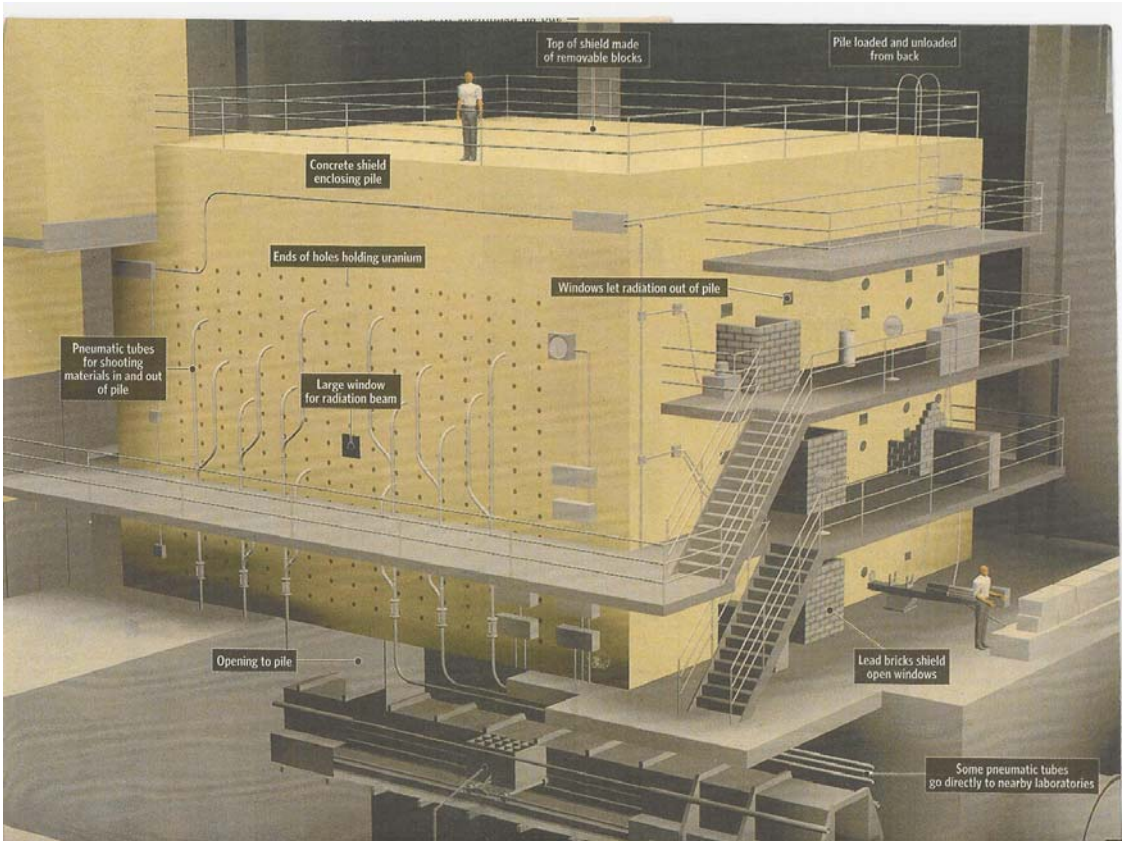
Brookhaven Graphite Research Reactor Decommissioning Project

FINAL
Remedial Design/Remedial Action Work Plan
For the
Biological Shield Removal



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BROOKHAVEN NATIONAL LABORATORY
BROOKHAVEN SCIENCE ASSOCIATES
Under Contract No. DE-AC02-98CH01886 with the
UNITED STATES DEPARTMENT OF ENERGY

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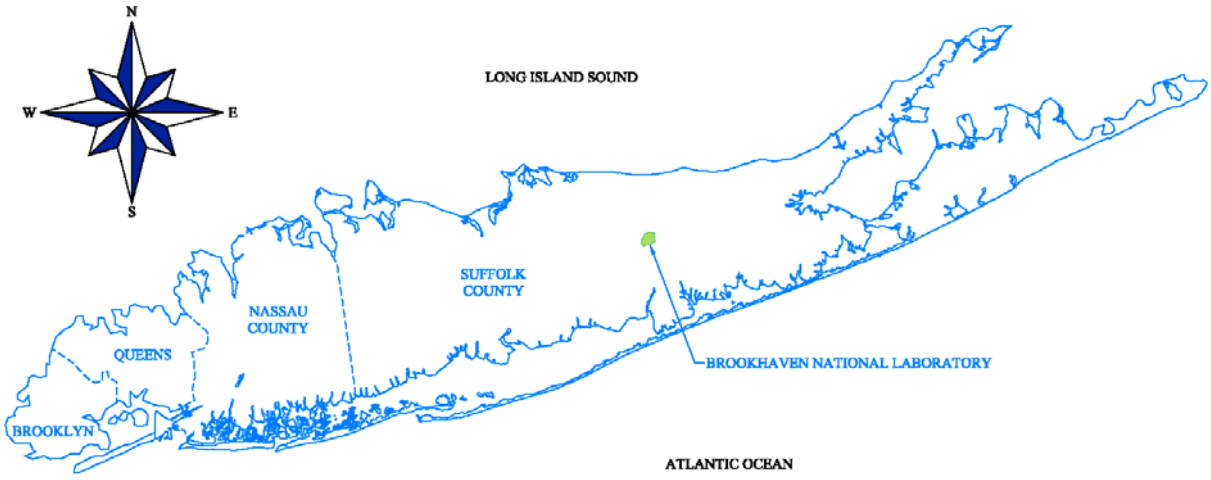
1.0 INTRODUCTION

This Remedial Design/Remedial Action (RD/RA) work plan presents the approach that will be used for biological shield removal associated with Area of Concern (AOC) 9, Brookhaven Graphite Research Reactor (BGRR) Brookhaven National Laboratory (BNL).

1.1 Site Background

BNL is a federal facility owned by U.S. Department of Energy (DOE). The DOE conducts research in physical, biomedical and environmental sciences and energy technologies. Brookhaven National Laboratory is located about 60 miles east of New York City, in Upton, Suffolk County, New York, near the geographic center of Long Island (Figure 1-1). Distances to neighboring communities from BNL are as follows: Patchogue ten miles west-southwest, Bellport eight miles southwest, Center Moriches seven miles southeast, Riverhead 13 miles east, Wading River seven miles north-northeast, and Port Jefferson eleven miles northwest.

Figure 1-1: Regional Site Location Map.



The BNL property, consisting of 5,321 acres, is an irregular polygon, and each side is approximately 2.5 miles long. The developed portion of the BNL Site includes the principal facilities, which are located near the center of the BNL Site on relatively high ground. The developed portion is approximately 900 acres, 500 acres of which were originally developed for Army use. The remaining 400 acres are mostly occupied by various large research machine facilities. The outlying facilities occupy approximately 550 acres and include an apartment area, Biology Field, Former Hazardous Waste Management Area, Sewage Treatment Plant, firebreaks, and the Former Landfill Area. The terrain is gently rolling, with elevations varying between 40 to 120 feet above mean sea level. The land lies on the western rim of the shallow Peconic River watershed, with a tributary of the Peconic River rising in marshy areas in the northern section of

the tract. The sole-source aquifer beneath BNL comprises three water-bearing units: the upper glacial deposits, the Magothy Formation, and the Lloyd Sand Member of the Raritan Formation. These units are hydraulically connected and make up a single zone of saturation with varying physical properties extending from a depth of five to 1,500 feet below the land surface. These three water-bearing units are designated as a "sole source aquifer" by the U.S. Environmental Protection Agency (EPA) and serve as the primary source of drinking water for Nassau and Suffolk Counties.

The BGRR is centrally located within the BNL Site (Figure 1-2, Location of the BGRR on BNL Site). Figure 1-3 illustrates the BGRR complex and the location of the pile within the complex.

1.2 Site History and Enforcement Activities

The U.S. Army occupied the BNL Site, formerly Camp Upton, during World Wars I and II. Between the wars, the Civilian Conservation Corps operated the BNL Site. It was transferred to the Atomic Energy Commission in 1947, to the Energy Research and Development Administration in 1975, and to DOE in 1977. Brookhaven Science Associates (BSA) operates BNL under a contract with DOE. In 1980, the BNL Site was placed on the New York State Department of Environmental Conservation's (NYSDEC) list of Inactive Hazardous Waste Sites. On November 21, 1989, the BNL Site was included on U.S. Environmental Protection Agency's (EPA's) National Priorities List because of soil and groundwater contamination that resulted from the Laboratory's past operations. Subsequently, the EPA, NYSDEC, and DOE entered into a *Federal Facilities Agreement* (CERCLA-FFA, 1992) (herein referred to as the Interagency Agreement; [IAG]) that became effective in May 1992 to coordinate the cleanup.

The BGRR at BNL was the first reactor built for the sole purpose of providing neutrons for research. During its years of operation, it was one of the principal research reactors in the United States. Construction was completed in August 1950, and initial criticality of the reactor was achieved the same month. The BGRR operated until June 10, 1968, when operation of the reactor was terminated and deactivation of the facility was initiated.

Figure 1-2: Location of the BGRR on BNL Site

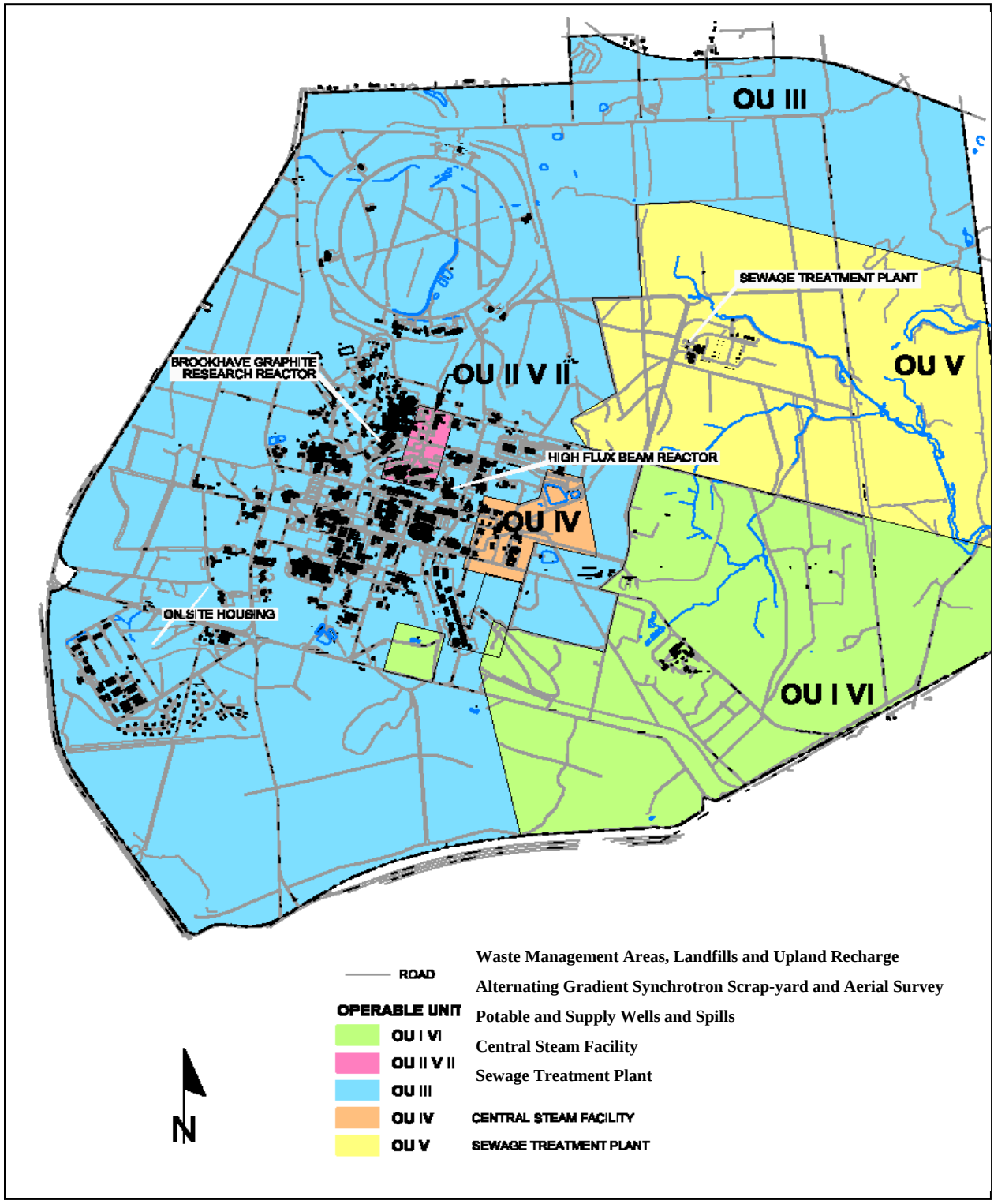
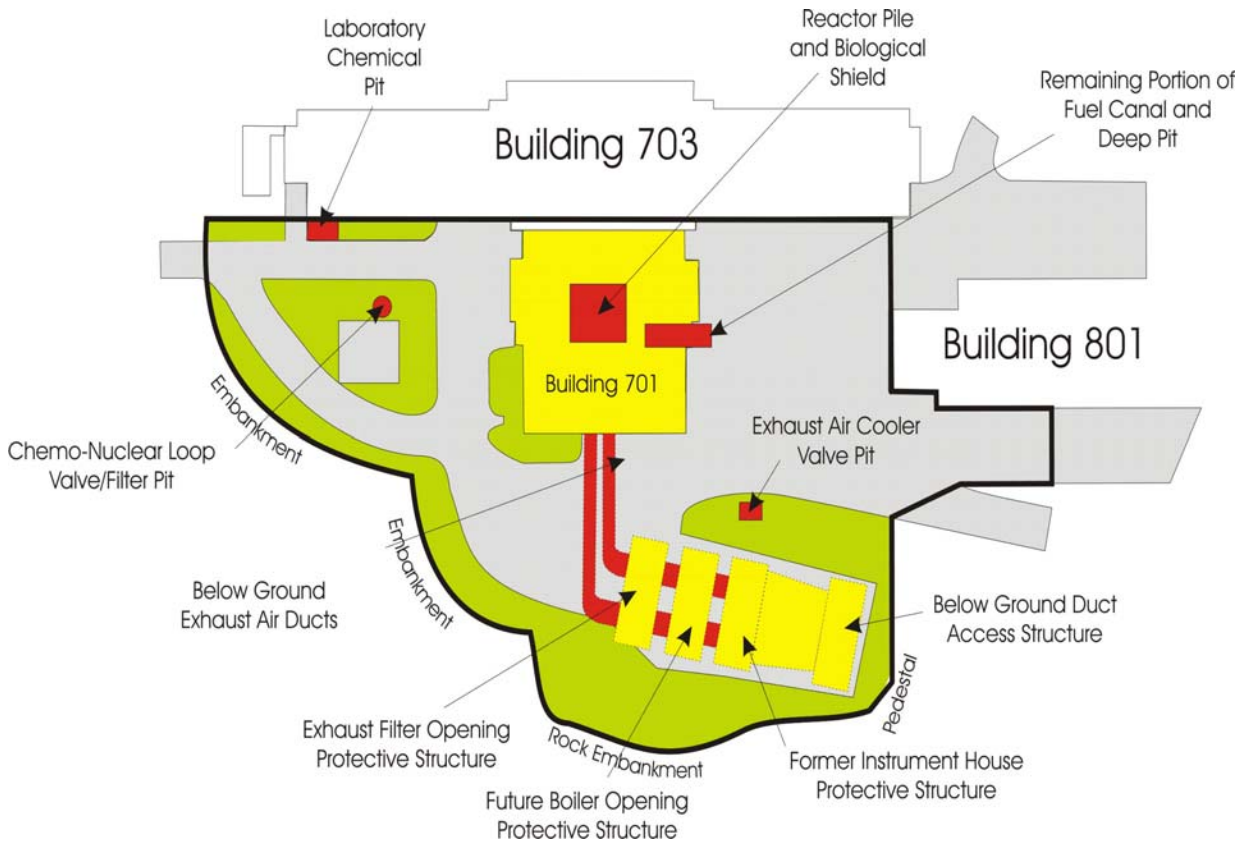


Figure 1-3: BGRR Complex



In June of 1972, de-fueling and shipment of the fuel to the DOE Savannah River site was completed. The BGRR complex was described as being in a safe shutdown condition by the U.S. Atomic Energy Commission and became a surplus facility within the DOE complex. From 1977 until 1997, portions of the facility were used as the BNL Science Museum.

In 2005, the *BGRR Final Record of Decision for Area of Concern 9 Brookhaven Graphite Research Reactor* (BSA, 2005a) was signed by the EPA, NYDEC and, the DOE. This agreement requires the removal of the graphite pile, biological shield, canal structure, reasonably accessible contaminated soils, and installation of water infiltration control and monitoring system for remaining structures and subsurface contaminated soils. This RD/RA Work Plan addresses the removal and disposal of the BGRR biological shield.

1.3 Current Status of BGRR Remediation

Decommissioning of the BGRR began in 1997 with the discovery and subsequent removal of approximately 60,000 gallons of contaminated water that had infiltrated and accumulated in the below ground ducts. Additional decommissioning activities to date have included the disposition of:

- Experimental equipment and systems from the reactor building;
- Reactor exhaust fans, motors, valves and instruments;
- Pile fan sump, pipes and associated contaminated soil;
- Above-ground ducts, pipes and associated contaminated soil;
- Canal house and water treatment house, along with associated equipment, pipes, asphalt, concrete and accessible contaminated soils;
- Reactor exhaust cooling coils, filters and primary liner (partial);
- The fuel canal structure outside the footprint of the reactor building;
- Accessible subsurface contaminated soil in the vicinity of the fuel canal, below-ground duct expansion joint #4 and secondary cooling air bustle;
- Isolation of the below-ground duct and demolition of the instrument house;
- Verification that all nuclear instrumentation has been removed;
- Removal and characterization of all experimental components;
- Inspection of all accessible fuel, non-fuel, and Newson channels; and
- Characterization of the boron shot from within the emergency shutdown system.

Remaining actions to be completed include:

- Graphite pile removal including all remaining in-core components (e.g. thermocouples, aluminum shot wells, invar tie rods, control rods, etc.);
- Biological shield removal;
- Design and installation of an engineered system to prevent water infiltration; and
- Establishment and implementation of land use and institutional controls.

1.4 Description of Biological Shield

The BGRR biological shield and associated components are the structures that shielded personnel from radiation, and provided physical support and an airtight membrane around the BGRR graphite pile.

The *BGRR Technical Manual* (BSA, 1969) describes the “Biological Shielding”; however, the common terminology of “biological shield” is used in this document. The biological shield is constructed of steel and high density concrete and it surrounds the graphite pile and air plenum chambers. The shield is 55 feet long by 37 feet 6 inches wide by 33 feet 7 inches high. The graphite pile and the plenum chambers are surrounded by the biological shield. Proceeding from the graphite outward, the shield consists of 6 inches of steel plate (in some places as two separate plates), 4 feet 3 inches of high-density concrete, and an outer casing of 3 inches of steel plate. Relatively small amounts of steel and aluminum are present inside the biological shield as part of the secondary air cooling system.

Figure 1-4 is a cutaway view of the biological shield and graphite pile and it shows the relationship between the two major components of the BGRR. A simplified plan view of the reactor is shown in Figure 1-5 and Figure 1-6 shows an isometric cutaway view of the biological shield and associated components.

The following descriptions are provided for the key components included in Figures 1-5 and 1-6:

- North and South Air Plenums – The two plenums are contained within the biological shield and were part of the primary air cooling system. Air was drawn through the fuel channels and around the face of the graphite and exited through the air plenums into the below-ground ducts.
- Thermal Shield – This protected the concrete from becoming dehydrated from the hot primary air exiting into the air plenums.
- Neutron Shield – These 3" steel plates were designed to structurally restrain accidental outward movement of the two pile halves and to serve as a neutron shield for the north and south faces.
- Bed Plate – The pile is supported by the upper of two steel bed plates which in turn are supported on a set of thirteen I-beams. The lower bed plate is keyed to the I-beams which are anchored to the concrete foundation. Graphite lubricated steel runners are between the two layers of bedplates to allow movement of the pile.
- Locking Mechanism – The upper steel bed plate was designed to be moved to adjust the diameter of the air gap between the two pile halves. To ensure inadvertent movement of the pile does not occur, two similar locking devices are located on the east and west sides of the pile. They consist of steel bars that fit into a recessed portion of the upper bed plate and is held in place by three adjustable shafts.

Figure 1-4: Cutaway View of Biological Shield and Graphite Pile

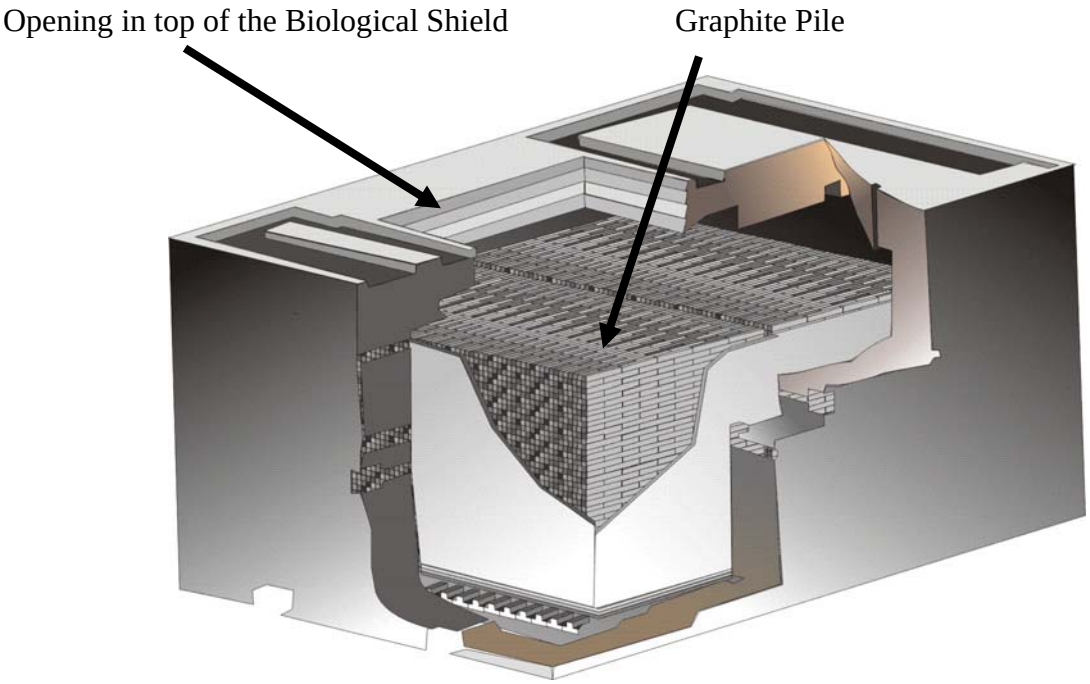


Figure 1-5: Plan View of Biological Shield and Graphite Pile

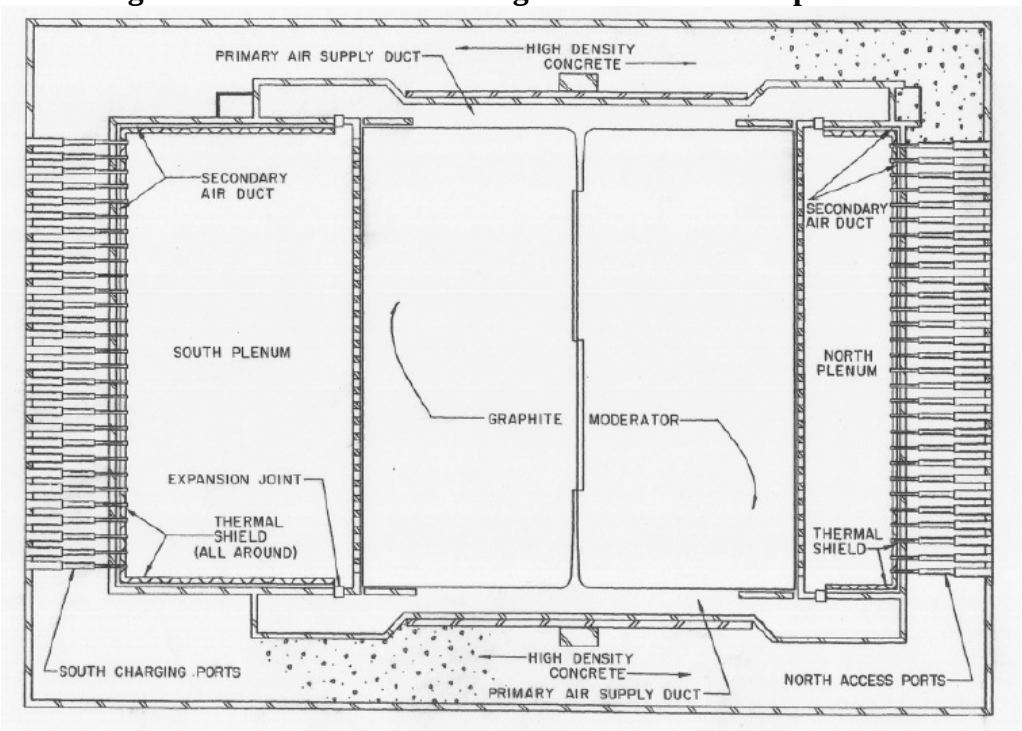
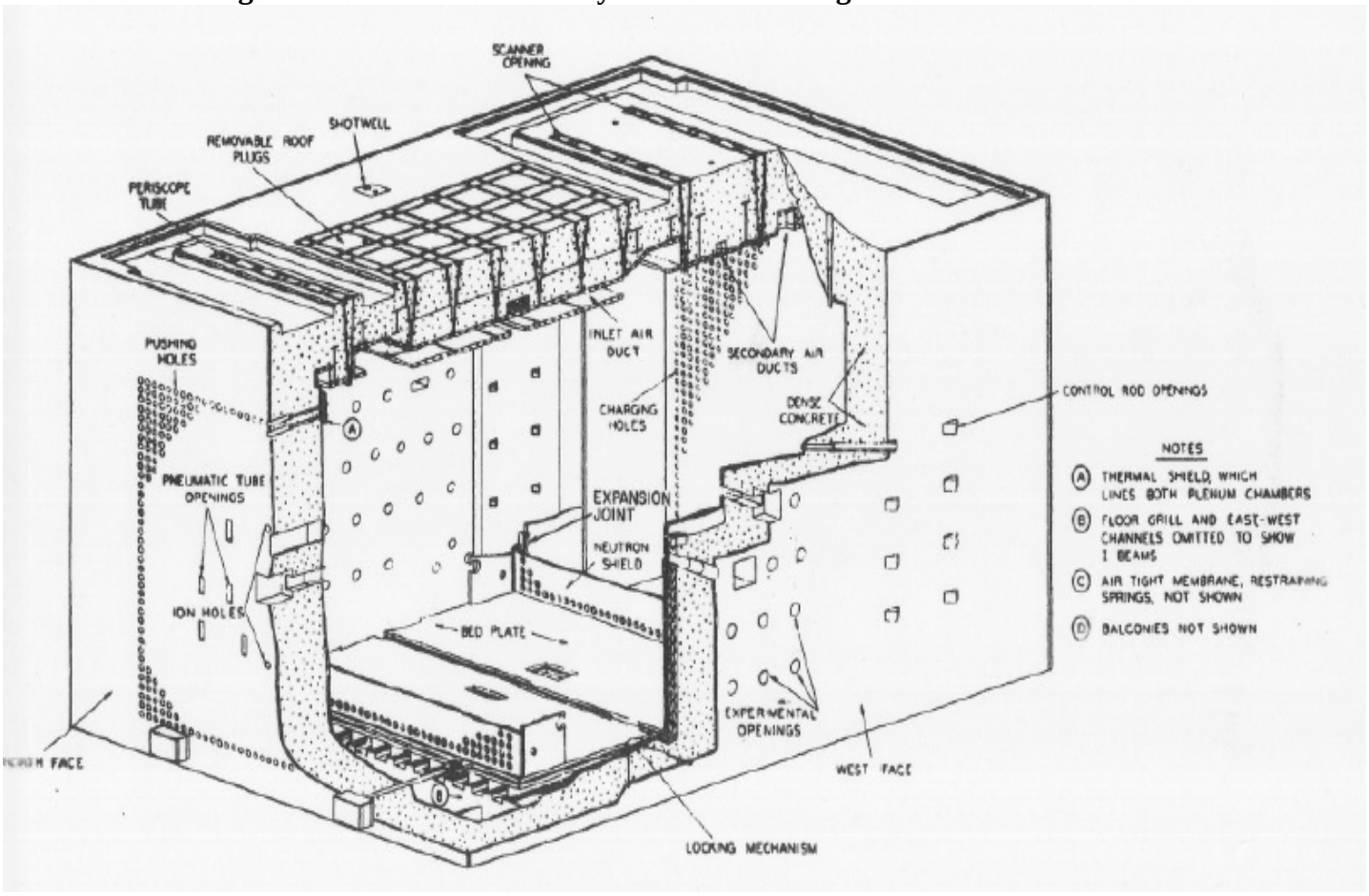


Figure 1-6: Isometric Cutaway view of the Biological Shield



1.5 Nature and Extent of Contamination

The BGRR pile was characterized in 2000, and as part of that effort, gamma surveys of the south face neutron shield were performed. In 2002, eight core bores were taken, two through the east face, three from the west face, two from the north face, and one core bore from the top. The results of these surveys were documented in the *BGRR Characterization Report for the 701 Below-Ground Structures, 702 Pile, and Remaining Soils* (BSA, 2003). In 2005, samples of outside steel were taken at 13 locations, four on the east face, four on the west face, four on the north face, and one on the south face. The one location on the south face was a full bore core through the biological shield. In addition, on the west face, there were 5 locations where steel on the inner surface was sampled. The results were documented in the *Radiological and Hazardous Material Assessment of the BGRR Bioshield and Associated Components* (BSA, 2006a) and can be summarized as follows:

- The outside steel samples indicated no activation of the metal;
- The outermost 2 feet of concrete indicated no activation;
- The surveys and sample data support the assumption of essentially symmetrical activation of the biological shield walls;
- The most abundant radionuclides in the activated steel are nickel-63 (62%), cobalt-60 (32%), iron-55, and nickel-59 with at total inventory of 60.7 curies; and
- The most abundant radionuclides in the activated concrete are tritium (98%), europium-152, nickel-63, and cobalt-60 with a total inventory of 20.6 curies.

Table 1-1: Inner Biological Steel Sample Summary Results

Location	Depth (ft)	Co-60 (pCi/g)	Cs-137 (pCi/g)
E-30	3.5 – 3.75	620	ND
E-30	3.75 – 4.0	1007	ND
E-30	4.0 – 4.25	6418	ND
E-30	4.25 – 4.5	300,900	ND
E-25	4.5 – 4.75	248	ND
E-25	4.75 – 5.0	68,300	ND
W-51	4.5 – 4.75	78.1	ND
W-51	4.75 – 5.0	15,260	ND
W-33	4.75 – 5.0	3711	ND
W-16	4.5 – 4.75	126	ND
W-16	4.75 – 5.0	10,500	ND
B-3-3	4.75 – 5.0	22,270	ND
B-3-3	Neutron Shield	62,900	154,600
C-15-15	4.75 – 5.0	1310	ND

Note: The depth is measured from the outer wall of the biological shield.

Hazardous materials identified in the biological shield are lead shielding in several locations, cadmium plating on control rod sleeves, cadmium coated boron shot in the shot wells, asbestos containing material (ACM) in the balcony floor tiles, and lead-cadmium alloy blocks in the helium system and fuel thermocouples.

1.6 Objectives

The following remedial action objectives are included in the BGRR ROD and will be met through the implementation of this RD/RA work plan:

- Through prudent remedial action, ensure the protection of human health and the environment from the potential hazards posed by the radiological inventory that resides in the BGRR complex. The remedial action should ensure protection of human health and the environment without undue uncertainties.
- Use the As Low As Reasonably Achievable (ALARA) principle, while implementing the remedial action, to reduce further the potential hazard to human health and the environment posed by the considerable radiological inventory that resides in the BGRR complex.

