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Facilities Services & Real Estate

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October 29, 2015

U.S. Nuclear Regulatory Commission
ATTN: Mr. John J. Miller
USNRC – Region 1
Division of Nuclear Materials Safety
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

Dear Mr. Miller,

Please find attached the updated Decommissioning Funding Plan (DFP) for E.I DuPont de Nemours & Co. Inc. Stine-Haskell Radioactive Materials License (#07-13441-02). I have also sent a pdf copy by email for your review.

Thank you again for the reminder as to the required update of our DFP. Please do not hesitate to contact me if you have further questions.

Regards,

Kelly L. Petrillo

Kelly L. Petrillo
Wilmington Area Radiation Safety Officer

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DuPont de Nemours & Co., Inc. Stine Haskell Research Center

Radioactive Materials License

Decommissioning Funding Plan Update

October 29, 2015

Prepared By

Kelly L. Petrillo
Radiation Safety Officer
DuPont Stine-Haskell Research Center

E.I DuPont De Nemours and Co., Inc.
License No. 07-13441-02
Docket No. 030-20681
Control No. 588540

NONNEGOTIABLE

APPENDIX F

Decommissioning Plan Cost Estimates

The Decommissioning Plan Cost (DFP) Estimates presented in this appendix were developed for the DuPont Stine-Haskell Radioactive Materials License which includes the Stine-Haskell Research Center (Newark, DE), Experimental Station Laboratories (Wilmington, DE), and Chestnut Run Plaza Laboratories (Wilmington, DE). DFP cost estimates were obtained from RSO, Inc. (Laurel, MD). The Closure Cost Estimates for the DuPont Experimental Station Laboratories Incinerator closure estimates were obtained from Clean Harbors (Norwell, MA), a third-party contractor per the requirements of the Incinerator's Permit for Hazardous Waste Storage, State of Delaware (Permit No. HW04d22), (EPA Identification No. DED003930807). Closure cost estimates were developed in 2012 and revised in 2015. The DFP was developed with the following assumptions and represents a 'worst-case' scenario.

- All decommissioning work will be conducted by a third-party vendor. (The services of DuPont Radiation Safety Office personnel and research personnel participating in the site Radiation Safety Program and use of the DuPont Experimental Station for incineration and disposal were not considered in the development of these cost estimates).

- Two third-party radiation technicians will wipe test and survey four laboratories per day.
    - 52 radioactive material use/storage areas
    - Wipe tests and surveys will take 13 days

- The incinerator located at the Experimental Station Laboratories (Wilmington, DE) will be completely decommissioned and dismantled for disposal.
    - All incinerator ash will be removed and analyzed for radioactive content. Pursuant to 10 CFR 20.2002, the DuPont Experimental Station may dispose of incinerator ash containing radioactive materials with Atomic Nos. 1-83, as ordinary waste in a landfill, provided the concentrations of the radionuclides (in microcuries per gram of ash) at the time of disposal are no greater than the values in Table II, column 2, 10 CFR Part 20, appendix B. Further, per NRC Policy and guidance Directive PG 8-10, for hydrogen-3, carbon-14, aluminum-26, chlorine-36, silver-108m, niobium-94, iodine-129, technetium-99, and thallium-204, the concentrations will be no greater than one-tenth of the value in Table II, Column 2, 10 CFR Part 20, Appendix B. It is assumed from historical data that the incinerator ash shall meet this release criterion.
    - Two third-party radiation technicians will wipe test and survey the 8 components of the incinerator (main hearth, afterburner, spray-dryer, venture, absorber, EDV, bag-house, and stack). It is estimated that the surveys will require approximately 10 days to complete.

- All unsealed source radioactive material inventory will be removed by third-party vendor, packaged, and transported to off-site location for burial. (Inventory will not be sent to the DuPont Experimental Station for incineration).

- All sealed source radioactive material inventory will be removed by third-party vendor, packaged, and transported to off-site location for burial. (Inventory will not be returned to respective manufacturers).

- The experimental soil plot will be sectioned into 1 square meter grids and sampled using soil core samplers and analyzed as described below.

    - Three twenty-four (24) inch soil cores will be taken from within each grid.

- The individual cores will be partitioned into three inch sections. The sections will be homogenized to yield one representative field plot sample at each three-inch level.

- Triplicate subsamples from each homogenized sample be combusted and then analyzed by liquid scintillation counting.

- Blanks spiked with a known amount of a radioactive standard (e.g., Spec-Check from Perkin Elmer) will be combusted and analyzed by liquid scintillation counting to determine recovery efficiency. This efficiency will be used in calculating the radioactivity of the soil combustion samples.

- If required, the soil will be removed by a third-party contractor and packaged and transported by the third-party vendor to an off-site location for burial. (Soil will be removed to a depth of commensurate with the deepest soil level meeting the release criteria as specified in the site license). Assumes soil will not be sent to the DuPont Experimental Station for incineration.

