BROOKHAVEN NATIONAL LABORATORY

Close Out Report

NSLS Hazard Removal Project

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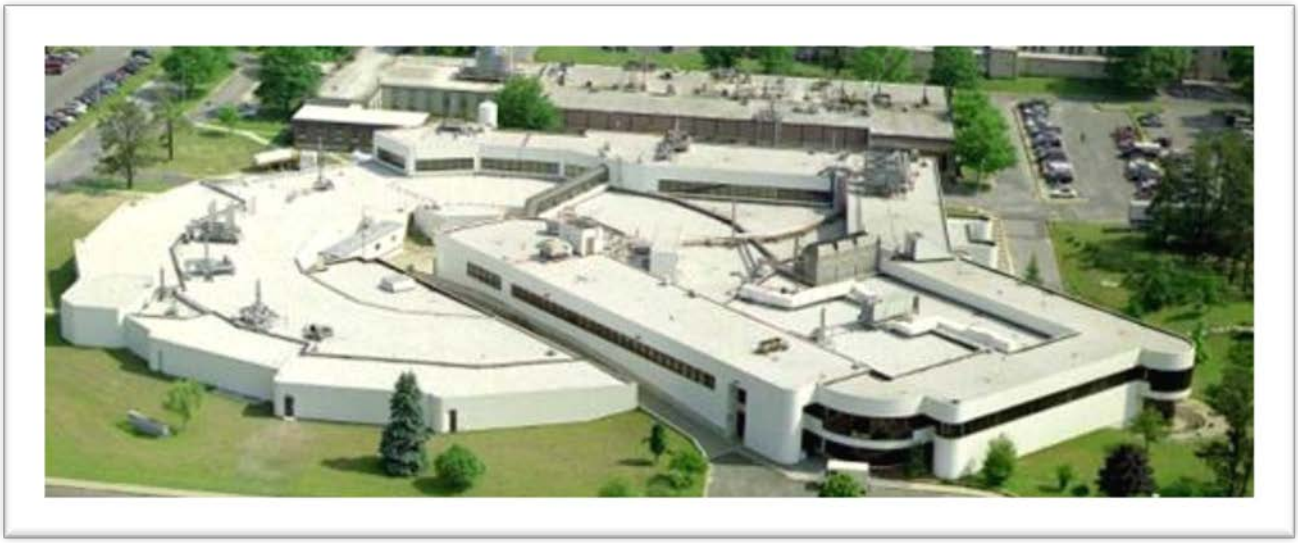
4/9/2016



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1.0 Overview

The purpose of this Closeout Report is to document the actions taken to remove hazards from the National Synchrotron Light Source (NSLS) and describe the as-left residual hazards in the facility at Hazard Removal Project (HRP) completion.

1.1 National Synchrotron Light Source Background

The National Synchrotron Light Source (NSLS) was a large user facility dedicated to the production and utilization of synchrotron radiation. It supported the development of electron-based radiation sources and new applications of this radiation in the physical and biological sciences. Ground was broken in 1979 for construction and first beam was delivered in 1982. The NSLS permanently ceased operations on September 30th, 2014.

Following shutdown in 2014, the BNL operating organization (formerly Photon Sciences Directorate) responsible for the NSLS completed facility stabilization. These activities included the removal of NSLS assets for re-use at NSLS-II, removal of chemicals and compressed gases, permanent shutdown and draining of experimental cooling water systems and de-energization of accelerator and beam line electrical systems.

The NSLS was housed in Building 725 on the Brookhaven National Laboratory (BNL) campus. The configuration of Building 725 is the result of a series of upgrades over the years and consists of two floors. The first floor (123,644 sq. ft.) consisted largely of the experimental floor and support equipment. This included the Linac, Booster synchrotron, VUV Ring, X-Ray Ring, beamlines, operational control and power systems, laboratories, offices, machine shops, storage and setup areas, stockroom and delivery areas, and a library. The second floor (38,512 sq. ft.) consisted of office space and conference rooms, as well as machine shops and instrumentation labs. Both floors have a number of mechanical equipment rooms.

Accelerator and research operations were conducted at NSLS over a span of more than 30 years involving operations staff, users, guest researchers, etc. that numbered in the thousands. There were numerous non-radiological and radiological hazards and conditions in Building 725 resulting from these activities.

1.2 Project Mission

The HRP mission was to safely and efficiently remove hazards and hazardous conditions resulting from NSLS operations to prepare it for the post-operations phase of the facility life cycle. The fate of the facility (e.g. demolition, re-purposing, etc.) was not known at project inception, hence, the project was planned and implemented without prejudice to the future use or fate of the facility.

1.3 Hazard Removal Project Summary

NSLS decommissioning conceptual studies were performed by Brookhaven Science Associates (BSA) dating back to 2012. Preliminary estimates to clean up the facility after shutdown were as high as $20 Million.

In August 2014 BSA assigned a Project Manager to lead NSLS hazard removal planning and execution. These hazard removal activities constitute much of the scope of what is typically referred to as *decommissioning*. The NSLS was turned over to the HRP team on April 1, 2015. Work and project demobilization was complete on March 31, 2016. It is noteworthy that the HRP was executed with a perfect safety record; there were no worker injuries of any kind.

With the exception of dispersible metals contamination on the 1st Floor and in the Building 725 HVAC systems, all hazards were removed from the NSLS at a total cost of $7.4 Million. The budgetary estimate to complete the metals cleanup is $2.5 Million.

2.0 Project Scope, Funding, Cost and Schedule

2.1 Scope

Hazard removal scope was constrained by the level of available funds throughout project execution. The initial work authorized by the Department of Energy (DOE) was limited to the removal of lead shielding. Additional scope was incrementally authorized as a result of 1) Favorable project performance; 2) financial returns to the project from metals recycling that totaled $775,000; and 3) a funding increase of $1.5 Million.

The final scope of hazard removal work authorized by DOE and completed by the HRP team for $7.4 M in is summarized below:

- Facility characterization to identify hazardous materials and hazardous conditions and residual contamination present in the NSLS facility.
- Development and implementation of a process for the radiological survey and release of equipment removed from Radioactive Material Control Areas (RMCAs) which included the NSLS accelerator enclosures.
- Project mobilization including detailed work planning, personnel acquisition and training, and acquisition of needed tools, equipment and consumables.
- Removal of over 500,000 pounds of lead shielding.
- Removal and radiological survey of over one million pounds of accelerator equipment and associated commodities from the RMCAs.
- Final radiological survey and release of the RMCAs.
- Removal of research electrical and mechanical commodities to eliminate potential sources of electrical and mechanical energy.
- Removal of miscellaneous hazards including depleted uranium shutters, beryllium components, and suspect nano-ductwork

- Sampling and lay-up of laboratory hoods, sinks and drains.
- Comprehensive housekeeping sweep to address unknown hazards and hazardous materials.
- Removal of beamlines, experimental structures and other free standing structures that were part of the research infrastructure.
- Packaging and recycling of over 2.3 million pounds of various metals.
- Packaging and disposal of approximately 70,000 pounds of low level radioactive waste and 200 pounds of mixed waste.
- Disposal of 40 roll-off containers of demolition debris and industrial waste.
- Disposal of hazardous materials and waste.
- Facility as-left reviews, walk-throughs and turn over following HRP completion.
- Determination and documentation of as-left conditions in a project Closeout Report.
- Archiving of project records in accordance with BNL requirements.

A summary of the base scope and incremental additions made via DOE approval of BSA-submitted Change Requests (CR) impacts on Total Project Cost (TPC) is provided below:

Increment	Date	TPC	Scope Summary/Notes
Base Scope	March 2015	$5.9M	Characterization Electrical & Mechanical Commodities Lead Shielding
CR-1	July 2015	$5.9M	Beryllium Components Depleted Uranium Shutters Nano-Ductwork Laboratory Hoods & Sinks Housekeeping Sweep *Additional work funded by deletion of X-17 hutch removal from scope; "0" net change in TPC.*
CR-2	August 2015	$7.4M	Electrical/Mechanical Commodities Linac, Booster, VUV Ring & X-Ray Ring *Additional work funded by $1.5 Million funding plus-up and project underruns.*
CR-3	September 2015	$7.4M	Preparation of Dispersible Metals Cleanup Cost Estimate and Schedule *Additional work funded by project underruns.*
CR-4	December 2015	$7.4M	Remaining Electrical & Mechanical Commodities Beamlines Experimental Hutches *Additional work funded by project underruns.*

2.2 Funding

A chronology of HRP funding actions is provided below:

Funding Step	Incremental Amount	Total Funding
Initial Funding for Project Planning- September 2014 (from NSLS Stabilization Project)	$400K	$0.4M
Funding for Base Scope Execution- January 2015	$5.5M	$5.9M
Plus-up for Accelerator Removal- September 2015	$1.5M	$7.4M

2.3 Cost

The final, as-built HRP cost is summarized below:

WBS/Functional Element	ACWP $(000)
1.0 Project Management and Administrative Support	814.8
2.0 Facility Characterization and Project Plan Development	667.2
3.0 ESH Support	312.0
4.0 Regulatory Documentation and Stakeholder Engagement	2.4
5.0 Facility Preparation	1910.4
6.0 Hazardous Material and Equipment Removal	4016.6
7.0 Disposition of Removed Material, Equipment and Waste	427.1
8.0 Project Closeout	24.5
Subtotal	8175.0
Recycle Returns	-775.0
Total ACWP	7,400

The HRP team successfully accomplished much more work than originally anticipated at project inception. This is attributable to: 1) Well organized and highly efficient project operations; 2) the addition of $775,000 in returns from the project team's aggressive approach to metals recycling; and 3) the addition of $1.5 Million in additional funds. The work that was accomplished under the HRP for $7.4 Million was well below BSA's earlier 2012 estimate of $20 Million.