The operational objectives of this project include:

- Through the use of engineered and process controls, prevent the spread of contamination during biological shield dismantlement and waste handling;
- Perform removal, transportation and disposal of contaminated materials using safe and efficient methods;
- Through the selection and use of appropriate packaging and transportation methods, prevent the spread of contamination;
- Comply with applicable regulations that govern the removal, packaging, transportation and disposal of the biological shield; and
- Complete the project with no Occupational, Safety and Health Association (OSHA) reportable injuries or DOE reportable incidents.

1.7 Site Cleanup Criteria

The completion criterion for this remedial action is the removal, shipment, and disposal of the biological shield.

2.0 SUMMARY OF REMEDIAL DESIGN/REMEDIAL ACTION

2.1 Scope of Work

The BGRR ROD defines the scope of work for the removal of the biological shield as, "Removal of the biological shield will include removal of the neutron shields and the steel-encased concrete walls. Loose debris will be removed and a fixative will be applied to the exposed surfaces."

The scope of the RD/RA is detailed in the *Brookhaven Graphite Research Reactor Biological Shield Removal Specifications,* May 10, 2007. A copy of the specifications is included in Appendix A.

2.1.1 Statement of Work

The Biological Shield Removal Project at the BGRR shall be performed in accordance with the Safety Basis Documents (SBD) including the Documented Safety Analysis (DSA), Technical Safety Requirements (TSR), and Fire Hazards Assessment (FHA). The BGRR will be a Radiological Facility for the removal of the biological shield but the controls established in the TSR's will be maintained as a best management practice. The work consists of the following:

1. Detailed project plans and procedures will be prepared to perform the Biological Shield Removal Project. Project plans will include an Environmental, Safety & Health (ES&H) Plan, Rigging Plan, Job Risk Assessment (JRA), Biological Shield Removal Work Plan and other Technical Work Procedures, ALARA/Contamination Control Plan, Qualification Plan for Special Tools, Waste Management Plan (WMP), Waste Packaging Procedure, and Quality Assurance Plan.

2. The design, fabrication, qualification and delivery of special tools required to complete the work. These activities shall be conducted in accordance with the BSA-approved design and qualification plan for special tools. BSA will provide final approval of special tools for use upon satisfactory completion of qualification testing.

3. The design, fabrication and installation of ancillary equipment required to support biological shield removal in accordance with BSA's specifications. Such ancillary equipment includes but is not limited to contamination control containment, temporary HEPA ventilation systems, temporary crane and other material handling apparatus, etc.

4. The removal of interferences and structural components of the biological shield. Specifically:

    a. Removal of the biological shield requires that the structures and appurtenances presenting a physical interference with the installation of the contamination control enclosure (CCE) and the biological shield removal process be removed. All

structures remaining in place after partial removal shall have their support structure approved by Professional Engineer.

There are seven (7) balconies attached to the outer biological shield walls. Two balconies, each located on the north and west walls at elevation 136 ft shall be removed in their entirety. The remaining five (5) balconies shall be removed to a point no greater than five feet (5'-0") from the biological shield attachment points. The asbestos containing material (ACM) floor tiles on the balcony areas shall be removed prior to demolition of the structures.

The sixteen (16) control rod drive mechanisms (CRDM), Chemo-Nuclear loop, and freight elevator shall be partially removed to allow access for biological shield removal and installation of the contamination control envelope. The lead walls associated with the Chemo-Nuclear loop will be completely removed.

b. The portions of the air tight membrane (ATM) not previously removed during graphite pile removal, pile restraining springs, experimental port graphite plugs and experimental port expansion joints shall be removed.

c. The biological shield walls shall be removed from the top at elevation 140'- 4" down to elevation 106'- 9". The biological shield walls are comprised of a 4'- 3" thick high-density concrete barrier surrounded by an inner and outer steel plate with a nominal thickness of 6" and 3", respectively. The following work activities shall be performed while removing the biological shield structure:

    i. Removal of the top of the biological shield structure;
    ii. Removal of the neutron shield;
    iii. Removal of the reinforced concrete including its size reduction for packaging, transportation and disposal;
    iv. Removal of the inner steel plates, including their size reduction for packaging, transportation and disposal;
    v. Removal of the outer steel plates, including their size reduction for packaging, transportation and disposal;
    vi. Removal of the pile upper bedplates and sliding rails. The steel beams and fixed lower bedplates shall remain;
    vii. Removal of all visible debris within the biological shield footprint including the north and south plenums;
    viii. Sealing of all plenums, chutes, and experimental openings;
    ix. Removal and/or stabilization of loose radiological contamination in the Building 701 area associated with the removal of the biological shield, including the remaining pile support structure within the biological shield footprint; and
    x. Installation of a permanent reinforced concrete cover over the footprint of the removed biological shield. The concrete cover will be designed to achieve a floor loading of 250 pounds per square foot.

5. Preparation of a Project Completion Report detailing the work performed and describing the "as-left" conditions. The Project Completion Report will be included in the BGRR Closeout Report. The Closeout Report for AOC 9 will be submitted for regulatory approval following the completion of all remedial actions including the installation of an engineered cap.

2.1.2 Subcontractor Selection

BSA has awarded the biological shield removal subcontract to a DOE Indefinite Duration Indefinite Quantity (IDIQ) Contractor. The DOE has completed an extensive bid process to pre-qualify contractors for contaminated facility decontamination and decommissioning (D&D). In addition, BSA has required the bidder to meet additional qualification criteria in the areas of corporate experience, key personnel experience, health and safety and quality assurance programs, ALARA, and contamination control. The qualification criteria are included as Appendix C.

2.1.3 Preliminary Design

The biological shield will be removed by rubblizing the concrete roof, removing the interior steel, rubblizing the concrete walls, and then removing the exterior steel. The removal of the biological shield will be accomplished using many of the tools previously used during pile removal.

Installation of the Biological Shield Removal Equipment

To prepare for the installation of the equipment for the biological shield removal, several preliminary actions will be performed, including:

- Walk-down the work area to ensure that building services have been de-energized and/or disconnected. This will include air, power, control and liquid systems that may have been required during the operation of the reactor.
- Install supports for the balcony sections that will remain after biological shield removal.
- Remove the balconies connected to the north side of the biological shield to facilitate waste removal.
- Remove the elevator machine room to allow for the installation of gantry rails north of the biological shield.

Following the completion of the preparatory actions, the biological shield removal equipment will be installed. The components will be hoisted into place using the 10-ton building crane in the BGRR. The removal equipment to be installed includes:

- The railways and support structures for the manipulator gantries. The rails will be installed on the top of the biological shield wall with additional support structure

installed where required. The railways will run from inside the north wall of Building 701 to the building columns just south of the biological shield.

- The gantries will be hoisted into place, one each for each of the manipulator arms and one for the gantry crane.
- The hydraulic power pack will be installed on the ground floor near the south wall of the biological shield.
- The control skid will be installed on the balcony east of the bioshield at the 123ft elevation.
- The manipulator arms and crane will be installed on their gantries and then connected to the power pack and/or control skid.
- A rack for tools and equipment storage will be mounted at the ground level north of the biological shield.
- The supersack loading/lifting fixture will be staged on the ground floor near the north end of the biological shield.

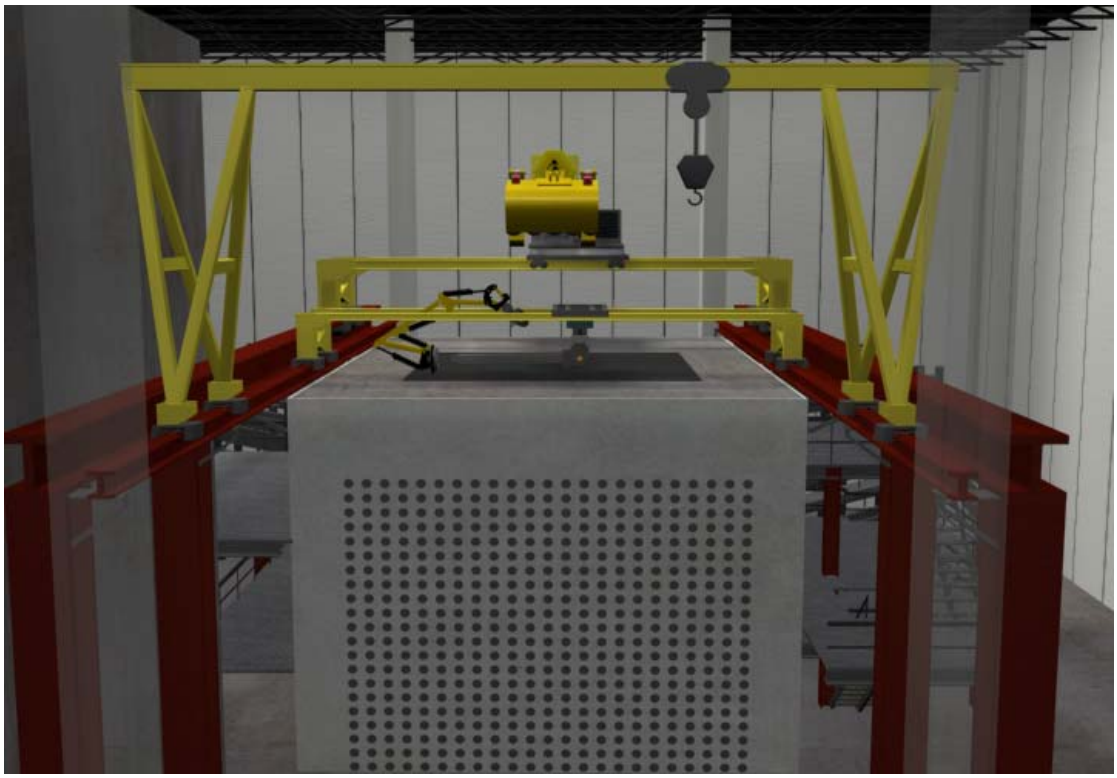


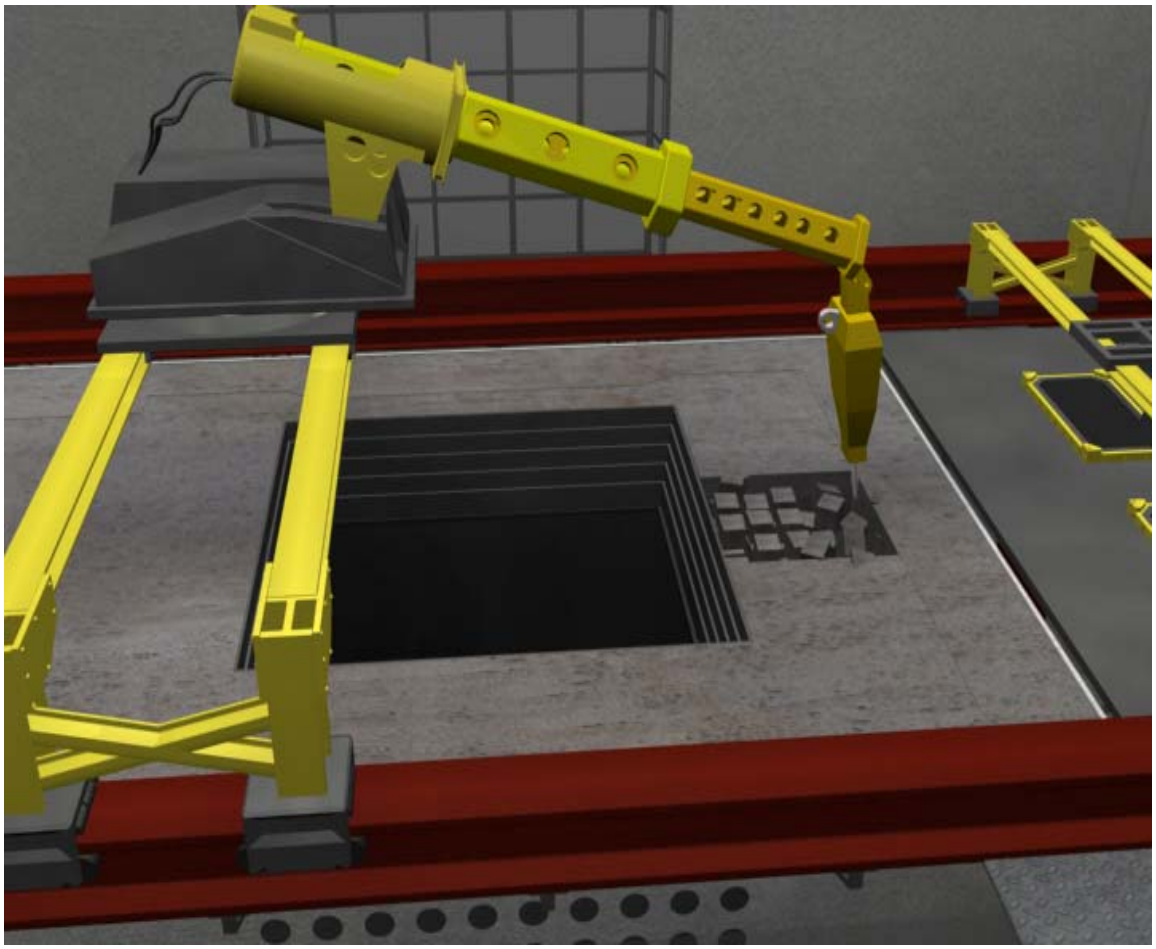
Figure 2–1: Biological Shield Removal Equipment

Concrete Roof Removal

To rubbilize the concrete roof the breaker hammer end-effector will be placed on the excavator arm (Figure 2-2). The breaker hammer will be used to rubblize the concrete on the roof from the frame that forms the opening in the roof to the outside wall of the

biological shield. The concrete in the walls will be rubblized to a depth equal to the top of the steel that forms the interior ceiling of the biological shield. The rubblized concrete and structural components encountered will be size reduced and loaded into supersacks. Initially, rubble removal will be performed using the clamshell bucket attachment on the equipment arm. Once the roof is fully rubblized, the breaker hammer will be replaced by the bucket attachment and used to load out the rubblized concrete.

Figure 2–2: Rubblizing the Concrete Roof



Removal of Interior Steel

Once the concrete is removed from the roof, the steel ceiling of the biological shield will be exposed. Prior to any interior biological shield removal, the intake air plenums will be sealed with plates and a layer of grout and the seals previously placed over the exit air ducts and deep pit chute will be verified to be intact. The equipment arm will use the

shear attachment to size reduce the structural beams. These will be loaded directly into the intermodal containers. The equipment arm will be reconfigured again to position the milling equipment on the flat steel components. Once in place, electromagnets will attach the milling equipment to the steel and the arm will release. The milling process will be initiated and equipment will automatically cut sections of steel measuring approximately 6' X 12'. The gantry crane will lift the plate out of the biological shield where it can be surveyed, wrapped or fixed (if required) and then loaded directly into intermodal containers. This process will be repeated until all of the steel in the ceiling has been removed.

The internal walls (including the east/west steel walls of the air-tight-membrane) and neutron shields will be removed in the same manner as the steel in the ceiling. When all of the flat portions of the inner lining have been removed, a skeletal frame of 3" and 6" thick steel consisting of the intersecting joints/corners remains. These components will be size reduced using the shear or will be segmented by the milling equipment later in the demolition process. The sized reduced sections and other loose steel components in the biological shield (i.e. springs, stack locking devices, etc) will be collected and placed into intermodal containers using the equipment arm.

Concrete Wall Removal

To remove the concrete wall the breaker attachment is installed on the excavator arm to rubblize the wall (Figure 2–3). The rubblized concrete will be loaded into supersacks using the clamshell bucket on the equipment arm. When the rubblizing process is completed, the bucket end-effector can be reattached to the excavator arm and will be used for load out of the rubble. When all of the concrete has been removed, the HEPA vacuum collections system will be used to collect any loose debris in the bottom of the biological shield and all surfaces will be vacuumed to remove any visible dust.

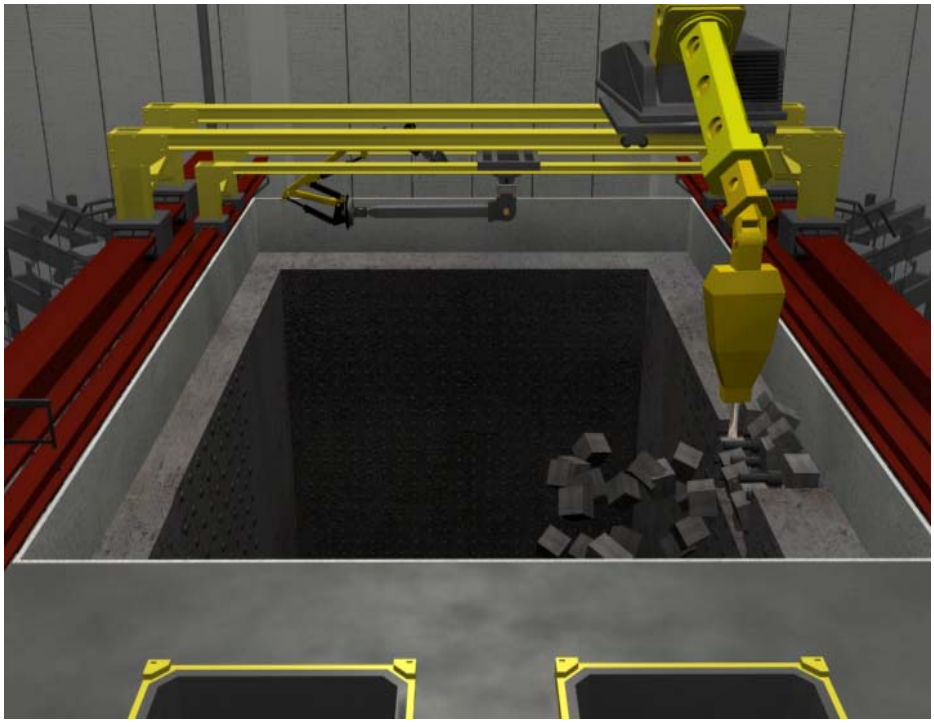


Figure 2-3: Rubblizing the Concrete Walls

Separation of the Balconies and Removal of the Steel Exterior

Balcony supports will be installed under all balconies that will remain after the biological shield removal. Balconies, Control Rod Drive Mechanisms (CRDM's) and any other equipment required to be removed will be separated from the exterior of the biological shield using abrasive and thermal cutting techniques using point source ventilation to capture dust and fumes. Waste generated will be packaged in intermodal waste containers. Lastly, the exterior biological shield walls will be sectioned using abrasive and thermal cutting techniques using point source ventilation to capture dust and fumes and packaged as waste in intermodal waste containers.

The final step for the biological shield removal is the installation of a permanent reinforced concrete over the footprint of the removed biological shield (Figure 2-4). Prior to the cover installation, verification that all loose and visible debris within the biological shield footprint has been removed will be conducted. BSA shall perform a final radiological survey of the top of the lower bedplates and accessible concrete surfaces around the bedplates to verify that residual contamination levels are less than 100,000 dpm beta gamma. The DOE will independently verify the as-left condition. Once the inspection is completed, a fixative will be applied to the internal surfaces of the biological shield footprint and the permanent reinforced concrete cover will be installed.

Figure 2– 4: Shield Removed w/ Concrete Cover Installed

2.1.4 BSA Activities and Project Oversight

BSA's technical specifications describe the scope of work that will be performed by BSA's biological shield removal subcontractor. As stated in the specifications, BSA will supply the following services to the subcontractor:

- General employee training in accordance with BSA's specifications;
- Sufficient quantity of waste packages and containers (Detailed in Appendix A *Brookhaven Graphite Research Reactor Biological Shield Removal Specifications)* including 20-yard intermodal containers, 20-foot Sealand connex containers, and supersacks for concrete, steel and secondary wastes;
- Off-site waste transportation and disposal of project wastes and secondary wastes;
- Waste characterization, waste certification, and waste verification inspections during loading of waste containers;
- Radiological controls and health physics services to support the work, including job coverage, instrumentation, transportation surveys, and personnel and environmental air (radiological) sampling and analysis;
- Dosimetry and bioassays required for personal monitoring;
- Potable water;
- Approval and oversight of the subcontractor's respiratory protection program;

- Structural support details for remaining building 701 components and structures;
- Efficiency testing of HEPA filters after installation;
- Page/party communications system; eight (8) handsets located throughout the building 701 high bay and ground floor office area;
- One (1) 10-ton overhead gantry crane with radio remote controls, installed in building 701 high bay area;
- Two (2) 440V, 100 amp fused disconnects and two (2) 208V, 60 amp fused disconnects for the subcontractor's use; and
- BSA will provide and maintain the following components and equipment:
    - High bay lighting;
    - Freight elevator until the commencement of its partial removal;
    - Passenger elevator;
    - Bldg. 701 10-ton overhead gantry crane;
    - Lighting and convenience receptacles to office spaces in building 701 shop area and second floor office/rest room area; and
    - Ground floor emergency/exit lighting in high bay area.

In addition, BSA will also have a dedicated project oversight staff to ensure that the project is completed safely and in accordance with the technical specifications. The BSA oversight staff will include a Project Manager, Field Engineer, Radiation Protection Manager, Health and Safety Manager and Technicians, Waste Manager, and Quality Assurance Manager.

2.1.5 RD/RA End State

Figure 2-4 depicts what the interior of Building 701 will look like after removal of the biological shield. The "End State" at completion of the biological shield removal remedial action is described as follows:

- Completion of the removal of the biological shield and all materials within the footprint of the biological shield down to and including the upper bedplates.
- Installation of a permanent reinforced concrete cover over the footprint of the removed biological shield.
- Four free standing balconies, two on the east side and two on the west side.
- Two free standing control rod drive mechanisms.
- Transportation and disposal of all generated wastes.

2.1.6 Safety Requirements

An ES&H plan will be prepared which includes an analysis of the tasks to be performed to complete the biological shield removal. The JRA will be prepared to identify the potential hazards associated with each of the identified tasks. Controls will be used to mitigate the hazards identified in the JRA's and will be reflected in biological shield removal procedures. The hazards and JRA conclusions will be communicated daily to

site workers by the BSA field engineer conducting the daily safety tailgate meeting. Biological shield removal will be completed in accordance with all of the OSHA requirements in 29 CFR 1910/1926 and BSA Standards Based Management System (SBMS) requirements and applicable ES&H Standards.

All work will be performed within the envelope of the SBD. Specifically:

- The detailed work plans and procedures including the ES&H Plan, Rigging Plan, Biological Shield Removal Work Plan and other Technical Work Procedures, ALARA/Contamination Control Plan, Qualification Plan for Special Tools, and the WMP will accurately incorporate the requirements of the SBD's.
- The work will be performed in accordance with the limits, controls and requirements expressed in the SBD's at all times. Any work that is not in compliance with these requirements will be immediately halted.

All site workers performing or supervising D&D activities will be required to complete the 40-hr OSHA HAZWOPER course, BSA Radiological Worker Training, and other training detailed in Section 01 35 24 of the *Brookhaven Graphite Research Reactor Biological Shield Removal Specifications.*

2.1.7 Work Controls and Work Management

All work will be performed with approved work permits which will be prepared, and issued following the requirements of the BSA SBMS "Work Planning and Control for Operations" subject area.

In addition, all Environmental Restoration Projects (ERP) work is planned and performed in accordance with ERP Operations Procedure Manual 3.2, Work Planning and Control, Appendix D. The purpose of the ERP Work Planning and Control System procedure is to ensure all work performed within ERP is reviewed, planned and controlled in a manner that meets the Laboratory-wide Work Planning and Control for Experiments and Operations Subject Area and is compliant with applicable Authorization Basis Documents (SBDs) and Facility Use Agreements (FUA).

All work performed under the authority of ERP will undergo planning and control to the rigor set forth within this document. Authorized ERP work includes remediation, decommissioning, characterization, construction, maintenance, modification and all other related work performed by ERP staff as well as external Laboratory organizations and non-BSA personnel (including BSA subcontractors) working on ERP projects.

The ERP work planning and control system also coordinates the preparation and approval of all ancillary BSA permits including concrete and masonry penetration, cutting and welding, confined space, and radiation work.

2.1.8 ALARA

The goal of both the Graphite Pile and Biological Shield Removal Projects is to maintain personnel radiation exposure as low as reasonably achievable (ALARA) and well below the regulatory dose limits in 10 CFR 835.202. To accomplish this goal, numerical Administrative Control Levels (ACL) will be established below the regulatory limits to administratively control and help reduce individual and collective radiation dose. The Graphite Pile and Biological Shield Removal Projects has established a special ACL of 1,000 mrem/yr (2008 and 2009) for each individual worker. Other requirements are as follows:

- Radiation exposures to guests without training, visitors without training, or minors shall not exceed 25 mrem per year;
- Minors under the age of 18 shall not be allowed to work in Controlled Areas or Radiological Areas; and
- No individual who arrives at the BNL Site with an estimated occupational exposure greater than 2,000 mrem for the calendar year will be allowed to work.

The ACL chosen is a BSA internal control level that was considered practical for radiation workers performing the removal activities and also in keeping with ALARA principles. During planning for the biological shield removal, the ERP ALARA Committee will review measures that have been taken to ensure that this work will done in a manner that will help to ensure that work will be accomplished ALARA.

During the actual performance of work radiological controls for maintaining personnel radiation exposure and contamination ALARA shall be accomplished as follows:

- Radiological surveys will be conducted for radiation, contamination and airborne radioactivity;
- Radiological conditions will be communicated to the workers;
- Radiation exposure will be monitored by use of monthly analyzed TLDs and real time dose reporting by utilizing an electronic access control/dose tracking system. In addition, alarming electronic dosimeters will be required for work in areas of high dose potential;
- Dose to all workers will be tracked weekly and dose reports will be provided to the DOE. The ERP ALARA committee will regularly meet to monitor the individual and collective dose against project performance and to determine if work process methods need to be modified.
- Internal exposure will be monitored using the BSA bioassay program and will be performed as required based on work scope and measured airborne radioactivity levels; and
- If airborne levels exceed those as prescribed in Appendix A, BSA will issue a radiological stop work order until corrective actions and controls are put in place to meet these requirements.

An ALARA/Contamination Control Plan will be developed prior to biological shield removal operations. The plan will detail and compare the ACL limits and compare the ACL's to detailed radiation exposure estimates for the tasks that comprise the removal of the biological shield. Actual exposure will be monitored and compared to the estimates; corrective actions will be developed to remedy unfavorable radiation exposure trends.

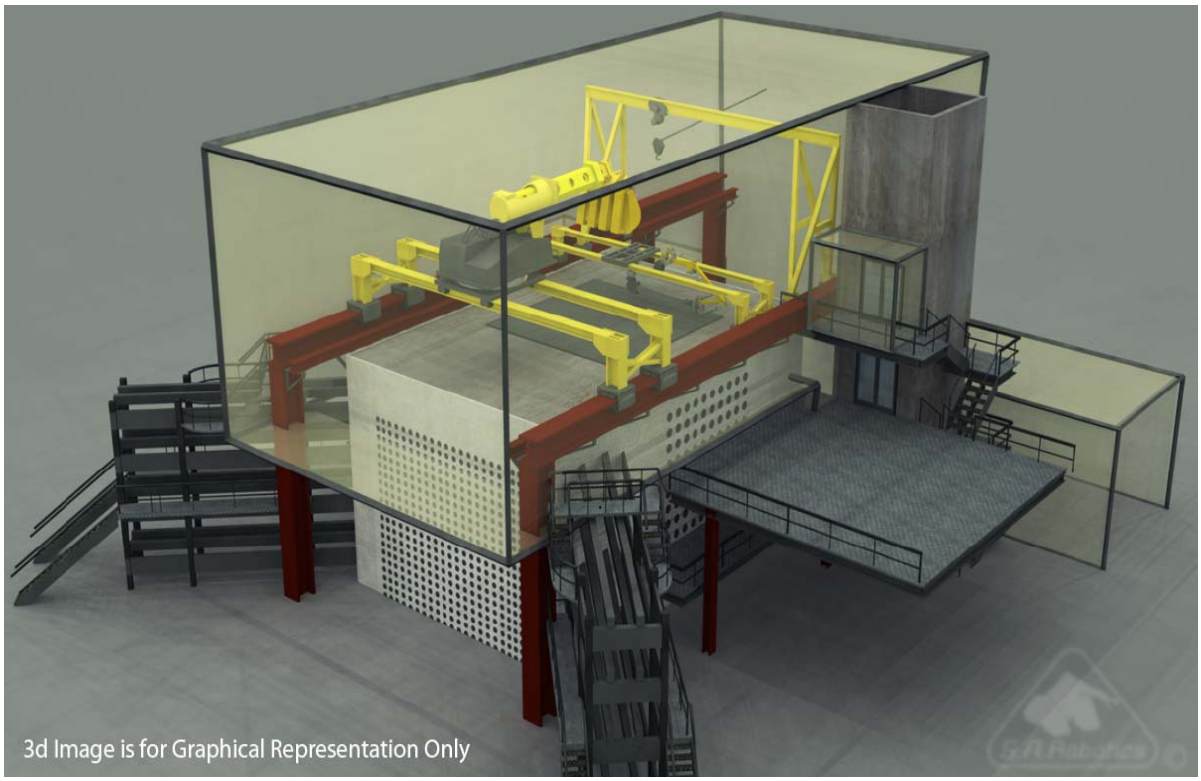
No personnel entry into the biological shield will be allowed for routine biological shield removal operations. During biological shield removal, inside the biological shield will be defined as inside the inner wall prior to the removal of the inner steel and neutron shield. Non-routine personnel entry into the biological shield will be considered on a case-by-case basis by the ERP Director and will conform to the ACL's established for the project and the ALARA goals.

2.1.9 Contamination Control

The spread of radiological contamination associated with the biological shield removal will be controlled through the implementation of engineered and administrative controls.

The contamination controls will include the design of a CCE, including a temporary high efficiency particulate air (HEPA) ventilation system, special tools and biological shield removal process design criteria. The HEPA system will have redundancy in the number of fans available but will not have a back-up power supply because dust generating activities will not be allowed without proper ventilation operating. A CCE will be constructed around the biological shield to support demolition and handling and packaging of waste (Figure 2-5). The CCE will be operated at a demonstrable negative pressure to preclude the spread of contamination outside of the biological shield and/or the CCE. The objective will be to minimize the generation of dispersible contamination, and provide for its collection and control at the point of generation. Fixatives will used throughout the dismantlement of the biological shield to mitigate the generation of dust. This will increase visibility within the biological shield and minimize the potential for a release of contamination outside of the contamination control envelope.

Figure 2-5: Contamination Control Envelope



The design of the CCE and temporary HEPA system, special tools and biological shield removal process controls shall meet the quantitative contamination control performance requirements set forth in the *Brookhaven Graphite Research Reactor Biological Shield Removal Specifications.* These controls are summarized below:

- At all times during inner biological shield removal, airborne radionuclide concentrations inside of the biological shield cavity will be continuously monitored. Airborne concentrations will not exceed 50 Derived Air Concentration (DAC) (10CFR835 Appendix A and C). In the event that airborne concentrations in excess of 50 DAC are detected within the biological shield, cavity work will cease until the causes have been evaluated and corrective actions implemented.
- Within the CCE, monitoring of airborne radionuclide concentrations will be conducted continuously through the use of continuous air monitors (CAM) with pre-established warning level (10 DAC) and alarm level (50 DAC) set points. Surface contamination levels will be documented via the pre-shift radiological survey. At no time during biological shield removal will the average loose contamination levels exceed the Table 2-1 values by a factor of more than 500 (i.e., the average permissible loose contamination levels are 500 times the Table 2-1 values). If average surface contamination levels in excess of these limits are detected within the

contamination control envelope work will cease until the causes have been evaluated and corrective actions implemented.

- Prior to entry into the CCE, the BSA Radiation Protection Manager shall assess the surface and airborne radiological contamination levels to determine the minimum PPE requirements.

