From:	Blasio, Christopher J. (GRC-QSH0)
To:	Kunowski, Michael; LaFranzo, Michael; Lee, Peter
Cc:	Case, Roderick C. (GRC-QSH0)[Leidos]; Ebner, David S. (GRC-FDP0); Dustin Miller; dculp@chaseenv.com; Scott Minerd; Douglas Facemyer; Edmonds, Patrick S. (GRC-FDP0)[Frontier-Arrowhead]
Subject:	[External_Sender] NASA Request for Conference Call with NRC Region 3 and NRC HQ
Date:	Friday, June 09, 2017 2:50:40 PM
Attachments:	Cyclotron FSS Report_Executive Summary.pdf

Hello Mike, Mike and Peter,

At this point, NASA is interested in continuing its current approach to de-licensing its cyclotron site as described in the survey report submitted on May 10, 2017. We are confident that the modeling and resulting dose estimates are sound and believe there is precedent for this methodology. As a reminder, our approach involves a building re-use scenario along with an evaluation of impacts associated with future alternate use scenarios. As I understand the current situation, our approach invokes two methodologies which have not been thoroughly vetted by the Commission.

- I believe the first of these has to do with our approach to use two sets of DCGLs in our Cyclotron Vault room, a $DCGL_{surface}$ and $DCGL_{volumetric}$. The $DCGL_{surface}$ is applied to surface contamination, and is equal to the default screening value (DSV) for the most restrictive radionuclide, Co-60. This surface DCGL incorporates both total and removal contamination components. For locations inside the cyclotron room that are likely to be activated, the $DCGL_{volumetric}$ is an external dose rate combined with a conservative removable contamination limit to bound the dose contribution from internal sources. The breakdown of this volumetric DCGL is 24 mrem/yr of dose associated with external dose and 1 mrem/yr associated with internal sources. Assuming a work year of 2,340 hours this external dose component of $DCGL_{volumetric}$ was calculated to be 10.3 µrem/hr above background while the internal dose of the $DCGL_{volumetric}$ was established at 150 dpm/100 cm2 for the most restrictive radionuclide, Eu-154.

- The second "non-vetted" methodology has to do with our use of dose-conversion factors found in NUREG-1640 "Radiological Assessments for Clearance of Materials from Nuclear Facilities" (2003). As described by the Region, the generic application of the approach/factors in NUREG-1640 has apparently not be authorized or sanctioned by the Commission because the NRC has not performed the necessary environmental review.

I understand that the Region must seek technical guidance from NRC Headquarters in evaluating the approach and data provided by NASA. I would like to request that the Region set up a conference call with the subject NRC HQ staff along with the licensee so we can have some preliminary discussions about our report, a path forward and timeline. I pulled the executive summary from our report and included it as an attachment to be shared. To make this meeting most productive, I will also plan on having Chase Environmental involved with the call. Chase proposed the approach for de-licensing our site based on similar tasks performed during the past couple years.

Also, and certainly secondary to the discussion above, I'd like to review comments made by the Region regarding the possible need for a decommissioning plan (DP). I understand that some of the existing protocols outlined in the NUREG 1757 guidance call for a DP for a situation such as ours, but, upon reviewing the subject regulation I don't know if this is the case since 10CFR30.36(g)(1) stipulates two basic criteria which trigger the need for a DP. First is that the decommissioning involves procedures/activities not already approved by the Commission. The second condition is that said procedures/activities could increase potential health and safety impacts to workers or to the public. I believe NASA has demonstrated in both its original DP submission (June 2015) and the subsequent withdrawal of said DP (March 2016), that the estimated internal and external doses are very low, certainly well below levels that could impact anyone's health. Considering that our site conditions and activities do not meet the 30.36(g)(1) regulatory criteria, it seems that a DP is not required. This may be a misunderstanding of the regulation on my part, so, I would appreciate any clarification on this matter.

Finally, I'd like to mention that I did speak with Patty Pelke regarding licensing of the facility. She pointed out my error in suggesting that the byproduct material definition did not apply to our site, in

general sense. I recognize that the use of our accelerator to activate targets who radioactive properties were to be used for research results in those targets as well as inadvertently activated structures/components being classified as licensed material. However, when asked the question about the beam tubes that were exclusively associated with researching the efficacy of neutron teletherapy as a cancer treatment modality, Patty thought that considering these items as non-licensed radioactive material would be reasonable since that particular use of the cyclotron was not involved with the intentional production of radioactive materials to be used for commercial, medical or research purposes. I am offering this information as it may open up options which allow both the licensee and regulator to more efficiently get through the matter at hand. Does the Commission see a benefit in removing these beam tubes, specifically the horizontal tube, from licensing consideration?

Thank you for your help.

R/
Chris B.

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1.0 EXECUTIVE SUMMARY

This report presents results of the Final Status Survey (FSS) of the National Aeronautics and Space Administration (NASA) Cyclotron Facility, also known as Building 140, located at the John H. Glenn Research Center (GRC), Lewis Field, in Cleveland, Ohio. This report describes the Cyclotron Facility, its operational history, previous characterization results, and condition at the time of survey when conducted between January 2017 and April 2017.

