimensions of Facility Components

Type of Space: Reference SNM radioactive material laboratory at Penn State University Park.

Average Size: 600 ft^2 (20 ft wide by 30 ft long by 10 ft high)

Level of Contamination: < 100 dpm/100 cm^2

Table 8 – Reference Lab Components		
Component	**Number of Components**	**Dimensions of Component**
Fume Hood	1	5 W x 2 D x 5 H feet
Lab Rad Benches	3	10 x 3 x 0.25 feet
Sinks / Drains	1	2 W x 1.5 D x 1 H feet
Shelving	12	10 x 1.5 feet
Floors (net exposed ft^2)	1	450 ft^2
Walls	1	1000 ft^2
Ceiling Tiles	1	600 ft^2
Bulk Equipment:		
SNM Secure Storage (Cabinet/Safe)	4	1.5 W x 2 D x 3 H feet
Waste Containers	3	1.5 x 1.5 x 2.5 feet
Benchtop Shielding (Plastic)	2	1.5 x 2 x 2.5 feet
Hand Items (Misc. lab ware)	10	

Section A.3.6 Planning and Preparation (Work Days)

Current Conditions

A third party contractor will be utilized for the decommissioning effort. It is assumed that normal operations continue up until the date the contractor comes on site. The contractor will need to first familiarize themselves with the facility and define the scope of work.

The Radiation Protection Office and Breazeale Nuclear Reactor Facility maintain all records pertinent to the use of radioactive materials under the licenses. These include receipts, inventory, locations of use or storage, waste inventory, personnel, and sealed sources. The records are kept electronically in a database and updated as the record is generated (i.e. inventory is updated as stocks are received; lab survey data is updated soon after the survey is completed, etc.) Laboratory surveys are performed on at least a quarterly basis and paper records kept for at least three years; therefore, a review of these documents will demonstrate the recent levels of contamination which may be expected. Locations of all licensable and generally licensed sealed sources are kept.

Historical Site Assessment

The following records are available in the Radiation Protection Office (RPO) with regard to historical use of radioactive materials:

A) Paper survey reports of laboratories where radioactive material has been used for the past three years. Survey reports are not to scale, but represent the pertinent fixtures and equipment used for radioactive materials work. Surveys may extend to non-use areas and equipment that may be in a particular location. Survey reports typically record the radionuclides recently used and may not reflect all historical uses in a particular location; however, historical purchase records are available.

B) Paper final survey reports of laboratories that have been decommissioned and released for unrestricted use after cessation of radioactive materials use. Survey reports are not to scale, but represent the pertinent fixtures and equipment used for radioactive materials work. Portable equipment released in a final survey report is not identified with specific information such as manufacturer, model or serial number. Once an item of equipment is determined to be free of radioactive contamination, the Caution Radioactive Materials label is removed and it is released to unrestricted use.

C) A listing of all locations by user, nuclides, building and room number where radioactive materials were ever authorized under license.

D) A listing of locations where radioactive materials are currently authorized.

E) A database of all licensable, generally licensed, and sealed sources currently in possession. Sealed sources are inventoried as least semi-annually by the RPO and all disposals of sealed sources are by the RPO. A concerted effort has been made to dispose of sources no longer needed; therefore there should not be any surprise discoveries of sealed sources.

F) Leak test records for all sealed sources.

G) A database of all radioactive waste currently being held in storage, whether for decay-in-storage, or ship-out.

H) Scale floor plans of buildings are maintained by the Office of the Physical Plant, and available in the Facilities Information System (FIS) but survey maps used by the RPO show major room components.

Other Activities

In addition to a records review, a visit to a representative sampling of locations will be made to confirm the starting radiological conditions. Based upon the current level of use, Penn State's "*no contamination*" policy, and a review of past surveys showing no contamination in labs, it can be concluded that radiological conditions are already within the release criteria.

The contractor will prepare the actual decommissioning plan for regulatory review. This will define the scope of work, the radiological conditions of the site, and provide a plan for action. Upon approval by the regulator, a working plan will be developed to include a strategy for systematic decommissioning surveys along with manpower and equipment requirements.

The following table summarizes the work days associated with these activities. The estimates are from Ecology Services, Inc. and Chase Environmental, Inc. and are the worst case values for a particular activity. Other than the characterization activity in Table 9, all others are independent of the number of laboratories. In addition, the final work days for this step are divided by the number of labs currently in use to obtain the work days per lab, which is the basis for all following tables.