- Not all of the tables found in Appendix A of NUREG-1757 were applicable and used in the development of the cost estimates for this Decommissioning Plan.

Site-specific cost estimates will be performed at least every 3 years and/or when there are significant changes to the license activity. The cost adjustment methodology that will be used to adjust the site-specific cost estimate and associated funding level periodically over the life of the facility is based on the methodology described in the guidance NUREG-1757, Volume 3, "Consolidated NMSS Decommissioning Guidance Financial Assurance, Recordkeeping, and Timeliness." Costs, as described in NUREG-1757, Volume 3, are divided into three general areas that tend to escalate similarly: (1) labor, materials, and services, (2) energy and waste transportation, and (3) radioactive waste burial/disposition. The costs presented under this license and DFP include a 25% contingency factor and are represented in year 2015 dollars. Applying cost adjustment factors to the set of the applicable cost components, as described in this DFP, is done to estimate decommissioning costs that can account for any reduction or escalation from the base year 2012 to any other year of interest using a relatively simple equation as described in NUREG-1757, Volume 3.

Planning and Preparation (Work Days)
from Table A.3.6, NUREG-1757, Vol. 3, Appendix A

Activity	Health Physicist	Radiation Technician	Radiation Technician
Preparation of Documentation for Regulatory Agencies	15 days	Not Applicable	Not Applicable
Submittal of Decommissioning Plan to NRC	7 days	Not Applicable	Not Applicable
Development of Work Plans	15 days	Not Applicable	Not Applicable
Procurement of Special Equipment	5 days[1]	Not Applicable	Not Applicable
Staff Training	2 days[2]	2 days[2]	2 days[2]
Characterization of Radiological Condition of Facility	10 days[3]	Not Applicable	Not Applicable
Totals	54 days	2 days	2 days

[1] Special equipment may include items such as crane/rigging and scaffolding.
[2] It is assumed that technicians familiar with radiation safety and decommissioning processes will be utilized. Training will include a DuPont site safety orientation in addition to a review of the Decommissioning Project Scope.
[3] It is assumed that the Health Physicist will review semi-annual third-party audit reports, incident records, and wipe test notebooks to determine the radiological condition of the facility.

Restoration of Contaminated Areas on Facility Grounds (Work Days)
from Table A.3.8, NUREG-1757, Vol. 3, Appendix A

Activity	Backhoe Operator	Radiation Technician	Radiation Technician
Field plot gridding and soil core sampling	Not Applicable	1 day	1 day
Sectioning and homogenization of soil core samples	Not Applicable	2 days	2 days
Combustion analysis of soil core samples	Not Applicable	7 days	7 days
Analysis of combustion samples	Not Applicable	2 days	2 days
Removal of soil from field plot	½ day	Not Applicable	Not Applicable
Packaging of removed soil for disposal	Not Applicable	½ day	½ day
Assessment of backhoe for contamination	Not Applicable	¼ day	¼ day
Decontamination of backhoe (if required)	Not Applicable	¼ day	¼ day
Backfilling of field plot	½ day	Not Applicable	Not Applicable
Total	1 day	13 days	13 days

The experimental soil plot will be sectioned into 1 square meter grids and sampled using soil core samplers. Three twenty-four (24) inch soil cores will be taken from within each grid. The individual cores will be partitioned into three inch sections and homogenized. Triplicate subsamples from each homogenized sample be combusted and then analyzed by liquid scintillation counting. Blanks spiked with a known amount of a radioactive standard (e.g., Spec-Check from Perkin Elmer) will be combusted and analyzed by liquid scintillation counting to determine recovery efficiency and will be used in calculating the radioactivity of the soil combustion samples.

Final Radiation Survey (Work Days)
from Table A.3.9, NUREG-1757, Vol. 3, Appendix A

Activity	Health Physicist	Radiation Technician	Radiation Technician
Wipe Testing and Meter Surveys of Radioactive Material Use and Storage Areas	Not Applicable[1]	13 days[2]	13 days[2]
Wipe Testing and Meter Surveys of Incinerator	Not Applicable	10 days	10 days
Analysis of Wipe Tests for Radioactive Material Use, Storage Areas, and Incinerator[3]	Not Applicable	5 days	5 days
Decontamination of Contaminated Areas of Radioactive Material Use and Storage Areas[4]	Not Applicable	5 days	5 days
Decontamination of Contaminated Areas for Incinerator[5]	Not Applicable	5 days	5 days
Packaging of Contaminated Materials for Disposal, Radioactive Material Use and Storage Areas[6]	Not Applicable	5 days	5 days
Packaging of Contaminated Materials for Disposal, Incinerator[7]	Not Applicable	Not Applicable	Not Applicable
Packaging of Radioactive Material Inventory for Disposal[8]	Not Applicable	5 days	5 days
Review of Wipe Test and Meter Survey Results	4 days[1]	Not Applicable	Not Applicable
TOTAL	4 days	48 days	48 days

