Demolition & Decommissioning of High Flux Beam Reactor Building 705 (The Stack)

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Community Advisory Council
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US Army Corps of Engineers®

Olgoonik FPM JV, LLC

with Teaming Partners
Cabrera Services, Inc.
ICC Commonwealth
GEI

U.S. DEPARTMENT OF ENERGY

BROOKHAVEN NATIONAL LABORATORY

Introduction

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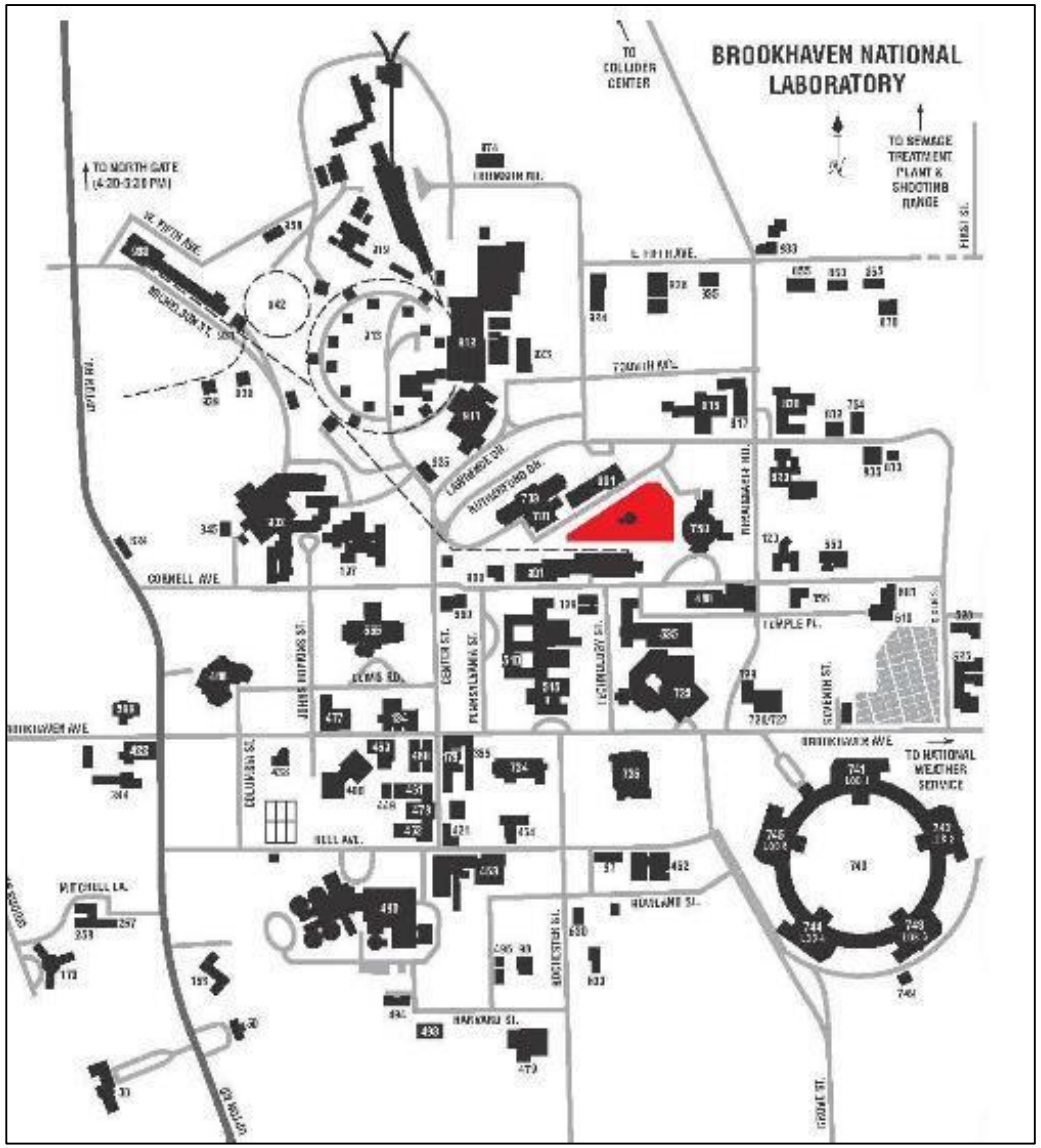
Tonight's presentation and discussion:
- Background
- Process
- Analysis of Alternatives
- Implementation of remedy

Questions:
- For clarifying? At any time.
- Deeper dive? Save for the end, please.