Table 9 – Planning and Preparation Work Days					
Activity	**Health Physicist**	**HP Technician**	**Clerical**	**Laborer**	**Job Supervisor**
Prepare documentation for regulatory agencies	2	1	5		5
Submittal of decommissioning plan	2	5	3		2
Development of work plans	2	5	3		1
Procurement of equipment and supplies	1		1		4
Staff training	1	2	1	2	1
Characterization of radiological conditions	0.2	3	1		1
Other (mobilization)	1	1	1	1	1
Total Days	9.2	17	15	3	15
Total Days per Lab	**1.8**	**3.4**	**3**	**0.6**	**3**

Section A.3.7 Decontamination or Dismantling of Components (Work Days)

Based upon the continuous survey and decontamination efforts conducted during the normal radiation safety surveillance program, there are few components which might need to be addressed in this category.

Fume hoods - A very small number, less than three (3), of chemical fume hoods are used with SNM radioactive materials. For these hoods, removal of interior air baffles will be done to reveal hidden surface areas and the connection to the exhaust duct. These areas will be checked for contamination.

Sinks – Although liquids are collected by the RPO, within a posted laboratory one sink per lab is assumed to possibly be contaminated from accidental spillage in the sink or for personal decontamination. To ensure contamination has not lodged in the drain system, the sink traps will be disconnected to survey interior of drain piping.

Type of Space: Reference SNM radioactive material laboratory at Penn State University Park.
Average Size: 600 ft^2 (20 ft wide by 30 ft long by 10 ft high)
Level of Contamination: < 100 dpm/100 cm^2

Table 10 – Decontamination or Dismantling of Components Work Days per Lab						
Component	**Decon Method**	**Health Physicist**	**HP Technician**	**Clerical**	**Laborer**	**Job Supervisor**
Fume Hood	Wipe Down		1		1	
Lab Rad Benches	Wipe Down		0.5		0.5	
Sinks / Drains	Wipe Down		0.5		0.5	
Shelving	Wipe Down		0.1		0.1	
Floors (net exposed ft^2)	Wipe Down		0.5		0.5	
Walls	Wipe down		1		1	
Ceiling Tiles	Test and Dispose		1		1	
Bulk Equipment:						
SNM Secure Storage (Cabinets)	Wipe Down		0.1		0.1	
Waste Containers	Wipe Down		0.1		0.1	
Benchtop Shielding (Plastic)	Wipe Down		0.1		0.1	
Hand Items (Misc labware)	Wipe Down		0.5		0.5	
Other (Supervision, analysis, record keeping, etc.)		1		1		1
Total Days		**1**	**5.4**	**1**	**5.4**	**1**

Section A.3.8 Restoration of Contaminated Areas (Work Days)

There are no known areas external to buildings where contamination has occurred for this DCE.

Section A.3.9 Final Radiation Survey (Work Days)

HP Technician activities during the final survey include removal of SNM materials and waste in laboratory, preparing survey documents, taking wipes and performing a meter survey, analyzing wipes, recording wipe and survey results, returning to lab to decontaminate, if needed, and removing radiation labels. HP activities include review of survey results, inspection of laboratory, and signing off on report. Clerical activities include preparation of documents for submission to regulatory authority.

Table 11 – Final Radiation Surveys Work Days per Lab					
Task	**Health Physicist**	**HP Technician**	**Clerical**	**Laborer**	**Job Supervisor**
Final Characterization Surveys	0.1	1	0.1		0.1
Final Report	0.5	0.5	0.1		0.1
Total Days	**0.6**	**1.5**	**0.2**		**0.2**

Section A.3.10 Site Stabilization Long Term Surveillance (Work Days)

There are no known areas requiring stabilization or long term surveillance for this DCE.

