NSLS Hazard Removal Project

Project Closeout Briefing
4.14.16
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U.S. DEPARTMENT OF ENERGY

BROOKHAVEN NATIONAL LABORATORY
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Outline

- Hazard Removal Summary
- Facility End State
- Residual Hazards- Dispersible Metals
- Material Recycling
- Safety, Cost and Schedule Performance
- Hazard Removal Reviews & Project Closeout

Key Points

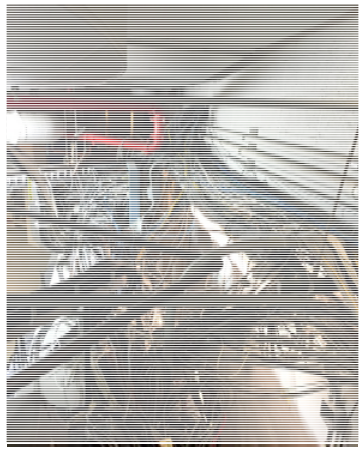
- Hazards including radioactive material removed with exception of dispersible lead and cadmium
- Residual lead will need to be carefully managed to protect workers and prevent migration to 2nd Floor
  - Conditions well documented in Closeout Report which will be linked to FUA
  - Suggest placeholder of $2.5M for future cleanup
- Project performance
  - Perfect safety record
  - Accomplished much more scope for $7.4M than anticipated
  - Work completed by 3/31/16 was about nine months ahead of conceptual schedule presented to DOE in August 2014

Project Mission

...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.

Non-Radiological Hazards

- Hazards identified during characterization/project execution (*)
  - Asbestos*
  - Beryllium components*
  - Dispersible beryllium*
  - Dispersible lead & cadmium
  - Biohazards
  - Chemicals, experimental samples, indium gallium
  - Compressed gases
  - Confined spaces
  - Sources of electrical/mechanical energy
  - Flammables/combustibles



Non-Radiological Hazards

- More…
  - Lead shielding
  - Magnetic fields
  - Risk/potential for nanomaterials
  - Equipment containing residual oil/Freon (e.g., pumps, refrigerators)
  - Physical hazards
  - Laboratory hoods/sinks
  - *Unknowns*

Unknowns

Radiological Hazards

- Radioactive/potential radioactive materials & equipment
  - Accelerator components (e.g., magnets, beam pipes, insertion devices) in:
    - Linac
    - Booster
    - Transport lines
    - VUV ring
    - X-Ray ring
  - DU shutters
  - Radiological sources

- No historical or present day evidence of loose contamination

Facility Sweep

- Poor housekeeping was significant source of risk/unknowns
- Waste Management SMEs & RCTs performed sweep of NSLS 1st and 2nd Floors, RF Penthouse to identify unknowns
  - Rooms, hutches, cabinets, debris field, etc.
- Resulting contraband/hazmat packaged & disposed ☑
  - Chemicals
  - Sharps
  - Biological wastes
  - PCB wastes
  - Unknowns
- Remaining non-hazardous equipment & debris disposed
- Risk of unknowns eliminated

Hazard Removal Summary

- Asbestos
  - Facility survey performed by outside contractor for MPO
    - Lobby ceiling ACM (to be remediated by F&O)
  - Gypsum board, laboratory countertops, hoods, insulation, etc., evaluated by BNL Steam Shop
    - 6 Laboratory hoods (transite backing) – Labelled
    - Booster/Linac Ceiling – samples free of ACM
    - Infrastructure insulation – samples free of ACM

- Beryllium components ☑
  - Beryllium windows removed/disposed
  - Copper-beryllium components removed/disposed
  - Post-removal work areas surveyed and cleared

Hazard Removal Summary

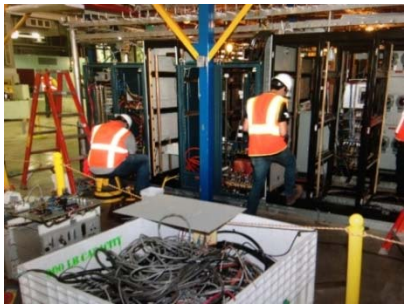
- Dispersible beryllium at X-17 hutch ☑
  - Contamination removed
  - Area surveyed and cleared
- Dispersible lead/cadmium
  - Lead, cadmium throughout 1st Floor and in interior of HVAC ductwork (not funded and included in project plan)
  - More later…
- Biohazards ☑
  - Removed/disposed
- Chemicals, experimental samples, etc. ☑
  - Removed/disposed
  - HRP chemicals used/transferred

Hazard Removal Summary

- Compressed gases ☑
  - Removed/disposed
- Confined spaces ☑
  - MERs/air handlers: F&O
  - Booster cave removed
  - Remaining confined spaces posted in accordance with Lab requirements

Hazard Removal Summary

- Potential sources of electrical/mechanical energy (research systems) ☑
  - Experimental cooling water systems
  - Compressed air system
  - Vacuum system
  - Electric power distribution, power supplies, instrumentation, cables, racks, etc.