Background

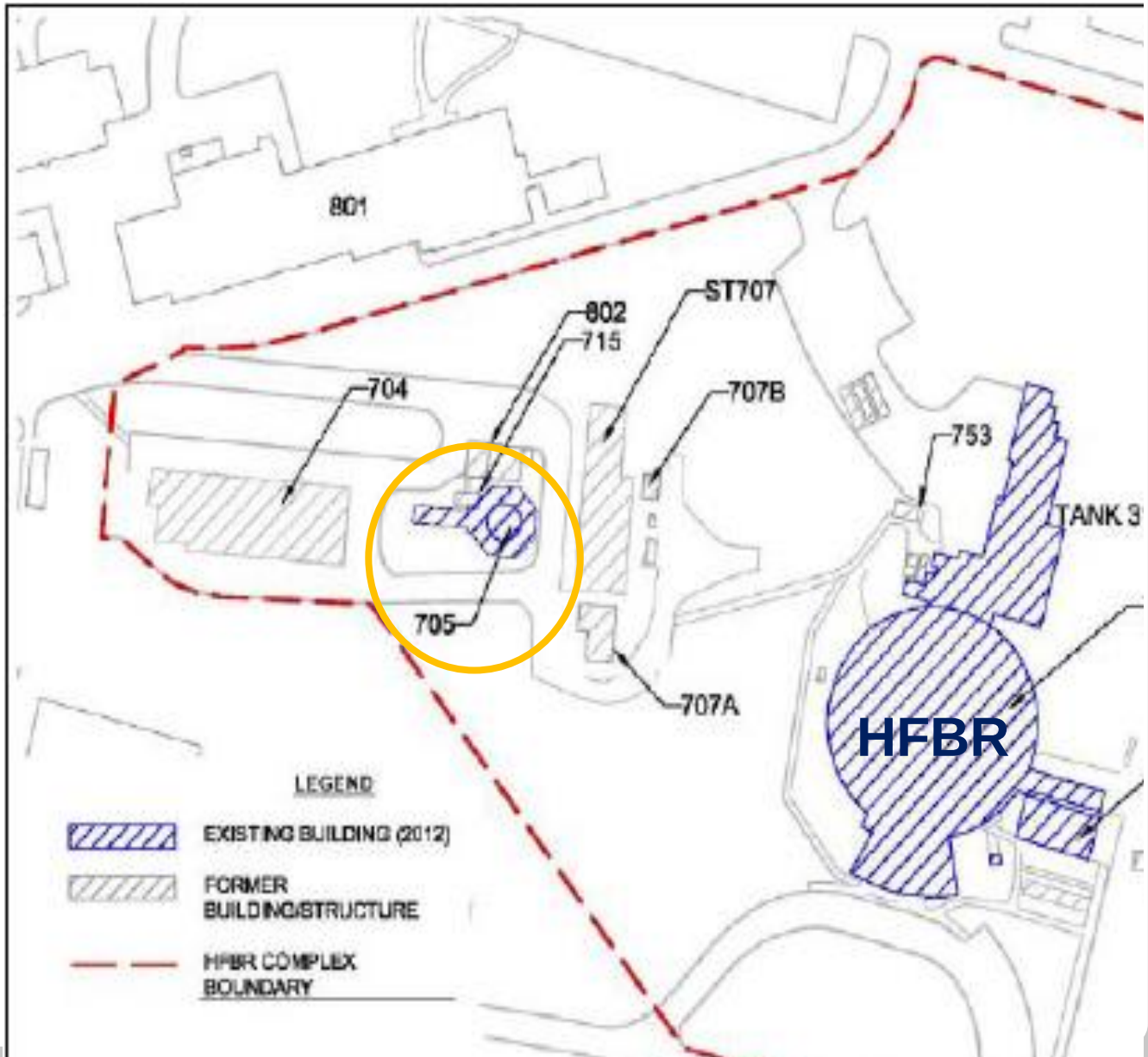
1950-1968: BNL operates Brookhaven Graphite Research Reactor (BGRR) for DOE.