Section A.3.11 Total Work Days By Labor Category

Table 12 – Total Work Days By Labor Category per Lab					
Task	**Health Physicist**	**HP Technician**	**Clerical**	**Laborer**	**Job Supervisor**
Planning and Prep (Table 9)	1.5	2.8	2.5	0.5	2.5
Decontamination (Table 10)	1.0	5.4	1.0	5.4	1.0
Restoration of Contam Areas	0.0	0.0	0.0	0.0	0.0
Final Rad Survey (Table 11)	0.6	1.5	0.2	0.0	0.2
Site Stabilization	0.0	0.0	0.0	0.0	0.0
Total Days	**3.1**	**9.7**	**3.7**	**5.9**	**3.7**

Section A.3.12 Worker Unit Cost Schedule

Salary data for Certified Health Physicists was obtained from the article "The 2024 CHP Salary Survey" published in the March 2025 CHP Corner within the Health Physics News. (Latest data accessed on November 29, 2025):

https://www.aahp-abhp.org/wp-content/uploads/2025/03/CHP-Corner-March-2025.pdf

- Average CHP salary = $172,359

Salary and labor rate data for Pennsylvania May 2024 (latest data accessed on December 8, 2025) was obtained from: https://data.bls.gov/oesprofile/ . Average mean annual wages are used unless otherwise indicated.

- Life, Physical Social Science – nuclear technician (code 19-4051) = $100,730
- Office admin support – info and records clerk (code 43-4199) = $50,200
- Construction laborer (code 47-2061) = $51,260
- Management – First-Line Supervisor of Construction Workers = $84,500

Table 13 – Worker Unit Cost Schedule					
Labor Cost Component	**Health Physicist**	**HP Technician**	**Clerical**	**Laborer**	**Job Supervisor**
Salary ($/yr)	$172,359	$100,730	$50,200	$51,260	$84,500
Fringe Benefits (%)	22%	22%	22%	22%	22%
Overhead & Profit Rate (%)	30%	30%	30%	30%	30%
Total cost per Year ($)	$261,986	$153,110	$76,304	$77,915	$128,440
Travel and Per-Diem per Day	$325	$325	$325	$325	$325
Total Cost per Work Day *	**$1,333**	**$914**	**$618**	**$625**	**$819**
* Based on 260 work days per year					

Section A.3.13 Total labor Costs by Major Decommissioning Task

Table 14 – Total Labor Costs per Lab						
Task	**Health Physicist**	**HP Tech**	**Clerical**	**Laborer**	**Job Supervisor**	**Total**
Planning and Prep	$2,052.26	$2,595.43	$1,546.19	$312.34	$2,047.50	$8,553.72
Decontamination	$1,332.64	$4,934.97	$618.48	$3,373.24	$819.00	$11,078.32
Restoration of Contam Areas	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Final Rad Survey	$799.58	$1,370.82	$123.70	$0.00	$163.80	$2,457.90
Site Stabilization	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Cost	**$4,184**	**$8,901**	**$2,288**	**$3,686**	**$3,030**	**$22,090**

To obtain the complete costs, the number of labs (5) is then multiplied by the per lab costs from above.

Table 15 – Total Labor Costs ALL Labs						
Task	**Health Physicist**	**HP Tech**	**Clerical**	**Laborer**	**Job Supervisor**	**Total**
Planning and Prep	$12,314	$15,573	$9,277	$1,874	$12,285	$51,322
Decontamination	$7,996	$29,610	$3,711	$20,239	$4,914	$66,470
Restoration of Contam Areas	$0	$0	$0	$0	$0	$0
Final Rad Survey	$4,797	$8,225	$742	$0	$983	$14,747
Site Stabilization	$0	$0	$0	$0	$0	$0
Grand Total Cost	**$25,107**	**$53,407**	**$13,730**	**$22,113**	**$18,182**	**$132,540**

Section A.3.14 Packing, Shipping, and Disposal of Wastes

Note: Labor costs for waste processing is included in this section and not in the above analysis.

Packaging Material Costs

Because of the University's "*no contamination*" policy, there would be a minimal amount of waste generated from decommissioning. There are no areas in which protective clothing, other than gloves, need to be worn. Penn State owns enough dry and liquid waste containers to handle all waste on-hand and residual liquid and dry collection beyond the normal waste generation volume. The only waste stream anticipated will be dry waste consisting of wipe down towels, gloves, and miscellaneous paper and/or solid items. Note that no labor costs are associated with packing materials needed. Using the Reference Laboratory, the following packing materials will be needed:

Table 16 – Packing Material Costs for Wastes On-Hand					
Waste Type	**Volume**	**Number of Containers**	**Type of Container**	**Container Unit Cost**	**Total Package Costs**
DAW	15.6 ft3	1	Fiber Box	$20.10	$20.10
Liquid	1 Gallon	1	Plastic Jug	$2.95	$2.95
				Total	**$23**
Notes: Container costs based on publicly available cost information provided by the manufacturer (ULINE), accessed November 2025. Products considered were the S-4867 15.6 ft3 Fiber Box, and the S-10758 1 Gallon Plastic Jug.					