TABLE 2–1: Removable and Fixed Contamination Levels

Nuclide	**Removable (dpm/100 cm2)**	**Total (Fixed + Removable) (dpm/100cm2)**
U-natural, U-235, U-238 and associated decay products	1,000 alpha	5,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1,000 beta-gamma	5,000 beta-gamma
Tritium organic compounds, surfaces contaminated by HT, HTO, and metal tritide aerosols	10,000	10,000

- During biological shield removal, monitoring of airborne radionuclide concentrations within Building 701, but outside the CCE, will be conducted continuously utilizing CAM's, general area air samples, and task specific air samples identified in the radiological work permit. Monitoring of surface contamination levels and radiation levels in Building 701 areas adjacent to the CCE will be performed shiftly (Once per 10 hour shift). Airborne concentrations will not exceed background, and loose surface contamination levels will not exceed the values provided in Table 1. If airborne radionuclide concentrations are above background, or unplanned loose surface contamination levels in excess of the Table 1 values are detected, work will cease until the causes have been evaluated and corrective actions implemented. The radiological baseline conditions within building 701 shall be established per the *Brookhaven Graphite Research Reactor Biological Shield Removal Specifications.*
- Analyses will include liquid scintillation for low energy emitters and gas flow proportional counters for beta/gamma and alpha emitters. For difficult to detect isotopes, scaling factors will be derived by the ERP Radiological Engineer from the data presented in *BGRR Determination of Radionuclide Inventory of the Graphite Pile for Waste Stream Characterization and Waste Acceptance Criteria Compliance* (BSA, 2005b).

2.1.10 Post RD/RA Inspections and Site Restoration

Prior to biological shield removal, BSA will perform a comprehensive survey (contamination, background radiation and airborne concentrations) to establish the baseline radiological conditions and the survey will be provided to BSA's biological shield removal subcontractor. BSA's subcontractor shall be required to restore Building 701 to the established baseline radiological conditions.

Upon completion of the biological shield removal, verification that all loose and visible debris within the biological shield footprint has been removed will be conducted. BSA shall perform a final radiological survey of the top of the lower bedplates and accessible concrete surfaces around the bedplates to verify that residual contamination levels are less than 100,000 dpm beta gamma. The DOE will independently verify the as-left condition. Once the inspection is completed, a fixative will be applied to the internal surfaces of the biological shield footprint and the permanent reinforced concrete cover will be installed.

3.0 WASTE MANAGEMENT AND DISPOSAL

A draft WMP has been prepared for the project and is included in Appendix B. The draft WMP will be finalized after subcontractor selection is completed and all the plans for the project are finalized.

3.1 Planned Waste Generation

Planned waste streams resulting from the biological shield removal include:

TABLE 3-1: Planned Waste Generation

Type of Material	Waste Type	Quantity	Planned Disposal Site
Graphite Plugs / Debris	LLRW (NTS)	10.0 yd3	Nevada Test Site
Metal Structural Materials	LLRW (oversized debris)	33 yd3	Energy Solutions, Clive, UT
Metal/Metal Plate, Aluminum, Concrete, Secondary Wastes	LLRW (standard debris)	3138 yd3	Energy Solutions, Clive, UT
Hazardous Materials (PCB contaminated components)	Hazardous	3.5 yd3	Onyx, Model City, NY
ACM Floor Tiles	Hazardous	1 yd3	Onyx, Model City, NY
Cadmium and Lead Coated Steel	Mixed Waste	5.9 yd3	Energy Solutions, Clive, UT

Graphite Plugs/Debris – The biological shield plenums contain approximately 10 yd3 of graphite plugs and miscellaneous debris (fuel anchors, pneumatic tubes, wire, retaining springs, etc.). This waste will be packaged by the subcontractor into the BSA supplied IP-1 steel boxes. Waste loading operations will be documented and observed by BSA waste verifiers.

Metal Structural Materials, Metal/ Metal Plate, Concrete and Dry Active Waste (DAW) – The metal removed during the project will be segmented as necessary and packaged by the subcontractor into the BSA supplied intermodal containers. The containers will be weighed by a load cell prior to sealing. The intermodal containers will be sealed in accordance with the manufacturers' instructions which include the placement of a gasket between the metal sealing surfaces and then mechanical closure of the container. The rubblized concrete will be placed into 96 cubic foot IP-1 soft sided supersacks and weighed as it is being loaded into intermodals or gondolas. Radiation dose rates of the waste being removed from the biological shield will be supplied to the subcontractor by BSA radiological control technicians to allow for strategic packaging within the waste containers. Waste loading operations will be documented by the subcontractor and observed by BSA waste verifiers. The subcontractor will be responsible to

ensure that the weight limit of each package is not exceeded and the containers will be loaded in a manner to prevent movement of items during transport. The intermodal containers will be transferred by the subcontractor to the WLA or other designated BSA staging area for shipment by rail to Energy Solutions.

DAW (protective clothing, filters, contamination control containments, tooling etc.) will result in approximately 200 cubic yards of packaged low-level radioactive waste. This low-level radioactive waste will be packaged together with the concrete and steel.

Hazardous/Prohibited Items- Hazardous/prohibited items expected to be removed as a result of the project include PCB's, miscellaneous cleaning fluids and, fluorescent lights containing mercury/metal halide bulbs. All hazardous/prohibited items removed will be transferred to the waste management facility for further disposition and disposal at the appropriate disposal facility.

Cadmium/Lead Mixed Waste – Approximately 5.9 cubic yards of mixed waste is expected to be generated as a result of the biological shield removal. The cadmium and lead waste is associated with the control rod drive sleeves, thermocouples, and experimental plugs. The mixed waste will be shipped for treatment and disposal at Energy Solutions.

3.2 Pollution Prevention and Waste Minimization

Several methods will be employed to minimize wastes generated during biological shield removal:

- Construction of a contamination control envelope to prevent the spread of contamination and the resulting cross contamination of clean areas and equipment and the unnecessary generation of the associated wastes;
- Segregating wastes in order to separate clean industrial waste from contaminated equipment and components;
- Packaging waste metal and PPE together to minimize the number of waste packages required;
- Using biological shield removal methods that minimize volumes of debris;
- Minimizing consumable materials brought into radiologically controlled areas;
- Through equipment design and process control, meeting the target packaging efficiency;
- Filtering of exhaust air from the contamination control envelope;
- Minimizing the number of entries into the radiological areas in order to minimize the generation of secondary wastes; and
- Performing continuous radiological monitoring in order to promptly identify and correct sources of contamination outside of the designated work areas.

Segregation

All wastes generated will be segregated and stored in a manner that will facilitate their effective management and disposal. To the extent possible, non-hazardous/non-radioactive, hazardous, and radioactive wastes will be segregated and containerized based upon the waste's classification.

Treatment On-site

On-site treatment operations will be limited to those actions that are required to meet the requirements of the designated waste disposal facilities, including the solidification of liquid wastes. This will include the size-reduction of biological shield components to conform to waste disposal site WAC's for disposal as well as ensuring that the target packaging efficiency is achieved.

Additionally, proactive measures to prevent the presence of decontamination fluids in the final waste packages will be used. This will be accomplished by placing BSA supplied absorbents inside of waste packages that may contain moisture. Prior to sealing all waste packages, BSA waste management personnel will perform an independent verification that the waste containers are in compliance with applicable Department of Transportation and disposal facility regulations. All materials used will be approved by BSA to ensure compliance with the waste disposal facility WAC's.

Reuse of Previously Contaminated Tools and Equipment

It is anticipated that some tools and equipment previously contaminated on other BGRR projects may be reused on the Biological Shield Removal Project. This equipment is already contaminated and reuse of this equipment during biological shield removal could minimize the generation of additional radioactive waste. Reuse of the following equipment is being considered:

- Bobcat with scarifier;
- Two (2) 6,000 CFM HEPA fan units;
- One (1) 10-ton Spanco trackless gantry crane;
- Two (2) Brokk Model 330D remote manipulator and various attachments;
- Propane powered Hi-Vac system;
- Portions of the contamination control containment from graphite pile removal; and
- Portions of the HEPA ventilation system from graphite pile removal.

4.0 PROJECT MANAGEMENT

This section of the RD/RA Work Plan describes the project management and control procedures that will be used to ensure that the remedial action objectives are satisfied. Since the remedial action will involve several parties (EPA, NYSDEC, DOE, BSA, BSA subcontractors, etc.), coordination of activities between parties is essential to ensure satisfactory completion of the remedial action.

4.1 Project Management Organization

A summary level organization chart showing the lines of responsibility for the project is provided on Figure 4-1. Listed below are the representatives involved in management of the Biological Shield Removal Project. A general description of the roles and responsibilities of each representative is given where applicable.

The DOE Site Federal Project Director has overall responsibility on the part of the DOE and will review and approve modification requests. The Site Federal Project Director is also responsible for providing reports to, and acting as a liaison with the NYSDEC and the EPA.

The DOE BGRR Federal Project Director reports to the DOE Site Federal Project Director and is responsible to coordinate the day-to-day technical and regulatory work activities, to ensure compliance, plan and conduct site project meetings to resolve issues, evaluate status, and to ensure the project maintains schedule and baseline commitments.

BSA's Director of the ERP organization has overall responsibility for the safe and cost effective completion of the project. The ERP Director is also the designated project manager.

The ERP D&D Operations Manager will be responsible for safely completing the remedial action activities including coordination with DOE, other BSA divisions/departments, and BSA subcontractors. The D&D Operations Manager will also be responsible for ensuring that the completion of the biological shield removal is completed within the operational envelope described in the *Brookhaven Graphite Research Reactor Biological Shield Removal Specifications* and this work plan. The Operations Manager will monitor project schedule and costs, and prepare monthly reports to DOE.

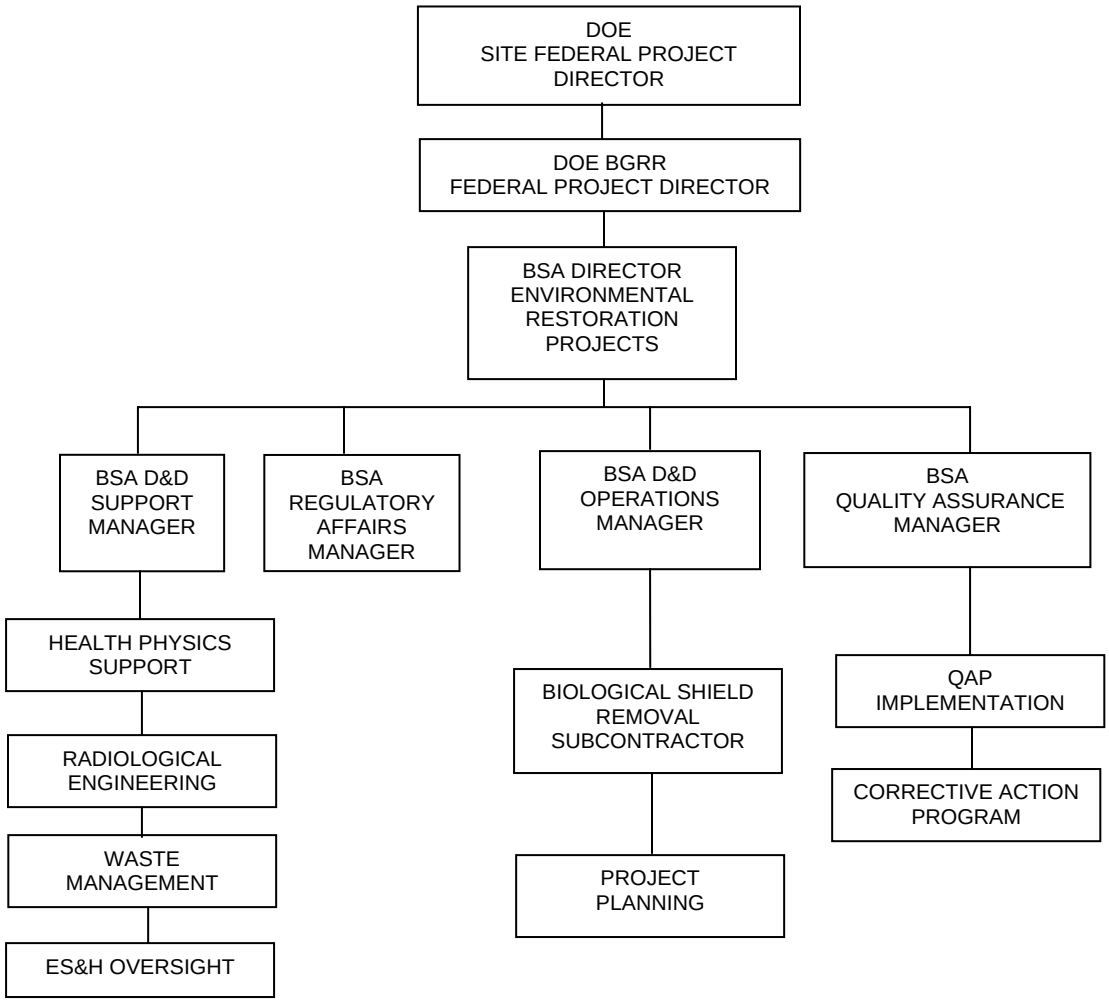
The ERP D&D Support Manager will coordinate and deploy the project oversight and support personnel and services required to complete biological shield removal. These oversight and support functions include health physics and radiological controls, radioactive waste management, work management and work controls, safety and industrial hygiene and environmental management.

The ERP Regulatory Affairs Manager is responsible for managing the interface with regulatory agencies: EPA, NYSDEC, New York State Department of Health (NYSDOH), Suffolk County Department of Health Services (SCDHS), and other federal State and local government agencies. Working with DOE, the ERP Regulatory Affairs Manager will be responsible for meeting

regulatory commitments and for ensuring the effectiveness and timeliness of regulatory interactions (e.g., briefings on project progress, special focus meetings and weekly teleconferences).

The BSA Radiological Control Division will supply the necessary health physics support, through the ERP D&D Support Manager. BSA's qualified technicians will be responsible for providing operational health physics support for the project. These technicians will also be responsible for air effluent monitoring, performing radiological surveys in order to release materials, tools and equipment from controlled areas, and surveys of all radioactive waste shipments.

FIGURE 4-1
BIOLOGICAL SHIELD REMOVAL PROJECT
PROJECT ORGANIZATION



The BSA ERP Quality Systems Manager will ensure that the general BSA quality management and ERP project specific QAP are implemented.

The biological shield removal subcontractors working for and under the oversight of BSA will be responsible for the safe completion of the work in accordance with the *Brookhaven Graphite Research Reactor Biological Shield Removal Specifications* and this RD/RA Work Plan.

4.2 Project Communication

To ensure effective project coordination and execution, the following actions will be performed:

- An Operational Readiness Evaluation will be conducted prior to beginning biological shield removal;
- BNL employees will be communicated with via lab wide emails and internal publications;
- The Building Managers of adjacent facility will be communicated with at the monthly Building Manager meetings;
- Weekly meetings among BSA and DOE project personnel will be held to monitor the progress during field activities; and
- Weekly teleconferences are held with the NYSDEC, NYSDOH, SCDHS, and EPA. to discuss project progress and issues. BSA uses these teleconferences to discuss all relevant project performance, progress, and issues.

Weekly field status and formal monthly reports will be submitted to DOE describing ongoing biological shield removal progress. These reports will include the status of the remedial action field activities, project cost and schedule performance analysis, and a discussion of any other issues relevant to the project.

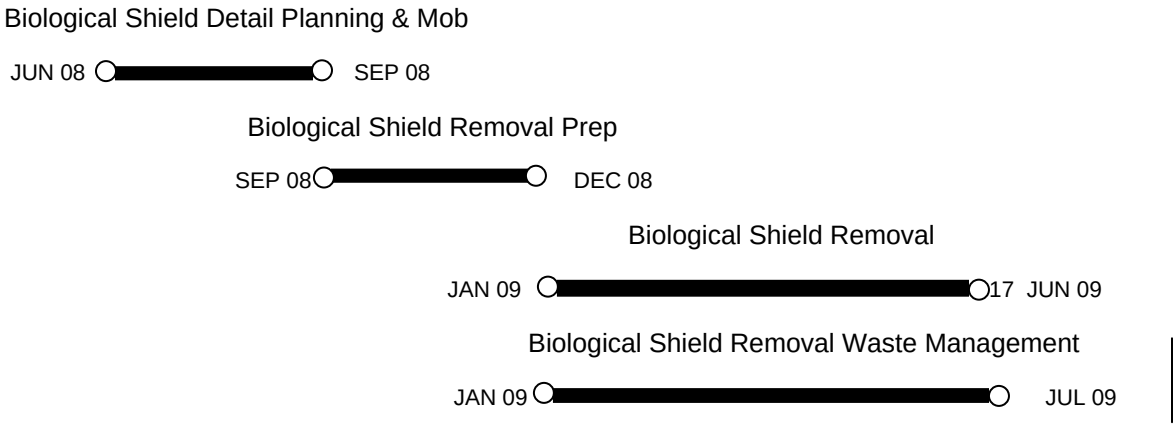
4.3 Project Schedule

The preliminary schedule for field activities is presented in Figure 4-2. As detailed project planning is conducted, the preliminary schedule is subject to changes. The project field activities are anticipated to start in September 2008 and be completed by June 2009. The NYSDEC, NYSDOH, SCDHS, and EPA will be updated on schedule changes during the weekly IAG teleconferences.

4.4 Quality Assurance Plan

To ensure that the remedial action is completed in accordance with the *Brookhaven Graphite Research Reactor Biological Shield Removal Specifications,* a Quality Assurance Plan, *Environmental Restoration Projects Directorate Quality Assurance Plan* (BSA 2006b), has been developed and will be implemented by BSA for the Biological Shield Removal Project.
As described in Appendix A, BSA is flowing applicable quality management requirements to its subcontractors.

Figure 4-2
Project Schedule



4.5 Community Outreach and Involvement

The community will be informed of biological shield removal developments by several methods described below. Complete information regarding community involvement activities can be found on BSA's website for the BGRR Project at http://www.bnl.gov/erd/.

Typical activities to inform the community include briefings to the Community Advisory Council, the Brookhaven Executive Roundtable, elected officials, and, as appropriate, the media.

The BGRR Project website will be updated with status of cleanup work, along with links to the following:

- BGRR Record of Decision
- Final Remedial Design/Remedial Action Work Plans
- Project schedule
- Completion Report

Communications through the Brookhaven Bulletin and the Monday Memo will caution onsite workers and residents about BGRR activities that may impact routine activities on the BNL Site.

5.0 PROJECT CLOSEOUT

The following sections describe the activities for documenting that the biological shield removal has been completed in accordance with the BGRR ROD**.**

5.1 Closeout Report

The successful completion of the biological shield removal will be documented in a Project Completion letter to DOE. The successful completion of the biological shield is defined as the complete removal of the concrete and steel down to elevation 106' – 9", residual contamination levels on accessible surfaces are less than 100,000 dpm bet gamma, and the cavity has been filled with concrete up to elevation 110'. The AOC 9 Closeout Report will be submitted to the NYSDEC and EPA upon completion of all BGRR remedial actions required to meet the requirements of the BGRR ROD. An outline for the Closeout Report is provided in Section 01 33 00 of Appendix A.

6.0 CONTINGENCY PLAN

The DOE and EPA require the implementation of a Contingency Plan to protect the local community that can be affected (both on-site and off-site), in the event of an accident or emergency. The Contingency Plan identifies the hazards that may arise during the completion of biological shield removal, assigns responsibilities and authority in the event that an emergency occurs, and describes the emergency responses expected of BGRR project and BSA Emergency Response personnel.

For on-site accidents and emergencies, these Contingency Plan requirements are satisfied through the development and use of the BGRR Local Emergency Plan (LEP). The BGRR LEP, which will be used throughout graphite pile and biological shield removal, is provided in Appendix E. The BGRR LEP is periodically updated and controlled as part of the ERP OPM.

Screening analyses have demonstrated that there are no on-site accidents or emergencies that could affect surrounding communities. All off-site shipments of radiological/hazardous material must include emergency response information on the shipping paper or manifest. As part of this information, BNL off-site hazardous waste and radioactive material shipments include an emergency response telephone number, which is operated 24 hours/7 days a week. The BNL Safeguards and Security Operator must then contact the BSA Waste Management Division and Radiological Control Division. Based on the severity of the emergency the Radiological Control Division may request assistance from the Radiological Assistance Program (RAP) Team.

The Radiological Assistance Program (RAP) is implemented regionally, with regional coordination between the emergency response elements of the states, tribes, other federal agencies, and DOE. Regional coordination is intended to provide a timely response and to foster a working relationship between DOE and the response elements of the state and local agencies within the region.

REFERENCES

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BSA, 2006b, *Environmental Restoration Projects Directorate Quality Assurance Plan, Rev 5*, prepared by Brookhaven Science Associates for U.S. Department of Energy, Brookhaven Area Office, Upton, New York, January 2006.

APPENDIX A

Brookhaven Graphite Research Reactor
Biological Shield Removal Specifications

BUSINESS PROPRIETARY
(BUSINESS SENSITIVE)

BROOKHAVEN NATIONAL LABORATORY

BROOKHAVEN GRAPHITE RESEARCH REACTOR BIOLOGICAL SHIELD REMOVAL SPECIFICATIONS

Prepared By:

T. Daniels
ERP D&D Operations Manager

Approved By:

L. Hill
ERP Director

August 29, 2007
Revision 4

NSF-ISR
ENVIRONMENTAL MANAGEMENT SYSTEM REGISTERED TO ISO 14001:2004

Prepared by:

Brookhaven National Laboratory
Environmental Restoration Projects
Upton, New York 11973

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F. ERP Operations Procedures Manual

DIVISION 00 - TECHNICAL SECIFICATIONS
SECTION 00 01 01 – STATEMENT OF WORK

PART 1 - General

The Contractor's work for the Biological Shield Removal Project at the Brookhaven Graphite Research Reactor (BGRR) shall be performed in accordance with the Documented Safety Analysis (DSA), Technical Safety Requirements (TSR), and Fire Hazards Assessment (FHA). The BGRR will be a Radiological Facility for the removal of the biological shield but the controls established in the TSR's will be maintained as a best management practice. The Work consists of the following:

A. The Contractor shall be responsible for the preparation of various project plans and procedures that are included in Brookhaven Science Associates (BSA's) specifications. BSA will review these plans and procedures and provide comments to the Contractor for their incorporation. The Contractor shall be responsible for implementation and execution in compliance with BSA approved plans and procedures. In addition, the Contractor shall review and provide comments on the Waste Management Plan (WMP), which will be prepared by BSA. The Contractor shall be responsible for the implementation of designated elements of BSA's WMP.

B. The Contractor shall design, fabricate, qualify and deliver all special tools required to complete the Work. These activities shall be conducted in accordance with the BSA-approved design and qualification plan for special tools. BSA will provide final approval of special tools for use upon satisfactory completion of qualification testing.

C. The Contractor shall provide field oversight, monitoring equipment, consumables and sampling and analysis services required to implement its Environmental, Safety and Health (ES&H) Plan. The Contractor shall be responsible for providing all PPE including respiratory protection equipment required to perform the Work.

D. The Contractor shall design, fabricate and install all ancillary equipment required to support biological shield removal in accordance with BSA's Contract specifications. Such ancillary equipment includes but is not limited to contamination control containment, temporary HEPA ventilation systems, temporary crane and other material handling apparatus, etc.

E. The Contractor shall remove all interferences, to the extent deemed necessary by the Contractor, and approved by BSA, to safely and efficiently remove the biological shield structure.

F. The Contractor shall be responsible for the total removal of the biological shield as detailed in Section 02 44 00, "Biological Shield Removal". The contractor is responsible for packaging all waste for disposal in accordance with BSA's WMP.

G. The Contractor shall remove all loose and visible debris within the biological shield cavity during and subsequent to demolition.

H. Following the removal of the biological shield, the Contractor shall remove loose contamination on accessible concrete and steel surfaces (i.e. top of lower bed plate and accessible concrete surfaces around the bed plate perimeter) of the biological shield footprint to levels less than 100,000 dpm (beta gamma) followed by stabilization of residual loose contamination through the application of a fixative coating.

I. The Contractor shall install a permanent reinforced concrete cover over the footprint of the removed biological shield. The concrete cover will be designed to achieve a floor loading of 250 pounds per square foot.

J. The Contractor shall remove all ancillary equipment (previously installed by the Contractor) upon completion of biological shield removal.

K. In addition to the waste containers provided for the removal of the biological shield, BSA will provide four (4) 20-foot Sealand connex containers for the transportation and disposal of project secondary wastes. Waste loaded into each Sealand container shall not exceed 1170 cubic feet; gross weight of each Sealand shall not exceed 50,000 pounds. Secondary wastes include step off pad wastes, and systems, structures, components and equipment furnished by the Contractor that cannot be decontaminated for unrestricted use at the end of the project. BSA will back-charge the Contractor at a rate of $50,000 per container for all containers containing secondary waste generated by the Contractor in excess of the container allowance provided for herein. The back-charge is an all inclusive cost for transportation and disposal.

L. The Contractor is responsible, at its expense, for decontaminating Building 701 structures, systems and components that are contaminated as a result of the Contractor's biological shield removal activities. The Contractor shall be responsible for decontaminating such Building 701 structures, systems and components to the baseline conditions recorded by BSA and the Contractor prior to the start of work.

M. BSA will be responsible for the off-site transportation and disposal of the removed biological shield components, associated debris, and project secondary wastes subject to the limitations set forth in Paragraph K, above. The Contractor shall be responsible for loading the removed biological shield associated debris and secondary waste into BSA-furnished containers. The contractor shall be limited to a net weight of 45,000 pounds in the 20-yard intermodals and 14,000 pound net weight in the supersacks. The Contractor's biological shield removal and waste loading procedures and activities shall accommodate BSA's waste sampling and inspection requirements and activities described in its WMP. The Contractor shall be responsible for conducting independent waste inspections concurrent with BSA's sampling and inspection activities. The Contractor shall be responsible for transporting these loaded waste containers to BSA's Waste Loading Area or other designated area on the Brookhaven National Laboratory (BNL) Site. BSA will have responsibility for off-site waste transportation and disposal.

N. The Contractor shall perform project closeout activities and provide documentation including the preparation of a project completion report in accordance with BSA's specifications.

O. BSA will provide the following services required to support the biological shield removal project:

1. General employee training in accordance with BSA's specifications.
2. Sufficient quantity of waste packages and containers including 20-yard intermodal containers, 20-foot Sealand connex containers, and supersacks for concrete, steel and secondary wastes.
3. Off-site waste transportation and disposal of project wastes and secondary wastes, subject to the limitations set forth in Paragraph K, above.
4. Waste verification inspections during loading of waste containers.
5. Radiological controls and health physics services to support the Work, including job coverage, instrumentation, transportation surveys, and personnel and environmental air (radiological) sampling and analysis.

6. Dosimetry and bioassays required for personal monitoring.
7. Potable water for industrial use.
8. Approval and oversight of the Contractor's respiratory protection program. (Note: The Contractor shall be responsible for training, medical screening, fit-testing, respirators, respirator cleaning and maintenance, and all other requirements in its respiratory protection program. The fit-testing must be quantitative.)
9. Structural Support details for remaining building 701 components and structures.
10. Efficiency testing of HEPA filters after installation.
11. Page/party communications system; eight (8) handsets located throughout the building 701 high bay and ground floor office area.
12. One (1) 10-ton overhead gantry crane with radio remote controls, installed in building 701 high bay area.
13. Two (2) 440V, 100 amp fused disconnects and two (2) 208V, 60 amp fused disconnects for the Contractor's use. It is the Contractor's responsibility to furnish and install all necessary electrical distribution downstream of these electrical sources.
14. BSA will provide and maintain the following components and equipment:
    a) High bay lighting;
    b) Freight elevator;
    c) Passenger elevator;
    d) Bldg. 701 10-ton overhead gantry crane;
    e) Lighting and convenience receptacles to office spaces in building 701 shop area and second floor office/rest room area; and
    f) Ground floor emergency/exit lighting in high bay area.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 00 01 01

DIVISION 00 - TECHNICAL SECIFICATIONS
SECTION 00 01 25 – ABBREVIATIONS AND ACRONYMS

PART 1 - General

1.00 Abbreviations and Acronyms:

AOC	Area of Concern
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASA	Auditable Safety Analysis
ASTM	American Society of Testing and Materials
AWWA	American Water Works Association
BHSO	Brookhaven Site Office
BGRR	Brookhaven Graphite Research Reactor
BMP	Best Management Practice
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
BOA	Basic Ordering Agreement
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIH	Certified Industrial Hygienist
CSP	Certified Safety Professional
DART	Days Away, Restricted, or Transferred
DOE	U.S. Department of Energy
dpm	Disintegrations per minute
DSA	Documented Safety Analysis
EMD	Environmental Management Directorate
EMS	Environmental Management System
ES&H	Environmental Safety & Health
ESHQR&T	Environment, Safety, Health, Quality, Radiological & Training
EWMSD	Environmental Services and Waste Management Division
FHA	Fire Hazards Assessment
FP	Fixed Price
FS	Feasibility Study
G&A	General and Administrative
GFI	Ground Fault Interrupter
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
HP	Health Physics
IAG	Interagency Agreement
ISMS	Integrated Safety Management System
ISOCS	In-Situ Object Counting System
JRA	Job Risk Assessment
LCAM	Life Cycle Asset Management
LLW	Low-Level Radiological Waste
LOE	Level of Effort
LTES	Long Term Environmental Stewardship
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MLLW	Mixed Low Level Waste
MOA	Memorandum of Agreement
mR/hr	milli-Roentgen per hour

mrem/yr	milli-rem per year
MS&T	Materials, Supplies & Travel
MSDS	Material Safety Data Sheet
ncpm	Net counts per minute
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NYSDEC	New York State Department of Environmental Conservation
ORE	Operational Readiness Evaluation
ORR	Operational Readiness Review
OSHA	Occupational, Safety, and Health Association
OU	Operable Unit
P-3	Primavera Project Planner
PA/SI	Preliminary Assessment/Site Inspection
PCBs	Polychlorinated Biphenyls
pCi/g	Picocuries per gram
PM	Project Manager
PPE	Personal Protective Equipment
PPM	Procurement and Property Management
QA	Quality Assurance
QAP	Quality Assurance Plan
RA	Removal Action
RCD	Radiological Control Division
RCT	Radiological Control Technician
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
ROD	Record of Decision
RWP	Radiological Work Permit
SAP	Sampling and Analysis Plan
SBMS	Standards Based Management System (https://sbms.bnl.gov/)
SCDHS	Suffolk County Department of Health Services
SECON	BNL Security Condition
SOW	Scope of Work
SPDES	State Pollutant Discharge Elimination System
TCLP	Toxicity Characteristic Leaching Procedure
TLD	Thermoluminescent Dosimeter Badge
TSR	Technical Safety Requirements
UL	Underwriters Laboratories
USEPA	U.S. Environmental Protection Agency
USQD/SE	Unreviewed Safety Question Determination/Safety Evaluation
WAC	Waste Acceptance Criteria
WBS	Work Breakdown Structure
WM	Waste Management
WMP	Waste Management Plan

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 00 01 25

DIVISION 00 - TECHNICAL SECIFICATIONS
SECTION 00 72 00 – GENERAL CONDITIONS

PART 1 - General

1.00 Definitions

A. As used in these specifications, the following have the meaning shown:

1. BSA - Brookhaven Science Associates, operator of Brookhaven National Laboratory, and its authorized representatives from various Divisions and Departments.

2. BNL – Brookhaven National Laboratory

3. BNL Site – Land occupied by Brookhaven National Laboratory, in Brookhaven Township, Suffolk County, New York.

4. ERP – Environmental Restoration Projects Directorate responsible for the Work.

5. Site – Immediate area of the BNL Site assigned to the Contractor to perform the Work.

6. Work or Project – Includes, but is not limited to, all labor, materials, tools, and equipment required and reasonably inferred by the Contract to complete all work described in the Statement of Work.

7. Contractor – Single person or entity identified in the Contract and responsible for completing the Work.

8. Subcontractor – Person or entity directly contracting with the Contractor, but not including one who merely furnishes materials.