For the purpose of the FSS, the Cyclotron Facility was split into two separate functional areas: the "Cyclotron Vault," which housed the cyclotron particle accelerator, and "Building 140 Auxiliary Rooms," which denotes all other areas of the facility. The Cyclotron Vault and much of its contents were determined to have measurable levels of radioactive activation products (principally Co-60 and Eu-152) as a result of cyclotron operation. Consequently, the cyclotron yoke pieces, windings, cores and all of the cyclotron-associated equipment, magnets, beam tubes, electrical systems, vacuum equipment, cooling equipment, and other interferences were removed and disposed as radioactive waste prior to performing FSS. Since no other areas outside of the Cyclotron Vault were found to be volumetrically contaminated, two separate methodologies were used to determine if Building 140 could be released from all radiological controls and removed from the NASA Radioactive Materials License. First, the Cyclotron Vault was dose modeled using data collected during the site characterization study [SAIC 2012] along with new survey and sample results obtained after all remedial actions were complete to determine if it met the criteria of 10CFR20, Subpart E, Section 20.1402, Radiological Criteria for Unrestricted Use [NRC 2015]. Second, with no evidence of appreciable volumetric contamination being found outside of the Cyclotron Vault during characterization activities, these remaining areas, denoted as Building 140 Auxiliary Rooms, were surveyed and released from radiological controls in accordance with NASA Glenn Research Center Occupational Health Programs Manual – Chapter 8 [NASA 2014] and current radioactive material license conditions.

1.1 Cyclotron Vault and Beam Tubes

Final Status surveys of the Cyclotron Vault were conducted from March 3 to March 8, 2017. Final status surveys consisted of scan surveys, total direct surveys, dose rate measurements, and removable contamination measurements. These final status surveys were designed using the guidance provided in the Multi- Agency Radiation Survey and Site Investigation Manual (MARSSIM) [NRC-2000] to demonstrate compliance with the release criteria for unrestricted use specified in 10 CFR 20.1402.

The Cyclotron Vault was divided into two survey units. MARSSIM Class 1 survey unit comprising the floor and lower walls up to 6 feet and a Class 2 survey unit comprising the upper walls and ceiling. 100% of the Class 1 survey unit and 50% of the Class 2 survey unit were direct scan surveyed for beta activity. A total of 49 systematic fixed point beta measurements were taken. A 100 cm^2 smear sample was taken at each fixed point location and analyzed for removable alpha, beta, and tritium activity. Gamma scans were performed on 100% of the Class 1 survey unit and 50% of the Class 2 survey unit. A total of 49 systematic fixed point and 15 background reference area dose rate and one-minute static measurements were taken. Gamma scans and one-minute static measurements were taken on the internal surfaces of each beam tube and beam dump.

This report presents sufficient data to support the conclusion that the facility meets the release criteria. Final status surveys demonstrate that building structures affected by the operation of the cyclotron meet the release criteria and are suitable for unrestricted release. Based on the building occupancy scenario, the Total Effective Dose Equivalent (TEDE) to an average member of the critical group is less than 5.6 millirem/year (mrem/yr), approximately 22% of the release criterion of 25 mrem/yr.

Additionally, for building structures with potential volumetric activation products, including beam tubes, a site-specific dose model was developed and the scenario analyses of NUREG 1640 Volume 1 "Radiological Assessments for Clearance of Equipment and Materials from Nuclear Facilities," were used to develop an upper bound of potential doses from plausible future "alternate scenarios." These alternate scenario analyses for recycling, renovation, and disposal demonstrate that potential doses are much less than 1 mrem/yr to the maximally exposed individuals [NRC 2003].

1.2 Building 140 Auxiliary Rooms

Building 140 Auxiliary Rooms encompass those areas outside of the Cyclotron Vault where no volumetric contamination as a result of cyclotron operations was found. Based upon historical information on these areas as well as previous characterization results, this area was divided into fifteen survey units comprising 100% of the floor areas and lower walls up to 6 feet. A total of 7,207 ft^2 was direct surveyed for total beta activity and 2,708 ft^2 were direct surveyed for both alpha and beta activity. A total of 173 systematic fixed point alpha and beta measurements were taken. A 100 cm^2 smear sample was taken at each fixed point location and analyzed for removable alpha and beta activity. No activity was found at any location above the release limits specified in NASA Glenn Research Center Occupational Health Programs Manual – Chapter 8 [NASA 2014] after all remedial actions were completed.

1.3 Land Areas

A total of 30 systematic surface soil samples were collected from 30 locations within the land area directly above the Cyclotron Facility (Building 140). All samples were analyzed by gamma spectroscopy. No cyclotron related activity was found at any location. In addition to sampling, a direct gamma walkover survey was performed over 100% of the Building 140 open land area. No elevated activity was identified during the gamma survey. Therefore, no additional soil samples were collected [SAIC 2012].

In 2015, 76 core samples of the overburden soils immediately adjacent to the Vault structure were collected from 9 subsurface locations immediately above the Vault roof and 8 subsurface locations adjacent to the Vault exterior walls from the top of the structure to the footers. All samples were analyzed by gamma spectroscopy. Eu-152 activity was found at one location along the west wall between the 18' and 24' depth level with the highest activity observed being 0.93±0.25 pCi/g. This activity is 11% of the NRC default soil screening value for Eu-152 given in NUREG 5512, Volume 3, Table 6.91 [NRC 1999]. Based upon the limited extent of observed activation as well as this low concentration measured, the level of Eu-152 in the subsurface soil is not significant. No cyclotron related activity was found at any other location.