2.4 Schedule

Preliminary HRP work was started while the NSLS was still operating in September 2014. All project work including the scope additions made through the four DOE-approved Change Requests was substantially complete on March 31, 2016. The final Closeout Report was published and issued on April 14, 2016.

Milestone	Planned	Actual
Facility Transfer Complete	01-Apr-15	01-Apr-15
Radiological Survey/Release Manual Issued	27-May-15	01-May-15
Project Mobilization Complete	01-May-15	15-May-15
Lead Removal Commenced	04-May-15	10-Jun-15
Interference Removal Complete	02-Jun-15	17-Jul-15
D/U Shutter Removal Complete	31-Jul-15	28-Jul-15
Electrical Isolations Complete	14-Aug-15	14-Aug-15
Lead Removal Complete (Experimental Floor)	26-Aug-15	30-Sep-15
Lead Removal Complete (X-Ray I.D.)	11-Sep-15	30-Sep-15
Facility Sweep Complete	16-Sep-15	30-Sep-15
Be Window Removal Complete	09-Oct-15	14-Oct-15
Remove Miscellaneous Equipment/Hazards	13-Oct-15	30-Dec-15
Accelerator Equipment Removal	12-Feb-16	08-Jan-16
Beamline Removal Complete	08-Jan-16	08-Jan-16
Hutch Removal Complete	31-Mar-16	11-Mar-16
Phase III Electrical/Mechanical Commodities Removal Complete	31-Mar-16	31-Mar-16
Project Complete (Closeout Report)	15-Apr-16	14-Apr-16

Superior HRP cost performance was also reflected in accelerated hazard removal completion schedule. The preliminary schedule presented to BHSO and DOE-HQ in August 2014 called for project completion at end of FY16. This same scope was completed at the end of March 2016, or about nine months ahead of the schedule first presented to DOE.

3.0 Identification and Removal of NSLS Hazards

The NSLS facility was characterized to identify residual hazardous materials and hazardous conditions to determine: 1) Risks to personnel and impacts to equipment removal performed after NSLS shutdown; 2) Potential impacts to the packaging, transportation and disposition of removed materials, equipment and waste; 3) Potential impacts to facility maintenance and/or re-purposing; and 4) Impacts or threats to the environment. Characterization was carried out by the HRP team and included reviews of facility documentation, interviews and facility walk-throughs with NSLS staff and BNL subject matter experts (SMEs), and the collection of field data including sampling and analysis performed in accordance with BNL standard operating procedures. The results of non-radiological and radiological characterization are described in Subsections 3.1 and 3.2, respectively. Additional hazards discovered during the course of

HRP execution; these are described in Subsection 3.3. The actions taken under the HRP to remove or resolve the identified hazards are also described herein.

3.1 Non-Radiological Hazards

The results of non-radiological characterization are described in Reference 1, *Brookhaven National Laboratory National Synchrotron Light Source (NSLS) Non-Radiological Hazards Characterization*, dated March 2015. The non-radiological hazards identified during characterization along with a summary of their removal are provided below:

A. Beryllium Components: Beryllium windows were installed at several locations in the NSLS including the beamlines and some accelerator components (i.e. X-Ray RF cavities). Following characterization, beryllium as a hazard was believed to be limited to intact beryllium windows; additional beryllium hazards were discovered during project execution (see Subsection 3.3).

> ☑ **Completed Removal Actions:** All beryllium windows removed and disposed as hazardous waste and post removal surveys performed to demonstrate the absence of residual beryllium. Tools and equipment used to remove beryllium windows were also disposed as hazardous waste; ***no further action needed.***

B. Dispersible Metals: Dispersible metals were found throughout the NSLS. Dispersible lead, the primary contaminant of concern, was found at levels in excess of the BNL housekeeping standard of 40µg/ft^2. These conditions, attributable to the oxidation and handing of over 600,000 pounds of lead over 30 years of NSLS operation, were found on both the 1st and 2nd Floors of Building 725. Lead contamination on the 1st Floor is much more pervasive than that observed on the 2nd Floor. Dispersible cadmium was also found but at a comparatively limited extent. Internal dispersible lead contamination was also found in all of the Building 725 HVAC systems. Characterization of the NSLS for surface metals is fully described in Reference 2*, Brookhaven National Laboratory National Synchrotron Light Source (NSLS) Surface Metals Characterization Report* dated January 2015.

> **Completed Removal Actions: None. Extensive contamination remains on exposed horizontal surfaces throughout the 1st Floor and in the Building 725 HVAC systems. The limited contamination found on the 2nd Floor also remains as found during characterization. These conditions must be evaluated and addressed in conjunction with the reoccupation and/or re-purposing of Building 725. The as-left conditions are summarized in Subsection 6.2, below.**

C. Biohazards: Biological specimens were found during facility walk-throughs in a small number of locations.

> ☑ **Completed Removal Actions:** All biohazards found in the NSLS removed and disposed; ***no further action needed.***

D. Chemicals and Experimental Samples: Small but numerous quantities and experimental samples were found in the debris left behind in the NSLS.

☑ **Completed Removal Actions:** All chemicals and experimental samples found in the NSLS found in the NSLS removed and disposed. In addition, the limited chemical inventory used in conjunction with the HRP was either consumed or transferred; ***no further action needed.***

E. Confined Spaces: A small number of confined spaces associated with the research infrastructure were noted in addition to those associated with F&O's Building 725 infrastructure.

☑ **Completed Removal Actions:** The shielded cave in the Booster enclosure was dismantled and all remaining confined spaces in Building 725 labeled in accordance with BNL requirements; ***no further action needed.***

F. Potential Sources of Electrical and Mechanical Energy: An enormous volume of installed research systems and equipment were turned over with the NSLS facility to the HRP team including electric power distribution equipment, power supplies, instrumentation, cables, racks, etc., experimental cooling water systems, compressed air systems and vacuum systems.

Completed Removal Actions: Removal of the electrical and mechanical commodities that were part of the research systems is substantially complete. These systems have been physically and permanently removed at their points of interface with the Building 725 infrastructure. However, there are two locations on the X-Ray tunnel mezzanine where research equipment remains:

Mezzanine at X-27/27	**Mezzanine at X-15**
	

G. Lead Shielding: Over 500,000 pounds of bare, uncoated previously used as radiation shielding remained in the facility. The lead shielding was the source of lead contamination found throughout the facility. Following the shutdown of the NSLS on September 30, 2014, this lead was no longer a usable component but a hazardous waste subject to the requirements in the Resource Conservation and Recovery Act (RCRA) enacted in 1976.

Completed Removal Actions: Except as noted herein, all lead shielding has been removed from the NSLS. The removed lead was recycled with the exception of approximately 200 pounds that were transferred to the BNL Waste Management Facility for disposal as mixed waste.

Remaining lead: The X-17 hutch contains steel encased lead that does not pose a risk or facility hazard; there is no safety or industrial hygiene driver for X-17 removal. In addition, there are inaccessible locations at many HVAC penetrations on top of the X-Ray tunnel mezzanine with bare, lead sheet that must be removed. It is estimated that 400 pounds of lead (total) remains in these locations; representative photograph provided below.

Lead Sheet at X-Ray Ring HVAC Penetration

H. Magnetic Fields: Numerous magnets remained in the NSLS as subcomponents to ion pumps installed throughout experimental systems on the 1st Floor and in a small number of VUV-Ring and X-Ray Ring insertion devices.

☑ **Completed Removal Actions:** All ion pumps and insertion devices removed from the NSLS and dispositioned (either recycled or disposed as radioactive waste); ***no further action needed.***

I. Nanomaterials: Experimental hutch exhaust ducts potentially impacted with nano-materials were identified.

☑ **Completed Removal Actions:** Subsequent investigations conducted during HRP execution confirmed that unbound nano-materials were never used in the NSLS (i.e. there is no risk of residual nano-materials in the NSLS). The ductwork in question was nonetheless removed; ***no further action needed.***

J. Residual Oil and Freon: Numerous pumps, refrigerators, air conditioning units, etc. were left in the facility.

☑ **Completed Removal Actions:** All aforementioned equipment was removed and disposed and Freon was evacuated from refrigeration systems remaining in place; ***no further action needed.***

K. Laboratory Hoods and Sinks: Laboratory hoods and sinks were largely emptied of their contents. However, they had not been inspected and sampled in accordance with BNL standard operating procedures representing an unknown.

☑ **Completed Removal Actions:** Laboratory hoods and drains have been sampled and laid up in accordance with BNL standard operating procedures to preserve the option for their future use (no mercury, radioactive contamination or perchlorates were found); ***no further action needed.***

L. Unknowns: There was an enormous volume of materials, equipment and debris that was left behind in the NSLS facility. The generally poor housekeeping conditions, lack of documentation and its haphazard distribution across the 1st Floor potentially masked hazardous or radioactive materials hidden within this debris field.