9. OSHA Recordable Injury – An occupational injury or illness that requires more medical treatment than simple first aid and must therefore be reported to OSHA

10. Days Away, Restricted, or Transferred (DART) Case – A DART case is a type of OSHA Recordable Injury, whereby the injury or illness is severe enough that an individual loses time away from their job by being away from work, by being on restricted duty, or by being transferred to another job function.

B. Wherever the Specifications use the terms "shown on drawings", they shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.

C. Wherever the terms "material" or "materials" are used in the Specifications, they shall mean any "product", "equipment", "device", "assembly" or "item" required under the contract, as indicated by trade or brand name, manufacturers' name, standard specification reference, or other description.

D. The term "approval" shall mean the written approval of BSA. (Approval by BSA does not relieve the Contractor from meeting its obligations, specification or Contract requirements.)

E. The terms "directed", "required", "permitted", "ordered", "designated", "prescribed" and similar words shall mean BSA's direction, requirement, permission, order, designation or prescription. The terms "approved", "acceptable", "satisfactory" and similar words shall mean approved by, acceptable to, or satisfactory to BSA; and, the terms "necessary", "reasonable", "proper", "correct" and similar words shall mean necessary, reasonable, proper, or correct, in the judgment of BSA.

F. "New" shall mean manufactured within the past twenty-four (24) months and never before used.

1.01 Review and Intent of Contract Documents

A. The Contractor shall, prior to starting the work on any single portion and at frequent intervals during the progress of the work, carefully study and compare the General Documents, General Conditions, Drawings, Specifications, Amendments and other Contract documents and shall at once report to BSA any error, inconsistency or omission the Contractor may discover.

1.02 Reference Drawings

A. Drawings generally are done to scale as noted. The Contractor shall not scale the drawings for establishing dimensions and/or layout. The dimensions shown on the documents or surveyed points (in feet) shall be used.

B. The reference drawings are provided for the Contractor's information. BSA does not imply or warrant the accuracy of the information provided in reference drawings. Critical dimensions, other dimensions, as built and existing configurations, etc. that are important to the Contractor's development of designs, processes and procedures, etc. shall be field verified by the Contractor. BSA will not consider any requested changes or modifications to the Contract that are in any way related to the accuracy or inaccuracy of reference drawings.

C. The Contractor shall give BSA timely notice of any additional design drawings, specifications, or instructions required to define the work in greater detail, or to permit its proper progress, and BSA will provide such information with reasonable promptness so as to not delay the Work.

D. The following drawings are identified as reference drawings. The entire BGRR drawing set is being provided to the Contractor for reference:

Index of Reference Documents

Field Alteration	# 1	ALT TO PLENUM BUCKSTAYS
"	#2	ALT TO 3" TOP PLATE
"	#4	Ends of Graphite Plug
"	#5	Side Plate Relocation
"	#6	Grill I-beam
"	#8	Cutting plate adjacent to control rod drive
"	#10	¾" x 6" flat bar F/ATM
"	#12	Alt grill beam guide lug
"	#13	Shim retainers
"	#14	Cut existing key base plate
"	#15	Invar sleeve at channel
"	#16	Steel sleeve at channel
"	#19	Gear box plate pusher

“	#20	Section Thru periscope tubes North and South Plenums
“	#21	Coil spring / ATM seal
“	#22	Revisions to ATM at top of pile
“	#23	Revisions to Seat Plug
“	#26	New stub for shifting linkage
“	#27	Cut/seal strip ¼’ plate
“	#28	Rev at graphite Block seal
A-701	l5A	Stairway No. 2 and 5 Details
A-701	2lA	Balcony and Stair Railing Detail, Sheet No.3
A-701	20A	Balcony and Stair Railing Detail, Sheet No. 2
A-701	3A	Upper Level Plan
A-701	3lA	Main Floor Plan Building 701
A-701	16A	Stairway No. 1 Details
A-701	19A	Balcony and Stair Railing Detail, Sheet No. 1
A-701	27A	Stairs to Rod Structure Building 701
A-701	32A	Intermediate Floor Plan Building 701
A-701	38B	Railings and Ladder at Balcony, Elevation 136' _4"
A-701	39A	Ladder Connecting Balconies, West Side Structure
BM-702	7A	Arrangement of Metal Temperature Thermocouples
C-702	12A	Reinforcement for Pile Shield
C-702	13A	Pile Shield Roof Plan Reinforcement
C-702	l4A	Balcony, Floor Slab Elevations 114' - 4", 118' - 4" and 127’ - 0"
C-702	1A	Buttress No. 4 Elevation and Detail
C-702	11A	Removable Roof Sections
C-702	10A	Removable Roof Sections
C-702	2A	Foundation Plan and Detail
C-702	3A	Buttress No. 1 Elevations and Details
C-702	4A	Buttress No. 2 Elevations and Details
C-702	5A	Buttress No. 3 Elevations and Details
C-702	15A	Balcony Floor Slab at Elevation 123' -0"
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C-70l	16A	Building 701 Main Floor Plan
C-70l	10A	FDN Pedestals Plan and Elevation Part 1
C-70l	22A	Building 701 Interior Beams B17 to B23 (Inclusive)
C-70l	2A	Excavation Plan
C-70l	2lA	Building 701 Interior Beams B9 to B-16 (Inclusive)
C-70l	3A	Foundation Plan and Sections
C-70l	4A	Main Floor Plan Elevation 119 feet 0 inches
C-70l	5A	Retaining Wall on "G" Line
C-70l	6A	Section of Floor and Foundation Column Line No. 1
C-70l	7A	Section of Floor and Foundation Column Line No. 2
C-70l	8A	Section of Floor and Foundation Column Line No.6.
C-70l	9A	Section of Floor and Foundation Column Line No. 7
C-70l	l2A	Column Pedestal B100-101-Bl-B7
C-70l	l4A	FDN Pedestals Plan and Elevation Part 3
C-70l	l9A	Grade Beams B1 to B8 Inclusive
FS-C	236-D	Schedule of Settlements
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M-702	l26A	Large Chamber Carriage Details
M-702	16A	Door for Removable Core
M-702	l8B	Removable Core Plug Assembly
M-702	10A	Details of Steel Enclosure

M-702	11A	Charging Platform
M-702	127A	Large Chamber Carriage Details
M-702	129A	Small Chamber Gate and Lifting Device Assembly and Details
M-702	15A	Small Chamber Duct
M-702	182A	Sections and Details of Shot wells
M-702	184A	Emergency Liquid Shutdown System. Arrangement Details
M-702	185A	Emergency Liquid Shutdown System. Arrangement Details
M-702	187A	Fission Pole Details
M-702	188A	Control Rod Liner Alterations
M-702	18A	Small Chamber - General Assembly
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M-702	20A	Small Chamber - Carriage Assembly
M-702	21A	Small Chamber - Take Up Unit Assembly and Details
M-702	21B	Arrangement of Animal and Ion Chamber
M-702	22A	Small Chamber - Sprocket Drive Housing Details
M-702	22B	Small Chamber Drive Supports
M-702	23A	Small Chamber - Sprocket Drive Assembly
M-702	23B	Large Chamber Drive Supports
M-702	25A	Small Chamber - Sprocket Drive Details
M-702	26A	Small Chamber - Carriage Details
M-702	27A	Large Chamber General Assembly
M-702	27C	Shot well Charging Tube
M-702	28A	Large and Small Chamber Gate Limit Switches
M-702	28C	Control Rod Outer Casing
M-702	29A	Large Chamber Carriage Assembly
M-702	29C	Control Rod Removable Casings
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M-702	33B	Graphite Blocks for Control Rods
M-702	35A	Large and Small Chamber Hand Drive Details
M-702	36B	Lead Shielding Assembly
M-702	39B	Shot well Plug Assembly (Vertical)
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M-702	42B	Pneumatic Tube System (Isometric)
M-702	42C	Liner - Shot well at Gap
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M-702	4B	Rod-Rack Splice
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M-702	52C	Spring for Control Rod Graphite Liners
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M-702	54B	Control Rod Liner Plate Schedule
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M-702	56B	Plate Details Control Rod Liners
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M-702	4lA	Lead Shielding for Control Rods, Details
M-702	70A	Arrangement of Control Rod Casing
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M-702	154A	Helium System Trough Details
M-702	164A	Roof Plugs - Graphite
M-702	18lA	Sections of' Shot well (Gap)
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M-702-3	2D	Bell Mouth Channel Opening - Intake
M-702	2X	Helium System - Plan Layout and Details
M-702	33B	Graphite Blocks for Control Rods
M-702	34A	Large Take-Up Unit Assembly and Details
M-702	36A	Pushing Machine – General Assembly
M-702	37A	Pushing Machine – Assembly
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M-702	38B	Helium Purge Outlet to Plenum
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M-702	3A	Details of Steel Enclosure
M-702	4A	Details of Steel Enclosure
M-702	40A	Liquid Shutdown System
M-702	42C	Liner - Shot well at Gap
M-702	43A	Pile Locking Device
M-702	45B	Periscope Plug Assembly and Details
M-702	45C	Removable Shot well Gap Plug Assembly
M-702	46C	Removable Shot well Plug Detail at Gap
M-702	47C	Graphite Plug Shot well at Gap
M-702	48B	Concrete Plug for Shot well at Gap
M-702	48C	Shot well Charging Tube Details at Gap
M-702	49B	Shot well Funnel at Gap
M-702	52A	Removable Plug Details
M-702	55A	Removable Plug Details
M-702	59A	General Arrangement - Shot well
M-702	60A	Sections of Shot well
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M-702	6A	Details of Steel Enclosure
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M-702	9A	Details of Grillage Assembly
M-702	l05A	Steel Encasement Elevations
M-702	10B	PE – Plug North
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M-702	l4A	Large Chamber Duct
M-702	l4C	Liner Type PE – Short
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S-702	8A	Steel Encasement – Opening in Roof
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S-702	5A	Steel Framing Supports for Ducts
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S-702	7A	Balcony Framing and Elevator Shaft Framing
S-702	10A	Charging Elevator Plan & Sections
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S-702	5B*	Steel Crate Details
S-702	7B*	Base for Steel Encasement
S-702	1C	Detail Steel Encasement
S-702	2C	Detail Steel Encasement
S-702	3C	Details of Steel Encasement
S-702	4C	Detail Steel Encasement
S-702	5C	Detail Steel Encasement
S-702	6C	Detail Steel Encasement
S-702	7C	Detail of Steel Encasement
S-702	8C	Detail Steel Encasement
S-702	9C	Detail Steel Encasement
S-702	10C	Detail Steel Encasement
S-702	11C	Detail Steel Encasement
S-702	12C	Detail Steel Encasement
S-702	13C	Detail Steel Encasement
S-702	14C	Detail Steel Encasement
S-702	15C	Detail Steel Encasement
S-702	16C	Detail Steel Encasement
S-702	17C	Detail of Steel Encasement
S-702	18C	Detail of Steel Encasement
S-702	19C	Detail Steel Encasement
S-702	20C	Detail Steel Encasement
S-702	21C	Detail Steel Encasement
S-702	22C	Detail Steel Encasement
S-702	23C	Detail Steel Encasement
S-702	24C	Detail Steel Encasement
S-702	25C	Detail Steel Encasement
S-702	26C	Detail of Steel Encasement
S-702	27C	Detail of Steel Encasement
S-702	28C	Detail of Steel Encasement
S-702	29C	Detail Steel Encasement

S-702	30C	Details of Steel Encasement
S-702	31C	Detail of Steel Encasement
S-702	32C	Detail of Steel Encasement
S-702	33C	Detail of Steel Encasement
S-702	34C	Detail of Steel Encasement
S-702	35C	Detail Steel Encasement
S-702	36C	Detail Steel Encasement
S-702	37C	Detail Steel Encasement
S-702	38C	Detail of Steel Encasement
S-702	39C	Detail Steel Encasement
S-702	40C	Detail Steel Encasement
S-702	41C	Detail Steel Encasement
S-702	42C	Detail of Steel Encasement
S-702	43C	Detail Steel Encasement
S-702	44C	Detail Steel Encasement
S-702	45C	Detail of Steel Encasement
S-702	46C	Detail of Steel Encasement
S-702	47C	Detail Steel Encasement
S-702	48C	Detail Steel Encasement
S-702	49C	Detail of Steel Encasement
S-702	50C	Detail Steel Encasement
S-702	51C	Detail of Steel Encasement
S-702	52C	Detail Steel Encasement
S-702	53C	Details of Steel Encasement
S-702	54C	Details of Steel Encasement
S-702	55C	Detail Steel Encasement
S-702	56C	Detail Steel Encasement
S-702	57C	Detail of Steel Encasement
S-702	58C	Detail Steel Encasement
S-702	59C	Detail Steel Encasement
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S-702	75C	Steel Crate
S-702	76C	Steel Crate
S-702	77C	Steel Crates
S-702	78C	Steel Crate
S-702	79C	Steel Crate
S-702	80C	Steel Crate
S-702	81C	Steel Crate
S-702	82C	Steel Crate
S-702	83C	Steel Crate
S-702	84C	Steel Crate

S-702	85C	Steel Crates
S-702	86C	Steel Crate
S-702	87C	Steel Crate
S-702	88C	Steel Crate
S-702	89C	Steel Crate
S-702	90C	Steel Crate
S-702	91C	Steel Crate
S-702	95C*	Steel Crate
S-702	96C	Steel Crate
S-702	97C	Steel Crate
S-702	98C	Steel Crate
S-702	99C	Steel Crate
S-702	100C	Steel Crate
S-702	101C	Steel Crate
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S-702	104C	Steel Crate
S-702	105C	Steel Crate
S-702	106C	Steel Crate
S-702	107C	Steel Crate
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FS-S	765A	702 – Transverse Section (East – West) Through Pile Structure
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1.03 Work Permits

A. The Contractor shall perform all Work in accordance with Work Permits, which will be prepared by BSA in accordance with the Integrated Safety Management System (ISMS). Work Permits are further discussed in Section 01 35 23 – Owner Safety Requirements.

B. Radiological Work Permits (RWP's) shall be initiated by the Contractor and will be completed and authorized by BSA. All radiological work shall be performed in accordance with the RWP.

1.04 Notice to Proceed

A. The Contractor shall not knowingly, without BSA's written formal notice, prematurely commence operations on the BNL Site. BSA shall not issue the Notice to Proceed before BSA receives all required bonds and insurance documents, and required submittals.

B. Work may proceed, however, in preparing and submitting all required work plans and procedures and in ordering materials and equipment that do not require BSA's prior approval.

1.05 Use of Site

A. The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times with BSA. The Contractor's right to entry and use thereof arises solely from the permission granted by BSA under the Contract.

B. The Contractor shall confine the use of the premises for all purposes, to the areas identified by BSA.

C. It shall be the responsibility of the Contractor to provide necessary and required security measures to safeguard the Site including all materials and equipment from theft, vandalism and intrusion of unauthorized persons during all working hours, non-working hours, weekends and holidays.

1.06 Work Hours

A. The Contractor shall not be limited to normal working hour shifts or the number of working days per week, except that no work will be performed on BSA holidays or when BNL has been closed due to adverse weather conditions.. The BSA holiday list can be found at www.bnl.gov/bnlweb/Admin/holidays.asp. The work hours and shift schedules will be subject to BSA approval.

B. The Contractor's personnel are to be made aware that extended or unusual work shifts may be more stressful physically, mentally, and emotionally on the work crews, leading to increased fatigue, stress, and lack of concentration. These effects lead to an increased risk of operator error, injuries, and/or accidents. The limits provided in Paragraph E, below, shall not be exceeded by the Contractor.

C. The normal work hours at BNL are 8:30 am to 5:00 pm, Monday through Friday. The Contractor shall request BSA approval in advance of all planned activities and submit a list of all Contractor and Subcontractor employees who are expected to work on the BNL Site during off-hour periods. All employees working during off-hours must possess a valid BNL contractor employee photo identification badge.

D. BSA will notify BSA Police Headquarters and the main gate of the days and hours outside of normal working hours that work is planned. Failure to notify BSA will be cause for BSA Police to deny access to the BNL Site.

E. Limitation on Extended Work Hours

The Contractor's personnel shall be limited to the following work schedule restrictions with no exceptions:

1. A person shall not be permitted to work more than 16 consecutive hours, including shift turnover time;

2. A person shall not be permitted to work more than 24 hours in any 48 hour period, including shift turnover time;

3. A person shall not be permitted to work more than 72 hours in any 7 day period, including shift turnover time;

4. A person shall not be permitted to work more than 14 consecutive days without having two (2) consecutive days off; and

5. If a person is required to work in excess of 12 continuous hours, his/her duties should be carefully selected. Moreover, this person shall not be assigned any task that could possibly endanger the safety of him/her and others due to fatigue.

F. The Contractor shall compile all labor hours worked on a daily, weekly and monthly basis. This compilation shall include all OSHA Recordable and DART cases and is to be submitted to BSA by the first week of the following month.

1.07 Identification of Employees

A. All Contractor employees must attend the Contractor/Vendor Orientation and be approved by BSA in order to work on the BNL Site. A contractor employee photo identification badge will then be issued in order to have access to the BNL Site.

B. The Contractor shall assure that all employees promptly obtain a current BNL contractor employee photo identification badge. Badges shall be obtained in the lobby of the Research Support Center, Building 400, Monday through Friday, between 8:30 a.m. and 12:00 noon.

C. Proper photo identification (e.g., driver's license, passport) and proof of social security number is required to obtain an identification badge. Access to the BNL Site by foreign nationals, including permanent resident aliens, is subject to BSA approval. Approval may take six or more weeks.

D. Contractor employees shall wear the badge so as to be visible at all times while on-site.

E. Contractor employee identification badges are valid for one (1) year after issuance. After one (1) year, contractors are required to attend the Contractor/Vendor Orientation and renew the photo identification badge. Badges will be provided at no cost to the Contractor. Immediately upon release of employees or project completion, the Contractor shall return badges to Building 400 lobby. (BSA will retain badges for re-issue for one year).

F. Contractor employees shall report lost identification badges immediately to the BSA Badging Office, in Building 400.

1.08 Kickoff Meeting

A. BSA will set up a kickoff meeting to discuss and finalize any project plans or issues. The Contractor's non-manual staff is required to attend the kickoff meeting.

1.09 Work Schedule and Notification:

A. The Contractor shall prepare a detailed, resource loaded (labor) schedule that accurately reflects the Contractor's work plan, and supports the schedule completion milestones included in the Contract. Individual activities in this schedule will normally be no longer than five (5) work days in duration. The intent of this requirement is to ensure that the Contractor provides a detailed schedule for managing the project. Where the five-day period is not practical, or is otherwise inconsequential to project management and control, longer durations will be accepted. The Contractor shall provide the schedule on a Primavera Project Planner (P-3) platform (Primavera version 3.1, Primavera Contractor, or Primavera Sure Trak). BSA shall approve the schedule prior to BSA's issuance of a Notice to Proceed. The Contractor shall attend weekly schedule reviews with BSA, and the Contractor's schedule shall be updated on a weekly basis.

B. Operational Readiness Evaluations (ORE) and lessons learned hold points shall be built into the Contractor's schedule. The minimum durations to be included in the Contractor's schedule are provided below. Prior to scheduling the hold point, the Contractor is responsible to complete all activities required for review. (Note: The Contractor shall be required to resolve hold point issues and concern's to BSA's satisfaction regardless of the time duration required to do so. BSA shall not unreasonably withhold Contractor approval of a hold point and unnecessarily delay the Contractor's ability to proceed.) The following hold points shall be included in the schedule:

   a. ORE prior to the start of inner biological shield removal. BSA and the Contractor will be performing targeted ORE reviews prior to the final BSA ORE. The following reviews and ORE shall be performed and included in the contractors schedule:

      i. ORE Review – Plans. This review will commence after BSA has approved all of the Contractors work plans and procedures as detailed in Section 01 33 00, Submittals. This review will be performed concurrently with field preparatory activities.
      ii. ORE Review – Personnel Qualifications and Training This review will commence after the contractor has mobilized all of their personnel and 100% of their training has been completed. This review will be performed concurrently with field preparatory activities.
      iii. ORE Review – Equipment. This review will commence after the contractor has completed installation of all support equipment, contamination control containment, ventilation system, and special tools. This review will be performed concurrently with field preparatory activities.
      iv. ORE Findings Resolution and ORE Report (5 work days). This will commence after completion of the ORE.

   b. Lessons learned following the first five days of inner biological shield removal (3 work days).

   c. Lessons learned following the first five days of outer biological shield removal (2 work days).

C. BSA must be notified and made aware of all work in progress. BSA will provide appropriate telephone extension numbers for notifications by the Contractor.

D. Following removal of the biological shield to the limits defined in the Statement of Work and removal of loose debris within the biological shield cavity, BSA shall perform radiological surveys to document the as-left radiological characteristics of the Building 701 work area.

E. BSA expects all work to be performed in accordance with the P-3 schedule. When activities have not been previously scheduled, the Contractor shall request the authority to proceed with unplanned work no less than 24 hours in advance of the conduct of these unplanned activities. BSA encourages the Contractor to develop work-arounds and identify potential schedule accelerations and will allow the Contractor to perform previously identified stand-by work without the 24-hr advance notification. BSA reserves the right to deny approval to proceed with work that is not on the P-3 schedule.

F. BSA oversight is required for all work. For off-hour work not included in the Contract or P-3 schedule, the Contractor will be backcharged on an hourly rate based on BSA's published schedule of rates for all resources required for BSA to support unscheduled work. The complete rate schedule is available through BSA's Technical Representative but listed below are the FY09 rates for the predominant BSA support personnel. This back-charge includes off-hour work directed by BSA due to the Contractor's failure to meet schedule completion dates.

a.	Radiological Control Technician	$82.03
b.	Waste Verifier	$77.41
c.	Field Engineer	$89.44
d.	Project Manager	$146.34
e.	Health and Safety Professional	$115.36

1.10 Subcontractor Approval

A. BSA shall approve the Contractor's selection and use of subcontractors.

1.11 Overall Project Coordination and the Flow Down of Contract Requirements

A. The Contractor is responsible for the Work, including that performed by the Contractor's subcontractors, vendors, and service providers at all tiers and of any nature. The Contractor is responsible for the coordination, scheduling and performance of all subcontractors, vendors and service providers. The Contractor shall flow applicable requirements of the Contract to such subcontractors, vendors and service providers.

B. BSA assumes no responsibility for contractual relations between the Contractor and other parties.

1.12 Transportation and Traffic

A. The Contractor shall schedule, confine, and perform work so as not to interfere with BSA traffic on existing roads, walks, parking and other paved areas. The Contractor shall park all vehicles in designated parking areas, and load and unload vehicles where directed by BSA. All Contractor personnel shall comply with all BSA traffic regulations. Violations will not be tolerated and chronic abusers will be removed from the BNL Site.

B. The Contractor shall coordinate the delivery and removal of all materials and equipment with BSA. Major delivery and removal activities will be included in the P-3 schedule, and subject to the same requirements as all project activities. Unless otherwise approved by BSA in advance, the delivery and removal of materials and equipment shall be conducted during normal working hours. The firms providing transportation and logistics services to the Contractor are subcontractors subject to the Contractor's coordination and oversight and must comply with the Contractor's ES&H Plan.

C. All Contractor vehicles (personal or otherwise), trucks, heavy equipment, equipment, material, trailers and any other conveyance or storage area are subject to inspection by BSA. All Contractor vehicles, trucks, heavy equipment, equipment, material, and trailers that are operated or staged within a radiological contaminated work zone must pass through the vehicle radiation monitor upon entry to the BNL Site and when leaving the BNL Site.

D. All Contractor vehicles, trucks, heavy equipment, equipment, and/or material that will be used in a radiological contamination area will be subject to incoming radiation and contamination surveys performed by BSA. Incoming surveys will take approximately four (4) hours per vehicle.

E. All Contractor vehicles, trucks, heavy equipment, equipment, and/or material that will be used in a radiological contamination area will be subject to outgoing radiological contamination and dose rate surveys performed by BSA. Any required decontamination required to meet BSA's radiological release criteria is the responsibility of the Contractor. Outgoing surveys will take approximately four (4) hours per vehicle.

F. Transportation vehicles and drivers used by the Contractor in connection with on-site waste transportation shall be in compliance with applicable BSA SBMS requirements.

1.13 Protection of Property

A. The Contractor shall be responsible for the safety and security of its property on the BNL Site.

B. The Contractor shall protect materials equipment and other property from damage by and as a result of performing the Work, including disappearance.

C. The Contractor shall repair, refinish, replace and otherwise correct all damage caused by the Contractor, and replace any missing materials, as required or otherwise directed by BSA.

1.14 Project Meetings:

A. The Contractor shall participate in project meetings held weekly unless otherwise designated by BSA. The purpose of these meetings is to review the work planned for the week, previous week's accomplishments, safety issues, and project schedule. In addition, the Contractor shall provide weekly P-3 schedule updates and participate in weekly BSA schedule review meetings.

B. The Contractor's key managers shall attend the weekly project meetings and arrangements will be made to ensure participation by the Contractor's corporate official.

C. Decisions, instructions and interpretations agreed upon at such meetings will be recorded in meeting minutes prepared by BSA and furnished to the Contractor and each attendee. The BSA contract technical representative and contract administrator will attend the meeting to ensure that all work discussed is in accordance with the Contract. If BSA provides direction to the

Contractor that is contrary to the Contract, a modification will be initiated prior to the performance of the Work.

D. As the need arises, the Contractor shall attend non-routine meetings to discuss special matters with BSA.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 00 72 00

DIVISION 00 - TECHNICAL SECIFICATIONS
SECTION 00 73 00 – SUPPLEMENTARY CONDITIONS

Part 1 - General

1.00 BNL Supplied Items

A. Items being supplied to the Contractor by BSA:

1. Training in accordance with Section 01 35 24 Training Requirements.

2. BSA will provide all 20 yard intermodal containers and supersacks required for the disposal of the biological shield waste. The Contractor may propose an alternate container for BSA consideration and approval.

3. BSA will perform waste verification inspections during loading of the waste containers. The Contractors work plan and P-3 schedule will provide for BSA's waste inspection activities.

4. BSA will be responsible for off-site waste transportation and disposal.

5. BSA will provide radiological control and health physics services for the work in accordance with BNL Radiological Control Manual and implementing procedures, including job coverage, RWPs, transportation surveys, personnel and environmental radiological air samples. (Note: Non-radiological sampling and analysis to support the Contractor's ES&H Plan is the responsibility of the Contractor.)

6. Thermoluminescent dosimeters and bioassays.

7. Electrical power inside Building 701.

   a) Two (2) 440V, 100 amp fused disconnects and two (2) 208V, 60 amp fused disconnects for the Contractor's use. It is the Contractor's responsibility to furnish and install all necessary electrical distribution downstream of these electrical sources.

   b) BSA will provide and maintain the following components and equipment:
      1. High bay lighting;
      2. Freight elevator;
      3. Passenger elevator;
      4. Bldg. 701 10-ton overhead gantry crane;
      5. Lighting and convenience receptacles to office spaces in building 701 shop area and second floor office/rest room area; and
      6. Ground floor emergency/exit lighting in high bay area.

8. Potable water.

9. Approval and oversight of the Contractor's respiratory protection program. (Note: The Contractor shall be responsible for training, medical screening, fit-testing, respirators, respirator cleaning and maintenance, and all other requirements in its respiratory protection program. Fit-testing must be quantitative.)

10. BSA will provide materials and personnel to perform acceptance testing of HEPA filters.

11. Space is available for a maximum of two (2) 12-foot by 56-foot office trailers. One 440V, 3-phase welding outlet is available for trailer power; the Contractor is responsible for power hook-up. No other utilities are available (e.g. water, sewer, communications) at the trailer site.

12. The following is a list of equipment that is available for the Contractor's use in the performance of the work. The equipment list is the same provided for the Graphite Pile removal and it is expected that the same equipment will be available for the Biological Shield Removal, unless damaged or no longer useable. BSA makes no warranty as to the condition of the equipment, and it will be the Contractor's responsibility to perform all service and maintenance on this equipment should it be used:

    a. Two (2) 6,000 CFM HEPA fan units with controls and (6) HEPA elements, (20) pre-filter elements, (8) large BI/BO bags and (8) small BI/BO bags. Each fan unit requires (8) HEPA elements and (4) pre-filter elements;
        - HEPA filters rated 99.97% efficiency at 0.3 microns.
        - Prefilters are 85% efficient.
        - Filter arrangement - 2 high x 2 wide, all filter elements are 24" x 24" x 6".
        - Prefilter requires (4) filter elements; each of the two HEPA stages requires (4) elements.
        - Fan/motor assembly delivers 6000 CFM@ 9"SPWG, mounted with flex connection and vibration base.
        - Each filter stage (3) has 4 test sample ports as well as Static Pressure taps.
        - Photohelic gauges on each filter stage and across all stages (4) with local readout and remote indication capability.
        - 208 Volt, 3 Phase, 60 Hertz
        - Control transformer provides 120VAC secondary at 2 amps minimum for 208 Volt input.
        - Local system controls are 120VAC with remote Start/Stop capability and include contacts on each motor starter.
        - Both Inlet and Outlet transition sections are flanged and have electric motor operation with Manual Override Low Leak Isolation dampers – damper sizes are 20" OD
        - Each unit has (4) lifting lugs located and sized appropriately for crane lifting.
        - All ductwork is 18-gauge galvanized steel. Common ductwork is 26" OD; individual fan unit connections are 20" OD.
        - Flex duct couplings are used to interconnect the (20") HEPA unit inlet and discharge connections and the Interconnecting Exhaust Duct
        - The exhaust stack has Isokinetic sampling probes sized for both flow rates, i.e. 6,000 and 12,000 CFM.
        - The exhaust stack is oriented horizontally with attachments for support stands (Unistrut or eq.)

    b. One (1) 10-ton Spanco trackless gantry crane;
        - Spanco Model PF with 2-speed operation at 17/50 FPM. Overall span = 20'-0", 17'-0" clear span, 25'-0" height under beam.
        - Trackless power drive with two 2 HP drive motors driving polyurethane wheels.

- Additional information on Spanco cranes available at http://www.spanco.com/

c. Two (2) Brokk model 330D diesel-powered radio-remote operated manipulators;
   - One (1) Brokk Model 330D remote manipulator (has loose contamination up to 210,000 dpm/100cm2 and fixed radioactive contamination to 7mR/hr)
   - One (1) Brokk Model 330D remote manipulator (radiologically clean with low hours);
   - Caterpillar tracks, wheel gears
   - 63 HP, 3 liter diesel engine
   - Forward and rear facing halogen lights with compressed-air cleaning nozzles (1 unit)
   - One (1) short-arm, (1) long-arm manipulator
   - Both have Brokk "Quick Hitch" arms and central greasing system
   - (2) Forward facing and (1) rear-facing cameras (1 unit)
   - (2) Video control consoles with (3) flat-screen monitors each
   - Attachments (all "Quick Hitch")
     - 29 gallon clamshell bucket
     - Impact hammer
     - Steel shear
     - Lift magnet
     - Steel plate sawing system
     - Filter removal tool (base only)
   - Additional information available at http://www.brokk.com/

   Note: All work within the contamination control envelope (CCE) must be performed without introducing hazardous materials that are prohibited by the DSA. These include the use of equipment powered by gasoline or diesel fuels.

d. Video inspection equipment includes two cameras with pan and tilt, console monitor, and camera control system

PART 2 – Products

Not used.

PART 3 – Execution

Not used.

END OF SECTION 00 73 00

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 31 00 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - General

1.00 Key Personnel

A. The following Contractor positions are designated as key personnel:

1. Corporate Official
2. Project Manager
3. Field Superintendent
4. Radiological Engineer
5. Site Health and Safety Officer

B. The assignment of key personnel by the Contractor shall be subject to BSA approval. Replacements for key personnel departing the project shall meet these qualification requirements and are also subject to BSA approval.

1.01 Project Documentation

A. BSA shall have access to all Contractor project documentation, records, and data required to satisfy the requirements of the specifications.

PART 2 - Products

Not Used.