1965-1996: BNL operates High Flux Beam Reactor (HFBR) for DOE.

1999: DOE closes HFBR permanently.

2009: DOE and EPA sign HFBR Record of Decision (ROD) with concurrence of NYS Department of Environmental Conservation.

By September 30, 2020: Per ROD, DOE Office of Environmental Management (EM) dismantles and disposes of Stack, plus below-ground structures and surrounding soils.



Process

Analysis of Alternatives (AoA)

2017: DOE EM hires U.S. Army Corps of Engineers (USACE) to conduct an AoA for stack demolition.

Goals of the AoA:

- **Identify and evaluate alternatives and risks, especially:**
  - Worker safety, human health, and the environment
  - Project cost and schedule
  - Impact of demolition and vibration on BNL operations and machines/instruments

- **Outline path to regulatory compliance** for each alternative.

Process

Analysis of Alternatives Results

AoA concludes: Multiple techniques/methods available for ROD completion

- **Viable Techniques:** Toppling, segmentation, hydrologic crushing; each has pros and cons
- **Critical Criteria: Vibration** – AoA recommended analysis of seismic effects of each demolition technique to measure impact on sensitive laboratory equipment. The vibration analysis defined constraints for stack dismantlement project.
- **Safest, most cost-effective alternative:** Unmanned hydraulic machinery

Process

Contract Award - January 2020

Olgoonik-FPM JV contracted to conduct stack dismantling and disposal using the remote controlled “hydraulic breaking” method. Project team includes:

- **Olgoonik-FPM Joint Venture (OFJV)** Prime Contactor
  - Dave Forse – Health and Safety
- **ICC Commonwealth (ICC)** Internal/External Stack Structure Removal
  - Pat Jenkins – Exterior Coating Abatement
  - Joe Sheehan – Demolition Means and Methods
    - Design, build, inspect, repair and demolish stacks/chimneys since 1927
    - Since 2013, completed 33 stack/chimney demolitions using MANTIS demolition machine, which will be used on the stack
- **Cabrera Services Inc.** Radiological and Waste Management
  - Mike Winters – Radiological Controls
  - Rob Frank - Waste Transportation and Disposal
- **GEI Consultants** Vibration Monitoring and Management

Process

Schedule (subject to delays due to COVID-19)

Spring 2020: Preparation of Environmental, Health, and Safety Work Plans

Early Summer 2020: Mobilization and Site setup

Summer 2020: Exterior Coating Abatement and Exterior Structures Removed

Late Summer/Early Fall 2020: Stack Demolition

Fall 2020: Soil Excavation and Shipment

Winter 2020: Final Status Survey, ORISE Verification, Site Restoration, and Closeout

Remedy Implementation

Stack Demolition

- **Employ Ultra High Pressure (UHP) closed loop coating-abatement system:**
  - Exterior paint contains asbestos and lead
  - Maximizes efficiency as coatings are removed and contained in one process
  - Removes exterior paint and minimize exposure to hazardous materials
  - Eliminates multiple handlings of waste streams

- **Employ the MANTIS System:**
  - Reduces worker exposure to silica and to “white glove/finger syndrome” associated with other demolition processes
  - Start at top and work downward with demolition debris dropped into the stack as it is generated

Remedy Implementation

Stack Demolition

- **Exterior Coating Abatement**
  - Exterior coating and water are pumped to a vacuum box lined with an asbestos-approved bladder bag.
  - During abatement, wastewater runs to a holding tank. Holding tank water is then treated through a series of filters.
  - Water tested after filtration to verify process performed as expected.
  - Discharge to BNL's Sewage Treatment Plant in accordance with permit conditions, or transport to an approved off-site disposal facility.
  - Air monitoring done throughout entire abatement process.

Ultra High Pressure Collection & Abatement

Holding tanks (blue, at right) store liquids after they are removed and vacuumed off the stack wall. Filtration system (yellow skid) treats water, which is pumped (blue pump) to white storage container (at left).