☑ **Completed Removal Actions:** All material, equipment and debris left behind at facility turnover to the HRP was removed and disposed; ***no further action needed.***

3.2 Radiological Hazards

The NSLS facility was carefully characterized to identify radioactive and potentially radioactive equipment and materials. The HRP carefully evaluated and used valuable operating experience gained at the SLAC National Accelerator National Laboratory in the development and implementation of its characterization plan. The results of these characterization activities are fully described in Reference 3, *National Synchrotron Light Source (NSLS) Materials and Equipment Survey and Release Manual* dated July 2015. The Manual was developed and used for the survey and release of more than one million pounds of accelerator equipment and associated commodities from the RMCAs that were left in the NSLS.

Radiological characterization conclusions are summarized as follows:

- There was no evidence of loose radioactive contamination across the 30-year NSLS operating life; this was confirmed during the course of facility characterization.
- Radioactive equipment was found and the potential for activation products was noted in high beam loss locations in the Linac, Booster, VUV Ring, X-Ray Ring and Transport Lines. All of this equipment was housed in RMCAs posted and managed in accordance with the BNL Radiological Control Manual. Measure dose rates, when found, were in the µR per hour range and only slightly in excess of background. The radiation dose rates and potential exposure of the workers involved with the HRP were below the threshold warranting personnel monitoring.
- There were eleven depleted uranium shutters installed in the VUV Ring.
- Several radiological sources remained in the facility.

☑ **Completed Removal Actions:** All equipment was removed from the RMCAs and surveyed in accordance with Reference 3 (i.e. the National Synchrotron Light Source (NSLS) Materials and Equipment Survey and Release Manual). Equipment meeting the release criteria provided in the Manual (i.e. indistinguishable from background) was recycled, and equipment and materials with detectable activity were disposed as radioactive waste. The depleted uranium shutters were removed during June 2015 ~~have been removed a~~and shipped in early April for disposal at the at the DOE NNSS disposal facility.~~transferred to the BNL Waste Management Facility (waste profiled approved, shipment pending) and all radioactive sources have been removed from Building 725.~~

There is no radioactive material remaining in Building 725 and the facility has been de-posted; ***no further action needed.***

3.3 As-Found Hazards

Additional hazards found during HRP execution and summaries of their disposition are noted below:

Asbestos: Asbestos was found in six laboratory fume hoods; other suspect areas including countertops, pipe fitting thermal insulation and spray-on coatings in the Booster and Linac areas were sampled and determined to be free of asbestos.

> ☑ **Completed Removal Actions:** Laboratory hoods containing asbestos were labeled in accordance with BNL requirements; ***no further action needed.***

Copper Beryllium Components: Copper beryllium components were found in the NSLS RF systems. These were in addition to the beryllium windows noted during facility characterization.

> ☑ **Completed Removal Actions:** All copper beryllium components removed and disposed as hazardous waste. Tools and equipment used to remove beryllium windows were also disposed as hazardous waste; ***no further action needed.***

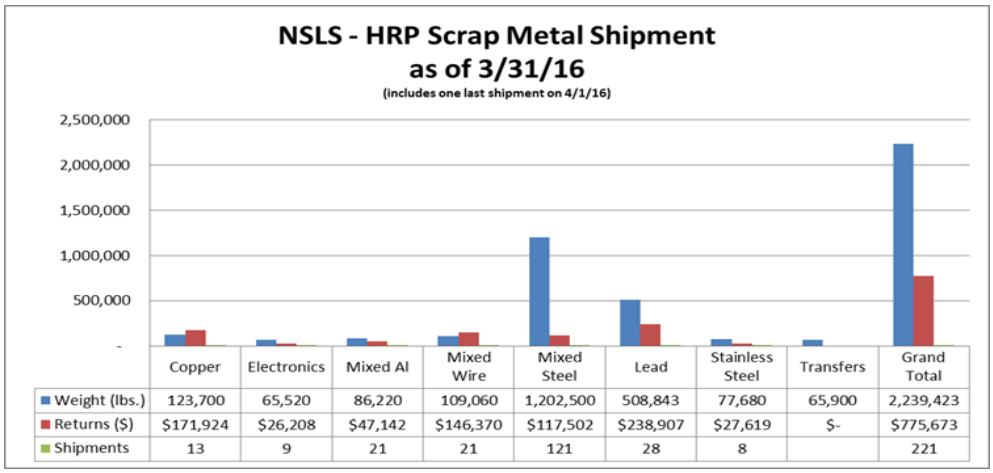
Dispersible Beryllium: Dispersible beryllium was found in the X-17 hutch. This loose contamination was apparently created when one of the X-17 beamlines was partially disassembled and removed for reuse at NSLS-II.

> ☑ **Completed Removal Actions:** Dispersible beryllium removed and confirmed via sampling and analysis. All wipes, tools and equipment used to remove the dispersible beryllium were disposed as hazardous waste; ***no further action needed.***

4.0 Waste Volume Reduction and Recycling

4.1 Recycling Performance

Virtually all equipment and material removed from the NSLS in conjunction with the HRP was recycled. A total of 2.2 million pounds of metals commodities was picked up at the NSLS by off-site recycling vendor. Approximately $775,000 was returned to the project as a result of these activities and used to fund additional hazard removal work. The extent and impact of metals recycling is shown below:



	Copper	Electronics	Mixed Al	Mixed Wire	Mixed Steel	Lead	Stainless Steel	Transfers	Grand Total
Weight (lbs.)	123,700	65,520	86,220	109,060	1,202,500	508,843	77,680	65,900	2,239,423
Returns ($)	$171,924	$26,208	$47,142	$146,370	$117,502	$238,907	$27,619	$-	$775,673
Shipments	13	9	21	21	121	28	8		221

4.2 Equipment Salvage for Re-Use

Equipment was removed, packaged and transferred by the HRP for re-use at other DOE projects as noted below:

- Thousands of pieces of equipment with an approximately replacement value of $70 Million was transferred NSLS-II under the Stabilization Project.
- Over $2 Million of RF equipment, power supplies, instrumentation, etc. transferred to Argonne National Laboratory.
- 1,200 lead bricks with an estimated value of $50,000 transferred to Yale University for eventual use on a DOE-sponsored experiment.

4.3 Radioactive Waste Mass and Volume Reduction

The HRP team was highly effective in minimizing the volume and mass of radioactive wastes resulting from the HRP. Over one million pounds of equipment was removed from NSLS RMCAs and surveyed in accordance with Reference 3. Where cost effective, the HRP team disassembled large components (e.g. dipole magnets) in order to avoid the disposal of such assemblies weighing as much as 18,000 pounds. Hundreds of thousands of pounds of low level radioactive waste generation were avoided through the use of this strategy while increasing the volume of material recycling. The final mass of radioactive waste was less than 70,000 pounds or only about 7% of the mass removed from the RMCAs.

5.0 Facility End-State

5.1 Physical Description

A summary of the Building 725 physical end-state achieved under the HRP is described as follows:

- Linac, Booster, VUV Ring and X-Ray Ring accelerators removed.
- Lead shielding removed with the limited exception of approximately 400 pounds (total) at the HVAC penetrations into the X-Ray Ring tunnel.
- Beamlines and experimental hutches removed.

- Accelerator and beamline mechanical systems removed essentially back to the Building 725 MERs; open ends of piping systems capped.
- Accelerator and beamline electrical equipment and instrumentation and associated commodities (e.g. cable trays, conduits, etc.) removed; electrical systems air gapped at facility interface points and Building 725 panel schedules and single line diagrams revised accordingly.
- RMCAs radiologically surveyed and de-posted; Building 725 is free of radioactive material.
- Building 725 free of non-radioactive hazardous materials and equipment that were formerly part of the NSLS research infrastructure.
- Building 725 free of all chemicals, materials, equipment and debris associated with previous research operations and activities.

Photographs provided an overview of the pre and post-HRP conditions in the NSLS are provided in Attachment A, *Hazard Removal Project Photographic Overview*.

5.2 As-Left Dispersible Metals Contamination

Dispersible metals contamination, predominantly lead, remains pervasive throughout the 1st Floor of Building 725; cadmium is also present to a lesser extent. There were insufficient funds to complete the dispersible metals cleanup.

Dispersible metals is present on most exposed horizontal surfaces such as floors and the top surfaces of structures and components that remain in the NSLS such as structural shapes, ledges, HVAC ducts, power distribution equipment, cable trays, pipe runs, etc. The highest concentrations can be found in the former experimental areas such as the accelerator enclosures, VUV Ring high bay and X-Ray Ring experimental floor. Lead levels in office spaces, crew quarters, etc. were carefully managed throughout HRP execution and are for the most part, below the levels in the BNL housekeeping standard. All of the Building 725 HVAC systems are internally contaminated with dispersible metals.