PART 3 - Execution

Not Used.

END OF SECTION 01 31 00

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 33 00 – SUBMITTALS

PART 1 - General

1.00 Related Sections

A. Section 00 01 01 – Statement of Work

B. Section 01 71 13 – Mobilization/Demobilization

1.01 General

A. BSA shall provide a draft copy of its Waste Management Plan (WMP) to the Contractor. The Contractor shall review the WMP and propose changes to the WMP to ensure consistency with the Contractor's detailed work plans and procedures. The WMP along with proposed revisions shall be submitted by the Contractor to BSA for final BSA approval.

B. The Contractor shall be responsible for providing submissions in accordance with the Submittal Schedule of this section. Specific requirements for some of these submittals are detailed below. Preparation, review, control, changes, and revisions to the submittals shall be in accordance with ERP-OPM-1.3 "Work Procedure Development and Requirements". Approvals for all documents shall be granted in accordance with ERP-OPM-2.7 "Safety Review Committee". (Note: The ERP OPM is included as an attachment to this specification and the referenced chapters can be found on the BSA provided compact disk.)

1. Environmental, Safety & Health (ES&H) Plan – The ES&H Plan shall be prepared in accordance with 29 CFR 1910.120, 29 CFR 1926, and all applicable BSA SBMS requirements and ES&H standards. The Plan shall also address the risks, hazards and mitigative actions described in the JSA. At a minimum, the following elements shall be included in the Plan:

    a. Certificate of Compliance
    b. Accident prevention program
    c. Contractor/subcontractor responsibilities
    d. Training and communication
        i. Drug-fee workplace
        ii. Hazard communication training
        iii. Pre-shift safety briefings
        iv. Shift turnover briefings
    e. Emergencies (This section of the ES&H Plan shall describe how the Contractor will meet the requirements of the BGRR Local Emergency Plan)
        i. First aid and medical attention
        ii. Fire protection and prevention
        iii. Environmental protection
        iv. BSA notification requirements
    f. Concrete and masonry penetrations
    g. Chemical safety
        i. Hazard communication program
        ii. List of hazardous chemicals known to be present
    h. Electrical safety

i. Electrical safety program and safeguard checklist
ii. Lock-out/tag-out program (The Contractor may utilize its Lock-out/tag-out program in addition to, but not in place of, ERP's program.)

i. Mobile equipment program
i. Safe operation and maintenance
ii. Rigging plan worksheet

j. Fall protection
k. Welding/cutting/open flame operations
l. Air Monitoring
i. Dust/particulates
ii. Dust suppression
m. Confined spaces
n. General PPE
o. Other safety areas

2. Rigging Plan - The Rigging Plan shall describe the requirements for material and equipment handling. All material handling activities and lifts involving a load that is greater than those which can reasonably be handled or lifted manually by a single worker (75 lbs.) are subject to the controls and requirements of the Rigging Plan. The Plan shall comply with applicable OSHA regulations and BSA SBMS requirements. At a minimum, the Rigging Plan shall include the following:

a. Training and qualification requirements for Contractor personnel
b. Detailed rigging drawings or sketches for all material handling operations prepared by competent and qualified Contractor personnel and subject to BSA approval
c. Critical Lifts – The Contractor is responsible for compliance with the requirements of the BSA Subject Area "Lifting Safety"
d. Waste container handling, blocking/bracing, and load securing instructions
e. Equipment/design limitations
f. Rigging safety and cross reference to ES&H Plan
g. Hold points/inspection points
h. Stop work expectations
i. Document and drawing control

3. Job Risk Assessment (JRA) – The Contractor shall perform a thorough and systematic safety analysis of the work. The analysis shall include the detailed identification of individual job tasks and an assessment of the hazards associated with each task. Following hazard identification, the Contractor shall establish controls and mitigating actions to manage the identified hazards and risks. The results of the JRA shall be reflected in the Contractor's ES&H Plan and Technical Work Procedures. The JRA shall include a cross reference that clearly demonstrates that all identified controls and measures are addressed. BSA approval of the JRA shall be a prerequisite to BSA's final approval of the Contractor's ES&H Plan and Technical Work Procedures. Upon full mobilization, the Contractor shall review with, and solicit the input of, it's manual work force and make resulting revisions to the JRA subject to BSA approval. The JRA shall be periodically reviewed by the Contractor during the course of the work, and changes in the project scope, methodology and/or technical approach shall require the review and revision (if required) of the JRA by the Contractor.

4. Biological Shield Removal Work Plan and Technical Work Procedures – The Contractor shall prepare technical work procedures for performing the work. The technical work procedures shall include the following:

a. General description of technical work procedure scope
b. Prerequisites
c. General precautions and limitations
d. Responsibilities of project personnel
e. Detailed instructions for performing the work including specific precautions and limitations
f. Identification of BSA hold points
g. Reference documents

The Technical Work Procedures shall provide instructions of sufficient detail to ensure the safe and successful completion of the Work. Technical Work Procedures shall be prepared for all aspects of the work, including but not limited to the installation of temporary systems and equipment, the operation of special tools and all temporary systems and equipment, biological shield removal operations, waste inspection, loading and packaging, on-site waste transportation, decontamination of equipment, and removal of temporary systems and equipment upon the completion of biological shield removal.

The Contractor shall minimize its use of, or shall otherwise use extreme and measured care in relying on skill-of-the-craft while setting the level of detail in its Technical Work Procedures. To the extent that skill-of-the-craft is used, the Contractor shall have a formal training and qualification program that objectively demonstrates the skill of its workers commensurate with the level of detail included in the Technical Work Procedures.

5. ALARA/Contamination Control Plan – The Plan shall include project specific methodologies to be employed by the Contractor to maintain individual and cumulative project exposures ALARA and minimize the spread of radioactive contamination. At a minimum, the ALARA/Contamination Control Plan shall include the following:

    a. Assignment of responsibilities including Contractor Project Manager participation in the ERP ALARA committee
    b. BSA project limits for radiation exposure and contamination control
    c. Job planning
    d. Radiological training
    e. Personnel exposure control and use of ACL's
    f. Detailed radiation exposure estimate for the project at the task level and the means to provide tracking against estimate
    g. Detailed description of the work practices, precautions and procedures to be used by the Contractor to meet BSA's contamination control requirements
    h. Work reviews, performance feedback and performance improvement
    i. Records (e.g., training and exposure)

6. Qualification Plan for Special Tools– The Plan shall describe a systematic approach that will be developed and used by the Contractor to ensure that special tools used for biological shield removal perform as intended. Among other things, the Plan shall describe the functional requirements of special tools including their design bases and requirements, Contractor quality assurance activities to ensure that the tools are fabricated to the Contractor's specifications, shop testing, mock-up designs and mock-up qualification testing to be performed at the BNL Site. The Plan shall include clear and rigorous shop testing and mock-up testing acceptance criteria for the special tools. BSA reserves the right to insert hold

points during its review of the Plan. In addition, a final report documenting the performance testing and acceptance must be submitted to BSA for approval.

7. Waste Packaging Procedure – The procedure shall provide detailed instructions for packaging the waste components into the waste containers. The Waste Packaging Procedure shall be prepared in compliance with BSA's WMP.

8. Quality Assurance Plan

   A. The Quality Assurance Plan shall be prepared by the Contractor to address the criteria in 10 CFR 830.122, ASME NQA-1 Quality Assurance Requirements for Nuclear Facility applications, BNL SBMS requirements, and in accordance with ERP-OPM-2.1 "Quality Assurance Plan".

      The Quality Classification for the Work including both services and furnished equipment is A-1 as set forth in SBMS Subject Area, "Graded Approach for Quality Requirements." Equipment to be furnished under this specification includes material handling equipment, temporary electric power distribution systems and components, contamination control envelopes and associated HVAC system, and special tools to complete the work. The Quality Classification of this equipment is also A-1 based on these BSA requirements. The technical requirements for this equipment are included in these specifications. These include the specification of functional and performance requirements and citations of governing consensus standards. To the extent that the equipment is designed for a unique application/service requirement, the designs will be reviewed by BSA. In all cases, the equipment will be tested at the BNL site prior to service to ensure that is meets the functional requirements included in the specifications. The controls, reviews, etc. included in the Contractor's Quality Assurance Plan shall ensure equipment furnished by the Contractor will safely and reliably meet the specific characteristics and functional requirements to successfully complete the project.

      At a minimum, the following sections shall be included in the Plan as applicable to the Work:

      a. Program
      b. Personnel Training and Qualifications
      c. Quality Improvement
      d. Documents and Records
      e. Work Progress
      f. Design
      g. Procurement
      h. Inspection and Acceptance Testing
      i. Management Assessment
      j. Independent Assessment

9. The Contractor shall also be responsible for providing each of the following:

   A. List of proposed heavy equipment, hauling equipment, trucks, and temporary services/facilities, and date of mobilization of equipment.

   B. Training records for all Contractor and subcontractor personnel.

C. OSHA 300 logs and Experience Modification Rates (EMR's) for the Contractor and all subcontractors. The EMR's must be less than 1.0.

D. Initial P-3 schedule and weekly schedule updates.

E. Pre-biological shield removal photographs: Show existing conditions of adjoining structures, systems and components prior to biological shield removal

F. Post-biological shield removal photographs: Show the same conditions following biological shield removal.

G. BSA shall provide the Contractor with a pre-biological shield removal baseline radiological survey of Building 701 structures, systems and components in the vicinity of the biological shield and biological shield. The Contractor shall be requested to concur with this survey, or perform a baseline survey to its satisfaction that will be provided to BSA prior to the start of work.

H. Photographs, radiological surveys, and project documentation to be included with the Project Completion Report. Project documentation is further defined in Paragraph 1.02 of this Section.

I. Project Completion Report - This Report shall contain a complete description of the Work performed by the Contractor, including:

    a. Introduction – general description of the project

    b. Summary of existing site conditions

    c. Overview of Work Performed
        i. Dates of significant activities (e.g. start, complete, duration)
        ii. Noteworthy challenges and accomplishments
        iii. Removal of the biological shield
            1. Major tools & equipment used
            2. Removal of concrete plugs
            3. Removal of biological shield blocks
            4. Removal of graphite restraints and membrane
            5. Final cleanup of the biological shield cavity
            6. Description of "as left" conditions
        iv. Waste Management
            1. Waste packaging
            2. Onsite transportation
            3. Quantity and types of shipping containers utilized

        v. Photographs showing before, during and after removal of the biological shield

J. The Contractor shall submit the above outlined documents in accordance with the following submittal schedule (all durations in provided work days):

Submittal Schedule

Submittal	**Submittal Date**
Technical Approach (Means & Methods)	With Bid
Experience Summary	With Bid
Project Management Capability and Experience Summary	With Bid
Corporate QA Program	With Bid
Payment Schedule	With Bid
Contractors Safety Program	With Bid
Copy of Company Record of Injury, Accident, Fire and Property Damage for Past 3 Years, OSHA Form 300A and EMR	With Bid
Organizational Structure and Resumes of Key Personnel – Corporate Official, Project Manager, Site Field Superintendent, Site Health & Safety Officer, , Radiological Engineer	With Bid
List of Subcontractors	With Bid
Insurance Certificate(s)	14 Days after Contract Signing
Payment and Performance Bond	14 Days after Contract Signing
Standard Form 141.3-Letter of Compliance with Safety Requirements and SBMS	20 Days after Contract Signing
Waste Management Plan - comments	20 Days after Contract Signing
P-3 Schedule and Resource Loading Charts	20 Days after Contract Signing
Environmental, Safety and Health Plan	40 Days after Contract Signing
Rigging Plan	120 Days after Contract Signing
Job Safety Analysis	120 Days after Contract Signing
Biological Shield Removal Technical Work Procedures	120 Days after Contract Signing
ALARA/Contamination Control Plan	120 Days after Contract Signing
Tooling Qualification Plan	20 Days after Contract Signing
Quality Assurance Plan	20 Days after Contract Signing
Waste Packaging Procedure	120 Days after Contract Signing
Proposed list of heavy equipment and mobilization dates	20 Days after Contract Signing
Training Records	40 Days after Contract Signing

Contractor Special Tools Operators Qualifications (See Section 01 35 24)	10 Days prior to the ORE
Pre-biological shield removal photographs	Prior to Start of Work
P-3 Schedule Updates	Weekly
Industrial Hygiene Monitoring Results	5 days after the receipt of results from analytical laboratories or 5 days after analysis by direct reading instruments, meters, or monitors.
Post-biological shield removal photographs	5 Days following restoration of Building 701
Project Completion Report including Project Records to BNL	10 Days following Completion of Work

C. Documents/Drawings Format

1. The Contractor shall prepare all documents for submittal using Microsoft Word 98 (or newer format). Schedules shall be prepared using P-3 software.

2. BSA shall provide copies of original construction drawings for mark up. The Contractor shall mark up the appropriate drawings to depict the as-left conditions.

D. Submittal Processing and Approval

1. Before submitting any documents for approval, the Contractor shall check them for accuracy, completeness, and compliance with the Contract requirements. The Contractor shall verify that all work contiguous with, and having bearing on, the Work indicated on documents is accurately described and distinctly illustrated, and that the work shown conforms to the requirements of the Contract.

2. The Contractor shall indicate approval on all submittals as evidence of the required reviews. Documents submitted to BSA without evidence of appropriate Contractor approval shall be returned for resubmission.

3. The contractor shall submit the documents in their original electronic form (i.e., not converted to Adobe Portable Document Format (PDF)) including, but not limited to, project plans, P3 schedules, digital photographs, digital video records, recorded voice media, and progress reports.

4. BSA makes no representation of the number of review and rework cycles that will be required to approve submittals as final. BSA is committed to submittal approval using one review and comment cycle. However, this is a function of the quality of the submittals as initially submitted by the Contractor, and the Contractors ability to clearly and completely address BSA's comments and concerns.

NOTE: BSA shall not be liable for the costs associated with the resubmission of documents.

E. Submittal Preparation:

a. The Contractor shall:

i. Place a permanent label or title on each submittal for its proper identification, including the identification of the Contractor's personnel responsible for submittal preparation and approval.

ii. Include the following information on the label:

1. Project name: BGRR Biological Shield Removal.

2. Date.

3. Name and address of the Contractor (and/or subcontractor).

4. Reference project specification section number, if applicable.

F. Submittal Transmittal:

a. The Contractor shall:

i. Package each submittal appropriately for transmittal and handling, and transmit each submittal using a transmittal form. BSA will not accept submittals received from sources other than the Contractor.

ii. On the transmittal, the Contractor shall record relevant information and requests for data. Attach the Contractor's Certification of Specification Compliance forms stating that the information complies with the requirements of the Contract.

b. Address all submittals to:

Brookhaven National Laboratory
BGRR Manager of D&D Operations
Building 701, P.O. Box 5000
Upton, New York 11973-5000

c. Mark all transmittal forms as follows:

Project Name: BGRR Biological shield Removal

d. The Contractor shall transmit submittals via electronic mail upon request by BSA.

1.02 Project Record Keeping Documents

A. The Contractor shall be responsible for keeping thorough, accurate and up-to-date project record documents. Copies of all project records shall be submitted to BSA within 10 business days of completing the project. The project records shall include, but are not limited to, the following:

1. Daily progress reports. The Contractor shall prepare daily progress reports throughout the duration of the project. The daily progress reports are to be provided to BSA. The daily progress reports shall contain the following information:

a. Date
b. Time

c. Names of all employees in attendance, and their signatures
d. Topics discussed at the daily tailgate, including safety related items.
e. Lessons learned
f. Daily project progress including quantitative data describing the amount of steel and concrete removed from the biological shield expressed in volume, mass and quantity of loaded waste containers.
g. Total hours worked, first aid treatments, OSHA Recordable and DART cases.

2. Waste Documentation: The Contractor shall document and provide all waste container loading data.

3. Radiological Surveys: BSA is providing radiological control and health physics services for the work, including job coverage, RWPs, transportation surveys, personnel and environmental radiological air samples. Only BSA qualified radiological control technicians (RCT's) can perform surveys for radiological control or equipment release. The Contractor may perform a confirmation survey of the pre-job and post-job radiological conditions in order to concur with BSA's survey. Any instrumentation used by the Contractor for surveys, radiological or informational shall have their calibration verified by the RCD Instrumentation group prior to being approved by BSA for use in the field.

4. Photographs: The Contractor shall provide photo documentation of the work activities.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 01 33 00

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 35 23 – OWNER SAFETY REQUIREMENTS

PART 1 - General

1.00 General

A. BSA's ISMS integrates Environment (such as environmental protection, pollution prevention), Safety, and Health management into the work of the Laboratory.

B. Construction/demolition-type activities are governed by the "Work Planning and Control for Experiments and Operations," found in BSA's SBMS, and the JRA and the Facility Risk Assessment (FRA) processes. The subject area is implemented by organizational procedures using a graded approach that runs from "skill-of-the worker" to the use of formal work permits and/or experimental safety reviews. The subject area requires a screening process (based on a formal graded approach). This process determines when a Laboratory-wide experimental safety review or work permit form is required or when skill-of-the-worker is appropriate. Regardless of the determination, a worker always has the right to request a Laboratory-wide experimental safety review or work permit. These processes supports the entire life cycle of operations, maintenance, construction, and support activities to incorporate the appropriate ES&H considerations and performance expectations.

1.01 Job Risk Assessment

A. The JRA process is implemented by breaking down tasks or activities into steps, identifying hazards associated with each step, and evaluating the controls in place. From this information, risk is determined. If the risk is above the established threshold limits, then additional controls must be developed and put in place before the start of work.

B. As described in Section 01 33 00 – Submittals, the Contractor shall perform a thorough and systematic safety analysis of the work. The analysis shall include the detailed identification of individual job tasks and an assessment of the hazards associated with each task. Following hazard identification, the Contractor shall establish controls and mitigating actions to manage the identified hazards and risks.

1.02 Authorization Basis Documents

A. A Documented Safety Analysis (DSA) was prepared by BSA to develop and document the safety basis for the BGRR decommissioning project at BNL. The DSA identifies hazards at the BGRR facility and the preventive and mitigative controls to perform operations safely and to protect the public, workers, and the environment. The Work shall be performed by the Contractor in compliance with all of the requirements included in the DSA as further described below:

1. The Contractor's document submissions shall accurately incorporate the requirements of the DSA. BSA shall not approve Contractor document submissions that do no include these requirements.

2. The Contractor shall work within the limits, controls and requirements expressed in the DSA. The Contractor shall stop any work that is not in compliance with these requirements and immediately notify BSA of the deficiency.

3. BSA shall not allow any work that is outside of the requirements of the DSA. BSA shall promptly issue a stop work order for any of the Contractor's activities that are not in compliance with these requirements.

B. For the activities associated with the graphite pile removal the BGRR is classified as a Hazard Category 3 nuclear facility and a TSR document was prepared by BSA in association with the DSA. The TSR document provides safety basis requirements for the BGRR project. TSR's are derived based on the safety functions and functional requirements that were determined to be essential in the DSA. The BGRR will be classified as a radiological facility for the removal of the biological shield and the controls required in the TSR's will be maintained as a best management practice. The Work shall be performed by the Contractor in compliance with the controls included in the TSR.

1. The Contractor's document submissions shall accurately incorporate the requirements of the TSR document. BSA shall not approve Contractor document submissions that do no include these requirements.

2. The Contractor shall work within the limits, controls and requirements expressed in the TSR. The Contractor shall stop any work that is not in compliance with these requirements and immediately notify BSA of the deficiency.

3. BSA shall not allow any work that is outside of the requirements of the TSR. BSA shall promptly issue a stop work order for any of the Contractor's activities that are not in compliance with these requirements.

C. A FHA document was prepared by BSA. This document is intended to ensure compliance with DOE fire protection requirements. The Work shall be performed by the Contractor in compliance with the requirements included in the FHA as further described below:

1. The Contractor's document submissions shall accurately incorporate the requirements of the FHA. BSA shall not approve Contractor document submissions that do no include these requirements.

2. The Contractor shall work within the limits, controls and requirements expressed in the FHA. The Contractor shall stop any work that is not in compliance with these requirements and immediately notify BSA of the deficiency.

3. BSA shall not allow any work that is outside of the requirements of the FHA. BSA shall promptly issue a stop work order for any of the Contractor's activities that are not in compliance with these requirements.

1.03 Applicable Codes and Standards

A. Applicable codes and standards for material furnished and work performed shall include all state laws, local ordinances, requirements of governmental agencies having jurisdiction, and applicable requirements of the latest editions of the following codes and standards including but not limited to:

ACGIH	American Conference of Governmental Industrial Hygienist
ANSI	American National Standards Institute

ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BNL ES&H	BNL Environment, Safety, and Health Standards
BNL RCM	BNL Radiological Control Manual
BNL SBMS	BNL Standards Based Management System
DOE	Department of Energy
EPA	Environmental Protection Agency
FM	Factory Mutual
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association NFPA-101
NYCRR	New York State Codes, Rules and Regulations
NYSBC	New York State Uniform Fire Prevention and Building Code
NYSDEC	New York State Department of Environmental Conservation
NYSDOL	New York State Department of Labor
NYSDOT	New York State Department of Transportation, Office of Engineering, Standard Specification, Construction and Materials
OSHA	Occupational Safety & Health Administration
SCDH	Suffolk County Department of Health
UL	Underwriter's Laboratories
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency

In case of conflict, the MOST STRINGENT requirements shall govern.

B. Where specific performance requirements are listed herein, it is the intent of this Specification that all manufacturers, fabricators, suppliers, installers, contractors, subcontractors, specialty and sub-subcontractors shall provide services satisfying these requirements whether mentioned by trade or manufacturer's name or submitted for approval as a substitute.

C. Where no explicit quality or standards for materials or workmanship are established for work, such work shall be of such quality consistent with industry standards and of the construction quality established for the Work generally. The Contractor shall conform to specified manufacturer's published specifications and installation instructions unless otherwise specified or indicated.

D. The BNL SBMS provides Lab-wide policies and procedures that BNL needs to support a compliant requirements management program. The ERP Operations Procedures Manual (OPM) provides project specific implementing procedures to meet the BNL SBMS requirements. Project specific documents, plans, procedures, and work instructions are prepared and performed in accordance with the requirements of the ERP OPM.

E. The Contractor shall perform all activities on the BNL Site in accordance with applicable BSA SBMS requirements, Environmental Management System (EMS), ERP OPM, and all project specific documents, procedures, and specifications. If the Contractor identifies any discrepancies between procedures and project documents, the Contractor shall immediately notify BSA and the discrepancy will be resolved prior to performing any affected work. All BSA procedures,

standards and other requirements are available on the BSA website (accessible only on site) or will be provided to the Contractor upon request.

The applicable BSA SBMS Subject Areas for the biological shield removal project includes:

1. ALARA Program
2. Asbestos
3. Calibration
4. Chemicals, Working With
5. Compressed Gas Cylinders and Related Systems
6. Confined spaces
7. Construction Safety
8. Electrical Safety
9. Emergency Preparedness
10. Engineering Design
11. ESH Policy Manual
12. ESH Standards
13. Events/Issues Management
14. Exhaust Ventilation
15. Facility Use Agreements
16. Guests and Visitors
17. Hazardous Waste Management
18. Lifting Safety
19. Liquid Effluents
20. Lockout/Tagout
21. Material Requiring Special Handling
22. Mixed Waste Management
23. Natural Hazards in the Environment
24. Noise and Hearing Conservation
25. Non-Radioactive Airborne Emissions
26. Nuclear/Criticality Safety
27. Personal Protective Equipment
28. Pollution Prevention / Waste Minimization
29. BNL Radiological Control Manual
30. SBMS subject area (13 Radiological Control Procedures)
31. Rad Dose Limits & ACL's
32. Radioactive Airborne Emissions
33. Radioactive Waste Management
34. Radiological Stop Work Procedure
35. Readiness Evaluations
36. Respiratory Protection
37. Spill Response
38. Stop Work – Imminent Danger
39. Storage & Transfer of Haz/Nonhaz Material
40. Testing and Maintaining Exhaust Ventilation Systems
41. Traffic Safety
42. Transfer of Hazmat Onsite
43. Transfer of Rad Material Onsite
44. Transport of Hazmat Offsite
45. Transport of Rad Material Offsite

46. Underground Injection Control
47. Use of BNL Facilities & Grounds
48. Work Planning and Control for Experiments and Operations

Applicable sections of the ERP OPM include the following:

1.1 BSA Integrated Project Team Charter
1.3 Work Procedure Development and Requirements
1.4 Document Review and Modification
1.5 Training Management System
1.7 Training Management Plan
1.8 Training Implementation Procedures
2.1 Quality Assurance Plan
2.2 Corrective Action Program and Condition Reporting System
2.3 Project Operations Review Committee
2.6 Records Management
2.7 Safety Review Committee
3.1 Conduct of Operations
3.2 Work Planning and Control
3.3 Unreviewed Safety Issue Determination
3.4 Field Activity Oversight
3.5 Operating Experience and Internal Lessons Learned Program
3.6 Unreviewed Safety Question Determination
3.7 Conduct of Operations Matrix
4.1 Environment, Safety and Health Plan
4.2 Environmental Management System Manual for ERP
4.6 Environmental Management Program for the ERP Directorate
4.7 Safety Observations
4.8 OHSAS Implementation Manual
5.1 BGRR Local Emergency Plan and Building Access Requirements
5.3 BGRR Surveillance and Maintenance Plan
6.1 ALARA Program
6.2 RWP Enhancements
6.3 Temporary Shielding
6.4 Hot Particle Program
6.5 Decontamination

1.04 General Safety Requirements

A. The Contractor is responsible for preparing and complying with the ES&H Plan prepared in accordance with 29 CFR 1910.120 and 1926, 10 CFR 851, and applicable BSA SBMS and ERP OPM requirements.

B. The Contractor is responsible for performing the Work safely. In addition, the Contractor shall provide:

1. Specific assignment of an individual, employed by the Contractor, as the Site Health & Safety Officer, who shall be responsible for Site construction safety. The Site Safety Officer shall complete a 30-hour OSHA construction safety course. The Contractor must demonstrate, with verification of completion of OSHA construction safety courses and other credentials, the ability of the Site Health & Safety Officer to supervise the type of work to be

performed under the Contract. The qualification requirements for the Contractor's representative are specified in the Contractor Qualification Documentation Requirements.

2. A letter or certificate of compliance indicating that the Contractor is aware of, has reviewed, and shall comply with the safety regulations of both the OSHA Standards (29 CFR 1910/1926), and BSA SBMS and ERP OPM requirements. The letter shall certify that all of these requirements are included in the ES&H Plan prepared by the Contractor.

C. The Contractor shall provide field oversight, monitoring equipment, safety equipment, consumables, and sampling and analysis services required to implement its ES&H Plan. The Contractor shall be responsible for providing all PPE including respiratory protection equipment required to perform the Work.

D. All Contractor personnel shall be able to comprehend the work and safety instructions required to perform the Work. All Contractor personnel shall acknowledge, in writing, that they have read and understood the ES&H Plan prior to the start of work.

E. The Contractor shall be required to include the applicable safety requirements in contracts with all tiers of subcontractors of all kinds. The Contractor shall provide for the oversight of all of its subcontractors. These requirements apply to subcontractors of all kinds including transient, incidental and ancillary service providers.

F. BSA demands that all work is performed safely and in accordance with the requirements of the Contract. BSA will not tolerate unsafe worker behavior and expects full compliance with all safety requirements. These requirements shall include, but not be limited to, all applicable OSHA regulations, BSA SBMS and ERP OPM requirements, other codes and regulations, and the Contractor's BSA approved JSA and ES&H Plan. BSA has a zero tolerance policy and the Contractor will be directed to replace personnel who do not comply with safety requirements.

G. The following requirements have been established for electrical safety:

1. Zone 1 (Within the Biological Shield Cavity) is classified as a Class II, Division 1, Hazardous Location in accordance with NEC Article 500.

2. Zone 2 (Within the Contamination Control Containment) is classified as a Class II, Division 2, Hazardous Location in accordance with NEC Article 500.

3. Zone 3 (Building 701 General Areas and Areas Adjacent to the Biological Shield and Contamination Control Containment) is not classified as a Hazardous Location per NEC Article 500.

4. The ventilation system inlet ductwork from the point of connection to Zone 1 to the first stage HEPA filter(s) shall be considered as part of Zone 1, and shall comply with recommended practices provided in NFPA 499. In designing this system, the Contractor shall take into consideration the need to breach this system for repairs and service (e.g. filter change-out), and that all electrical tools and equipment used in these activities shall meet Zone 1 requirements.

5. All electrical equipment brought on-site shall have a label indicating that it has been tested and is in compliance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.

H. All work associated with the project must be performed within the occupational exposure limits for Industrial Hygiene hazards set in OSHA 29CFR1926 and ACGIH *Threshold Limit Values®.* The contractor is required to provide qualified monitoring and hazard assessment personnel (per DOE G4401-3 *Occupational Exposure Assessment*), to conduct monitoring with calibrated equipment using NIOSH or OSHA approved methods, and to have analysis conducted by an AIHA Proficiency Analytical Testing certified laboratory. Copies of all field sampling sheets, laboratory analysis reports, and hazard assessment evaluation reports is to be provided to BSA for inclusion in the BNL Industrial Hygiene records management system.

I. If a safety related event, accident, or a reportable condition occurs, ERP and the Contractors shall immediately gather facts, conduct a causal analysis, identify corrective actions, and prepare the applicable reporting documentation in accordance with ERP-OPM-2.2, "Corrective Action Program and Condition Reporting System". In accordance with ERP-OPM-2.2, the Contractor shall immediately notify BSA and provide accurate reports to BSA of all events, injuries of any kind, accidents, near misses and adverse or unexpected field conditions. The fact finding shall be conducted during the same work shift the safety event/accident/ condition occurred or was discovered. Similarly, statements from all involved parties must be prepared and submitted during the same work shift the safety event/accident/ condition occurred or was discovered.

1.05 BSA Administrative Radiological Control Levels

A. A goal of BSA is to maintain personnel radiation exposure as low as reasonably achievable (ALARA) and well below the regulatory dose limits in 10 CFR 835.202. To accomplish this goal, numerical Administrative Control Levels (ACL) are established below the regulatory limits to administratively control and help reduce individual and collective radiation dose. BSA has established a special project ACL of 1,000 mrem/yr for all workers that shall not be waived under any circumstances. An individual arriving at BNL with prior occupational exposure for the year will be limited to receiving 1000 mrem/yr of exposure at BNL provided the individual's total annual exposure from all sources does not exceed 2000 mrem. (Example: if an individual arrives at BNL with a year to date dose of 800 mrem they would be allowed to receive the 1000 mrem for the remainder of the year, if another individual arrives at BNL with 1200 mrem they would be limited to 800 mrem for the remainder of the year). Other requirements are as follows:

1. Radiation exposures to guests without training, visitors without training, or minors shall not exceed 25 mrem per year.

2. Minors under the age of 18 shall not be allowed work in Controlled Areas or Radiological Areas.

3. No individual who arrives at the BNL Site with an estimated occupational exposure greater than 2,000 mrem for the calendar year shall be allowed to work.

4. If an individual's year to date occupational exposure is not documented then an administrative dose limit of 100 mrem would be imposed until the exposure is documented.

B. Airborne radioactivity shall be monitored by BSA radiological control technicians. If the airborne levels exceed 0.5 DAC for non-respirator work and 50 DAC for respirator work, BSA shall issue a radiological stop work order until corrective actions and controls are put in place to meet these requirements.

1.06 Work Permits

A. The Work included in this Contract shall be performed in accordance with Work Permits prepared, approved and issued pursuant to the requirements provided in ERP-OPM-3.2 "Work Planning and Control".

B. The Work Permit and supporting documentation (e.g. RWP's, JRA's, digging permits, etc.) prepared by BSA, and signed and accepted by the Contractor, shall be posted or be on hand at the project Site. By signing and accepting the Work Permit, the Contractor indicates that it understands the job hazards and all of the requirements for performing the Work.