[1] It is assumed that the HP will not be actively participating in the radiation surveys but will be overseeing the process and reviewing the wipe test and meter surveys on periodically. Assumption is every four days of sampling.
[2] It is assumed that two radiation technicians will be able to wipe test and survey at least four radioactive material use/storage areas per day. At 52 areas, this equates to approximately 13 days.
[3] It is assumed that wipe tests obtained during a given day will be analyzed that day. This line item sums the amount of time required to transport the samples to the third-party vendor's facility for analysis. This line item is included as part of the Wipe Testing and Meter Survey line item.
[4] Historical records indicate minimal potential for contamination levels in excess of 1 microcurie (μCi) per use/storage area. Records also indicate that most contamination can be removed by standard decontamination techniques, grinding, sanding, or small-scale structure removal (i.e., floor tiles).
[5] Assumes readily decontaminated incinerator components by standard decontamination techniques. Cost for disposal of incinerator components that cannot be decontaminated to acceptable levels are captured as a specific line item in Table A.3.18, NUREG-1757, Vol. 3, Appendix A.
[6] Packaging of contaminated materials for off-site burial. Materials may include floor tiles, anti-fatigue mats, secondary containment trays/containers, and debris from decontamination sanding/grinding efforts.
[7] Labor costs associated with packaging of contaminated materials for off-site burial is captured as a specific line item in Table A.3.18, NUREG-175, Vol. 3, Appendix A.
[8] It is assumed that the site's entire unsealed and sealed source radioactive material inventory will be packaged by the third-party vendor for off-site burial.

Total Work Days by Labor Category
from Table A.3.11, NUREG-1757, Vol. 3, Appendix A

Activity	Health Physicist	Radiation Technician	Radiation Technician	Backhoe Operator
Planning and Preparation (Totals from Table A.3.6)	54 days	2 days	2 days	Not Applicable
Restoration of Contaminated Areas (Totals from Table A.3.8)	Not Applicable	13 days	13 days	1 day
Final Radiation Survey (Totals from Table A.3.9)	4 days	48 days	48 days	Not Applicable
TOTAL Work Days	58	63	63	1

Worker Unit Cost Schedule
from Table A.3.12, NUREG-1757, Vol. 3, Appendix A

Labor Cost Component	Health Physicist	Radiation Technician #1	Radiation Technician #2	Backhoe Operator
Total Cost Per Work Hour	$125.00	$85.00	$85.00	$80.00
Total Cost Per Work Day[1]	$1,000.00	$680.00	$680.00	$640.00

[1] Assumes an 8-hour work day.
Hourly rates were obtained from RSO Inc., 2014.

Total Labor Costs by Major Decommissioning Task
from Table A.3.13, NUREG-1757, Vol. 3, Appendix A

Task	Health Physicist	Radiation Technician #1	Radiation Technician #2	Backhoe Operator	Total Labor Cost
Planning and Preparation (Table A.3.6)	$54,000.00 (54d x $1000/d)	$1,360.00 (2d x $680.00/d)	$1,360.00 (2d x $680.00/d)	Not Applicable	$56,720.00
Restoration of Contaminated Areas (Table A.3.8)	Not Applicable	$8,840.00 (13d x $680.00/d)	$8,840.00 (13d x $680.00/d)	$640.00 (1d x $640.00/d)	$18,320.00
Final Radiation Survey (Table A.3.9)	$4,000.00 (4d x $1,000/d)	$32,640.00 (48d x $680.00/d)	$32,640.00 (48d x $680.00/d)	Not Applicable	$69,280.00
TOTAL Labor Cost	$58,000.00	$42,840.00	$42,840.00	$640.00	**$144,320.00**

Packaging, Shipping, and Disposal of Radioactive Wastes (Excluding Labor Costs) from Table A.3.14(a), NUREG-1757, Vol. 3, Appendix A

Waste Type	Waste Volume		Waste Containers[1]		Overpacks[2]		Total Packaging Costs, $
	ft^3	yd^3	No. Units	Cost, $	No. Units	Cost, $	
Decontamination Supplies (towels, rags, bags, PPE)	15	~0.5	1	$150.00	1	$125.00	$275.00
Radioactive Material Inventory – Unsealed Source	20	~0.75	1	$150.00	1	$125.00	$275.00
Radioactive Material Inventory – Sealed Source	4	~0.15	1	$150.00	1	$125.00	$275.00
Soil	200	~7.5	8	$1200.00	8	$1000.00	$2200.00
Contaminated Materials (floor tiles, decontamination debris)	40	~1.5	2	$300.00	2	$250.00	$550.00
Cost Totals	279	10.5	13	$1,950.00	13	$1,625.00	**$3,575.00**