Floor Surfaces (1st Floor and Lobby)

Floor wipe samples were obtained from 20 locations from the 1st Floor and analyzed with on site with a Thermo Fisher Scientific Niton X-ray Fluorescence Analyzer, Model XL3T600 (XRF) instrument. These samples were obtained on March 30, 2016 after a final cleanup of the entire 1st Floor was performed using HEPA vacuums. The results listed below represent the latest and most reliable information regarding the floor contamination on the 1st Floor:

Building 725 First Floor Samples As-Left Conditions	
Sample Location Description (From Plan)	**XRF Pb Analysis Results (ug/ft²)**
NSLS Entrance Area Near Doors (1-192)	51.58
NSLS Lobby Meeting Area (1-192)	11.53
NSLS Lower Lobby Near Stairs (1-191)	149.33
Klystron Area (1-186)	254.69
Booster (1-189)	695.63
Control Room (1-181)	131.72

Copier Area (1-176)	42.37
VUV Area Near Former U1	213.06
VUV Area Near Former U7	147.25
Area 3 Near East Roll-up Door (1-123)	288.41
Room 1-114	188.62
Room 1-153	151.86
X-ray Tunnel Floor @X13	528.12
X-ray Tunnel Floor @X25	253.29
Experimental Floor @ X2	90.33
Experimental Floor @ X7	518.16
Experimental Floor @ X17	469.74
Experimental Floor @ X22	151.83
Hallway Outside of Room 1-129	295.79
Area 1-201 (Center of X-ray Tunnel)	376.86

Other 1st Floor Horizontal Surfaces

Facility non-radiological characterization included a facility-wide survey for dispersible metals contamination; the results of the survey are described in Reference 2. This body of work examined the entire facility and hence was limited in terms of the 1st Floor wipe sample density. Supplemental data was collected in October and November 2015 to support the development of a cost estimate and schedule for the dispersible metals cleanup. This campaign included over 200 sample locations on the 1st Floor and comprehensively describes the as-left dispersible lead conditions on the 1st Floor. Highlights from this supplemental survey are note below:

- Samples collected from walls and overhead surfaces were generally below the 40µg/ft^2 BNL housekeeping standard.
- Dust (and indeed dispersible metals) depositional areas such as the tops of structural shapes and ledges, top surfaces of electrical and mechanical equipment, etc. were typically in the 300-800µg/ft^2 range with some locations exceeding 4,000µg/ft^2.

The supplemental survey wipe sample results are provided as Attachment B, *Supplemental Metals Wipe Survey Results*. Attachment C, *1st Floor Final Wipe Survey Locations* illustrates the physical locations on the 1st Floor where the wipe samples were collected.

HVAC Systems

The Building 725 HVAC systems were surveyed for internal metals contamination as part of non-radiological facility characterization; the results are published in Reference 2. Quantifiable levels of lead were detected on ductwork surfaces in all of the 15 HVAC sections sampled, with a maximum of 1,200 µg/ft^2 found inside the return hatch of "A/C-1". In general, where lead was detected and samples were analyzed for additional metals of concern, cadmium was also detected above its respective IH75190 BNL Surface Wipe Criteria for metals. Silver was also identified above its corresponding BNL IH75190, Surface Wipe Criteria for Metals in "A/C-14", and mercury was detected above its respective laboratory reporting limit in "A/C- 6".

Supplemental wipe samples were taken during HRP execution- an additional 21 wipe samples were collected from the interior of 10 HVAC sections and analyzed for lead using the XRF. Lead was detected above the BNL housekeeping standard in 20 of the 21 samples. The results of this supplemental survey are summarized below.

AC 5					
1-186	Inside HVAC Duct	Klystron Area	725 102915 PB AC5-09	11/9/2015	**144.45**
AC 7					
Area 3 (1-123)	Inside HVAC Duct	NA	725 102915 PB AC7-10	11/6/2015	**46.51**
1-104 (U12)	Inside perimeter heat vent	Inside Pipe	725 102915 PB AC7-15	11/9/2015	26.33
AC 9					
1-168	Inside HVAC Duct	NA	725 102915 PB AC9-07	11/6/2015	**119.49**
AC 11					
1-204	Horizontal I-Beam, duct or piping	Inside Duct	725 102915 PB AC11-12	11/12/2015	**82.98**
AC 14					
1-110C	Inside HVAC Duct	N/A	725 102915 PB AC14-09	11/9/2015	**113.11**
Outside 1-110C	Inside perimeter heat vent	N/A	725 102915 PB AC14-06	11/13/2015	**170.61**
AC 16					
1-161	Inside HVAC DUCT	NA	725 102915 PB AC16-05	10/29/2015	**450.48**
1-166	Inside HVAC DUCT	NA	725 102915 PB AC16-10 A	10/29/2015	**1692.43**
1-166	Inside HVAC DUCT	NA	725 102915 PB AC16-10 B	11/17/2015	**237.38**
AC-16 Corridor	Inside HVAC DUCT	Ductwork @ MER 8	725 102915 PB AC16-11	11/4/2015	**4274.23**
1-164	Inside HVAC DUCT	NA	725 102915 PB AC16-12	11/17/2015	**973.53**
1-166	Inside HVAC Return	NA	725 102915 PB AC16-14	10/29/2015	**216.45**
1-161	Inside HVAC Return	NA	725 102915 PB AC16-16	10/29/2015	**193.38**
AC 17					
1-171	Inside HVAC DUCT	NA	725 102915 PB AC17-14	11/9/2015	**61.15**

2nd Floor Dispersible Metals

Facility characterization included a wipe survey if the 2nd Floor. Typical lead levels found were in the 1.1 µg/ft2 to 110µg/ft2 lead range; the full results are documented in Attachment B. There is no reason to believe that the conditions the April 1. 2016 turnover to F&O are different from those recorded in the

cited characterization report unless actions have been taken by others to address the contamination that was found.

6.0 Project Closeout

6.1 BNL Subject Matter Expert Review and Walk-Through

The completed HRP activities and expected as-left conditions were reviewed on February 26, 2015 with a comprehensive roster of BNL SMEs responsibility in key functional areas such as Safety, Industrial Hygiene, Electrical Safety, Fire Protection, Pressure Safety, Waste Management, Radiological Controls, Facility Management, Environmental Protection, Readiness Evaluations and Property Management. The February 26th review also included a walk-through of the NSLS facility attended by many of the participants. It should be noted that many of the attendees also participated in the comprehensive walk-throughs that were conducted to support turnover of the NSLS to the HRP on April 1, 2015. The roster of February 26th attendees is provided as Attachment D, *February 26, 2015 Hazard Removal Review Attendees*. The resolution of outstanding items identified during the review is summarized below:

Issue/Requested Action	Resolution
Conduct walk-through with Eugene Santiago and Mike Gaffney to review physical end-state of facility and determine if there are needed actions to eliminate potential sources of energy associated with remaining equipment or conditions associated with the research infrastructure.	Walk-through conducted on 3/21/16. The few and minor observations made during the walk-through have been resolved.
Conduct walk-through with Joe Terranova to review as-left facility configuration for fire and life safety issues.	Walk through conducted on 4/11/16. The conclusions from this walk through were communicated to the FPM for resolution. For completeness, they are noted as follows: • Remove numerous fire extinguishers throughout the experimental floor and perimeter walkways. As per the NFPA 10 standard, ten pound ABC dry chemical extinguishers can be installed at intervals not to exceed a 75' travel distance. There are an excessive number of extinguishers installed throughout the building due to the original beamline obstructions. Since the experimental floor has been vacated, there are dozens of unnecessary extinguishers throughout and a few should also be relocated along the egress paths to comply with BNL requirements. • 'Egress paths need to be defined and exit way signage needs to be installed based upon the new configuration of the building. • The control room ceiling tiles need to be replaced so as to comply with the 10% rule- No more than 10 % of the ceiling tiles can be removed to maintain the integrity of the ceiling membrane so that it can act to collect heat and smoke for the sprinklers and detectors. • Numerous penetrations in fire rated wall assemblies need to be repaired.
Sample insulation on infrastructure piping system (e.g. chilled water) fittings for ACM.	Piping systems samples acquired and analyzed; insulation is free of ACM.
Label ductwork to indicate internal lead and	Work Order issued to BNL Sign shop; Building 725 FPM is coordinating sign

cadmium contamination.	installation.
Evaluate/update facility postings.	HRP construction areas de-posted as part of project demobilization; facility walk-through with FPM conducted on 4/1/16.

6.2 Facility Categorization/Facility Use Agreement

The Accelerator Safety Envelope and Safety Assessment Document previously in effect for the NSLS have been retired. Building 725 is no longer an Accelerator Facility. This building has been re-categorized as an Industrial Facility in accordance with BNL's institutional requirements. The Building 725 Facility Use Agreement has been revised to reflect this change, record the hazard removal actions taken under the HRP, and incorporate this Closeout Report to memorialize the as-left conditions associated with dispersible metals.

6.3 Final Walk-Through and Facility Turnover

A facility walk-through was conducted with the Associate Laboratory Director- Environment, Safety and Health and the Facilities and Operations Directorate (F&O) Facility Complex Manager and Facility Project Manager responsible for Building 725. Control of Building 725 was transferred to F&O on April 1, 2016.