1.07 Conduct of Operations

A. A Tailgate Safety Meeting shall be held at the commencement of each work day, or new work shift if multiple daily shifts are worked, to discuss the activities for the day, specific hazards, and to solicit worker feedback on safety and work process. The Tailgate Safety Meeting shall be conducted by BSA and the Contractor in accordance with ERP-OPM-3.4 "Field Activity Oversight". All workers shall attend this meeting or subsequently briefed as to its contents. If a change in field conditions occurs, or a new task is identified, a separate safety tailgate meeting will be held prior to the performance of the affected work.

B. The Contractor shall ensure all work is performed in accordance with approved Plans, Work Procedures, and Work Instructions. The Contractor shall promptly cease work and place the work area in a safe condition in the event that Work Procedures cannot be performed as written.

C. The Contractor shall ensure that all work is planned, performed, documented, and supervised in accordance with ERP-OPM-3.7 "Conduct of Operations Matrix".

PART 2 - Products

Not Used.

PART 3 - Execution

Not Used.

END OF SECTION 01 35 23

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 35 24 – OWNER TRAINING REQUIREMENTS

PART 1 - General

1.00 Related Sections

A. Section 00 72 00 – General Conditions

B. Section 00 73 00 – Supplementary Conditions

1.01 General

A. The Contractor shall be responsible for obtaining all necessary training, certifications, registrations, licenses, etc. for all personnel involved with the Work. Contractor personnel shall not be allowed to engage in work activities without first obtaining all proper and required training. Contractor personnel training shall be kept up to date throughout the duration of the project. Equivalent training may be acceptable if approved by BSA.

1.02 Required Training

A. The Contractor and BSA shall perform a joint job training assessment for all personnel to determine the training requirements. The ERP Training Coordinator will assist the contractor with scheduling training provided by BSA. As part of the ORR, BSA will verify that all required training has been completed. The following training shall be required as a minimum for the Contractor's employees:

1. OSHA 40 Hr. HAZWOPER

2. OSHA 8 Hr. HAZWOPER Supervisor (for Field Superintendent, Site Health and Safety Officer, and other Contractor supervisory personnel)

3. BSA Contractor Vendor Orientation

4. Medical Surveillance (i.e., whole body count, Bioassay, respirator clearance)

5. BSA radiological worker training
   - Radiological Worker I
   - Contamination/Airborne radioactivity (RWT-300A)

6. Four (4) hour ERP OPM training for all subcontractor management and supervisory personnel.

7. Eight (8) hour General Employee and BGRR Specific Training

B. Upon award of the Contract, the Contractor should schedule the required training described herein. All required training shall be completed at least five (5) days prior to the ORE Review – Personnel Qualifications and Training.

C. If the Contractor is unable to attend the courses at the regularly scheduled times, arrangements for special training classes can be made through BSA. BSA's costs of conducting non-scheduled training classes shall be back-charged to the Contractor.

1.03 BSA On-site Computer Based Training

A. All Contractor personnel involved with waste packaging are required to complete the BSA Radioactive Waste Generator (HP-RADIGEN), BSA Hazardous Waste Generator (HP-RADIGEN3), BSA Transportation of Hazardous Material (TQ-HAZMAT-A), and BSA HAZMAT Transportation Awareness Training (TQ-HMT-SECURITY) courses. These are BSA web-based courses and will require approximately 60 minutes each to complete the program and quiz.

B. The Contractor's Project Manager, Field Superintendent, and Site Health and Safety Officer are required to complete the BGRR Facility Environmental Training Course (ER-BENV1).

C. Following completion of the Contractor/Vendor Orientation Training (CVO), the Contractor personnel will receive credit for the following BSA computer based training courses: Stop Work Procedure (GE-STOPWORK) and Emergency Plan & Response (GE-EMERGPLAN).

D. All Contractor personnel requiring BNL network access are required to read and understand the computer based training course Cyber Security (GE-CYBERSEC).

1.04 Medical Surveillance

A. Contractor shall provide medical surveillance of its personnel in accordance with OSHA regulations. In addition, Contractor personnel shall be required to complete a whole body count and bioassay provided by BSA in order to receive a thermo luminescent dosimeter (TLD) and work in radiological areas.

1.05 BSA Radiological Worker Training

A. All Contractor personnel are required to complete the BSA Radiological Worker 1 Course (HP-RWT002) and the Contamination/Airborne Course (HP-RWT-300) and Practical (HP-RWT-300/A) and be approved by BSA to obtain and wear a TLD in order to work.

B. The Radiological Worker 1 Course is a seven and one-half (7-1/2) hour course, given on the first and third Tuesday of every month between the hours of 9:00 am and 4:30 pm at Bldg. 703. The course is designed for personnel who need unescorted access to Controlled Areas, Radioactive Material Areas, Radiation Areas and High Radiation Areas.

C. The Contamination/Airborne Course is a three (3) hour course, given on the first and third Wednesday of every month between the hours of 9:00 am and 12:00 pm. The Practical Course is a one and one-half (1-1/2) hour course, and follows the Contamination/Airborne Course on the first and third Wednesday of every month. The Contamination/Airborne Course and practical factors demonstration are required for employees who need unescorted access to the Radiological Buffer Areas, Contamination, High Contamination and/or Airborne Radioactivity Areas. Radiological Worker 1 is prerequisite. Note: The practical factors demonstration is a separate session and must be taken in order for the trainee to receive qualification. The Contractor shall be

responsible for providing respiratory protection training to its employees in accordance with the requirements of its program that shall be approved by BSA.

1.06 Radiological Worker Requirements

A. All Contractor personnel shall submit radiological dose records to BSA prior to the issuance of a TLD by BSA and the start of work.

B. All Contractor personnel required to work in contamination and or airborne radioactivity areas shall be required to have whole body counts prior to the start of work, then on an annual basis and prior to departing the BNL Site. BSA shall provide the whole body counts by appointment (two weeks notice is required).

C. All Contractor personnel required to work in contamination and or airborne radioactivity areas shall have radiological bioassays prior to the start of work, then on an annual basis, and prior to departing the BNL Site. BSA will provide the bioassays analyses. Submittal of bioassay samples shall be coordinated with BSA in advance.

D. It is the Contractor's responsibility to ensure that departing employees complete required termination whole body counts and bioassays. The Contractor shall be responsible for the cost to return the individuals to complete these requirements if they improperly depart the BNL Site.

1.07 Crane Operator Training

A. All Contractor personnel involved with material handling and rigging shall be required to attend BSA's 8-hour Basic Rigging Course (TQ-RIG-C). In addition, all Contractor personnel operating the BGRR overhead crane or other hoists shall be required to the BSA web-based Overhead Crane Operator Course (HP-Q-010-W) and practical demonstration class. The Basic Rigging Course is an eight (8) hour course, given on the second Friday of each month between the hours of 8:30 am and 4:30 pm.

1.08 Contractor's Industrial Hygiene/Safety Program

A. The Contractor is responsible for providing general safety and industrial hygiene training to all project personnel that includes the following:

1. Fall protection
2. Back safety
3. Hand and power tool safety
4. Ladder safety
5. Heat stress
6. Electrical safety
7. Noise and hearing conservation
8. Hazard communication
9. Fire extinguisher
10. Equipment specific (e.g. forklift, man-lift, etc.)

B. All Contractor personnel required to wear respirators shall complete the training and medical screening required by 29 CFR 1910.134. The Contractor shall provide for this training and medical screening. The Contractor is responsible for supplying and cleaning respirators. BSA

shall approve the Contractor's respiratory protection program. Contractor personnel are required to have an annual quantitative respirator fit test in order to work in areas where respirators are required. Fit test records shall be submitted to BSA.

1.09 Contractor Training and Qualification of Operators Using Special Tools

A. The Contractor shall prepare a training and qualification plan to qualify its operators of special tools. The operators shall be trained in special tools design and operating limitations, safety, maintenance and inspection, and operating procedures. The Contractor's operators shall also receive hands-on training using mock-ups that accurately simulate conditions in the field. The Contractor shall establish clear and rigorous qualification criteria that shall be satisfied and documented prior to being authorizing operators of special tools to perform production work in the field.

1.10 Training Records

A. The Contractor shall maintain current training records at the Site for all personnel.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 01 35 24

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 43 40 – SPECIAL TOOLS

PART 1 - General

1.00 Related Sections

A. Section 02 00 00 – Existing Conditions

B. Section 02 44 00 – Biological Shield Removal

1.01 Definitions

A. Special Tools – All tools which are of such a specialized nature that without substantial modification and alteration their use is limited to the performance of particular services. Special tools include but are not limited to:

1. Manipulators for remote biological shield removal and material handling.

2. End effectors and/or other remote equipment for the segmentation and handling of miscellaneous components.

3. Remote handling apparatus for waste containers.

4. Remote manipulators for applying fixative coating systems.

5. Remote manipulators for general cleanup, material removal and miscellaneous tasks.

6. Remote manipulators to provide for real-time video surveillance of pile removal and waste container loading operations.

1.02 Submittals

A. The Contractor shall provide the design bases, functional requirements, drawings, descriptive sheets, or other written materials that fully describe and identify each special tool for BSA review and approval.

B. The Contractor shall submit plans for constructing mock-ups and qualification testing to demonstrate the effectiveness of the special tools prior to use. The Plan shall include shop testing prior to delivery to the BNL Site, and final qualification testing prior to use. The Plan shall provide clear, conservative and objective acceptance criteria that must be satisfied prior to approval for use. The Plan shall be subject to BSA review and approval.

PART 2 – Products

Not Used.

PART 3 - Execution

3.00 Mock-Ups

A. The Contractor shall provide all materials, labor, and equipment to construct representative mock-ups of the biological shield and work areas that accurately simulate the field conditions and test the functional adequacy of special tools. Mock-up materials of construction shall be of a size and weight that duplicate relevant and actual conditions that shall be encountered in the field that can impact the performance of special tools, or the performance of special tools. The Contractor shall consider mechanical properties of materials and environmental conditions in the mock-up designs. Mock-up designs are subject to BSA review and approval

3.01 Design and Fabrication of Special Tools

A. The general design criteria and design bases of special tools are subject to BSA review and approval.

B. The Contractor shall provide detailed design and fabrication schedules for special tools. BSA reserves the right to include shop inspections and hold points in the design and fabrication schedule.

C. BSA shall be provided with access to all shops in which special tools are being fabricated. BSA may conduct a final inspection of special tools prior to their release from the shop and delivery to the BNL Site.

D. Shop testing shall be performed to demonstrate that special tools have been fabricated in accordance with the Contractor's requirements. The scope and acceptance criteria of shop tests shall be included in the Qualification Plan for Special Tools. BSA reserves the right to witness all shop tests.

3.02 Site Qualification Testing

A. The Contractor shall perform qualification testing at the BNL Site against the acceptance criteria in the Qualification Plan for Special Tools using mock-ups as described herein. Other attributes to be evaluated by the Contractor include:

1. The shake-down of operating procedures and equipment/operator interfaces, and identification and resolution of any potentially unsafe procedures and unacceptable workload demands.

2. Evaluation of work methods and requirements for manual, hands-on work in high radiation exposure areas

3. Evaluation of the non-mechanical aspects of the design, such as control dynamics, communications, information and electronic displays.

4. Routine maintenance of and repairs to special tools.

3.03 Final Approval for Use

A. The Contractor shall satisfy all special tool acceptance criteria prior to release for use subject to BSA approval. The Contractor shall provide the rework required for special tools to meet their acceptance requirements. Under no circumstances will BSA allow the use of special tools that have not been systematically designed, fabricated and qualified as described in these

specifications. The Contractor shall prepare a final report documenting the testing and performance of the tools and submit the report to BSA for approval.

END OF SECTION 01 43 40

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - General

1.00 Summary

A. This section provides BSA's requirements for temporary services and facilities, including utilities, support facilities, miscellaneous services and protective barriers.

B. The Contractor shall provide all field office facilities, break rooms, and temporary storage buildings, temporary utilities and services required to complete the work. The Contractor shall be responsible for the maintenance of such facilities and services in a safe condition for the duration required to support the work, and shall provide for their removal upon work completion. The location of all such facilities must be approved by BSA.

C. Utilities for a standard construction trailer will include electrical power (440V, 30A, 3-phase and 120V, 30A single phase).

1.01 Regulations

A. The Contractor shall comply with applicable laws and regulations.

1.02 Standards

A. The Contractor shall comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Electrical Service: The Contractor shall comply with NEMA, NECA and UL standards and regulations for temporary electric service and shall install service in compliance with National Electric Code (NFPA 70).

2. GFCIs: Ground fault circuit interrupters are required for all electric services to and within the Site from other than permanent wiring of a building or structure.

1.03 Inspections

A. The Contractor shall arrange for BSA personnel to inspect and test each temporary utility before its use. The Contractor shall remedy findings and deficiencies identified by BSA inspections within two (2) business days. The Contractor shall immediately remedy safety hazards identified during such inspections.

1.04 Conditions of Use

A. The Contractor shall keep facilities clean and neat, and operate them in a safe and efficient manner. The Contractor shall take necessary fire prevention measures. The Contractor shall not overload facilities or allow hazardous, dangerous or unsanitary conditions. The Contractor shall not allow public nuisances (e.g. unsanitary portable toilets, poor housekeeping) to develop or persist on the BNL Site. The Contractor shall perform housekeeping to the satisfaction of BSA.

B. The Contractor shall maintain Material Data Safety Sheets (MSDSs) for all material on-site, provide an inventory and copy of each MSDS to BSA, and provide an updated inventory as material is brought on-site. The Contractor shall store all material properly in accordance with BNL SBMS requirements.

1.05 Field Offices

A. The Contractor shall provide insulated, weather-tight field offices of sufficient size to accommodate its personnel. The field offices shall be prefabricated units or similar construction with lockable entrances, operable windows and serviceable finishes.

1.06 Sanitary Facilities

A. The Contractor shall install self-contained single-occupant toilet units of the chemical type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material. The Contractor shall install the facilities where needed and as approved by BSA. The Contractor shall comply with regulations and local health codes. Toilets must be serviced at least weekly, and more often if needed, as determined by BSA. The Contractor shall provide paper goods and similar disposable materials for each facility.

1.07 Drinking Water Facilities

A. The Contractor shall provide containerized tap-dispenser bottled-water type drinking water units for its employees.

1.08 Fire Extinguishers

A. The Contractor shall provide one (1) portable tank type fire extinguisher per work area containing fifteen pounds of liquid carbon dioxide, complete with seat type valve, three (3) feet of hose and non-shatterable discharge hose (as manufactured by Walter Kiddie & Co., Model 15KS, or equal).

1.09 Project Identification and Temporary Signs

A. The Contractor shall install project identification signs where indicated, or as directed by BSA. The signs shall be supported on frames of preservative-treated wood or steel.

B. BSA will prepare signs for pickup and installation by Contractor.

1.10 Protective Barrier Installation

A. Barricades, Warning Signs, and Lights:

1. The Contractor shall comply with standards and code requirements for erecting barricades. The Contractor shall install appropriate warning signs to inform personnel and the public of the hazard being protected against and where needed, install lighting including flashing lights, if required.

2. The Contractor shall provide precautions to prevent unauthorized entrance, vandalism and theft. The Contractor shall provide a secure, locked facility where materials and equipment are to be stored.

1.11 Environmental Protection

A. The Contractor shall operate temporary facilities and equipment and conduct work by methods that comply with environmental regulations, and minimize the possibility that air, waterways and soil might be contaminated or polluted.

B. When the work requires the Contractor to bring temporary fuel storage facilities on to the BNL Site, the Contractor shall be responsible for providing a temporary impermeable containment area for all fuel transfer operations in accordance with Suffolk County Department of Health Services, Article 12.
http://www.co.suffolk.ny.us/Health%20Services/article12.pdf .

C. The Contractor shall submit a spill prevention program that is proactive and effective in preventing spills on the BNL Site. The spill prevention program shall be reviewed and approved by BSA.

D. If, during work activities, a release, discharge, or spill of petroleum products or chemicals occurs, the Contractor shall:

1. Immediately notify Safeguards and Security and Fire Rescue at Ext. 2222 or 911 (from a BNL phone) or 631-344-2222 from a cell phone or pay phone, and the BSA Project Manager of the release, discharge, or spill.

2. Immediately initiate cleanup and disposal operations by a BSA- approved hazardous waste management contractor, complete the operations, and be responsible for monitoring and/or sampling in the event of a spill, to the satisfaction of BSA.

3. BSA will coordinate the disposal of contaminated material, with appropriate documentation and disposition forms. The Contractor is responsible for cleanup and disposal costs and all costs incurred as a result of the spill.

E. The Contractor shall avoid use of tools and equipment that produce harmful noise, if possible.

F. The Contractor shall make use of temporary enclosures in areas where work may generate airborne contaminants that cannot be controlled with engineering controls or the risk is high for a release to the environment, as determined by NESHAPs. The Contractor shall maintain enclosure contamination levels ALARA. The Contractor shall decontaminate the enclosure to minimize the potential spread of contamination. The enclosure shall be decontaminated at the completion of work or disposed of as waste. BSA will perform NESHAPs evaluations to determine if an enclosure is required based on Contractor provided information.

1.12 Operation

A. The Contractor shall enforce strict discipline in using temporary facilities, limit availability to intended use, minimize abuse, and maintain facilities in safe and good operating condition until their removal.

B. Temporary structures shall be protected from damage by the elements.

1. The Contractor shall maintain operation of enclosures, cooling, heating, humidity control, ventilation and similar facilities on a 24-hour per day basis to achieve indicated results and to avoid damage.

1.13 Termination and Removal

A. The Contractor shall remove each facility when it is no longer needed, or during demobilization. All facilities shall be removed after the completion of the Work and shall be surveyed for release by BSA radiological control technicians (RCT's).

B. Temporary facilities are the property of the Contractor.

PART 2 – Products

Not used.

PART 3 – Execution

Not used.

END OF SECTION 01 50 00

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 71 13 – MOBILIZATION/DEMOBILIZATION

PART 1 - General

1.00 Related sections

A. Section 00 01 01 – Statement of Work

B. Section 01 33 00 – Submittals

C. Section 01 77 00 – Closeout Procedures

PART 2 - Products

Not used.

PART 3 - Execution

3.00 Mobilization

A. Upon award of contract, the Contractor shall submit all the necessary plans and documents stipulated in Section 01 33 00 Submittals to BSA for review and approval.

B. The Contractor shall obtain all required permits from BSA prior to initiating any work activities.

C. The Contractor shall coordinate with BSA regarding equipment, materials, containers, deliveries and access to the BNL Site.

D. The Contractor shall be responsible for obtaining the required training for all personnel prior to start of work. Contractor employees shall not be granted BNL Site access without required training certifications and documentation.

E. The Contractor shall notify BSA prior to delivery of radioactive material, including calibration check sources for radiation detection equipment, to the BNL Site. BSA shall approve all deliveries in advance of delivery.

F. All radiation monitoring equipment shall be inspected, calibration checked and approved by BSA prior to use at the BNL Site.

G. All Industrial Hygiene monitoring equipment (including chemical, noise, confined space atmosphere testing and non-ionizing radiation) shall be inspected, checked for current calibration evidence, and approved by BSA prior to use on the BNL Site

H. The Contractor shall identify and establish all work zones and material staging areas prior to beginning work, with approval by BSA.

I. BSA will perform mechanical inspections and radiological surveys of incoming heavy equipment that will enter the radiological work area. Incoming mechanical surveys require two (2) hours to complete. Incoming radiological surveys of heavy equipment require four (4) hours to complete.

The Contractor shall provide 48 hours notice to BSA prior to delivery of equipment. The Contractor shall make the heavy equipment available and accessible to BSA.

J. BSA will perform quality control inspections of waste containers and any waste conveyance, not otherwise specified, prior to use.

3.01 Demobilization

A. The Contractor shall demobilize completely from the BNL Site within ten (10) business days after completion of the Work.

B. All temporary facilities and equipment used in radiologically controlled areas will be dismantled, packaged, and transported to the on-site Waste Loading Area (WLA) or other designated area for off-site transportation and disposal.

C. Contaminated debris associated with demobilization will be packaged and transported to the WLA or other designated area for off-site transportation and disposal.

D. The work areas shall be left in neat, clean and accessible condition after work activities are complete.

E. The Contractor shall not remove identified suspect equipment or vehicles (e.g. equipment or vehicles that were within a radiologically controlled area or are potentially contaminated from their on-site usage) from the BNL Site until BSA has surveyed the equipment, and the vehicles/equipment passed through BSA's vehicle monitor on Princeton Avenue. Outgoing surveys require four (4) hours to complete and must be repeated if decontamination of equipment is required.

F. The Contractor shall ship all radioactive material, including check sources, in accordance with the SBMS Subject Area, "Packaging and Shipping Radioactive Materials from BNL to Off-site".

END OF SECTION 01 71 13

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 - General

1.00 Related Sections

A. Section 00 01 01 – Statement of Work

B. Section 01 71 13 – Mobilization/Demobilization

1.01 General:

A. Project Closeout Inspection:

1. When the Work is complete, the Contractor shall notify BSA.

2. Before notifying BSA, the Contractor shall complete the following:

a. The Contractor shall assure that the Work is complete in accordance with BSA's requirements and is ready for inspection by BSA. This assurance shall include performing a post-biological shield removal visual examination of the biological shield cavity to ensure that the goal of removing gross, loose debris and contamination from within the biological shield cavity has been satisfied.

b. Final cleanup has been completed as described in Section 01 71 13, Paragraph 3.01 Demobilization.

3. BSA reserves the right to set up a preliminary project closeout inspection prior to completion of the Work.

4. The Contractor shall provide to BSA a list of items remaining to be completed or corrected.

a. Within a reasonable time after receipt of the list, BSA will inspect the work areas to determine status of completion.

b. Should BSA determine that the Work is not complete:

i. BSA shall so notify the Contractor, in writing, giving the reasons therefore.

ii. The Contractor shall remedy the deficiencies and notify BSA when ready for re-inspection.

iii. BSA shall then re-inspect the Work.

iv. This procedure will be repeated until all deficiencies have been corrected and Work is accepted by BSA as completed.

5. Results of the completed inspection shall form the basis for final acceptance.

B. Final Acceptance:

1. Before requesting final acceptance of the Work and the last payment, the Contractor shall complete the following:

   a. The Contractor shall close out all user accounts for goods and services purchased by the Contractor from BSA.

   b. The Contractor shall submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for BSA acceptance.

   c. The Contractor shall submit a letter to BSA certifying that all subcontractors have been paid.

C. Record Document Submittals:

1. The Contractor shall submit Record Documents in accordance with Section 01 33 00 (Submittals).

D. Record Drawings:

1. The Contractor shall provide redlined revisions to BSA-provided drawings to depict "as-left" conditions

E. Record Specifications:

1. The Contractor shall provide a list of variations or changes in actual work performed in comparison with the specifications and addenda. The Contractor shall give particular attention to selection of options and similar information on elements that are concealed and cannot be readily discerned later by direct observation. Such deviations shall be clearly reflected by the Contractor on the Record Drawings.

F. Completion Report:

1. The Contractor shall prepare the Project Completion Report for BSA review and approval in accordance with Section 01 33 00 (Submittals).

G. Final Payment:

1. After compliance with all of the above requirements and approval in writing by BSA for project closeout, the Contractor shall submit a final payment requesting release of balance of 10% retainage and Contract closeout.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 01 77 00

DIVISION 02 – EXISTING CONDITIONS
SECTION 02 44 00 – BIOLOGICAL SHIELD REMOVAL

PART 1 - General

1.00 Related sections

A. Section 00 01 01 – Statement of Work

B. Section 02 81 00 – Waste Management & Transportation

1.01 General

A. The Contractor shall furnish all labor, materials, and equipment necessary to remove the biological shield, package and transport the resulting waste to the WLA or designated staging area located on the BNL Site.

B. The biological shield removal means and methods shall be determined by the Contractor and described in detail in the Contractor's BSA-approved project submittals. The Contractor's means and methods shall meet all of the performance requirements included in the Contract and are subject to BSA approval prior to their implementation.

C. The Contractor shall use special tools to remotely remove the biological shield. The Contractor's tools, processes and procedures shall be devised so as to preclude the need for personnel entry and manual work inside of the biological shield cavity. If for some unforeseen reason an entry must be made, the request will be considered and approved by BSA on a case-by-case basis.

D. The Contractor shall not perform thermal cutting operations of the neutron shield and inner biological shield wall steel components. Thermal cutting of the external interferences and outer biological shield steel wall are allowed.

E. The Contractor shall employ removal methods and procedures that minimize the generation of secondary wastes.

F. BSA requires one-time handling and packaging of radioactive wastes. Wastes shall be packaged by the Contractor at the point of generation (including all BSA inspections and required sampling) in accordance with BSA's WMP. The Contractor is responsible for coordinating closely with BSA and ensuring that all waste inspection and packaging requirements are satisfied.

G. The Contractor shall size-reduce the waste materials to debris standards set by BSA's WMP or as otherwise required to fit in 20 yard intermodal containers furnished by BSA. Waste materials shall be placed in appropriate containers once they have been size-reduced. Waste handling and/or processing of biological shield debris outside of the contamination control boundary shall not be permitted.

1.02 Definitions

A. Remove: Detach items from existing construction.

B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed.

1.03 Project Conditions

A. Building 701 is predominantly free of loose radiological contamination. The Contractor shall conduct biological shield removal in a manner that preserves the present radiological conditions. The Contractor shall be responsible for decontaminating areas in and around Building 701 that become contaminated as a result of the Contractor's biological shield removal activities at its expense. BSA will provide the Contractor with a baseline radiological survey and the Contractor is encouraged to verify the pre-biological shield removal radiological conditions. Based on this baseline survey, BSA and the Contractor shall agree on the pre- and post- removal radiological conditions.

B. The paint applied to the outer surfaces of the biological shield and interferences contains lead.

C. The Contractor shall notify BSA of discrepancies between existing conditions and the specifications/drawings before the award of the Contract. Contract changes as a result of such discrepancies brought to BSA's attention by the Contractor after award of the Contract shall not be considered by BSA.

D. The Contractor shall protect utilities, structures and services in the immediate and in the general vicinity of the work areas. The Contractor shall have a structural monitoring program to ensure that the dismantling techniques being used do not adversely affect Buildings 701 and 703. The Contractor, at the Contractor's expense, shall repair damages to such utilities, structures and services caused by the Contractor.

1.04 Work Area Preparation

A. The Contractor shall be responsible for work area preparation as follows:

1. Site preparation activities shall be included in the Technical Work Procedures.

2. Coordination with BSA for the removal of existing structures, systems and components that are interferences to biological shield removal.

3. Mobilization of all materials, equipment, and personnel to the BNL Site in accordance with the Contractor's P-3 schedule.

4. Designation and establishment of all work zones. Work zones shall be delineated and created in accordance with the Contractor's technical work procedures.

5. Installation of temporary barricades, gates, postings, and other controls prior to the start of biological shield removal including but not limited to:

    i. Establishment of all controls (e.g., radiological), temporary facilities, and services prior to the start of work.
    ii. Establishment of waste staging areas in accordance with the WMP.

1.05 Temporary Ventilation, Contamination Control Envelope and Contamination Control

A. The Contractor shall design, deliver, install and operate a temporary CCE as further described below.

1. Portable HEPA vacuum cleaners and air-handling equipment shall comply with BNL Radiological Control Manual, Article 463.

2. The physical size of the containment will be as small as practical to limit the collateral contamination of Building 701 structures, systems and components. In addition, the CCE will be of sufficient size to allow for the safe and efficient conduct of biological shield and waste handling operations.

3. The fan unit and components shall meet the approval requirements of a Nationally Recognized Testing Laboratory (NRTL); reference 29 CFR 1910, Subpart S, and NFPA 70E. Pressure boundary of the filter bank shall be leak tested in accordance with ANSI N509/N510. HEPA filter elements shall meet the testing requirements of DOE STD 3020. Ductwork shall meet the requirements of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) "HVAC Duct Construction Standards Metal and Flexible."

4. A State of NY Registered Professional Engineer shall approve the structural design of the CCE; installation/erection of the containment shall be in accordance with the Engineer's instructions.

5. BSA will perform a NESHAP's evaluation of the Contractors ventilation system and the Contractor shall be responsible for implementing all requirements from that evaluation.

6. The ventilation exhaust stack height shall be at least 10' higher than Building 701 or located where it will not be subjected to eddy currents or wake events. The exhaust stack shall be designed and constructed in accordance with ANSI N13.1.

7. A Professional Engineer shall approve the design and installation of the HEPA systems, exhaust stack, and the electrical and mechanical component selection. This includes an evaluation of the system for the acceptance test criteria in ASME N510-1995. A guideline for the size of the HEPA system is provided in Section 2.6 of the DSA. The ventilation system shall be designed and operated in accordance with the SBMS Subject Area "Exhaust Ventilation".

8. Surveillance testing of HEPA filters shall be performed at each installation or change out of HEPA filters. BSA will provide the equipment and personnel to perform these tests. Testing will be performed in accordance with BNL Safety & Health Services Division SOP-IH62200, "HEPA Filter Surveillance Program". ERP RCD will maintain control of all HEPA vacuums in accordance with ERP OPM 6.2, "HEPA Vacuum Operation".

9. The Contractor shall prepare a technical work procedure for the installation, testing and operation of the CCE.

10. The CCE will be designed considering ease of dismantlement and disposal upon completion of the work.

11. The CCE will be operated at a demonstrable negative pressure to preclude the spread of contamination outside of the biological shield and/or the CCE.

12. Air effluent from the CCE will be HEPA filtered and continuously monitored, and limits on air effluent quality are subject to BSA approval.

13. The CCE will allow for the safe and efficient ingress and egress of personnel, equipment and waste containers while precluding the spread of contamination.

14. All penetrations through the CCE shall be hermetically sealed.

15. The CCE will be approved by BSA prior to use and following any modifications and/or repairs.

16. The Contractor shall perform daily inspections of the integrity of the CCE. Inspections must be performed before use/entry of the work shift. Inspection records must be maintained at the work area.

17. The Contractor shall perform constant real-time visual observation of work from outside the CCE by installing strategically placed windows/observation portals and/or use of video monitoring and surveillance.

18. The Contractor shall provide for constant radio communications between workers inside the CCE, between workers inside the CCE, and with supervisors/monitors outside the CCE. In addition, the Contractor shall provide an additional visual and audible alert system in the event of an emergency stop work order or evacuation.

19. The contractor shall provide for lighting within the CCE sufficient for work and independent observation.

20. When respiratory protection is required within the CCE, the Contractor shall use air purifying respirators or powered air purifying respirators.

21. The CCE will be removed from Building 701 and disposed of at the completion of work unless otherwise directed by BSA.

B. The Contractor shall develop and use engineered controls, procedures and safeguards that will preclude the spread on contamination during biological shield removal. BSA expects a defense – in-depth approach to the Contractor's contamination control strategy.

1. The Contractor shall use fixative coating systems in and around the biological shield to prevent the spread of loose contamination during biological shield removal. Fixative coatings shall be in compliance with BSA's WMP, BSA's disposal site waste acceptance criteria and subject to BSA approval. Under no circumstances will the application of fixative coatings create the generation of mixed wastes.

2. Special tools shall be designed with the objective of minimizing the generation of dispersible contamination and debris as a result of biological shield removal operations.

1.06 Contamination Control Performance Requirements

The Contractor shall design the contamination control containment (including temporary HEPA system), special tools and the biological shield removal process with the objective of minimizing the generation of dispersible contamination, and providing for its collection and control at the point of generation. The Contractor's design of the contamination control containment and temporary HEPA system, special tools and biological shield removal process controls shall meet the quantitative contamination control performance requirements set forth below:

A. Zone 1: Inside of the Biological Shield Cavity.

At all times during biological shield removal, airborne radionuclide concentrations inside of the biological shield cavity will be continuously monitored by BSA. Airborne concentrations shall not exceed 50 DAC (10CFR835 Appendix A and C). Airborne concentrations in excess of 50 DAC shall be considered as a failure by the Contractor to meet BSA's performance requirements. The Contractor shall promptly cease biological shield removal operations, evaluate the cause(s) of the excessive airborne concentrations, and take corrective actions required to remedy this non-conforming condition. The resumption of biological shield removal operations will require prior BSA approval. Under no circumstances will such disruptions to biological shield removal be considered by the Contractor or BSA as a basis for a modification to the Contract.

