Q5
03037847

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

Jewel Mullen, M.D., M.P.H., M.P.A.
Commissioner

Dannel P. Malloy
Governor
Nancy Wyman
Lt. Governor

Thomas Thompson
US Nuclear Regulatory Commission
Via Fax (610-337-5269)

February 27, 2014

Control # 582357

Re: Request for Modification of Radioactive Materials License (# 06-27895-03)

Dear Mr. Thompson:

The Connecticut Department of Public Health Laboratory has moved our operations from our 10 Clinton Street (Hartford CT) facility to our 395 West Street (Rocky Hill CT) facility. We thus wish to modify our current license by removing the 10 Clinton Street address from Item #10.

To support the decommissioning of 10 Clinton St., we have completed a radiological exposure assessment for the impacted area. The document is included with this letter. Please review this proposal and get back to me with comments.

This letter supersedes my letter to you dated February 21, 2014 as the date on this previous letter was incorrect.

Regards,

Stewart Chute Ph.D.
Toxicologist & RSO
Connecticut Department of Public Health
860-509-7758 or 860-920-6512

Keeping Connecticut Healthy
DPH
Connecticut Department of Public Health

Phone: (860) 509-8000 • Fax: (860) 509-7184 • VP: (860) 899-1611
410 Capitol Avenue, P.O. Box 340308
Hartford, Connecticut 06134-0308
www.ct.gov/dph
Affirmative Action/Equal Opportunity Employer

582357
NMSS/RGN1 MATERIALS-002

Radiological Exposure Assessment for the Connecticut Department of Public Health Laboratory:

To Support the Decommissioning of 10 Clinton St. Hartford CT

Compiled by Stewart Chute, Ph.D
February, 2014

Background:

On November 21 2013, the CTDPH submitted a Historical Site Assessment (HSA) to the US Nuclear Regulatory Commission. The purpose of this document was to describe the isotopes, their activities, the laboratory operations, and the potentially impacted areas within the licensed area. Also, on October 10, 2013, the CTDPH submitted an initial characterization survey of removable surface contamination for alpha, beta, and gamma activity. Additionally, on January 22, 2013 the Laboratory's Chief Administrator submitted a letter describing the remediation activities that occurred at the 10 Clinton Street facility.

The CTDPHL possess small, unimportant, quantities of source material under the general license requirements of 10 CFR 40.22 (a), and in accordance with CFR 40.13 (c)(1)(vi). The CTDPHL also possesses small, exempt, quantities of special nuclear materials as granted within 10 CFR 70.17, and calibration or reference sources under the general license requirements within 10 CFR 70.19 (a)(1).

In January 2009, the Connecticut Department of Public Health Laboratory (CTDPHL) was awarded a Cooperative Agreement from the United States Environmental Protection Agency for a "Demonstration of Enhancing Radiological Incident Response and Recovery: Enhancing Capability and Capacity of Environmental Radioanalytical Laboratories Across the Nation" [RFA No:EPA-OAR-NAREL-07-10]. Within this grant, the CTDPHL has been participating in proficiency testing programs to verify that the capability to analyze samples is maintained. Additionally, the CTDPHL has been validating analytical methods against reference materials containing known amounts of contaminants. The purpose of this testing and validation work is to assure that sufficient surge capacity is in place for the testing of environmental samples from sites undergoing radiological evaluation and remediation.

The CTDPHL has also been providing radioanalytic testing services for other government agencies and continues to use exempt quantities of byproduct reference materials for radiological testing of drinking water under the Environmental Protection Agency (EPA) Safe Drinking Water Act. In addition, the CTDPHL conducts analyses for low-levels of alpha-, beta-, or gamma-emitting radionuclides in various media at the request of the Connecticut Department of Energy and Environmental Protection or local health directors.

Inventory of radioactive isotopes in the CTDPH laboratory was submitted earlier (See letter of 10/10/2013). Analysis of the isotopes and activities present indicates that the amount of gamma activity is low relative to alpha or beta activity in inventory. The relative hazard of external dose is therefore much less than it is for internal dose. Accordingly, this assessment will focus on the greatest hazard, and though risk from external exposure is not absent, it is not useful to develop a worst-case exposure scenario evaluating external exposure because if the hazard from internal exposure is low, then the hazard from external exposure is lower.