ATTACHMENTS

Attachment A: *Hazard Removal Project Photographic Overview*

Attachment B: *Supplemental Metals Wipe Survey Results*

Attachment C: *1st Floor Final Wipe Survey Locations*

Attachment D: *February 26, 2015 Hazard Removal Review Attendees*

REFERENCES

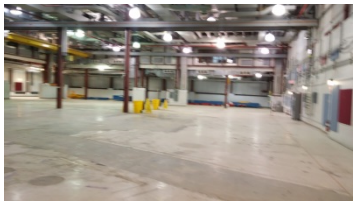
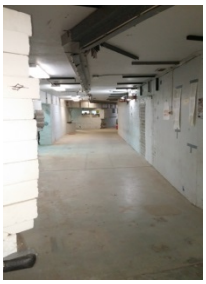
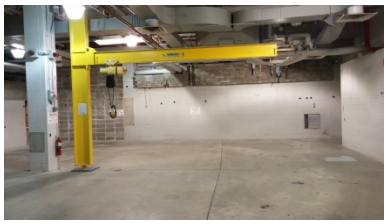
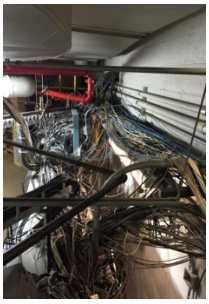
Reference 1: *Brookhaven National Laboratory National Synchrotron Light Source (NSLS) Non-Radiological Hazards Characterization*, dated March 2015

Reference2: *Brookhaven National Laboratory National Synchrotron Light Source (NSLS) Surface Metals Characterization Report* dated January 2015

Reference 3: National Synchrotron Light Source (NSLS) Materials and Equipment Survey and Release Manual dated July 2015

Close Out Report for NSLS Hazard Removal Project

Attachment A: **Hazard Removal Project Photographic Overview**

VUV High-Bay Before 	VUV High Bay After 
X-Ray Ring Before 	X-Ray Ring After 
Booster Before 	Booster After 
X-Ray Experimental Floor Before 	X-Ray Experimental Floor After 
Electrical Commodities (Typical) Before 	Electrical Commodities (Typical) After 

Close Out Report for NSLS Hazard Removal Project
Attachment B: **Supplemental Metals Wipe Survey Results**

An NSLS-wide metals wipe survey was performed as part of facility characterization. The survey and results are documented in *BNL NSLS Surface Metals Characterization* Report, Rev. 1, dated January 2015. A supplemental wipe survey was performed under the HRP to obtain the additional data needed to support detailed planning for the cleanup of dispersible metals contamination is Building 725. An additional 233 surface wipe samples were collected from the first floor of the facility. The samples were collected from horizontal surfaces, walls, and ceilings to provide additional characterization for the first floor. Samples were analyzed for lead using an on-site Thermo Fisher Scientific Niton X-ray Fluorescence Analyzer, Model XL3T600 (XRF). Twenty of the samples were also submitted to an off-site laboratory for analysis. The results are summarized below. (Note: Values listed in red are in excess of the 40µg/ft^2 BNL housekeeping standard.)

Area (AC-1)	Sample Location Description (From Plan)	Notes (Additional Sample Description If Needed)	Sample ID	Sample Collected Date	XRF Pb Analysis Results (ug/ft²)	Off-site Pb Analysis Results (ug/ft²)
1-153	Walls	NA	725 102915 PB AC1-01	11/2/2015	19.67	N/A
1-153 (Outside of Room)	Ceiling decking	Outside of 1-153/1-154 (could not get to ceiling inside 1-153)	725 102915 PB AC1-02	11/4/2015	4.98	N/A
1-153	floor	NA	725 102915 PB AC1-03	11/2/2015	**284.19**	N/A
1-153	Horizontal I-Beam, duct or piping above drop ceiling	Top of Insulated Pipe	725 102915 PB AC1-04	11/4/2015	39.40	N/A
1-153	Drop Ceiling top	NA	725 102915 PB AC1-05	11/4/2015	**51.92**	N/A
1-153	window	NA	725 102915 PB AC1-06	11/2/2015	**71.65**	N/A
Exp. Floor	Floor	X12C, X13	725 102915 PB AC1-07	11/2/2015	**673.35**	N/A
		X9,10 Ratchet	725 102915 PB AC1-08	11/2/2015	**246.29**	**380.00**
		X3A	725 102915 PB AC1-09	11/2/2015	**459.20**	**620.00**
Exp. Floor	Inside HVAC DUCT	At X9 Hutch	725 102915 PB AC1-10	11/4/2015	**323.83**	N/A
		At X13 Inside Duct	725 102915 PB AC1-11	11/17/2015	**554.22**	N/A
Exp. Floor	Ceiling decking	X3, Between BLs 2 & 3	725 102915 PB AC1-12	11/4/2015	10.92	N/A
		X9,10 Ratchet	725 102915 PB AC1-13	11/4/2015	9.07	N/A
		X15 near West Rollup	725 102915 PB AC1-14	11/4/2015	4.70	N/A
Exp. Floor	Horizontal I-Beam, duct or piping	X3, Between BLs 2 & 3	725 102915 PB AC1-15	11/4/2015	**158.84**	N/A
		X9,10 Ratchet	725 102915 PB AC1-16	11/4/2015	**488.92**	**540.00**

		X15 near West Rollup	725 102915 PB AC1-17	11/4/2015	**577.25**	**960.00**
1-151A	Horizontal I-Beam, duct or piping	Ceiling in West Rollup Door Area	725 102915 PB AC1-18	11/4/2015	5.47	N/A
1-151A	Horizontal I-Beam, duct or piping	Duct in West Rollup Door Area	725 102915 PB AC1-19	11/4/2015	**133.85**	N/A
Exp. Floor	Horizontal I-Beam, duct or piping	I-Beam b/w X11A & B	725 102915 PB AC1-20	11/4/2015	**466.69**	N/A
Exp. Floor	Wall	X15 Ratchet	725 102915 PB AC1-21	11/2/2015	24.07	N/A
		X9 Ratchet	725 102915 PB AC1-22	11/2/2015	32.86	N/A
1-223 (inside Tunnel)	Floor	X12	725 102915 PB AC1-23	11/2/2015	**591.63**	**1200.00**
1-223 (inside Tunnel)	Wall	X12	725 102915 PB AC1-24	11/2/2015	8.85	N/A
1-223 (inside Tunnel)	Ceiling	X12	725 102915 PB AC1-25	11/2/2015	18.12	N/A
1-223 (inside Tunnel)	Horizontal I-Beam, duct or piping	X12	725 102915 PB AC1-26	11/10/2015	10.19	N/A
1-221 (inside Tunnel)	Floor	X5/X6	725 102915 PB AC1-27	11/2/2015	**284.04**	N/A
1-221 (inside Tunnel)	Wall	X5/X6	725 102915 PB AC1-28	11/2/2015	17.73	N/A
1-221 (inside Tunnel)	Ceiling	X5/X6	725 102915 PB AC1-29	11/2/2015	10.76	N/A
1-221 (inside Tunnel)	Horizontal I-Beam, duct or piping	Top of Pipe @X4	725 102915 PB AC1-30	11/10/2015	**1626.26**	N/A
1-200	Floor	NA	725 102915 PB AC1-31	11/2/2015	**189.69**	N/A
1-200	Wall	NA	725 102915 PB AC1-32	11/2/2015	6.38	N/A
1-200	Ceiling	NA	725 102915 PB AC1-33	11/12/2015	4.40	N/A
1-200	Horizontal I-Beam, duct or piping	Top of Pipe	725 102915 PB AC1-34	11/12/2015	**550.67**	N/A
		Top of Duct	725 102915 PB AC1-35	11/12/2015	**296.91**	N/A
		Rm 1-201 Top of Pipe	725 102915 PB AC1-36	11/12/2015	**313.46**	N/A
		Rm 1-201 Inside Duct	725 102915 PB AC1-37	11/12/2015	**365.32**	N/A
		Rm 1-201 Wall	725 102915 PB AC1-38	11/12/2015	18.40	N/A
1-200	Utility Trench (Pit)	Left Sample Square	725 102915 PB AC1-39	11/2/2015	**339.32**	N/A
Exp. Floor	Horizontal I-Beam, duct or piping above tunnel	Top of Duct @ W. Rollup	725 102915 PB AC1-40	11/12/2015	**365.54**	N/A
		Top of Duct @ X3/X4 (walkway over)	725 102915 PB AC1-41	11/12/2015	**353.46**	**410.00**
		Top of Pipe @X1	725 102915 PB AC1-42	11/13/2015	**283.77**	**620.00**

Area (AC-2)	Sample Location Description	Notes	Sample ID	Sample Collected Date	XRF Pb Analysis Results (ug/ft²)	Off-site Pb Analysis Results (ug/ft²)
Exp. Floor	Floor	X22C	725 102915 PB AC2-01	11/2/2015	**1210.60**	**1200.00**
		X29	725 102915 PB AC2-02	11/2/2015	**528.62**	**790.00**
		X19	725 102915 PB AC2-03	11/2/2015	**1224.02**	N/A
Exp. Floor	Inside HVAC DUCT	X24/23A2	725 102915 PB AC2-04	11/6/2015	**129.95**	N/A
		X19	725 102915 PB AC2-05	11/6/2015	**203.97**	N/A
Exp. Floor	Ceiling decking	X20	725 102915 PB AC2-06	11/6/2015	8.71	N/A
		X24/23A2	725 102915 PB AC2-07	11/6/2015	9.50	N/A
		X26C	725 102915 PB AC2-08	11/6/2015	16.03	N/A
Exp. Floor	Horizontal I-Beam, duct or piping	X20	725 102915 PB AC2-09	11/6/2015	**318.17**	**270.00**
		Top of Duct X24	725 102915 PB AC2-10	11/6/2015	**501.63**	**740.00**
		Top of Duct X23C	725 102915 PB AC2-11	11/6/2015	**497.93**	N/A
Exp. Floor	Horizontal I-Beam, duct or piping above tunnel	Top of Duct X17	725 102915 PB AC2-12	11/12/2015	**328.84**	**340.00**
		Top of Elect. Box X27	725 102915 PB AC2-13	11/13/2015	**539.82**	**570.00**
		Top of Pipe X25	725 102915 PB AC2-14	11/13/2015	**137.51**	N/A
Exp. Floor	Wall	X25/26	725 102915 PB AC2-15	11/3/2015	**93.59**	N/A
1-225 (inside Tunnel)	Floor	X22	725 102915 PB AC2-16	11/2/2015	**839.92**	N/A
1-225 (inside Tunnel)	Wall	X22	725 102915 PB AC2-17	11/2/2015	38.41	N/A
1-225 (inside Tunnel)	Ceiling	X22	725 102915 PB AC2-18	11/2/2015	10.55	N/A
1-225 (inside Tunnel)	Horizontal I-Beam, duct or piping	X23/X24 Ledge	725 102915 PB AC2-19	11/10/2015	**4745.74**	N/A
1-227 (inside Tunnel)	Floor	X29	725 102915 PB AC2-20	11/2/2015	**654.72**	**1600.00**
1-227 (inside Tunnel)	Wall	X29	725 102915 PB AC2-21	11/2/2015	**45.50**	N/A
1-227 (inside Tunnel)	Ceiling	X29	725 102915 PB AC2-22	11/2/2015	6.29	N/A
1-227 (inside Tunnel)	Horizontal I-Beam, duct or piping	X28/RF Cavities	725 102915 PB AC2-23	11/2/2015	**271.05**	N/A
1-227 (inside Tunnel)	Under Floor In Cable Tray	Pipe Sample	725 102915 PB AC2-24	11/17/2015	**404.68**	N/A
Area (AC-4)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**