B. Zone 2: Inside of the Contamination Control Containment.

1. Airborne Contamination.

At all times during biological shield removal, airborne radionuclide concentrations inside of the CCE shall be continuously monitored by BSA and airborne concentrations shall be less than 10 DAC. Airborne concentrations in excess of this limit shall be considered as a failure by the Contractor to meet BSA's performance requirements. The Contractor shall promptly cease biological shield removal operations, evaluate the cause(s) of the excessive airborne concentrations, and take corrective actions required to remedy this non-conforming condition. The resumption of biological shield removal operations shall require prior BSA approval. Under no circumstances will such disruptions to biological shield removal be considered by the Contractor or BSA as a basis for a modification to the Contract.

2. Surface Contamination

BSA will frequently monitor surface contamination levels inside of the contamination control containment. At no time during biological shield removal shall the average, loose contamination levels exceed the Table 1 values in Section 02 51 26 by a factor of more than 500 (i.e., the average permissible loose contamination levels are 500 times the Table 1 values). Average surface contamination levels in excess of these limits shall be considered as a failure by the Contractor to meet BSA's performance requirements. The Contractor shall promptly cease biological shield removal operations, evaluate the cause(s) of the excessive airborne concentrations, and take corrective actions required to remedy this non-conforming condition. The resumption of biological shield removal operations shall require prior BSA approval. Under no circumstances will such disruptions to biological shield removal be considered by the Contractor or BSA as a basis for a modification to the Contract.

C. Zone 3: Building 701 General Areas and Areas Adjacent to Biological Shield and Contamination Control Containment

BSA shall continuously monitor airborne radionuclide concentrations and frequently monitor surface contamination levels in Zone 3 areas. Airborne concentrations shall not exceed background, and loose surface contamination levels shall not exceed the values provided in Table 1 of Section 02 51 26. Airborne radionuclide concentrations above background, or unplanned loose surface contamination levels in excess of the Table 1 values caused by the Contractor's biological shield removal activities shall be considered as a failure by the Contractor to meet BSA's performance requirements. The Contractor shall promptly cease biological shield removal operations, evaluate the cause(s) of the excessive airborne concentrations, and take corrective actions required to remedy this non-conforming condition. The resumption of biological shield removal operations will require prior BSA approval. Under no circumstances will such disruptions to biological shield removal be considered by the Contractor or BSA as a basis for a modification to the Contract. (Note: The Zone 3 loose contamination limits do not include contaminated work areas, deliberated planned by the Contractor and approved by BSA that are required to support the work, or loose contamination that was otherwise present prior to the Contractor's mobilization in Building 701).

D. All vacuum cleaners used by the Contractor shall be HEPA ventilated. BSA will provide materials and personnel to perform acceptance testing of HEPA filters. Testing will be performed in accordance with BNL Safety & Health Services Division SOP-IH62200, "HEPA Filter Surveillance Program". ERP RCD will maintain control of all HEPA vacuums.

1.07 ALARA

A. The Contractor shall perform biological shield removal with the objective of maintaining occupational radiation exposure ALARA. As part of its ALARA plan, the Contractor shall provide BSA with detailed radiation exposure estimates for the tasks comprising the biological shield removal project. The Contractor shall monitor actual exposure against these estimates, and the Contractor shall take corrective actions required to remedy unfavorable radiation exposure trends.

B. The area inside of the biological shield is a radiologically harsh environment. BSA shall not permit the entry of Contractor personnel into this area for routine operations. The Contractor's approach to biological shield removal will be developed accordingly. Contractor personnel entry into the biological shield will be considered on a non-routine, case-by-case basis and subject to specific BSA approval.

C. Biological shield components with radiation dose rates in excess of 5,000 mrem at one (1) foot shall not be removed from the biological shield cavity without BSA approval. The Contractor shall immediately notify BSA in the event that a component with this high radiation dose rate is encountered. The Contractor will be required to develop a contingency plan to remove and transport such components in accordance with ALARA principles and BSA Subject Matter Experts will be made available to provide technical assistance to the Contractor. All other filled waste containers shall be transported to the WLA or other designated location within BNL without additional constraints but in accordance with BSA standards and procedures.

1.08 Hot Particle Program

A. At all times during biological shield removal, Zones 1 and 2 shall be controlled as Hot Particle Areas. The following controls shall be included in the RWP for Hot Particle Areas:

1. Periodic personnel monitoring during the work activity, at a frequency based on the potential magnitude of skin exposure (typically once per hour).

2. Suspension of work if hot particle is found on individuals PPE or skin to investigate origin and to prevent reoccurrence.

3. Suspension of work if a high level hot particle (typically ≥250,000CPM) is found in an occupied work area to investigate origin and to prevent reoccurrence.

4. Four (4) hour personnel stay times.

5. Additional PPE and clothing.

6. Facility Support coverage during work or assistance during PPE removal.

7. Use of sticky pads or multiple step-off pads.

B. Physical controls shall be in place for all entrance or access points to areas that contain dose rates greater than 1000 mrem/hr at 30 cm. These controls shall be in accordance with 10 CFR835.502 (b) (d) and BNL Radiological Control Manual chapter 3, Appendix 3A. These physical controls will be pre-approved by ERP RCD. All locks used for these physical controls will have keys that are numbered stamped and shall be of a type that is not easily reproducible. ERP RCD will maintain control of the keys until the project is complete.

PART 2 - Products

Not used.

PART 3 - Execution

3.01 Biological Shield Removal, General

A. The Contractor shall remove all biological shield components including the following:

1. Biological Shield Interferences - Removal of the biological shield requires that the structures and appurtenances presenting a physical interference with the installation of the contamination control containment and the biological shield removal process be removed. All structures remaining in place after partial removal shall have their support structure approved by Professional Engineer.

   There are seven (7) balconies attached to the outer biological shield walls. The balconies are listed as follows:

   - East – el. 114 ft;
   - East – el. 123 ft;
   - North – el. 118 ft;
   - North – el. 136 ft;
   - West – el. 118 ft;
   - West – el. 127 ft;
   - West – el. 136 ft;
   - Two balconies, each located on the north and west walls at elevation 136 ft shall be removed in their entirety. The remaining five (5) balconies shall be removed to a

point no greater than five feet (5'-0") from the biological shield attachment points. The ACM floor tiles on the removed balcony areas shall be removed prior to demolition of the structures. The Contractor shall structurally support the remaining balcony structures.

The Contractor shall partially remove the sixteen (16) control rod drive mechanisms (CRDM) as deemed necessary to allow access for biological shield removal and installation of the contamination control containment. These mechanisms consist of structural steel framing and motor/drive skids mounted in two banks with four structural support frames and eight CRDM drive units per bank. Each drive skid consists of an electric motor, drive unit (gear box), and steel extension rod. The Contractor shall design and install supports under the remaining CRDM steel.

The Contractor shall partially remove the Chemo-Nuclear loop as necessary to allow access for biological shield removal. The Contractor shall structurally support the remaining components.

The Contractor shall remove the portion of the east stairwell at the attachment point at the southeast corner of the biological shield at elevation 143 ft. Removal of the stairwell shall be limited to that only necessary to remove the biological shield. The Contractor shall structurally support the remaining stairwell.

The Contractor shall partially remove the freight elevator adjacent to the biological shield. The elevator consists of a tower constructed of brick and steel, a conveyor car, steel lift cables and cast iron counter weights. The tower structure shall be partially removed down to elevation 136 ft. and top of the remaining structure shall be covered with a permanent metal cover.

2. Air Tight Membrane (ATM), Pile Restraining Springs, Experimental Port Graphite Plugs and Experimental Port Expansion Joints – The Contractor shall remove portions of the ATM not previously removed during graphite pile removal.

   The Contractor shall remove the experimental port expansion joints, graphite plugs, and the graphite restraining springs that span the space between the ATM and the biological shield.

3. Biological Shield Structure - The Contractor shall remove biological shield walls down to elevation 106'-9". The biological shield walls are comprised of a 4' - 3" thick high-density concrete barrier surrounded by an inner and outer steel plate with a nominal thickness of 6" and 3", respectively. The Contractor shall perform the following work activities while removing the biological shield structure:

   - Removal of the top of the biological shield structure.
   - Removal of the neutron shield.
   - Removal of the reinforced concrete including its size reduction for packaging, transportation and disposal.
   - Removal of the inner steel plates, including their size reduction for packaging, transportation and disposal.
   - Removal of the outer steel plates, including their size reduction for packaging, transportation and disposal.
   - Removal of the pile upper bedplates and sliding rails. The steel beams and fixed base plates shall remain.

- Removal of all visible debris within the biological shield footprint including the north and south plenums.
- Sealing of all plenums, chutes, and experimental openings.
- Removal and/or stabilization of loose radiological contamination in the Building 701 area associated with the removal of the biological shield, including the remaining pile support structure within the biological shield footprint.
- Installation of a permanent reinforced concrete cover over the footprint of the removed biological shield. The concrete cover will be designed to achieve a floor loading of 250 pounds per square foot.

B. The Contractor shall exercise extreme caution with all aspects of biological shield removal to prevent the spread of contamination to uncontaminated areas. Should a previously clean area become contaminated as result of biological shield removal activities, it shall be the Contractor's responsibility to decontaminate the affected area(s) to pre-contaminated conditions at its expense.

C. The Contractor shall maintain work areas in accordance with the ES&H Plan, and in accordance with BSA's RWP requirements and other direction provided by BSA.

D. Uncontrolled dropping of materials is not allowed.

E. Lifts involving any biological shield components may be considered a Critical Lift and subject to BSA's Critical Lift requirements.

F. Any lifting apparatus being supplied by the Contractor shall be manufactured in accordance with the requirements of the National Safety and Health Act, OSHA Section 1910.179, the NEC, and the Crane Manufactures of America (CMAA).

G. While removing the biological shield the Contractor shall segregate all components that have the potential of containing hazardous constituents (Note: The biological shield steel walls are painted with a lead base paint and are not considered hazardous requiring segregation. If the lead paint is removed from the walls it shall be considered hazardous requiring segregation.) Special attention will be required for all non concrete and non metal parts identified during demolition of the biological shield. The Contractor shall obtain BSA approval prior to packaging any unidentified components.

3.02 Cleaning/Housekeeping

A. The Contractor shall maintain radiological contamination levels ALARA. Decontamination by the Contractor shall be required for contamination exceeding the following conditions:

1. Contamination levels for clean areas exceeding the limits of Table 1 in section 02 51 26.

2. Average contamination levels for contamination areas outside the contamination control containment exceeding 20 times the limits of Table 1 in section 02 51 26.

3. Average contamination levels inside of the contamination control containment exceeding 500 times the limits of Table 1 in section 02 51 26.

4. BSA shall not permit unfavorable trends. The Contractor shall promptly evaluate contamination events outside of the contamination control containment, and corrective actions implemented to preclude event reoccurrence.

B. The Contractor shall clean adjacent structures and remove dust, dirt, and debris caused by biological shield removal operations, and return adjacent areas to the conditions existing prior to the start of work.

END OF SECTION 02 44 00

DIVISION 02 – EXISTING CONDITIONS
SECTION 02 51 26 – RADIOACTIVE DECONTAMINATION

PART 1 - General

1.00 Related sections

A. 00 01 01 – Statement of Work

B. 02 81 00 – Waste Management & Transportation

1.01 References

A. BNL Radiological Control Manual

1.02 General

A. The Contractor shall be required to perform radioactive decontamination of equipment, structures and components as described below:

1. The Contractor is responsible for the removal of the temporary systems and equipment that it installs and uses in connection with biological shield removal. Systems and equipment that the Contractor removes from the BNL Site shall be decontaminated by the Contractor to levels below the limits provided in Table 1. The extent to which such systems and equipment can not be decontaminated below these levels, the contaminated systems and equipment shall be disposed of as low level radioactive waste. The Contractor is responsible for the packaging of this waste in BSA – furnished 20-foot Sealand connex containers, and transporting these containers to a designated waste staging area on the BNL Site. BSA will be responsible for the off-loading, off-site transportation and disposal of this waste. Note: This waste shall be considered as secondary waste and subject to the 4 20-foot Sealand connex containers allowance for which BSA is responsible. BSA's on-site staging, off-site transportation and disposal of secondary waste volumes in excess of 4 20-foot Sealand connex containers will be back-charged to the Contractor at a rate of $50,000 per container.

2. The Contractor is responsible for decontaminating the exterior surfaces of waste containers exiting the contamination control containment. Table 1 provides the acceptance criteria that shall be satisfied by the Contractor before the waste containers will be permitted to be loaded on the Contractor's conveyance for transportation out of Building 701.

3. The Contractor is responsible, at its expense, for decontaminating Building 701 structures, systems and components outside of the contamination control containment that are contaminated as a result of the Contractor's biological shield removal activities. The Contractor shall be responsible for decontaminating such Building 701 structures, systems and components to the baseline conditions recorded by BSA and the Contractor prior to the start of work. Radioactive wastes resulting from these decontamination activities shall be considered as secondary wastes, and managed as described above.

B. Project Conditions and Requirements

1. All items are considered potentially contaminated if they have been used or stored in Contamination, High Contamination, Airborne Radioactivity or Radiological Buffer Areas.

2. The Contractor shall establish a holding/inspection area to allow BSA radiological control technicians to perform radiological surveys.

    a. The holding/inspection area shall be arranged such that routine access is prevented by means of barrier rope with appropriate posting to identify that the items contained are being held for survey. The area will be off-limits to individuals other than Contractor and BSA radiological survey personnel.

3. The Contractor should assume that an aggressive decontamination effort will be required to achieve unrestricted release of items that have come in contact with radioactive materials or were used in contamination areas. Based on past experience using the best available technologies, decontamination to meet the Table 1 release criteria may be difficult to achieve. As such, tools and equipment used in Contamination, High Contamination, Airborne Radioactivity or Radiological Buffer areas for performance of the work are to be considered expendable. BSA will not reimburse the Contractor for any tools and equipment that cannot be released for unrestricted use from the BNL Site.

1.03 Submittals

A. The Contractor shall prepare and submit decontamination procedures for BSA approval. The submission shall include any manufacturer's technical information for decontamination or contamination controlling agents planned to be used by the Contractor. Any such agents require BSA's approval prior to use.

B. The Contractor shall provide BSA with a list of all tools, equipment, and material to be brought on the BNL Site which have been previously used in radiological environments, including the following information:

    a. Previous use of the equipment;
    b. Dates of use;
    c. Levels of contamination; and,
    d. Radioisotopes involved.

    The list must be submitted as soon as known but no less than 30 days in advance of bringing such items on the BNL Site. BSA reserves the right to reject the Contractor's request to bring these items on site.

1.04 Decontamination Methods

A. The Contractor shall employ decontamination methods that minimize generation of secondary waste.

B. BSA shall approve decontamination methods and procedures prior to work.

1.05 Definition of Removable and Fixed Contamination Levels

A. A surface shall be considered contaminated if the removable or total radioactivity is detected above the BNL Radiological Control Manual. A partial excerpt is provided in the table below.

TABLE 1 – Removable and Fixed Contamination Levels

Nuclide	Removable (dpm/100 cm2)	Total (Fixed + Removable) (dpm/100cm2)
U-natural, U-235, U-238 and associated decay products	1,000 alpha	5,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1,000 beta-gamma	5,000 beta-gamma
Tritium organic compounds, surfaces contaminated by HT, HTO, and metal tritide aerosols	10,000	10,000

PART 2 – Products

2.00 Contractor's Equipment

A. The Contractor shall supply all labor equipment, tools, and material required to decontaminate structures, systems and equipment in connection with performing the work.

B. For the purposes of meeting BSA's ALARA objective it is expected that:

1. Reasonable efforts are to be used by the Contractor to remove residual contamination to the extent that there is no detectable contamination on items that were free of contamination prior to use; or,

2. There is no increase in the level of contamination on items that were previously contaminated.

C. All Contractor furnished tools, equipment, and material shall be surveyed for radioactive contamination by BSA personnel upon removal from contamination controlled areas.

2.01 Materials

A. Use of any decontamination agents and fixative coating materials shall be in compliance with the Waste Acceptance Criteria (WAC) of BSA's disposal facilities.

1. The Contractor shall deliver coating materials in original, new and unopened containers bearing the manufacturer's name, label, and the following information:

a. Name or title of material;

b. Manufacturer's stock number and date of manufacture;

c. Manufacturer's name;

d. Application instructions; and,

e. Material Safety Data Sheets.

PART 3 - Execution

3.00 Prevention of or Minimizing Contamination

A. The Contractor shall plan and coordinate all work to minimize exposure of equipment and tools to potential radioactive contamination. Where possible, equipment shall be located in areas with the least potential for contamination.

B. It is the Contractor's responsibility to evaluate materials, equipment, and tools for ease of decontamination and disassembly that may be required for decontamination prior to use on site. Use of items intended to be free released (i.e., those other than expendable) should incorporate appropriate precautions to prevent contamination, which should be implemented prior to and during use. Examples of precautionary measures shall include HEPA filters, protective coverings or wrappings, strippable coatings, or protective caps. In addition, all openings on equipment or tools that may permit contamination of inaccessible or difficult to clean areas shall be covered and protected. All items with inaccessible areas for survey shall require release authorization from a BSA designated material evaluator.

C. The Contractor shall provide precautionary measures, such as protective coverings or wrappings, to prevent contamination of the exterior surfaces of the waste containers.

3.01 Methods of Decontamination Activities

A. When selecting a decontamination technique, consideration shall be given to those technologies that minimize radiological airborne emissions, secondary wastes, and tool or equipment damage.

B. The Contractor shall include the decontamination methodologies in a Technical Work Procedure subject to BSA review and approval.

C. The Contractor shall provide for personnel decontamination including decon showers/facilities and, if used, water collection.

3.02 Waste Management Activities

A. The Contractor shall control, collect, and package all waste generated as a result of its decontamination activities.

3.03 Relocation, Reuse, and Release of Tools, Equipment, Materials, and Waste Containers

A. The Contractor shall perform all decontamination activities required to meet the levels identified in Table 1. BSA will perform all release surveys.

B. The Contractor shall provide a minimum of 24 hours prior notice to BSA of its intent to remove tools and equipment from the work area.

C. BSA radiological control technicians will conduct radiological surveys to release tools, equipment, material, and waste containers from Contamination Areas in accordance with BSA's Standard Operating Procedures and Radiological Control Manual.

D. BSA will not permit the use of encapsulation or wrapping as a means of releasing tools and equipment for unrestricted use.

3.04 Final Cleaning of Biological Shield Cavity

A. Following complete removal of the biological shield, the Contractor shall remove all visible debris.

3.05 Unsuccessful/Impractical Contractor Decontamination

A. Decontamination may be considered impractical for non-expendable items that are integral parts of equipment and not readily replaceable such as porous materials (e.g., wood and fiberglass), wire rope, chains, brushes, items with finned surfaces, and similar items where contamination may be embedded within the material configuration matrix. These items may not be released if detectable contamination is identified on the surface. Items considered for release shall require release authorization from BSA.

B. Should the Contractor's equipment or tools become contaminated, they will have to be decontaminated. The Contractor shall perform decontamination of its equipment or tools to the extent practical at its expense, before removal from the area. If decontamination proves impractical or impossible, contaminated tools and equipment will be disposed of as secondary waste.

C. It shall be assumed that small tools used for decontamination work, HEPA vacuum cleaners, wooden scaffold, wooden ladders, and miscellaneous fibrous materials cannot be decontaminated and will be disposed of as secondary waste.

3.06 Rinsate/Effluent Handling

A. The Contractor shall collect all waste and effluent generated while removing and/or fixing contamination.

B. The Contractor shall collect and process decontamination wastes prior to packaging in BSA-furnished containers. The Contractor's decontamination waste shall meet BSA's debris waste profile for disposal at Energy Solutions. Under no circumstances shall the Contractor generate mixed waste. The Contractor shall be responsible for the treatment and disposal of any mixed waste resulting from its decontamination activities.

END OF SECTION 02 51 26

DIVISION 02 – EXISTING CONDITIONS
SECTION 02 81 00 – WASTE MANAGEMENT & TRANSPORTATION

PART 1 - General

1.00 References

A. Environmental Management Directorate Waste Management Plan, January 28, 2002

B. BSA SBMS Environmental Management System Description for Environmental Management and Hazardous Materials Transportation

C. BSA SBMS Subject Area's for Radioactive Waste Management

D. BSA SBMS Subject Area's for Radioactive Waste Transportation On- and Off-site

E. FS-SOP-1050, Radiological Survey for Radioactive Material Shipments

F. 10 CFR 835 Appendix E

G. 40 CFR 264.314 and 265.314

H. 49 CFR 173.425, Table of Activity Limits, Excepted Quantities, and Articles

1.01 Related Sections

A. Section 01 33 00 – Submittals

B. Section 02 44 00 – Biological shield Removal

C. Section 02 51 26 – Radioactive Decontamination

1.02 General – Waste Management

A. The Contractor shall meet all of the requirements included in BSA's WMP.

B. The Contractor shall sort, segregate, inspect and package all waste in accordance with the applicable requirements of the Nevada Test Site and Energy Solutions waste acceptance criteria.

1.03 General – Waste Packaging

A. The Contractor shall be responsible for loading BSA-furnished waste containers with materials resulting from the Contractor's removal of the biological shield. BSA will provide 20 CY intermodal containers for loading segments, parts and appurtenances incident with the removal of the biological shield. The intermodals shall be loaded to a maximum net weight of 45,000 pounds.

B. The Contractor shall obtain a minimum of a 60% packaging efficiency when loading non metallic waste from the biological shield demolition.

C. The Contractor shall deliver the loaded waste containers to the BSA's Waste Loading Area or another designated staging area on the BNL Site.

D. The Contractor shall be required to perform waste inspection and verification activities during the course of waste container loading.

E. The Contractor shall be responsible for the collection and packaging of miscellaneous debris incident to biological shield removal in accordance with the BSA's WMP.

F. Secondary waste packaged in BSA provided containers shall be delivered to BSA's Waste Loading Area or a designated area on the BNL Site. Waste loaded into each Sealand container shall not exceed 1170 cubic feet; gross weight of each Sealand shall not exceed 50,000 pounds. Secondary wastes include step off pad wastes, and systems, structures, components and equipment furnished by the Contractor that cannot be decontaminated for unrestricted use at the end of the project. BSA will back-charge the Contractor at a rate of $50,000 per container for all containers containing secondary waste generated by the Contractor in excess of the container allowance provided for herein.

G. The Contractor shall provide a method for accurately determining the weight of the loaded waste containers.

H. The Contractor shall ensure that prohibited waste items are sorted and segregated from the wastes loaded in the containers by the Contractor. Rework, including unpacking and repacking of waste containers will be at the expense of the Contractor.

I. The Contractor shall be responsible for all waste handling operations within Building 701.

J. The Contractor shall protect waste containers from puncture, denting, scrapping or otherwise damaging the containers in any way. If the containers are expected to be exposed to weather that could affect their material condition they shall be protected.

K. The Contractor shall seal each container according to the manufactures specification after BSA approves the waste container packaging and contents.

L. The Contractor shall develop written procedures for the packaging and handling of waste.

1.04 General – Waste Transportation

A. The Contractor shall load the waste containers onto trucks for transportation to BSA's Waste Loading Area or another designated staging area on the BNL Site. Packages will be off loaded and stored by BSA personnel. The Contractor shall schedule and coordinate these activities closely with BSA.

B. The trucks and trailers supplied by the Contractor shall be in proper mechanical condition and will meet the requirements of the DOT. The Contractor shall ensure that the drivers of loads comply with BSA site speed limits, routing requirements, and PPE requirements in areas of loading and unloading materials.

C. The Contractor shall decontaminate the waste containers in accordance with Section 02 51 26 (Radioactive Decontamination).

D. The Contractor shall ensure that their operators of waste transportation vehicles are in possession of a BSA Waste Control Form at all times when transporting waste outside of the work area. BSA will complete the Waste Control Forms and provide the completed forms to the Contractor.

E. The Contractor's vehicle operators shall have a valid commercial driver's license with a hazardous material endorsement.

F. Contractor personnel involved with waste transportation on the BNL Site shall be trained to transport radiological and hazardous waste on BNL property. This involves BSA training part A&B of "Transportation of Hazardous Material (TQ-HAZMAT-A/B)"

G. The Contractor shall develop written procedures to control all work being performed to transport the waste to the Waste Management Facility or another designated area on the BNL Site.

PART 2 - Products

2.00 Equipment

A. The Contractor shall supply all equipment required for sizing waste and loading waste into BSA-furnished containers, and the equipment for safely handling, loading and transporting loaded waste containers to BSA's Waste Management Facility or another designated area on the BNL Site.

PART 3 - Execution

3.00 Collection and Disposal of Office Waste

A. Prohibited items that are suspected to be radiologically contaminated, or items not normally discarded into office area trash containers shall be segregated by the Contractor from typical office trash. Prohibited items include, but are not limited to:

- Tools,
- Equipment,
- Mop heads,
- Hose clamps,
- Floor sweepings,
- Aerosol cans,
- High density material,
- Personal protective clothing (PPE),
- Yellow masslinn,
- Yellow tape/Rad Con tape,
- Herculite,
- Yellow shoe covers,
- Radiological smears,
- Radiological safety signs,
- Plastic sample bottles, and
- Survey instrument cords.

B. If any prohibited or suspect materials are found, the Contractor shall notify BSA.

C. If tools or equipment are found in office area trash containers, the Contractor shall contact BSA for radiological evaluation and the procedure for decontamination and/or disposition.

D. The Contractor shall place office trash in a designated area agreed upon by BSA and the Contractor. BSA will collect office trash daily.

3.01 Waste Storage Areas

A. The Contractor shall be responsible for maintenance and upkeep of the waste storage areas in accordance with the WMP.

B. Signs shall be posted in storage areas identifying empty or full containers.

C. It shall be the Contractor's responsibility to ensure that loading capacity of the waste storage area floors is not exceeded.

3.02 Loading Containers

A. The Contractor shall fill containers such that the interior volume is efficiently and compactly loaded as practical up to the maximum gross weight limit of the container. Contents shall be prepared for containerization so as to minimize load shifting or damage to the container during movement.

END OF SECTION 02 81 00

APPENDIX B

Waste Management Plan for the BGRR Biological Shield Removal

WASTE MANAGEMENT PLAN

FOR THE

BGRR BIOSHIELD REMOVAL

June 06, 2007

Approved _____ Date: _____
Mike Clancy, WMP Manager

Reviewed _____ Date: _____
Fred Petschauer, ERP Support Services General Manager

Approved _____ Date: _____
Les Hill, ERP Director

Reviewed _____ Date: _____
Bob Deschamps, ERP Radiation Protection Manager

Preparer: W. Needrith

Expiration Date: 12/30/10

Revision 0

NSF-ISR
ENVIRONMENTAL MANAGEMENT SYSTEM REGISTERED TO ISO 14001:2004

TABLE OF CONTENTS

LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
BGRR	Brookhaven Graphite Research Reactor
BNL	Brookhaven National Laboratory
BHSO	Brookhaven Site Office
BSA	Brookhaven Science Associates
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DAW	Dry Active Waste
D&D	Decontamination and Decommissioning
DOE	Department of Energy
DOT	Department of Transportation
ECR	Environmental Compliance Representative
ES	Energy Solutions
ERP	Environmental Restoration Projects
EPA	Environmental Protection Agency
ES&H	Environmental Safety & Health
EWMS	Environmental and Waste Management Services
FE	Field Engineer
FS	Facility Support
IH	Industrial Hygiene
ISM	Isotopes and Special Materials
JSA	Job Safety Analysis
JTA	Job Training Analysis
LLRW	Low-Level Radiological Waste
NTS	Nevada Test Site
PE	Project Engineer
PM	Project Manager
PPE	Personal Protective Equipment
RCT	Radiological Control Technician
RWCF	Radioactive Waste Control Form
SBMS	Standards Based Management System
TBD	Technical Basis Document
WAC	Waste Acceptance Criteria
WCO	Waste Certification Official
WCPP	Waste Certification Program Plan
WLA	Waste Loading Area
WM	Waste Manager
WMC	Waste Management Coordinator
WMP	Waste Management Plan

1.0 OBJECTIVE AND PROJECT SCOPE OF WORK

The purpose of this Waste Management Plan (WMP) is to specify the requirements for the management of wastes resulting from the removal of the Brookhaven National Laboratory's (BNL) Brookhaven Graphite Research Reactor (BGRR) Bioshield and includes the handling, packaging, and on-site transportation and storage of these wastes.

The scope covered under this WMP includes:

- Packaging of the removed interferences necessary for bioshield removal.
- Packaging of the east and west sides of the airtight membrane (ATM), graphite restraining springs, and the experimental port expansion joints.
- Packaging of the steel and concrete bioshield structure down to elevation 106'-9".
- Packaging of the pile 3" steel upper bedplate and sliding rails.
- Packing of misc. debris located within north and south annulus space ie: graphite plugs, retainers, fuel anchors, pneumatic tubes.
- Packaging of secondary waste including personnel protective clothing, depleted HEPA filters, bioshield removal equipment and containment construction material, and other miscellaneous waste into waste containers.
- Inspection, verification, characterization and documentation of waste loading operations and loaded waste required to meet waste profile and burial site waste acceptance criteria.
- Transporting the waste containers from Building 701 to the Waste Loading Area or other designated storage facility on the BNL site.
- The establishing and maintenance of Waste Accumulation Areas.

2.0 WASTE MANGEMENT PLAN OVERVIEW

Brookhaven Science Associates (BSA) has overall responsibility for managing the bioshield removed waste. BSA's subcontractor, responsible for the bioshield removal, will be assigned certain waste management tasks and responsibilities as described herein.

The BSA's removal subcontractor is responsible to remove all bioshield components and interferences defined in BSA's technical specifications. Waste containers will be filled compliant with the waste acceptance criteria of the Nevada Test Site, Energy Solutions, or otherwise designated disposal facility and all applicable BSA procedures and standards. Additionally, the bioshield removal subcontractor will install a contamination control envelope (CCE) and record all waste loading operations. Provisions will be made for BSA to view all waste loading operations. The bioshield removal subcontractor will provide written documentation of the inventory of each waste container.

Waste to be removed and handled by the bioshield removal subcontractor includes those listed in the scope above. These items will be packaged into BSA provided containers, such as intermodal containers, DOT TYPE IP-1 soft sided containers (super sacks), and DOT TYPE IP-1 steel containers. If during the project, the bioshield removal subcontractor identifies any miscellaneous items not previously identified by BSA, the subcontractor will remove such items and package into designated BSA supplied containers. The bioshield removal subcontractor is responsible for identifying non-conforming waste items (as defined by the

waste site waste acceptance criteria and the approved waste profile) and for separating them from the bioshield waste stream for BSA disposition.

The bioshield removal subcontractor will be responsible to pick-up BSA provided containers from the BSA designated central storage area for use within Building 701. These containers will include the soft-sided containers (supersacks), DOT TYPE IP-1 steel containers, as well as the intermodal or equivalent containers. The removal subcontractor will also provide the transportation of filled containers to Waste Loading Area, EWMS Facility or other BSA designated lay down area(see figure 1). The subcontractor will ensure that the outside of the container is free of loose contamination (< 1000 dpm/100 sq. cm.) prior to transport to Waste Loading Area or other designated BSA staging area. BSA Radiation Control Division personnel will perform the required contamination survey.

BSA will provide all agreed upon waste disposal containers and packages to the bioshield removal subcontractor. Disposal containers and packages will be stored at a central location within the BNL property, ready for pick-up by the subcontractor. The BSA Container Custodian or designee will be responsible for maintaining the central storage location and coordinating the pick-up of the containers. BSA will be responsible for characterizing all waste associated with removal of the bioshield and shall perform independent waste verification of all waste loading operations. BSA will complete Radioactive Waste Control Forms, which shall be approved by Environmental and Waste Management Services Division (EWMSD) staff prior to transporting waste from Building 701 to Waste Loading Area or other designated BSA staging area. BSA will complete all radiological surveys and shipping paperwork in order to meet all the Department of Transportation (DOT) and selected waste disposal site's waste acceptance criteria prior to shipment.