For the total number of labs, the per lab packing material costs are multiplied by 5. It is further assumed there will be a need for 12, 55-gallon metal drums: [redacted] and 1 drum

for any contaminated metals.

Table 17 – Packing Material Costs to Decommission All 5 Active Laboratories					
Waste Type	**Volume**	**Number of Containers**	**Type of Container**	**Container Unit Cost**	**Total Packaging Costs**
DAW	15.6 ft3	5	Fiber Box	$20	$101
Liquid	5 gallon	5	Plastic Jug	$3	$15
Liquid Overpack	30 Gallon	1	Plastic Drum	$91	$91
Drum (Metals)	55 gallon	12	Steel Drum	$149	$1,788
				Total	**$1,994**

Shipping Costs

Once a laboratory has been decommissioned, there is labor cost associated with the collection of the waste containers from the lab, documenting the shipment, and packing the truck. These costs are addressed below. Note that since all lab wastes will be shipped at one time, the costs shown are for ALL labs.

To calculate the number of standard 40 foot semi-truck loads needed, the volume of a 40 foot trailer (https://afmeng.com/HotStamping/Hot_Stamping_Information/Hot_Stamp_Machine_Shipping/Truck_Sizes.pdf?ID=815) is 3083 ft^3. The total volume to be shipped is:

Table 18 – Shipping Volume of Wastes ALL Labs			
Waste Type	**Unit Volume**	**Number of Containers**	**Total Volume (ft^3)**
DAW	15.6 ft3 (Box)	6	93.6
Liquid Overpack	4.01 ft3 (30 gallon drum)	1	4.01
Drum (Metals)	7.35 ft3 (55 gallon drum)	12	88.2
		Total	**171.11**

Therefore only one 40 foot truck, or less, will be needed to ship all wastes. The labor costs for handling containers and packing the truck are:

Table 19 – Shipping Labor Costs ALL Labs						
Task	**Health Physicist**	**HP Tech**	**Clerical**	**Laborer**	**Job Supervisor**	**Total**
Collect Containers From Lab (Work Days per Lab)	0	0.1	0	0.1	0.1	0.3
Load Truck (Work Days per Lab)	0	0	0	0.1	0.1	0.2
Documentation (Work Days per Lab)	0.1	0.1	0.1	0	0	0.3
Subtotal Work Days per Lab	0.1	0.2	0.1	0.2	0.2	0.8
Total for 5 Labs (Work Days)	**0.5**	**1**	**0.5**	**1**	**1**	**4**
Cost / Work Day	$1333	$914	$618	$625	$819	
Total Cost	**$800**	**$1,097**	**$371**	**$750**	**$983**	**$4,000**

Shipping costs were provided by Ecology Services, Inc. Note that normally rad waste would ship to Energy Solutions in Oak Ridge, TN (705 miles to TN).

Table 20* – Shipping Costs ALL Labs							
Waste Type	**No. of Truck loads**	**Unit Cost ($/mile/load)**	**Surcharges ($/mile)**	**Overweight Charges ($/mile)**	**Distance Shipped (miles)**	**Labor Cost ($)**	**Total Shipping Costs**
All	1	$6.00	$1.00	0	705	$0	$8,460
Labor						$4,000	$4,000
Truck Rental	1						$2,900
						Total	**$15,360**

Waste Disposal Costs

For the Reference Lab, one dry box and one gallon of liquid per lab is assumed to be generated. Historically, the cost per pound is more consistent year to year so this DCE will estimate disposal cost by weight rather than volume. The following assumptions apply to this estimate:

- Each box of Dry Active Waste is assumed to weigh 100 pounds, 6 boxes generated
- Each 30 gallon drum of liquid waste is assumed to weigh 175 pounds, 1 drum generated
- Each 55 gallon drum of metals is assumed to weigh 175 pounds, 1 drum generated

Table 21 – Waste Disposal Costs ALL Labs				
Waste Type	**Total Weight ALL Labs & On-Hand**	**Unit Cost (Table 7)**	**Surcharges ($/lb)**	**Total Disposal Cost**
DAW	600	$8.20	$0	$4,920
Liquid Overpack	175	$10.75	$0	$1,881
Drum (Metals)	2,100	$9.00	$0	$18,900
			Total	**$25,701**

Sealed Sources

For the discrete sources, some are owned by the Department of Energy and it is expected that the DOE will accept these sources back. However, for this DCE disposal costs are included to be conservative.