VUV High Bay	Top of HVAC Duct	North of Small Mezz.	725 102915 PB AC4-01	11/5/2015	**408.36**	**640.00**
		NW of Large Mezz.	725 102915 PB AC4-02	11/5/2015	**465.30**	**740.00**
		South of Large Mezz.	725 102915 PB AC4-03	11/5/2015	**324.76**	N/A
		NE of Large Mezz.	725 102915 PB AC4-04	11/5/2015	**339.15**	**750.00**
VUV High Bay	Ceiling decking	NW of Large Mezz.	725 102915 PB AC4-05	11/5/2015	21.29	N/A
		NE of Large Mezz.	725 102915 PB AC4-06	11/5/2015	14.27	N/A
VUV High Bay	Horizontal I-Beam, crane or piping	I-Beam SW of Large Mezz.	725 102915 PB AC4-07	11/5/2015	**284.64**	N/A
		Top of Unpainted Duct East of Large Mezz.	725 102915 PB AC4-08	11/5/2015	**199.08**	N/A
		I-Beam NE of Large Mezz.	725 102915 PB AC4-09	11/5/2015	**401.65**	N/A
		I-Beam NNW of Large Mezz.	725 102915 PB AC4-10	11/5/2015	**494.32**	N/A
VUV High Bay	Walls (at elevation)	NW of Large Mezz.	725 102915 PB AC4-11	11/5/2015	17.51	N/A
		SW of Large Mezz.	725 102915 PB AC4-12	11/5/2015	10.95	N/A
VUV High Bay	Window	Lobby Window	725 102915 PB AC4-13	11/5/2015	9.39	N/A
VUV High Bay	Fire Suppression Piping	NW of Large Mezz.	725 102915 PB AC4-14	11/5/2015	**453.18**	N/A
		SW of Large Mezz.	725 102915 PB AC4-15	11/5/2015	**776.84**	N/A
		SE of Large Mezz.	725 102915 PB AC4-16	11/5/2015	**758.93**	N/A
		NNW of Large Mezz.	725 102915 PB AC4-17	11/5/2015	**85.87**	N/A
VUV High Bay	Inside HVAC Duct	Duct Above Lobby Window	725 102915 PB AC4-18	11/5/2015	**298.73**	N/A
		Middle Duct East of Large Mezz.	725 102915 PB AC4-19	11/5/2015	**250.76**	N/A
VUV High Bay	Floor	NA	725 102915 PB AC4-20	11/3/2015	**887.77**	**1800.00**
		NA	725 102915 PB AC4-21	11/3/2015	**351.31**	**1300.00**
Area (AC-5)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
1-189	Walls	Booster	725 102915 PB AC5-01	10/30/2015	27.03	N/A
		Booster	725 102915 PB AC5-02	10/30/2015	8.45	N/A
1-189	Ceiling decking	Booster	725 102915 PB AC5-03	11/9/2015	11.67	N/A
1-189	floor	Booster	725 102915 PB AC5-04	10/30/2015	**513.94**	**1200.00**
1-189	Horizontal I-Beam, duct or piping	Booster	725 102915 PB AC5-05	11/9/2015	**417.03**	N/A

1-186	Horizontal I-Beam, duct or piping	Top of Duct, Klystron Area	725 102915 PB AC5-06	11/9/2015	**184.20**	N/A
1-186	Wall	Klystron Area	725 102915 PB AC5-07	10/30/2015	14.41	N/A
1-186	Floor	Klystron Area	725 102915 PB AC5-08	10/30/2015	**193.96**	N/A
1-186	Inside HVAC DUCT	Klystron Area	725 102915 PB AC5-09	11/9/2015	**144.45**	N/A
1-192	Ceiling decking (above drop Ceiling)	Ceiling Decking	725 102915 PB AC5-10	11/12/2015	35.23	N/A
1-192	Floor	Lobby	725 102915 PB AC5-11	10/30/2015	15.77	N/A
1-192	Horizontal I-Beam, duct or piping above drop ceiling	Top of White Pipe	725 102915 PB AC5-12	11/12/2015	**75.11**	N/A
1-192	Stairwell wall	NA	725 102915 PB AC5-14	10/30/2015	9.90	N/A
1-192	Stairwell floor	NA	725 102915 PB AC5-15	10/30/2015	24.99	N/A
Area (AC-6)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
1-124A	Walls	NA	725 102915 PB AC6-01	11/2/2015	6.08	N/A
1-124A	Ceiling decking (above drop Ceiling)	NA	725 102915 PB AC6-02	11/17/2015	9.77	N/A
1-124A	floor	NA	725 102915 PB AC6-03	11/2/2015	**55.45**	N/A
1-124A	Horizontal I-Beam, duct or piping above drop ceiling	Top of Pipe Insulation	725 102915 PB AC6-04	11/4/2015	28.81	N/A
1-132B	Walls	NA	725 102915 PB AC6-06	11/2/2015	5.33	N/A
1-134	Ceiling decking (above drop Ceiling)	(Changed Room)	725 102915 PB AC6-07	11/4/2015	8.86	N/A
1-132B	Floor	NA	725 102915 PB AC6-08	11/2/2015	**289.90**	N/A
1-134	Horizontal I-Beam, duct or piping above drop ceiling	Top of Light Fixture (Changed Room)	725 102915 PB AC6-09	11/4/2015	**4502.13**	N/A
Area (AC-7)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
Stockroom (1-116)	Ceiling Tile (Top)	NA	725 102915 PB AC7-01	11/6/2015	20.53	N/A
Stockroom (1-116)	Ceiling decking (above drop Ceiling)	NA	725 102915 PB AC7-02	11/17/2015	23.75	N/A

Stockroom (1-116)	floor	NA	725 102915 PB AC7-03	10/30/2015	**43.28**	N/A
Stockroom (1-116)	Horizontal I-Beam or piping above drop ceiling	NA	725 102915 PB AC7-04	11/6/2015	**54.94**	N/A
Area 3 (1-123)	Top of Duct	Sampled Insulated Pipe	725 102915 PB AC7-05	11/6/2015	**239.17**	N/A
Area 3 (1-123)	Ceiling decking	NA	725 102915 PB AC7-06	11/6/2015	7.79	N/A
Area 3 (1-123)	Horizontal I-Beam, crane or piping	Outside 1-110D	725 102915 PB AC7-07	11/6/2015	**737.10**	N/A
Area 3 (1-123)	floor	NA	725 102915 PB AC7-08	10/30/2015	**372.83**	N/A
		NA	725 102915 PB AC7-09	10/30/2015	**689.73**	N/A
Area 3 (1-123)	Inside HVAC Duct	NA	725 102915 PB AC7-10	11/6/2015	**46.51**	N/A
1-123A (lead cutting Lab)	Ceiling decking	NA	725 102915 PB AC7-11	11/6/2015	31.44	N/A
1-123A (lead cutting Lab)	Horizontal I-Beam, crane or piping	Top of Duct	725 102915 PB AC7-12	11/6/2015	**223.89**	N/A
1-104 (U12)	Ceiling decking	NA	725 102915 PB AC7-13	11/9/2015	2.80	N/A
1-104 (U12)	Horizontal I-Beam, crane or piping	Top of Pipe	725 102915 PB AC7-14	11/9/2015	**100.35**	N/A
1-104 (U12)	Inside perimeter heat vent	Inside Pipe	725 102915 PB AC7-15	11/9/2015	26.33	N/A
1-100 (U-9)	Floor	NA	725 102915 PB AC7-16	11/3/2015	**70.52**	N/A

Area (AC-9)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
1-168	Walls	NA	725 102915 PB AC9-01	10/29/2015	**280.21**	N/A
		NA	725 102915 PB AC9-02	10/29/2015	13.37	N/A
1-168	Ceiling decking	NA	725 102915 PB AC9-03	11/9/2015	31.82	N/A
1-168	floor	NA	725 102915 PB AC9-04	10/29/2015	**244.16**	N/A
1-168	Horizontal I-Beam, duct or piping	I-Beam	725 102915 PB AC9-05	11/9/2015	**42.13**	N/A
1-168 (mezzanine)	Horizontal I-Beam, duct or piping	NA	725 102915 PB AC9-06	10/29/2015	**353.70**	N/A
1-168	Inside HVAC DUCT	NA	725 102915 PB AC9-07	11/6/2015	**119.49**	N/A
1-168 (in pit)	Walls	NA	725 102915 PB AC9-08	11/3/2015	23.72	N/A
1-168 (in pit)	Floor	NA	725 102915 PB AC9-09	11/3/2015	13.16	N/A