Remedy Implementation

Stack Demolition

- **MANTIS System**
  - Only requires a crane for the installation & removal of the equipment, and is supported by the stack itself during demolition operations.
  - Debris is controlled by using the MANTIS to direct the debris' center of gravity to the inside of the stack, away from the personnel access platform.
  - Demolition methodology utilizes the stack itself as a debris control system, as the demolished concrete is contained within the stack at all times and collected at grade.

Remedy Implementation

MANTIS System (cont'd)

- The K-Bracket personnel access platform design incorporates a "sealed" deck that contains all material and small debris by utilizing a rubber belt around the circumference of the stack, in conjunction with plywood decking and outer vertical guard, and heavy debris netting that extends outward at the top of the handrail.

- The Mantis and K-Bracket platform are totally independent of one another, providing protection to the workers.

- The MANTIS is run by electric and controlled by remote, which removes hazards associated with using fuel and allows the operator to remain on the working deck at all times.

- **Dust suppression** - A sophisticated system has been developed over the years, which consists of water suppression at the hammer head and at the MANTIS base (both directed at the point of impact on opposite sides of the stack wall), broadcast sprayers at the MANTIS boom directed downward, multiple levels of full circumference suppression within the stack itself and at grade directed at the debris pile, as well as personnel stationed at multiple locations to perform supplementary "spot suppression" as needed.

Remedy Implementation

Safety compliance:

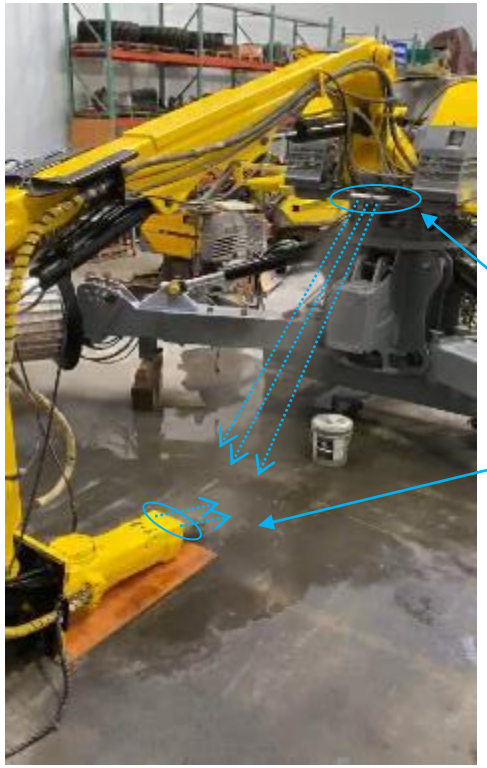
- USACE EM-385-1-1 Safety Manual
- DOE Safety Regulations (10 CFR 835, 10 CFR 851)

Demolition dust and emission controls protect potential receptors on- and off-site:

- Dust suppression
- Real-time dust monitoring
- On-site sample analysis, and
- Confirmatory fixed-base analytical sampling

Air sampling to be conducted during <u>all</u> site preparation, abatement, demolition, excavation, and load-out activities

- Monitoring to include <u>real-time</u> measurements from air monitoring stations with TSI DustTrak respirable dust monitors.



Water nozzles on MANTIS and at hammer impact point

Remedy Implementation

Top safety considerations for the workers

- Working at height
- Heat stress
- Exposure to silica dust
- Heavy equipment and trucking (trucks, crane, loader, excavator, bulldozer operations. etc.)

What will the workers and air be monitored for?

- Asbestos and lead for the stack coating abatement workers
- Silica and Radiation personal monitoring for stack demo workers within the exclusion zone
- PM_{10} monitoring at the Community Air Monitoring Plan (CAMP) boundary

Types of PPE to be used

- General Level D for all site workers at minimum (i.e. hard hat, safety shoes and glasses)
- Nitrile gloves, Tyvek coveralls, safety glasses or shields and respirators using N100 & P100 cartridges for workers in contact with contamination
- Covid-19 consideration (if required -face covering cloth or fiber mask)

Remedy Implementation

Air monitoring equipment placed

- Placed on workers for silica and radiation monitoring for active stack workers
- CAMP monitoring boundary at 300’ radius from stack
- BNL will also have monitoring stations outside the construction area and along the site boundary