As this judgment is relative, it is useful to assess the extent of external exposure possible. A spill scenario assessing gamma exposure shows that workers just outside the immediate vicinity of the contamination point will not receive a measurable dose of gamma or beta radiation over the quarter year cycle of dosimeter exchange.[1] Results indicate that the gamma exposure to a worker just outside the work area is 0.02% of the mean annual background exposure to cosmic and terrestrial radiation and that exposure to beta radiation is close to zero.

Purpose:
The purpose of this document is to assess of the likelihood of contamination by examining exposure pathways and developing a worst-case scenario involving the release of radioactive material. This assessment includes a discussion of exposure pathways and an analysis of the isotopes (contaminants) that may that may be of the most concern. For this discussion the released (i.e.; spilled) radioactive material (RAM) are the "contaminants of concern" used within the worst-case scenario described.

Exposure Pathways:
An exposure pathway traces the route of contamination from the source to the exposure. Exposure occurs upon direct contact with a surface contaminated with radioactive material (RAM). The inventory of radioactive material at the CTDPH Laboratory includes only non-volatile salts and direct transfer of contamination from a contaminated surface to the air is negligible. Contaminated surfaces may be solid (e.g.; a bench-top) or a particle such as dust or soil. Direct contact results from touching a contaminated surface (dermal contact), breathing in soil particles (inhalation) or eating soil adhered to fingers or food items (incidental ingestion). The CTDPH believes that areas where the isotopes were used or stored have the highest likelihood of being contaminated. Furthermore, any other contamination that may exist in the licensed area would most likely have originated from a spill on these working and storage surfaces. From the point of origin the spilled RAM could be inadvertently transferred to other (secondary) surfaces within the laboratory such as labcoats, doorknobs, and instrument control surfaces. Though foot traffic is another means of transfer its significance is negligible as the volumes of working solutions

[1] The exposure scenario utilized involves simulates taking all consumable items of RAM in inventory and placing them, unshielded, at one small point and leaving them there for the duration of a dosimeter exchange cycle (12 weeks). Cumulative exposure to gamma and beta radiation was evaluated at a distance of 2 meters from this spill point. Details of this assessment are available upon request.

used were small (less than a liter). It is unlikely then that a spill on a work surface would extend from its point of origin to the floor. These secondary contaminated surfaces remained within the laboratory space. From secondary surfaces spilled RAM may be transferred beyond the laboratory by direct contact and transfer with another (tertiary) surface. The extent of transfer between secondary and tertiary surfaces is dependent on the extent of secondary contamination. If no secondary contamination is found, then the extent of transfer to surfaces outside the laboratory is negligible or non-existent. Survey data of secondary surfaces did not indicate evidence of RAM contamination (See letter of 10/10/2013). The likelihood therefore that RAM contamination could have extended beyond the laboratory space is no greater than negligible.

Exposure pathways within the building

The basis for selecting the isotopes which present the greatest putative remediation concern is a hypothetical scenario in which the entire inventoried amount of the selected isotope is spilled on the work surface of a survey unit. The inventory of "consumable" (i.e.; dispersed in soil samples or dissolved in water) radionuclides at the CTDPH lab includes the amounts shown in Table 1. For comparison, Table 1 also lists exempt amounts (10 CFR 30.71 Schedule B), and concentrations for discharge as effluent (10 CFR 20 Appendix B). If the comparison shows that stock activity is below the exempt amount (Part B), or that stock is rendered exempt by dilution in less than three liters of water (Part A), then the comparison nuclide is below the threshold of concern. Note that all isotopes in the categories "Other Isotopes" and "Source Material" are all well below the threshold. Also note that Ra-226 is close to the threshold dilution. From this table, the primary contaminants of concern are Plutonium and Americium. This approach is conservative because the stock of consumable items containing both Plutonium and Americium is held in 19 separate containers and thus the likelihood of all being spilled at once is low.

Table 1: Identifying contaminants of concern. Inventoried activities of consumable items are compared to exempt amounts or concentrations. A concern is justified if the amount inventoried exceeds the footnoted threshold. Values in the third column are from 10 CFR 30.71 Schedule B (uCi) or 10 CFR 20 Appendix B (uCi/l). The fourth column of Part A is the required dilution and the amount in Part B is the ratio relative to the exempt amount.