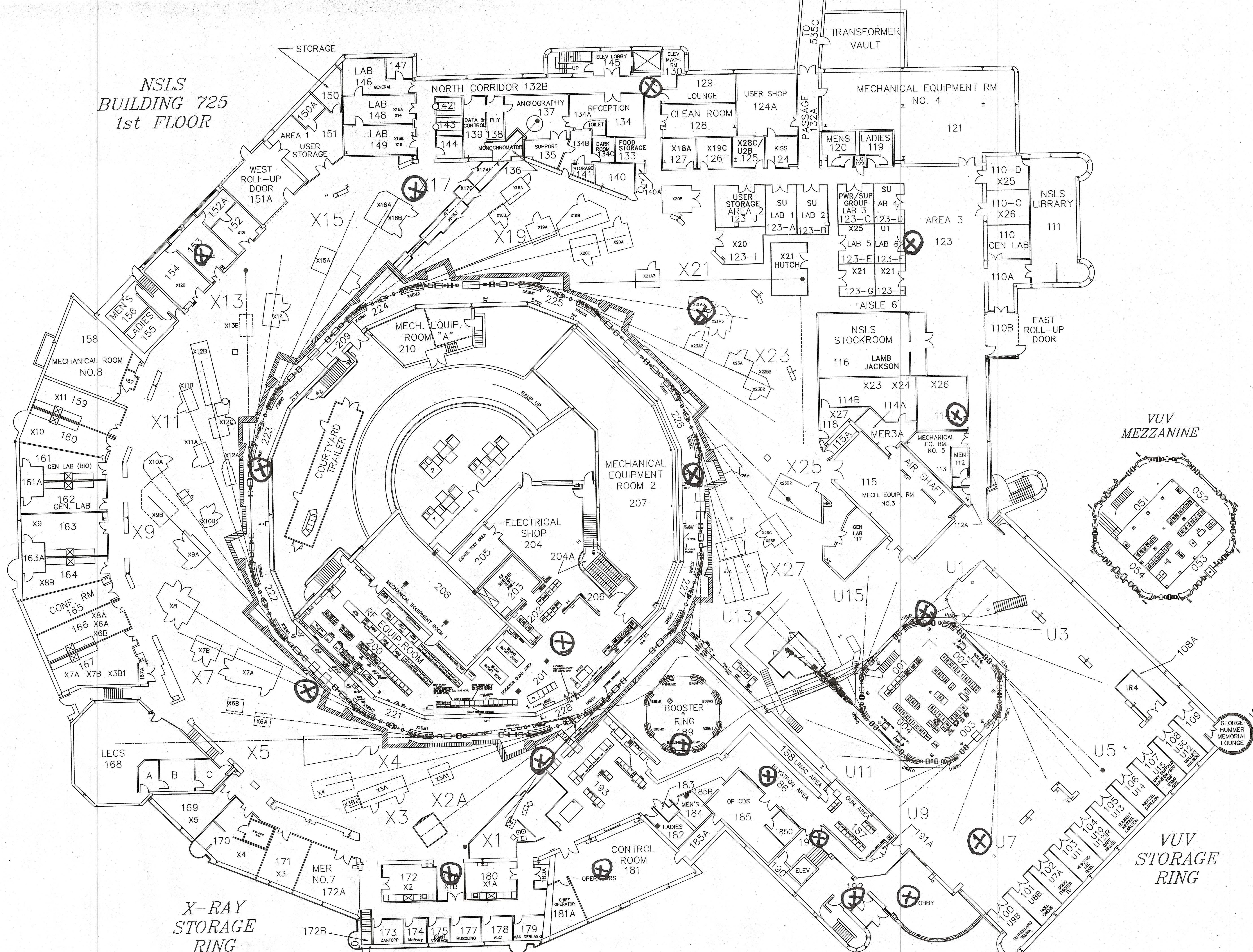
1-168B	Floor	NA	725 102915 PB AC9-10	10/29/2015	17.92	N/A
1-168B	Horizontal I-Beam, duct or piping above drop ceiling	Ceiling Decking	725 102915 PB AC9-11	11/6/2015	**49.36**	N/A
1-168B	Ceiling Tile (Top)	NA	725 102915 PB AC9-12	11/6/2015	16.44	N/A
1-168B	Beneath floor	NA	725 102915 PB AC9-14	11/3/2015	**131.51**	N/A
1-168	Concrete Ledge	NA	725 102915 PB AC9-15	11/9/2015	**58.83**	N/A
Area (AC-11)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
1-203	Floor	NA	725 102915 PB AC11-01	11/2/2015	**503.00**	N/A
1-203	Wall	NA	725 102915 PB AC11-02	11/2/2015	17.34	N/A
1-203	Ceiling	NA	725 102915 PB AC11-03	11/2/2015	**210.81**	N/A
1-203	Horizontal I-Beam, duct or piping	Top of Crane I-Beam	725 102915 PB AC11-04	11/2/2015	**670.00**	N/A
1-204	Floor	NA	725 102915 PB AC11-09	11/2/2015	**419.14**	N/A
1-204	Wall	NA	725 102915 PB AC11-10	11/2/2015	19.07	N/A
1-204	Ceiling	NA	725 102915 PB AC11-11	11/12/2015	10.98	N/A
1-204	Horizontal I-Beam, duct or piping	Inside Duct	725 102915 PB AC11-12	11/12/2015	**82.98**	N/A
		Top of Duct	725 102915 PB AC11-13	11/12/2015	**86.65**	N/A
		Top of Duct	725 102915 PB AC11-14	11/12/2015	**143.35**	N/A
		Rm 1-202 Top of Pipe	725 102915 PB AC11-15	11/12/2015	**139.18**	N/A
		Rm 1-202 Ceiling	725 102915 PB AC11-16	11/12/2015	5.65	N/A
Area (AC-14)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
1-111 - Library	Ceiling Tile (Top)	NA	725 102915 PB AC14-01	11/9/2015	8.18	N/A
1-111 - Library	Ceiling decking (above drop Ceiling)	NA	725 102915 PB AC14-02	11/9/2015	19.04	N/A
1-111 - Library	Wall	NA	725 102915 PB AC14-03	10/30/2015	1.80	N/A
1-111 - Library	Horizontal I-Beam or piping above drop ceiling	NA	725 102915 PB AC14-04	11/9/2015	23.17	N/A
1-111 - Library	Window ledge	NA	725 102915 PB AC14-05	10/30/2015	9.49	N/A
Outside 1-110C	Inside perimeter heat vent	NA	725 102915 PB AC14-06	11/13/2015	**170.61**	N/A

1-110C	Ceiling decking	NA	725 102915 PB AC14-07	11/9/2015	5.67	N/A
1-110C	Horizontal I-Beam, crane, duct or piping	NA	725 102915 PB AC14-08	11/9/2015	**145.47**	N/A
1-110C	Inside HVAC DUCT	NA	725 102915 PB AC14-09	11/9/2015	**113.11**	N/A
1-110C	Floor	NA	725 102915 PB AC14-10	10/30/2015	**148.80**	N/A
1-110C	Wall	NA	725 102915 PB AC14-11	10/30/2015	6.24	N/A
1-111 - Library	Window	NA	725 102915 PB AC14-12	10/30/2015	3.86	N/A
Area (AC-16)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
1-161	Walls	NA	725 102915 PB AC16-01	10/29/2015	11.50	N/A
1-161	Ceiling decking	NA	725 102915 PB AC16-02	11/4/2015	7.95	N/A
1-161	Floor	NA	725 102915 PB AC16-03	10/29/2015	27.91	N/A
1-161	Horizontal I-Beam, duct or piping	NA	725 102915 PB AC16-04	11/4/2015	**385.82**	N/A
1-161	Inside HVAC DUCT	NA	725 102915 PB AC16-05	10/29/2015	**450.48**	N/A
1-166	Walls	NA	725 102915 PB AC16-06	10/29/2015	13.08	N/A
1-166	Ceiling decking	NA	725 102915 PB AC16-07	11/4/2015	9.32	N/A
1-166	Floor	NA	725 102915 PB AC16-08	10/29/2015	**89.88**	N/A
1-166	Horizontal I-Beam, duct or piping	Top of Light Fixture	725 102915 PB AC16-09	10/29/2015	**141.56**	N/A
1-166	Inside HVAC DUCT	NA	725 102915 PB AC16-10 A	10/29/2015	**1692.43**	N/A
1-166	Inside HVAC DUCT	NA	725 102915 PB AC16-10 B	11/17/2015	**237.38**	N/A
AC-16 Corridor	Inside HVAC DUCT	Ductwork @ MER 8	725 102915 PB AC16-11	11/4/2015	**4274.23**	N/A
1-164	Inside HVAC DUCT	NA	725 102915 PB AC16-12	11/17/2015	**973.53**	N/A
AC-16 Corridor	Horizontal I-Beam, duct or piping	Near 1-167	725 102915 PB AC16-13	11/4/2015	**57.61**	N/A
1-166	Inside HVAC Return	NA	725 102915 PB AC16-14	10/29/2015	**216.45**	N/A
1-166	Top of Cabinet, under diffuser	NA	725 102915 PB AC16-15	10/29/2015	**52.31**	N/A
1-161	Inside HVAC Return	NA	725 102915 PB AC16-16	10/29/2015	**193.38**	N/A
1-165	Ceiling Shelf	NA	725 102915 PB AC16-17	11/4/2015	**52.26**	N/A
Area (AC-17)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**