Weather related conditions affecting work

- Lightning
- Very heavy rain
- High winds above 30mph
- Heat/Cold stress
- Hurricane
- Snow

Remedy Implementation

Radiological Characterization, Identified Hazards & Controls

Radiological Control (RadCon) Program

- Utilizing trained workers in personal protective equipment/clothing.
- Handling demolition debris carefully in accordance with stringent radiological requirements to ensure contamination is controlled.
- Focusing on stack interior surfaces and installed components with low levels of fixed and removable contamination.
- Conducting ongoing monitoring to verify expected conditions.

Remedy Implementation

Radiological Characterization, Identified Hazards & Controls

What media has been sampled?

- Over the past 20 years the Building 705 Stack has been radiologically characterized by analyzing concrete core samples, surface contamination (swipes), stack drain water, sediment, soil, and air samples

What were the samples analyzed for?

- Based on knowledge and review of the operating history of both the BGRR and HFBR, samples have been taken during multiple campaigns to define the radioactive constituents. Samples were analyzed for gross alpha, gross beta, gamma spectroscopy as well as the entire Thorium, Uranium and Plutonium series.

What did we find or learn from the results?

- The primary radionuclides present were Cesium-137 (Cs-137), Tritium (H-3) and Strontium-90 (Sr-90) with the total estimated Curie content present in the Stack concrete of 29.7 millicuries (2005) . Additional isotopes were identified at several orders of magnitude less than the primary isotopes and included Plutonium 239/240, Americium-241, Radium-226.
- Contamination in the concrete is limited to the first 1/2 to 3/4 of an inch inside the stack.
- Airborne Emissions - Modeling using this data shows that radionuclide particulate emissions from demolition work meets 40 CFR 61 (NESHAPS), i.e., it is protective of worker, public and environmental health

Remedy Implementation

Radiological Characterization, Identified Hazards & Controls

Radiological Controls for Demo and Excavation Activities

- Demolition and handling of stack debris generates the greatest potential for particulate.
- Water dust suppression emitters on the Mantis and along the path of debris down to the Stack base will be used when dust is generated during demolition.
- Water dust suppression will also be used during excavation of contaminated soils and buried contaminated components.

Remedy Implementation

Soil Excavation

Delineation-and-excavation method to assure removal of contaminated soil and minimizes removal of uncontaminated soil

- Conducted after stack demolition in areas around the pedestal and silencer
- Before excavation, sample soil at 6 inches and 1 foot below grade
- Excavate to depth based on sample results
- Post-excavation confirmation sampling
- Continued excavation until cleanup levels achieved
- Unaffected soil stockpiled for potential re-use as fill at site
- Water truck for dust suppression
- Final Status Surveys and ORISE independent verification surveys to be utilized.

Remedy Implementation

Waste Transportation and Disposal

- **Stack Debris handled in Inter Modal Containers (IMCs)**
  - Empty IMCs brought to site via rail and staged at rail spur
  - Roll-off trucks will transport IMCs to stack for loading
  - Materials will be direct-loaded into IMCs and then returned to rail spur staging area
  - IMCs loaded onto railcars and shipped for disposal
- **Contaminated Soil**
  - Impacted soils will be loaded into super-sacs and loaded into rail gondolas for transport

Stack Debris and Soil will be transported to US Ecology in Idaho for disposal

Remedy Implementation

Waste Transportation and Disposal

- Waste Water (dust suppression and storm water) collected from Stack Drain tank and from excavations
    - Collected on site for analysis and transport to an approved off-site disposal facility.

Waste water will be disposed of at Waste Control Specialists, Andrews, TX

Project Closeout

- Final Closeout Report will be prepared documenting the following:
  - Decommissioning activities
  - Final Status Survey Report showing that cleanup goals were met
    - Top of pedestal (at grade)
    - Soil
  - ORISE Verification Survey results
  - Waste Disposal Actions
  - Details of site restoration
  - Lessons Learned
  - Stakeholder involvement
  - Project Costs
- Closeout Report will be submitted to regulators for review and approval

Building 705 (The Stack)

Questions and discussion