- Research systems removed ☑
  - Accelerators and associated support systems
  - Beamlines and associated equipment
  - Electrical/mechanical systems removed essentially back to points of interface with Building 725 infrastructure
  - Interface points left in inherently safe configuration (air gapped, capped, blanked, etc.)
  - Single line diagrams & panel schedules revised

Hazard Removal Summary

- Flammables/combustibles ☑
  - Removed/disposed
  - HRP flammables/combustibles used/transferred
- Lead shielding ☑
  - Over 500,000 pounds (>> 99.9%) removed/disposed
  - Remaining shielding
    - Steel encapsulated lead in X-17 hutch, nonhazardous in current state
    - Approximately 400 lbs. (total) at HVAC penetrations

Hazard Removal Summary

- Magnetic fields ☑
  - Hundreds of ion pumps removed/disposed
  - Insertion devices removed/disposed

- Nanomaterials ☑
  - No history of unbound nanomaterials in the NSLS
  - Suspect ductwork removed

- Experimental equipment containing residual oil/Freon ☑
  - Pumps moved/disposed
  - A/C or refrigeration units evacuated or removed/disposed

Hazard Removal Summary

- Physical hazards ☑
  - Trash/debris removed/disposed
  - Most removed via equipment and debris removal

- Laboratory hoods/sinks ☑
  - Sink traps sampled/laid up per SOP
    - No mercury, rad
  - Hoods sampled/laid up per SBMS requirements
    - No perchlorates

Hazard Removal Summary

- Unknown hazards ☑
  - Identified by WM - removed/disposed

- Radiological hazards/waste ☑
  - Magnets, vacuum chambers, accelerator components, insertion devices removed/disposed
  - RMCAs rad surveys performed
  - NSLS free of radioactive material

End State

- 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
- Research mechanical systems removed essentially back to the Building 725 MERs; open ends of piping systems capped

End State

- Electrical systems, equipment, instrumentation and associated commodities (e.g. cable trays, conduits, etc.) removed; electrical systems air gapped at facility interface points
- RMCAs 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 research infrastructure
- Building 725 free of chemicals, materials, equipment and debris associated with previous research operations

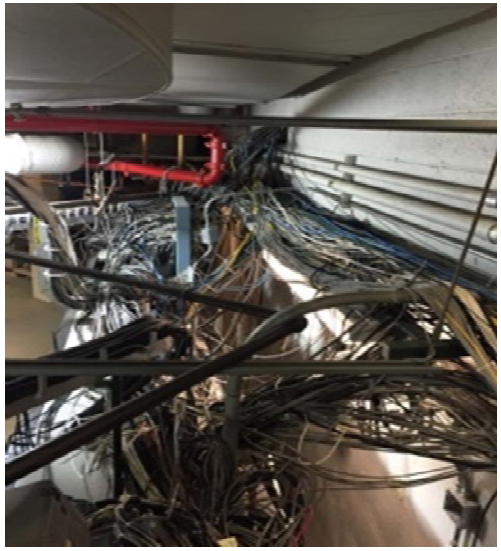
VUV High Bay

X-Ray Ring

Booster

X-Ray Experimental Floor

Electrical Commodities



Residual Floor Contamination- 1st Floor

- Last pass with HEPA vacuum made across entire 1st Floor
- Immediately followed by 20-location swipe survey (analyzed on site with XRF)
- Lobby and occupied areas in vicinity of or below 40µg/ft^2 housekeeping standard
- Most industrial areas (majority of floor area) in the 150-700µg/ft^2 range
- Full data set included in Closeout Report