Table 22 – Discrete Source Disposal				
Discrete Sources	**Description**	**No.**	**Labor Hours[1]**	**2025 Vendor Total Charge[1]**
Pu-238/239	[redacted]	[redacted]	0	$0
Pu-239/Be Neutron	[redacted]		40	$15,500
U-235	[redacted]		45	$54,000
	Total Hours		85	
	Total Contractor Charges ($258/hr)		$21,930	
	Total Other Vendor Charges			$69,500
			Total	**$91,430**

1 – Cost estimate from Ecology Services, Inc. (November 2025)

Section A.3.15 Equipment and Supply Costs

Smears and related supplies (gloves, vials, and scintillation fluid) are based on MARSSIM criteria for final surveys. Estimating an average of 20 smears per lab, and 6 labs to be surveyed, indicates a need for approximately 120 smears, to be analyzed via liquid scintillation counting. Purchase costs for anticipated packaging supplies are noted in Table 17.

Instrumentation needs would include pancake GM survey meters, low energy sodium iodide detectors, and an alpha probe survey meter.

Table 21 – Supply Costs

Supplies	Quantity	Unit	Unit Cost	Total
Survey Meters (GM)	2	Survey Meter	$2,600	$5,200
Survey Meter (LE NaI)	1	Survey Meter	$2,900	$2,900
Survey Meter (Alpha)	1	Survey Meter	$2,750	$2,750
Smears	4	Boxes (100 smears/box)	$1	$4
Gloves	3	Boxes (150 gloves/box)	$15	$45
Scintillation Vials	1	cases (500/case)	$734	$734
Scintillation Cocktail	2	cases (4 liter)	$515	$1,030
			Total	**$12,663**

Section A.3.16 Laboratory Costs

It is not anticipated that any analyses will need to be performed by an independent third party laboratory; however, to be conservative, this DCE includes outside laboratory services to analyze laboratory smear surveys for these 6 labs being decommissioned.

Third-party laboratory estimates are $155 per lab. With 5 active labs being decommissioned, the Laboratory Cost estimate can be determined.

Table 24 – Laboratory Cost

Equip / Supplies	Quantity	Unit Cost	Total
Sample Analysis (LSC)	6 labs	$135 per lab	$930
		Total	**$930**

Section A.3.17 Miscellaneous Costs

Present methods of waste disposal are through a waste broker and no special licenses or site permits are necessary. Contractors provide proof of insurance before being awarded contracts. The work associated with decommissioning is not taxable by Pennsylvania.

The Nuclear regulatory Commission may bill for regulatory oversight efforts to include final status survey reports, confirmatory survey efforts, department lab, or contractor fees and oversight of license termination activities. An estimate of these costs is included in the following table.

Table 25 – Miscellaneous Costs	
Cost Item	**Total**
License fees, insurance, taxes, other	$0
NRC oversight	$50,000
Total	**$50,000**

Section A.3.18 Total Decommissioning Costs

This estimate does not take credit for any salvage value that might be realized from the sale of potential assets.

Table 26 – Total Decommissioning Costs		
Task/Component	**Cost**	**Percentage**
Planning and Preparation (Table 15)	$51,322	15.52%
Decontamination/Dismantling (Table 15)	$66,470	20.10%
Restoration (Table 15)	$0	0.00%
Final Rad Survey (Table 15)	$14,747	4.46%
Site Stabilization (Table 15)	$0	0.00%
Packing Material Costs (Table 17)	$1,994	0.60%
Shipping Costs (Labor and Transport) (Table 20)	$15,360	4.65%
Waste Disposal Costs (Table 21)	$25,701	7.77%
Discrete Source Disposal (Table 22)	$91,430	27.65%
Equipment Costs (Table 23)	$12,663	3.83%
Laboratory Costs (Table 24)	$930	0.28%
Miscellaneous Costs (Table 25)	$50,000	15.12%
Subtotal	$330,617	**100%**
25% Contingency	$82,654	
Total Decommissioning Cost Estimate	**$413,272**	