Container sizes and costs were obtained from RSO, Inc. (2014)
1 Waste container box size: 30" x 38" x 44" = ~29 cubic feet = ~1 cubic yard at $150.00/container
2 Overpack: 1 cubic yard plus liner and shipping pallet at $125.00/overpack

Shipping Costs from Table A.3.14(b), NUREG-1757, Vol. 3, Appendix A

Waste Type	Number of Truckloads	Unit Cost ($/mile/truckload)	Distance Shipped (miles)	Total Shipping Costs
Decontamination Supplies	0.054	$5.50	2150	$11,825.00
Radioactive Material Inventory – Unsealed Source	0.072	$5.50	2150	See note
Radioactive Material Inventory – Sealed Source	0.014	$5.50	2150	See note
Soil	0.717	$5.50	2150	See note
Contaminated Materials (floor tiles, decontamination debris)	0.143	$5.50	2150	See note
TOTAL	1	$5.50	2150	**$11,825.00**

Shipping cost/mile was obtained from RSO, Inc.
Assumes transportation from Wilmington, Delaware to Energy Solutions (Clive, Utah).
Assumes all waste materials transported by single truck.
Assumes 10% increase since 2012.

Waste Disposal Costs
from Table A.3.14(c), NUREG-1757, Vol. 3, Appendix A

Waste Type	Disposal Volume, (ft^3)	lbs per ft^3	lbs.	Disposal Cost, $/lb	Disposal Cost, $	Surcharges, $/$m^3$	Total Disposal Costs
Decontamination Supplies	15	15	225	$7.70	$1,732.00	$0	$1,732.00
Radioactive Material Inventory – Unsealed Source	20	50	1,000	$7.70	$7,700.00	$72,655.00[1]	$80,355.00
Radioactive Material Inventory – Sealed Source	4	9	36	$261.80	$27,500.00[2]	$0	$27,500.00
Soil	200	163	32,600	$7.70	$251,020.00	$0	$251,020.00
Contaminated Materials (floor tiles, decontamination debris)	40	112	4480	$7.70	$34,496.00	$0	$34,496.00
TOTAL							**$395,103.00**

Unit costs and surcharges were obtained from Ecology Services, Inc. (2012) and adjusted 10% for 2015.

[1] Assumes C-14 inventory of 5 Ci and H-3 inventory of 1 Ci. Surcharges estimated at $13.20/mCi for C-14 for activity over 50 mCi; $7.7/mCi for H-3 activity over 50 mCi. Assumes 10% increase since 2012.

[2] Estimated sealed source burial disposal cost, per Ecology Services, Inc., is $27,500.00 and does not consider license transfer of material. Assumes 10% increase since 2012.

Laboratory Costs
from Table A.3.16, NUREG-1757, Vol. 3, Appendix A

Activity	# Samples[1]	Cost, $/sample	Total Cost
Wipe Test Sample and Analysis	3,200	$6.00	**$19,200.00**

[1] Assumes 50 wipe test samples per radioactive material use/storage area (52 areas x 50 samples/area = 2,600) and approximately 600 soil combustion analyses.

Wipe test sample analysis cost was obtained from RSO, Inc.

Total Decommissioning Costs
from Table A.3.18, NUREG-1757, Vol. 3, Appendix A

Task / Component	Cost	Percentage
Planning & Preparation	$56,720.00	5.7
Decontamination and/or Dismantling of Radioactive Facility Components	Included as part of Final Radiation Survey	0.0
Restoration of Contaminated Areas on Facility Grounds (Field Plot)	$18,320.00	1.8
Final Radiation Survey (includes decontamination efforts)	$69,280.00	7.0
Site Stabilization and Long-Term Surveillance	Not Applicable	0.0
Packing Material Costs	$3,575.00	0.4
Shipping Costs	$11,825.00	1.2
Waste Disposal Costs	$395,103.00	40.0
Incinerator Component Disposal Costs[1]	$414,897.00	42.0
Equipment/Supply Costs	Included in Final Radiation Survey	0.0
Laboratory Costs	$19,200.00	1.9
Miscellaneous Costs	Not Applicable	0.0
Subtotal	**$988,920.00**	100%
25% Contingency	$247,230.00	
TOTAL DECOMMISSIONING COST ESTIMATE	**$1,236,150.00**	

[1] Incinerator component packaging and disposal costs were obtained from Closure Cost Estimates (including decontamination, dismantling, and disposal) provided by Clean Harbors (Norwell, MA), a third-party contractor for the DuPont Experimental Station Incinerator per the requirements of Permit for Hazardous Waste Storage, State of Delaware (Permit No. HW04d22), (EPA Identification No. DED003930807) developed in 2012 and revised in 2015.