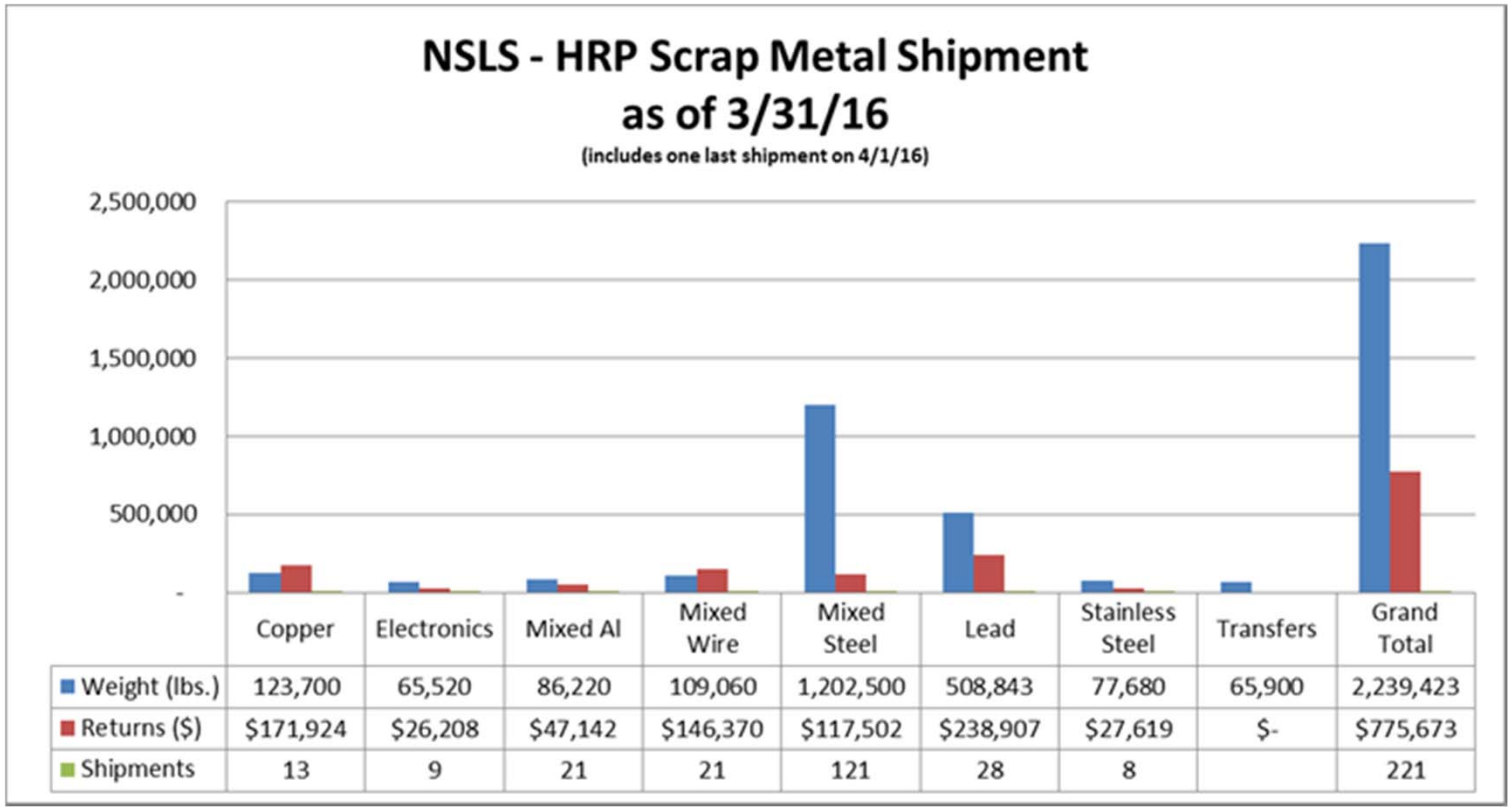
Other 1st Floor Residual Lead Contamination

- All Building 725 HVAC systems internally contamination…noted during facility characterization
  - Quantifiable levels of lead found during characterization with 1,000µg/ft^2 max
  - 20 or 21 supplemental wipe samples taken with 4,000µg/ft^2 max
- Exposed horizontal surfaces throughout 1st Floor
  - 200 supplemental wipe sample campaign during November 2015
  - Overhead & wall samples generally less than housekeeping standard
  - Depositional areas (tops of structural shapes and ledges, top surfaces of electrical and mechanical equipment, etc.)typically in 300-800µg/ft^2 range with some locations > 4,000µg/ft^2
- Full data set available via Closeout Report

Lead Contamination- 2nd Floor

- January 2015 characterization: 88 of 93 samples with quantifiable levels
- Most reliable data that is available
- 1.1 µg/ft^2 to 110µg/ft^2 lead range (typical)
- Full data set included in characterization report

NSLS Material Recycling



	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

Radioactive Waste Volume Reduction

- Built on lessons learned from SLAC
- Over one million pounds of equipment was removed from NSLS RMCAs and surveyed
- Where cost effective, large components (e.g. 18,000 lb. dipole magnets) disassembled to isolate radioactive subcomponents
- Hundreds of thousands of pounds of low level radioactive waste generation avoided, also increased volume of high-value recycle stream (e.g. copper coils)
- Final mass of radioactive waste was less than 70,000 pounds or only about 7% of that removed from the RMCAs

Project Closeout/Facility Transfer

- Property
  - Barcoded property found during HRP dispositioned through PPM
  - Property in use dispositioned during demobilization
- Fire protection
  - Run Cards to be updated by F&O
  - Fire protection will remain operational
- Life safety
  - Building egress paths are clear
  - Exit doors operational
  - Emergency Lights operational
  - Walk-down performed w/Lab SME

Project Closeout/Facility Transfer

- Security
  - Main doors, 2nd Floor: Under F&O control throughout HRP
  - 1st Floor turned over to F&O on 4/1/16
- Signs, Tags, Postings
  - HRP construction zones de-posted
  - Facility postings updated by F&O in accordance with BNL requirements
- SAD/ASE surrendered
- FUA revision in progress
- Facility reviews conducted with BNL SMEs
- Closeout Report will be published today