1-171	Walls	NA	725 102915 PB AC17-01	10/29/2015	8.42	N/A
1-171	Ceiling decking (above drop Ceiling)	NA	725 102915 PB AC17-02	11/9/2015	8.71	N/A
1-171	floor	NA	725 102915 PB AC17-03	10/29/2015	**348.59**	N/A
1-171	Horizontal I-Beam, duct or piping above drop ceiling	HVAC Duct	725 102915 PB AC17-04	11/9/2015	38.66	N/A
1-169	Beneath floor	Rectangular Mancover	725 102915 PB AC17-05	11/17/2015	**155.59**	N/A
1-169	Walls	NA	725 102915 PB AC17-06	10/29/2015	3.29	N/A
1-177	Walls	NA	725 102915 PB AC17-07	10/30/2015	9.78	N/A
1-175	Ceiling decking (above drop Ceiling)	NA	725 102915 PB AC17-08	11/16/2015	14.60	N/A
1-177	Floor	NA	725 102915 PB AC17-09	10/30/2015	**123.47**	N/A
1-175	Horizontal I-Beam, duct or piping above drop ceiling	NA	725 102915 PB AC17-10	11/16/2015	30.47	N/A
1-181	Beneath floor	NA	725 102915 PB AC17-11	11/3/2015	**74.91**	N/A
1-181	wall	NA	725 102915 PB AC17-12	10/30/2015	7.16	N/A
1-181	Horizontal I-Beam, duct or piping above drop ceiling	Top of Ceiling Tile	725 102915 PB AC17-13	11/9/2015	11.59	N/A
1-171	Inside HVAC	NA	725 102915 PB AC17-14	11/9/2015	**61.15**	N/A
Area (AC-Unknown)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
Tunnel to 535	Ceiling	NA	725 102915 PB AC6-10	11/2/2015	13.44	N/A
Tunnel to 535	Wall	NA	725 102915 PB AC6-11	11/2/2015	1.05	N/A
Tunnel to 535	Floor	NA	725 102915 PB AC6-12	11/2/2015	32.24	N/A
Area (MER 1)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
MER-1	Walls	Air Handler	725 102915 PB MER1-01	11/3/2015	5.92	N/A
MER-1	Ceiling decking	NA	725 102915 PB MER1-02	11/12/2015	7.95	N/A
MER-1	floor	NA	725 102915 PB MER1-03	11/3/2015	**113.41**	N/A

MER-1	Horizontal I-Beam, duct or piping above drop ceiling	Top of Pipe	725 102915 PB MER1-04	11/12/2015	39.56	N/A
Area (MER 2)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
MER-2	Walls	NA	725 102915 PB MER2-01	11/2/2015	19.61	N/A
MER-2	Ceiling decking	NA	725 102915 PB MER2-02	11/2/2015	7.60	N/A
MER-2	floor	NA	725 102915 PB MER2-03	11/2/2015	**215.45**	N/A
MER-2	Horizontal I-Beam, duct or piping above drop ceiling	Top of Duct on Mezzanine	725 102915 PB MER2-04	11/2/2015	**84.37**	N/A
Area (MER 3)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
MER-3	Walls	NA	725 102915 PB MER3-01	11/3/2015	9.50	N/A
MER-3	Ceiling decking	NA	725 102915 PB MER3-02	11/17/2015	14.83	N/A
MER-3	floor	NA	725 102915 PB MER3-03	11/3/2015	**232.10**	N/A
MER-3	Horizontal I-Beam, duct or piping above drop ceiling	On Sprinkler Pipe on Mezzanine	725 102915 PB MER3-04	11/3/2015	**50.36**	N/A
MER-3	Walls	Air Handler	725 102915 PB MER3-05	11/3/2015	3.33	N/A
MER-3	Floor	1-115	725 102915 PB MER3-06	11/3/2015	**499.89**	N/A
MER-3	Walls	1-115 Air Handler	725 102915 PB MER3-07	11/3/2015	**2589.50**	N/A
Area (MER 3A)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
MER-3A	Walls	NA	725 102915 PB MER3A-01	11/3/2015	11.62	N/A
MER-3A	Ceiling decking	NA	725 102915 PB MER3A-02	11/17/2015	20.72	N/A
MER-3A	floor	NA	725 102915 PB MER3A-03	11/3/2015	**169.59**	N/A
MER-3A	Top Side of Dropped Ceiling Tile	NA	725 102915 PB MER3A-04	11/3/2015	37.09	N/A
Area (MER 4)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
MER-4	Walls	NA	725 102915 PB MER4-01	11/3/2015	13.09	N/A
MER-4	Ceiling decking	NA	725 102915 PB MER4-02	11/17/2015	8.70	N/A
MER-4	floor	NA	725 102915 PB MER4-03	11/3/2015	**127.62**	N/A

MER-4	Horizontal I-Beam, duct or piping	Top of Pipe	725 102915 PB MER4-04	11/17/2015	**64.73**	N/A
Area (MER 5)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
MER-5	Walls	NA	725 102915 PB MER5-01	11/3/2015	11.97	N/A
MER-5	Ceiling decking	NA	725 102915 PB MER5-02	11/17/2015	7.14	N/A
MER-5	floor	NA	725 102915 PB MER5-03	11/3/2015	**227.08**	N/A
MER-5	Horizontal I-Beam, duct or piping	Top of pipe	725 102915 PB MER5-04	11/17/2015	18.40	N/A
Area (MER 7)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
MER-7	Walls	NA	725 102915 PB MER7-01	11/3/2015	4.71	N/A
MER-7	Ceiling decking	NA	725 102915 PB MER7-02	11/10/2015	0.09	N/A
MER-7	floor	NA	725 102915 PB MER7-03	11/3/2015	**59.53**	N/A
MER-7	Horizontal I-Beam, duct or piping	NA	725 102915 PB MER7-04	11/10/2015	**95.81**	N/A
Area (MER 8)	**Sample Location Description**	**Notes**	**Sample ID**	**Sample Collected Date**	**XRF Pb Analysis Results (ug/ft²)**	**Off-site Pb Analysis Results (ug/ft²)**
MER-8	Walls	NA	725 102915 PB MER8-01	11/3/2015	10.10	N/A
MER-8	Ceiling decking	NA	725 102915 PB MER8-02	11/10/2015	11.64	N/A
MER-8	floor	NA	725 102915 PB MER8-03	11/3/2015	**258.94**	N/A
MER-8	Horizontal I-Beam, duct or piping	Top of Pipe	725 102915 PB MER8-04	11/10/2015	**221.59**	N/A


NSLS
BUILDING 725
1st FLOOR
X-RAY
STORAGE
RING
VUV
STORAGE
RING
VUV
MEZZANINE
NORTH CORRIDOR 132B
TRANSFORMER
VAULT
MECHANICAL EQUIPMENT RM
NO. 4
NSLS
LIBRARY
NSLS
STOCKROOM
MECHANICAL
EQUIPMENT
ROOM 2
ELECTRICAL
SHOP
RF EQUIP. ROOM
COURTYARD
TRAILER
MECH. EQUIP.
ROOM "A"
BOOSTER
RING
CONTROL
ROOM
181
LEGS
168
WEST
ROLL-UP
DOOR
151A
EAST
ROLL-UP
DOOR
MECHANICAL ROOM
NO.8
GEORGE
HUMMER
MEMORIAL
LOUNGE
LOBBY
AREA 3
AREA 1
USER SHOP
CLEAN ROOM
RECEPTION
ANGIOGRAPHY
LOUNGE
STORAGE

BROOKHAVEN NATIONAL LABORATORY

Attendance Roster

NSLS HAZARDS CLOSEOUT

Date: February 26, 2016 Location: Building 725, Conf. Rm. C

	Life #	First Name (print)	Last Name (print)	Dept/Div
1.	J8419	Michelle	McQueen	DH
2.	18112	Michael	Clancy	EP
3.	20500	Jason	Remien	ES
4.	17246	Christopher	Weilandics	HP
5.	26814	SRIKANTHA	CHILAKALA	HP.
6.	24818	MARK	MARCO	HP
7.	19497	Lori	Stiegler	HP
8.	24022	Bruno	Semon	HP
9.	22039	Mike	Goffrey	HP
10.	23534	Joe	Terrano	EN.
11.	N6939	ROBERT	CARATONNA	BHSO
12.	20826	Dennis	Ryan	RP
13.	N8926	TONY	LOE	DH
14.	17351	DONNA	KING	PPM
15.	22032	Debbie	Bauer	ES
16.	22585	Steve	Fernow	EP
	18541	JOANN	GIAMBALVO	FM

BROOKHAVEN NATIONAL LABORATORY

Attendance Roster

NSLS Hazards Closeout

Date: February 26, 2016 Location: Building 725, Conf. Rm. C

	Life #	First Name (print)	Last Name (print)	Dept/Div
1.	15686	Nicole	Bernholc	HP
2.	19328	Robert	Sehr	HP
3.	24873	Eugene	Santiago	SHS
4.	22941	John	Peters	HP
5.	24256	ED	Nowak	HP
6.	22599	Les	Hill	DH
7.				
8.				
9.				
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