PART A: Inventory as effluent

SPECIAL NUCLEAR MATERIAL				
Nuclide	**uCi inventoried**	**Effluent (uCi/l)**	**liters**	**Concern ? ***
Pu-239	7.75E-03	2.00E-05	3.87E+02	Possible
Pu-242	5.10E-03	2.00E-05	2.55E+02	Possible
U-235	2.35E-04	3.00E-04	7.82E-01	No
SOURCE MATERIAL				
Nuclide	**uCi inventoried**	**Effluent (uCi/l)**	**liters**	**Concern ? ***
Th-230	1.16E-09	1.00E-04	1.16E-05	No
U-232	9.78E-09	6.00E-05	1.63E-04	No
U-234	2.58E-09	3.00E-04	8.58E-06	No
U-238	2.60E-09	3.00E-04	8.67E-06	No
AMERICIUM AND RADIUM				
Nuclide	**uCi inventoried**	**Effluent (uCi/l)**	**liters**	**Concern ? ***
Am-241	1.51E-01	2.00E-05	7.55E+03	Possible
Am-243	5.30E-03	2.00E-05	2.65E+02	Possible
Ra-226	9.55E-04	6.00E-05	1.59E+01	Possible
Ra-228	2.56E-07	6.00E-05	4.26E-03	No

PART B: Inventory compared to exempt amounts

OTHER ISOTOPES				
Nuclide	**uCi inventoried**	**uCi exempt**	**Ratio**	**Concern ? ****
Ba-133	1.91E-03	10	1.91E-04	No
Cd-109	9.91E-01	10	9.91E-02	No
Co-57	2.84E-02	100	2.84E-04	No
Co-60	2.66E-01	1	2.66E-01	No
Cr-51	7.77E-03	1000	7.77E-06	No
Cs-134	8.57E-04	1	8.57E-04	No
Cs-137	2.30E-01	10	2.30E-02	No
H-3	4.03E-02	1000	4.03E-05	No
Ir-192	1.62E-10	10	1.62E-11	No
Ru-106	1.56E-04	1	1.56E-04	No
Sb-125	1.09E-03	10	1.09E-04	No
Se-75	1.06E-07	10	1.06E-08	No
Sn-113	7.20E-02	10	7.20E-03	No
Sr-85	3.13E-02	10	3.13E-03	No
Sr-89	3.85E-09	1	3.85E-09	No
Sr-90	6.34E-03	0.1	6.34E-02	No
Te-123m	2.01E-02	0.1	2.01E-01	No
Y-88	1.25E-01	10	1.25E-02	No
Zn-65	1.23E-04	10	1.23E-05	No

* The concern is ranked "Possible" if the stock can not be disperesed in 3 liters of effluent.

** The concern is ranked "Possible" if the "Ratio" is greater than one.

Discharge to sewers

Monthly average water consumption at the 10 Clinton St facility was high. Records show that under normal operation, the lab used about 185,000 gallons of water per month. (This average consumption per employee is similar for other environmental labs.) During the remediation phase of de-construction, the staff in the laboratory decreased about tenfold. Water consumption, and sewage outflow, should decrease in proportion to the number of occupants, suggesting that the sewage outflow from the building was about 18,000 gallons (68,000 liters) per month during this time. Americium-241 is the isotope that requires the greatest dilution (Table 1), and therefore has the most restrictive scenario for discharge into the environment. According to10 CFR 20 Appendix B, The monthly average concentration discharged to sewers for Americium is $2X10^{-4}$ uCi/l. Assuming all the stock of consumable Americium (approximately 0.16 uCi) were to be washed into the building's drain system during remediation activities, the average concentration leaving the building would be about $9.3X10^{-7}$ uCi/l, that is, about 200 times below the limit. This analysis suggests that the putative adverse impact of inventory on the environment outside the building is negligible.

Summary and conclusions:

This assessment described the work done at the 10 Clinton Street facility and the isotopes in consumable inventoried items. It described the type of exposures that could be hazardous and provided an analysis of the ways which individuals within and outside the building could be exposed to spilled inventory. By ranking contaminants (isotopes) according to level of concern, many were categorized as presenting no concern. Those that presented putative hazards for exposure were shown not to present a concern for the environment outside the building. Conclusions of this assessment are as follows:

- There is no evidence of primary or secondary contamination within the licensed laboratory space and the exposure pathway for internal exposure to RAM at the 10 Clinton St facility was, in all likelihood, non-existent.

- A consideration of a hypothetical worst-case scenario indicates that the stock of Plutonium and Americium would need to be diluted significantly with water to be rendered into sewage effluent.

- In consideration of the above finding and to address concerns of an adverse effect on the environment outside the building, an analysis using an unrealistic worst-case scenario shows that the impact of spilled inventory would be negligible.