3.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or Relevant and Appropriate Requirements (ARARs) are substantive environmental requirements, cleanup standards, and standards of control that must be adhered to during implementation of this project. ARARs applicable to the management of the bioshield removal waste are as follows:

- BGRR Record of Decision, March 17, 2005
- 10 CFR 835, Occupational Radiation Protection
- 10 CFR 830.120, Quality Assurance Requirements
- 49 CFR 172 through 179, Transportation Requirements
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)
- DOE Order 435.1, Radioactive Waste Management, U.S. Department of Energy (DOE), Office of Environmental Management
- DOE Manual 435.1, Radioactive Waste Management Manual, U.S. DOE, Office of Environmental Management, June 19, 2001
- DOE Orders 460.1 and 460.2, Transportation of Hazardous Material
- BNL SBMS Environmental Management System Description for Environmental Management and Hazardous Materials Transportation
- BNL SBMS Subject Areas for Radioactive Waste Management
- BNL SBMS Subject Areas for Hazardous Materials Transportation On- and Off site
- Nevada Test Site Waste Acceptance Criteria

- Energy Solutions of Utah Waste Acceptance Criteria
- BSA Radioactive Waste Management Basis

4.0 HISTORICAL DESCRIPTION

The BGRR at BNL was the first reactor built for the sole purpose of providing neutrons for research. During its years of operation, it was one of the principal research reactors in the United States. Construction was completed in August 1950, and initial criticality of the reactor was achieved the same month. The BGRR operated until June 10, 1968, when operation of the reactor was terminated and deactivation of the facility was initiated. In June of 1972, de-fueling and shipment of the fuel to the DOE Savannah River site was completed. The BGRR complex was described as being in a safe shutdown condition by the U.S. Atomic Energy Commission and became a surplus facility within the DOE complex. From 1977 until 1997, portions of the facility were used as the BNL Science Museum.

Decommissioning of the BGRR began in 1997 with the discovery and subsequent removal of approximately 60,000 gallons of contaminated water that had infiltrated and accumulated in the below ground ducts. Additional decommissioning activities to date have included the dispositioning of:

- Experimental equipment and systems from the reactor building;
- Reactor exhaust fans, motors, valves and instruments;
- Pile fan sump, pipes and associated contaminated soil;
- Above-ground ducts, pipes and associated contaminated soil;
- Canal house and water treatment house, along with associated equipment, pipes, asphalt, concrete and accessible contaminated soils;
- Reactor exhaust cooling coils, filters and primary liner (partial);
- Portion of the fuel canal outside the structural foundation footprint of the reactor building and accessible subsurface contaminated soil in the vicinity of the fuel canal, below-ground duct expansion joint #4 and secondary cooling air bustle; and
- Isolation of the below-ground duct and demolition of the instrument house;

In 2005, the BGRR Record of Decision (ROD) was signed by the U.S. Environmental Protection Agency (EPA), New York Department of Environmental Conservation (NYDEC) and, the DOE. This agreement requires the removal and disposal of the BGRR bioshield.

5.0 ROLES AND RESPONSIBILITIES

Roles and responsibilities for managing the bioshield removal wastes are described herein.

Environmental Restoration Projects (ERP) Directorate Support Services General Manager (ERP SSGM): This individual reports to the ERP Director and is responsible to oversee the programmatic disposition of the bioshield waste stream. It is the SSGM's responsibility to:

- Ensure that all personnel working on the bioshield removal project follow the requirements, procedures, and restrictions outlined in this WMP.
- Ensure that the EWMS Division is staffed appropriately to support the bioshield removal and that sufficient waste management resources are available.

- Revise this WMP, as necessary, and process through an ERP review and approval cycle as described in ERP procedure ER-OPM-1.3.
- Review and approve all changes in procedures and work activities associated with this WMP.
- Authorize all WMP governed work to proceed.
- Review and approve any condition reports or occurrence reports related to this WMP.
- Inform the ERP Director and DOE of progress, issues and changes to the plan.

ERP Waste Manager (WM): The WM manages and coordinates the handling and disposal of all bioshield hazardous, radioactive, and mixed wastes packaged by the removal contractor. The WM is responsible for the integration of sound waste management practices into the bioshield removal project and to ensure that waste is properly planned for and budgeted, minimized, characterized, and disposed of in a manner that is cost- effective and in compliance with all applicable regulations and waste acceptance criteria. The WM ensures that all burial site criteria and Environmental and Waste Management Services (EWMS) Division requirements governing waste management are met. The BGRR WM responsibilities also include:

- Act as the Waste Generator and be responsible for Rad Waste Control Forms (RWCF).
- Review project waste profiles for selected waste disposal site.
- Review updates and changes to this plan.
- Review waste management audits and inspection results related to the project.
- Inform the Deputy Division Manager for Waste Programs of the EWMS Division of any issues and changes related to the management and disposal of project wastes.
- Maintain the waste inventory.
- Oversee day-to-day fieldwork related to the generation, transport and shipping of wastes.
- Assist the Field Engineers (FEs) in performing routine waste accumulation area compliance inspections.
- Act as the primary liaison between the EWMS Division and the project staff.
- Establish and authorize waste storage areas for the project in accordance with BNL requirements.
- Act as the “Accumulation Area” manager for the project for the accumulation of radioactive, hazardous and mixed wastes.
- Assist in identifying and implementing pollution prevention and waste minimization techniques.
- Assist in developing integrated contracting strategies for waste transport and disposal.
- Review project plans and documents related to the management of waste materials. Coordinate the technical reviews of such plans and documents.
- Ensure personnel from EWMS are available for independent verification of waste packages.
- Act in the capacity of Container Custodian. The Container Custodian is responsible for pre-use inspections and maintaining control over the waste containers from their arrival on-site to their departure off-site.

Waste Management Coordinator (WMC): The WMC for this project will be the EWMS Division Deputy Waste Programs Manager. The WMC will provide technical direction to the ERP WM and the pile removal contractor regarding requirements for managing hazardous, radioactive and mixed wastes generated from this project. The WMC provides guidance to this

project on the proper implementation of the EWMS Division requirements governing waste management and ensures that waste management activities are in compliance with all applicable regulations and waste acceptance criteria. The WMC responsibilities also include:

- Provide oversight of bioshield waste management activities.
- Provide technical direction of EWMS Division staff matrixed to bioshield removal project.
- Review and approve project WMP's including updates and changes.
- Inform the Manager of EWMS Division of any issues and changes related to the management and disposal of project wastes.
- Act in the capacity of the NTS Waste Certification Official (WCO).
- Contract officer representative (COR) of the project's waste management Basic Ordering Agreement (BOA) contracts; interfacing with disposal site operators.
- Notify DOE prior to the shipment of any radioactive material and obtain approval as required.
- Review and approve all characterization plans.
- Review and countersign all shipping documents (e.g. manifest, bill of laden).

Environmental Compliance Representative (ECR): The ECR provides:

- Technical support guidance and coordination related to environmental compliance issues.
- Review of pollution prevention and waste minimization opportunities for waste materials generated by this project.

The Radiation Protection Manager (RPM): The RPM is responsible for implementation of the requirements of the BNL Radiological Control Manual and all Facility Support Radiological Control procedures. The RPM is responsible to:

- Oversee and coordinate radiation/contamination surveys of waste containers generated during the removal project.
- Ensure that there is a sufficient quantity of qualified RCT's available to support the bioshield removal waste management activities.
- Ensure waste shipments from Building 701 to Waste Loading Area (WLA) or other designated BSA storage location, are properly monitored and performed in accordance with BSA standards and procedures.
- Coordinate and approve radiation work permits.
- Supervise radiation monitoring and surveillance activities.
- Conduct radiological assessments.

Radiological Control Technicians (RCTs): The RCTs implement radiation safety procedures and requirements of the BSA Radiological Control Manual. Specifically RCTs:

- Monitor radiation safety.
- Report non-conforming conditions.
- Assure that all work is conducted in accordance with the applicable RWP's and all other BSA radiological requirements.
- Conduct radiological surveys required to support waste management activities including surveys of personnel, equipment, containers and transport vehicles.

- Complete applicable sections of radioactive waste labels and RWCFs.
- Release items including equipment, instruments, trucks, and rail cars from radiologically controlled areas.

Waste Verifier (WV): The BSA waste verifier will be responsible for overseeing all waste loading operations and will be responsible to:

- Confirm that all waste containers are inspected prior to usage and document.
- Observe the loading of waste containers.
- Ensure that the loaded waste meets the disposal site WAC.
- Verify that no non-conforming wastes are inadvertently added to packages.
- Confirm package weights.
- Document the inventory of container contents.

Bioshield Removal Subcontractor Project Manager (PM):

- Ensure that all subcontractor personnel working on the project follow the applicable requirements, procedures, and restrictions outlined in this WMP.
- Responsible for the pick-up and loading of all waste disposal containers and packages generated from the project.
- Ensure waste verification (video and documentation) for all loading operations is performed.
- Transport and place loaded packages to WLA or other designated BSA storage location.
- Ensure that all waste containers are inspected, documented and approved prior to filling.
- Ensure that the driver for the loaded container vehicle holds a current CDL license stamped with a hazardous material endorsement and is trained in compliance with DOT HazMat requirements.
- Ensure that all materials, equipment, and vehicles are BSA inspected and approved prior to usage.
- Ensure that on site transportation of waste is in accordance with the BSA provided Safety Assessment Methodology (SAM) form as described in section 11.1 of this document.
- Ensure that all vehicle pre-use and post loading inspections are performed and documented.

6.0 ERP DIVISION LEVEL PLANNING

6.1 Cost-savings Initiatives

Cost-saving strategies for the BGRR bioshield removal project include the following:

- The potential reuse of tools and equipment contaminated on previous BNL cleanup projects. Such equipment includes Brokk manipulators, and HEPA ventilation equipment.
- Evaluation of optimal transport modes from BNL to the selected disposal facility.

In addition, costs will be avoided by following programmatic infrastructure requirements, including the Standards Based Management System (SBMS), and this Waste Management Plan.

6.2 Exemption Process

The low level radioactive waste (LLRW) generated from the project is to be disposed at the Energy Solutions (formerly Envirocare of Utah) disposal facility (ES). ES was selected for this waste stream to eliminate the costs associated with the additional waste profile requirements for the Nevada Test Site (NTS) as well as minimize shipping costs. Disposing of the waste at ES will enable ERP to utilize existing characterization data as well as BSA's existing waste profile. A commercial disposal exemption was included as part of the Radioactive Waste Management Basis (RWMB) for BNL and has been approved (letter from M. Holland to M. Bebon dated 5/26/2006) for this waste due to its best value merit. The RWMB will be updated by BSA and resubmitted to DOE for approval on an annual basis. For mixed low-level wastes generated the DOE's complex-wide mixed waste exemption for its disposal will be used.

7.0 PLANNED WASTE GENERATION

Planned waste streams resulting from the Bioshield removal include:

Type of Material	Waste Type	Quantity	Planned Disposal Site
Graphite Plugs / Debris	LLRW (NTS)	10.0 yd3	Nevada Test Site
Metal Structural Materials	LLRW (oversized debris)	33 yd3	Energy Solutions, Clive, UT
Metal/Metal Plate, Concrete, Secondary Wastes	LLRW (standard debris)	2107 yd3	Energy Solutions, Clive, UT
Outer bioshield walls, interferences	LLRW (standard debris)	586 yd3	Energy Solutions, Clive, UT
Bioshield Concrete (partial)	Soil	445 yd3	Energy Solutions, Clive, UT
Hazardous Materials (PCB contaminated components)	Hazardous	3.5 yd3	Onyx, Model City, NY
Cadmium and Lead Coated Steel	Mixed Waste	5.9 yd3	Energy Solutions, Clive, UT

Graphite Plugs/Debris – The bioshield plenums contain approximately 10 yd3 of graphite plugs and miscellaneous debris. The graphite plugs are ~4" long with a 2" diameter. The debris consists primarily of fuel anchors which are ½" diameter aluminum rods ~4' long. Additionally, several 4" diameter aluminum pneumatic tube sections ~ 4' long and other incidental debris such as wire, retaining springs, etc. are on the plenum floors. This waste will be packaged together by the subcontractor into the BSA supplied IP-1 steel boxes. Waste loading operations will be video documented by the subcontractor and observed by BSA waste verifiers. These boxes once filled will be surveyed by BSA RCD and transported by the subcontractor to the EWMS facility where gamma spectroscopy will be performed. Upon

review of the gamma spectroscopy and the existing BGRR characterization, the appropriate waste disposal facility will be selected. If the determination is made that the waste meets Class A waste in as defined 10CFR61.55 then the commercial disposal facility ES of Utah will be selected. If the waste exceeds Class A it will be disposed at the NTS. BSA will utilize existing approved profiles for either waste facility.

Outer Bioshield Walls / Interferences –This material consists of the outer bioshield steel plates as well as the interferences that need to be removed due to logistics. The interferences include such items as stairwells and balconies. The waste will be segmented/sectioned as necessary and packaged by the subcontractor into the BSA supplied intermodal containers. Waste loading operations will be documented by the subcontractor and observed by BSA waste verifiers. The subcontractor will be responsible to ensure that the weight limit of each package is not exceeded. This low-level radioactive waste will be packaged into BSA provided intermodals and is planned for disposal at the commercial disposal facility (ES of Utah).

Metal/ Metal Plate, Concrete and Dry Active Waste (DAW) – DAW generated from protective clothing (PPE), depleted filter elements from HEPA ventilation systems, and miscellaneous debris such as contamination control containments, tooling etc. generated during pile removal will result in 200 cubic yards of packaged low-level radioactive waste. This low-level radioactive waste will be packaged into BSA provided intermodals and is planned for disposal at the commercial disposal facility (ES of Utah).
Metal/Metal plate and concrete to be removed will result in ~2352 cubic yards of removed will result in low-level radioactive waste.
The concrete will be rubblized and placed into BSA provided 96 cubic foot IP-1 soft sided packages (supersacks). It is estimated that 650 supersacks will be needed allowing for a 60% packaging efficiency. Waste loading operations will be video documented by the subcontractor and observed by BSA waste verifiers. The subcontractor will be responsible to ensure that that the weight limit of each package is not exceeded. These bags once filled will be surveyed by ERP RCD and transported by the subcontractor to the WLA or other designated BSA laydown area for eventual shipment by rail. This low-level radioactive waste is planned for disposal at the commercial disposal facility (ES of Utah). A portion of the concrete removed (~445 yds^3) will be, after transported to the WLA, loaded into Gondola rail cars and combined with soils that will be removed from the WLA. This will be performed by BSA and not a function of the subcontractor.
The Metal/Metal Plate removed during the project will be segmented/sectioned as necessary and packaged by the subcontractor into the BSA supplied intermodal containers. Waste loading operations will be documented by the subcontractor and observed by BSA waste verifiers. The subcontractor will be responsible to ensure that the weight limit of each package is not exceeded. Care will be taken by the subcontractor to provide a safe and efficient manner when loading the intermodal containers. Containers will be loaded as to prevent movement of items during transport. Size reduction of the metal plate will be the subcontractors' responsibility; if size reduction is deemed impractical by the subcontractor then concurrence from the BSA PM will be obtained prior to packaging. Radiation dose rates of the metal being removed will be supplied to the subcontractor by BSA RCD to allow for strategic packaging within the intermodals. The subcontractor will be required to package the steel plate ensuring compliance with all applicable DOT requirements for shipping. The intermodal containers will be transferred by the subcontractor to the WLA or other designated BSA laydown area for eventual shipment by rail. This low-level radioactive waste is planned for disposal at the

commercial disposal facility (ES of Utah).

Hazardous/Prohibited Items- Hazardous/prohibited items expected to be removed as a result of the project include PCB's, miscellaneous cleaning fluids and, fluorescent lights containing mercury/metal halide bulbs. Each particular hazard will be considered separately and treated as such by the Subcontractor. Appropriate EWMS personnel will be tasked to observe the removal and packaging of the hazardous constituent. All wastes will be handled in accordance with BNL SBMS requirements. Appropriate monitoring will be in place to ensure worker safety. BSA, prior to use, will approve the selected hazardous waste disposal site. The hazardous materials will be placed into DOT approved packages which will be Q/A inspected by EWMS division prior to use. The loading of these containers will be observed and documented by a EWMS waste verifier. Removed materials will be surveyed by the ERP RCD technician prior to removal from the BGRR facility. A waste control form will be completed by the EWMS representative and ERP RCD personnel prior to transporting to the EWMS facility. All hazardous/prohibited items removed will be transferred by the subcontractor to the EWMS facility for further disposition and disposal at the appropriate disposal facility. The disposal facility for these items will be determined by the EWMS Division Deputy Waste Programs Manager dependent on the individual items radiological and hazardous constituents. Shipping documentation will be generated for all hazardous/radioactive wastes to be disposed. This documentation (Bill of Laden/ Manifest) will be reviewed and approved by the EWMS Division Deputy Waste Programs Manager prior to shipment. All vehicles carrying hazardous waste packages will be surveyed by ERP RCD personnel prior to being removed from the BGRR facility.

Cadmium/Lead Mixed Waste – Approximately 5.9 cubic yards of mixed waste is expected to be generated as a result of the bioshield removal. This waste will be removed and packaged by the subcontractor into BNL Q/A inspected and approved steel boxes, e.g. B-12. The steel boxes will be shipped for treatment and disposal by BSA to the Energy Solutions commercial disposal facility, Clive, Utah in accordance with the DOE complex-wide mixed waste commercial disposal exemption. Treatment will entail macro-encapsulation of the entire steel box prior to disposal. A EWMS waste verifier will observe and document the loading of the mixed waste and ensure proper packaging techniques are employed. A certificate of disposal will be provided to BSA confirming the end state of the lead waste.

8.0 POLLUTION PREVENTION AND WASTE MINIMIZATION

Some methods that will be employed to minimize wastes generated during the bioshield removal project include the following:

- Construction of a containment to prevent the spread of contamination that will avoid cross contamination of clean areas and equipment and thereby minimize waste generation.
- Segregating wastes in order to separate clean industrial waste from contaminated equipment and components.
- Using removal methods that minimize volumes of debris.
- Minimize consumable materials brought into radiologically controlled areas.
- Ensuring that BSA's removal subcontractor meets the minimum required packaging efficiency.

8.1 Segregation

All wastes generated will be segregated and stored in a manner that will facilitate their effective management and disposal. To the extent possible, non-hazardous/non-radioactive, hazardous, and radioactive wastes will be segregated and containerized based upon the waste's classification.

8.2 Treatment On-site

On-site treatment operations will be limited to those actions that are required to meet the requirements of the selected waste disposal facility. This will include the size-reduction of bioshield components to conform to waste disposal site's waste acceptance criteria (WAC) for its disposal as well as ensure a proper fit into designated waste containers.
Additionally, the pile subcontractor will use proactive measures to prevent the presence of freestanding liquids in the final waste packages. This will be accomplished by employing the use of absorbents inside of waste packages that may contain moisture. All materials used will be approved by the BSA WCO to ensure compliance with the selected waste disposal facilities WAC.

8.3 Release of Waste and Property Contaminated with Residual Radioactivity

All property and equipment potentially contaminated with residual radioactivity will be surveyed and evaluated in accordance with BSA Radiological Control Division procedures to ensure all standards are met prior to release.

8.4 Metals Recycling

Recyclable metals will not be generated during bioshield removal project.

8.5 Property Transfer and Reuse of DOE Property and Waste in Lieu of Disposal

It is anticipated that some DOE property from the BGRR Canal and Deep Soil Pocket Excavation and Removal Project may be transferred and reused. Specifically, the following equipment will be made available to BSA's bioshield removal subcontractor for reuse:

- Bobcat with scarifier
- Two (2) 6,000 CFM HEPA fan units
- One (1) 10-ton Spanco trackless gantry crane
- Two (2) Brokk Model 330D remote manipulator and various attachments

Upon completion of the project the DOE equipment used by the subcontractor will be returned to the DOE in the same condition as before it was used. This includes contamination levels as well as operability.

8.6 Management of Excess Lead

Lead that will be removed during the bioshield removal project will be placed into B-12 steel boxes. The B-12 boxes will be disposed of at a commercial disposal facility (Energy Solutions

of Utah) in accordance with the DOE's complex-wide mixed waste commercial disposal exemption. The disposal site will be responsible to macro-encapsulate the entire B-12 box prior to disposal. A certificate of disposal will be provided to BSA confirming the end state of the lead waste. Approximately 5.9 ft^3 of lead will be removed and disposed as a result of the bioshield removal work.

9.0 WASTE CHARACTERIZATION AND PROFILING

ERP has completed the waste characterization of the bioshield. The sampling methodologies and analytical results are documented in the "*Brookhaven Graphite Research Reactor Radiological and Hazardous Material Assessment of the BGRR Bioshield and Associated Components"* dated October 2006 and will be made available to the subcontractor. The characterization for the specific radiological items identified in this WMP include utilizing existing BGRR analytical data to perform a dose to curie conversion and assigning the appropriate curie content for each isotope identified in that existing data. Specific items and containers may be subject to gamma spectroscopy on site; this will be based on the activity identified in the radiological survey. This determination will be made by the ERP WM. Analytical data exists for all items depicted in this plan and have been confirmed to comply with existing BSA waste profiles for ES of Utah as well as the NTS. Waste streams included in this plan will use the existing analytical data and be characterized as follows:

1. Bioshield steel, interferences, airtight membrane, restraining springs, expansion joints and, DAW targeted for ES of Utah disposal.:
    - Item will be surveyed and dose to curie calculations will be performed;
    - Exterior of the item will be surveyed and confirmed to be free of removable contamination or the item will be wrapped;
    - Item will be inventoried and placed within the pre-staged waste container.
    - Waste will be transported to the WLA or other designated BSA laydown area.

2. Graphite plugs and miscellaneous debris targeted for NTS disposal:

    NOTE: This material may, dependant on ES acceptance, be disposed at ES of Utah. Items will be packaged as described below regardless of end state

    - Item will be packaged into IP-1 steel container and the container will be surveyed. A dose to curie calculation will be performed and entered onto a RWCF;
    - Exterior of the container will be surveyed and confirmed to be free of removable contamination and;
    - Container will be transported to EWMS facility and be subject to gamma spectroscopy prior to transport to the off site disposal facility.

3. Bioshield concrete targeted for ES of Utah disposal:
    - Concrete will be loaded into supersacks and surveyed. A dose to curie calculation will be performed and entered onto a RWCF;
    - Exterior of the supersack will be surveyed and confirmed to be free of removable contamination;
    - Item will be transferred to the WLA or other BSA designated lay down area for final disposition.

Hazardous materials to be removed as a result of this work will be characterized based on the waste item's physical characterization and chemical make-up (e.g.: lead). Further characterization of these items will be as directed by the EWMS Division Deputy Waste Programs Manager.

Items to be removed that vary from the waste streams identified in this plan will be removed and characterized under an addendum to this WMP. A separate WMP may be written dependent on the complexity of the items identified. The ERP WM and the EWMS Division Deputy Waste Programs Manager will determine which protocol will be followed. Varying items may require additional analytical data which would require obtaining samples of the varying materials or components for off site analyses at an approved lab for both radiological and hazardous constituent. Off site analytical procedures for varying components will at a minimum include:

- TCLP on selected components
- Gamma spectroscopy
- Alpha spectroscopy
- Gross Beta and Tritium
- PCBs/Pesticides
- Physical parameters (pH, reactivity, flashpoint, etc. per waste site WAC)

The sampling methodologies and analytical results will be reviewed by the WM and appropriate EWMS staff and confirmed to be compliant with the selected waste disposal facility WAC as well as BNL waste profiles.

9.1 Waste Certification

All Low-Level Radioactive Waste (LLRW) that is generated will be managed in accordance with BSA's Waste Certification Program Plan (WCPP). Included in the WCPP are requirements for waste characterization, analytical laboratories, on-site control and certification, waste package inventory and container selection, documentation and qualified waste certifiers. Confirmatory sampling of all waste streams will be performed at a frequency determined by BNL's EWMS Division and will be in compliance with BNL's approved waste profile for the specific disposal facility (NTS or Energy Solutions). All loaded DOT TYPE IP-1 steel containers will have a gamma spectroscopy performed prior to transportation to NTS. Bioshield waste destined for Energy Solutions will utilize existing BGRR analytical data to perform a dose to curie conversion and then assigning the appropriate curie content for each isotope identified in that existing data. Specific items and containers may be subject to gamma spectroscopy on site; this will be based on the activity identified in the radiological survey. This determination will be made by the ERP WM.

10.0 CONTROL OF DECONTAMINATION & DECOMMISSIONING (D&D) WASTES

The ERP Directorate is responsible to control all wastes generated from D&D projects at BNL. The ERP Directorate will ensure that all wastes are being managed under the appropriate BNL Standards Based Management System (SBMS) guideline as well as the BSA Waste

Certification Program Plan (WCPP). Specific areas of D&D projects to be controlled by the ERP Directorate are:

10.1 BNL Waste Management Subject Areas

The BNL Standards Based Management System (SBMS) contains five Subject Areas applicable to managing wastes:

- Radioactive Waste Management
- Hazardous Waste Management
- Mixed Waste Management
- Industrial Waste Management
- Liquid Effluent Management

10.2 Interim Storage of Wastes

The environmental restoration program shall meet the requirements of the applicable SBMS documents for managing wastes:

- Meeting training requirements
- Segregating wastes
- Maintaining inventory
- Labeling wastes
- Completing Radioactive Waste Control Forms (RWCFs)
- Receive approval of the waste storage areas from the EWMS Division Deputy Waste Programs Manager
- Posting of storage and accumulation areas
- Providing spill containment
- Performing routine inspections

Radioactive waste staging will not be allowed to exceed 90 days at Building 701. All waste staging areas will be pre-approved by BNL's EWMS Division in accordance with the applicable SBMS requirements. Soft-sided containers will be staged upon a tarp and be covered to ensure protection from inclement weather conditions.

10.3 Container, Package and Conveyance Requirements

Containers

The container is considered the receptacle for the waste generated from the bioshield removal project. Anticipated waste containers for the bioshield removal project include soft-sided containers (supersacks) and, intermodals (or equivalent). The BSA Container Custodian or designee is responsible to visually inspect and document any findings of each container prior to use as well as maintain control over the waste containers from their arrival on-site to their departure off-site. This includes ensuring that containers are stored to prevent damage and secured to prevent the unauthorized addition of wastes.

All waste containers will meet the requirements of the Waste Certification Program Plan

(WCPP). BSA EWMS Division personnel will inspect the new containers before use as well as observe the filling of each container and the final closure of each container.

Packages

The term package is used for shipping purposes and will be the final form of the waste prior to loading onto a waste conveyance. The "declared" package will be used to manifest each shipment. The waste container may be used as the "declared" package as well. The following waste packages are anticipated for the bioshield removal wastes: intermodals (or equivalent), DOT TYPE IP-1 steel boxes, DOT TYPE IP-1 soft sided containers and, shielded containers. All shipping packages will be QA/QC inspected by BSA's EWMS Division upon receipt on the BNL site and shall bear a green BNL QA Incoming Inspection Tag indicating acceptance for use. All waste will be placed into approved waste packages in accordance with the requirements specified in Title 49 of the Code of Federal Regulations (CFR). Packaged waste shall also be inspected in accordance with applicable SBMS requirements. The ERP Container Custodian or designee will be required to visually inspect each package prior to use as well as maintain control over the waste packages from their arrival on-site to their departure off-site. This includes ensuring that the packages are stored to prevent damage.

Conveyance

The conveyance is the mode of transportation used to deliver the package to the selected off-site disposal facility. BSA will be responsible for providing the conveyances for the bioshield removal wastes. The anticipated conveyances for the bioshield removal wastes are tractor-trailer, flatbed railcar, Gondola railcar and, shielded vans. The conveyance will be QA/QC inspected by BSA's EWMS Division upon receipt on the BNL site. BSA Radiological Control Division (RCD) will survey each conveyance prior to loading and upon completion of loading. BSA RCD will ensure that all DOT radiological requirements have been met prior to releasing the conveyance off site. The conveyance will be loaded and shipped in accordance with the requirements specified in Title 49 of the Code of Federal Regulations (CFR). The conveyance shall also be QA/QC inspected by BSA's EWMS Division prior to leaving the BNL site.

10.4 Documentation and Record Keeping

The waste generator (ERP WM) or designee shall complete a Radioactive Waste Control Form (RWCF) for each container of low-level radioactive waste generated. If necessary, Non-radioactive and Mixed Waste Control forms also will be generated. All waste forms will be reviewed by the EWMS Division WCO for waste acceptance and compliance with the approved waste profile and the Waste Acceptance Criteria of the disposal facility. Additional documents that the waste generator shall maintain include the inspection records, characterization documents, and container video records and inventory sheets.

11.0 WASTE TRANSPORTATION REQUIREMENTS

11.1 Applicable Requirements

Transportation of materials and wastes will be conducted in accordance with the following BNL Standard Based Management System (SBMS) procedures:

- Transfer of Radioactive Material On-site
- Hazardous Material Transportation Manual
- Transfer of Hazardous and Radioactive Materials On-site

A Safety Assessment Methodology (SAM) form will be prepared by the ERP WM and approved by the BSA Transportation Safety Officer or Subject Matter Expert (SME) prior to transporting waste on the BNL site. This form will include various BSA requirements such as routing and any radiological or transport time restrictions. The BSA subcontractor will be responsible to provide the appropriate tractor and flatbed trailer as well as all blocking and bracing materials needed to secure loads. The operator of the vehicle must hold a current CDL license stamped with a hazardous material endorsement. All materials, vehicles, equipment and driver qualifications will be subject to BSA inspection and approval prior to use to ensure safe operability. Inspections to be performed and documented by the subcontractor will include vehicle maintenance schedules, daily pre-use inspection checklists as well as the inspection of the loaded trucks to ensure proper blocking and bracing prior to transporting to Waste Loading Area or other BSA designated lay down area.

11.2 Applicability to ERP Activities

On-site transportation refers to the movement of waste via a motorized means within the confines of the BNL property and roadways. Any waste that contains more than one (1) gram of fissile material (Pu-238, Pu-239, and U-235) must have the Safeguards and Securities Isotopes and Special Materials (IS&M) Group's permission to transport the waste (NOTE: The bioshield removal is not expected to generate wastes exceeding this one gram threshold). Subcontractor-furnished vehicles will transport the wastes from Building 701 to Waste Loading Area or other BSA designated lay down area. The approved route to each of the designated lay down areas is shown in Figure 1. An approved RWCF will accompany each shipment.

BSA's RCT's will perform release and transportation surveys for all on-site shipments of waste. The BSA RPM or designee will authorize the release of trucks, equipment and containers from radiologically controlled areas and remove postings as required.

12.0 TREATMENT AND DISPOSAL OF ERP PROJECT WASTES

12.1 Compliance and Liability Assessments

The EWMS Division Deputy Waste Programs Manager will ensure that an assessment of the selected treatment, storage and disposal facility (TSDF) was performed within the last year.

12.2 EWMS Division Control of Waste at TSDFs

The EWMS Division Deputy Waste Programs Manager is responsible for ensuring that the wastes are monitored at the disposal facility. Destruction and Disposal certificates must be obtained from facilities that treat and dispose of waste.

12.3 Off-site Rule of CERCLA Wastes

All disposal facilities that provide waste management services shall meet the acceptability provisions of the EPA CERCLA off-site rule as specified in Title 40 of the Code of Federal Regulations (CFR) part 300.440. Should a new facility be identified for disposal, the EWMS Division Deputy Waste Programs Manager will evaluate it against the CERCLA rule to ensure compliance.

12.4 Waste Profiling for Disposal

Approved waste profiles are required for all radioactive waste shipments to disposal facilities. All waste to be sent to a disposal facility will be shipped under an approved profile. Prior to shipment, the BSA WCO will ensure that the waste complies with the Waste Acceptance Criteria of the disposal facility and meets the criteria of the Waste Profile.

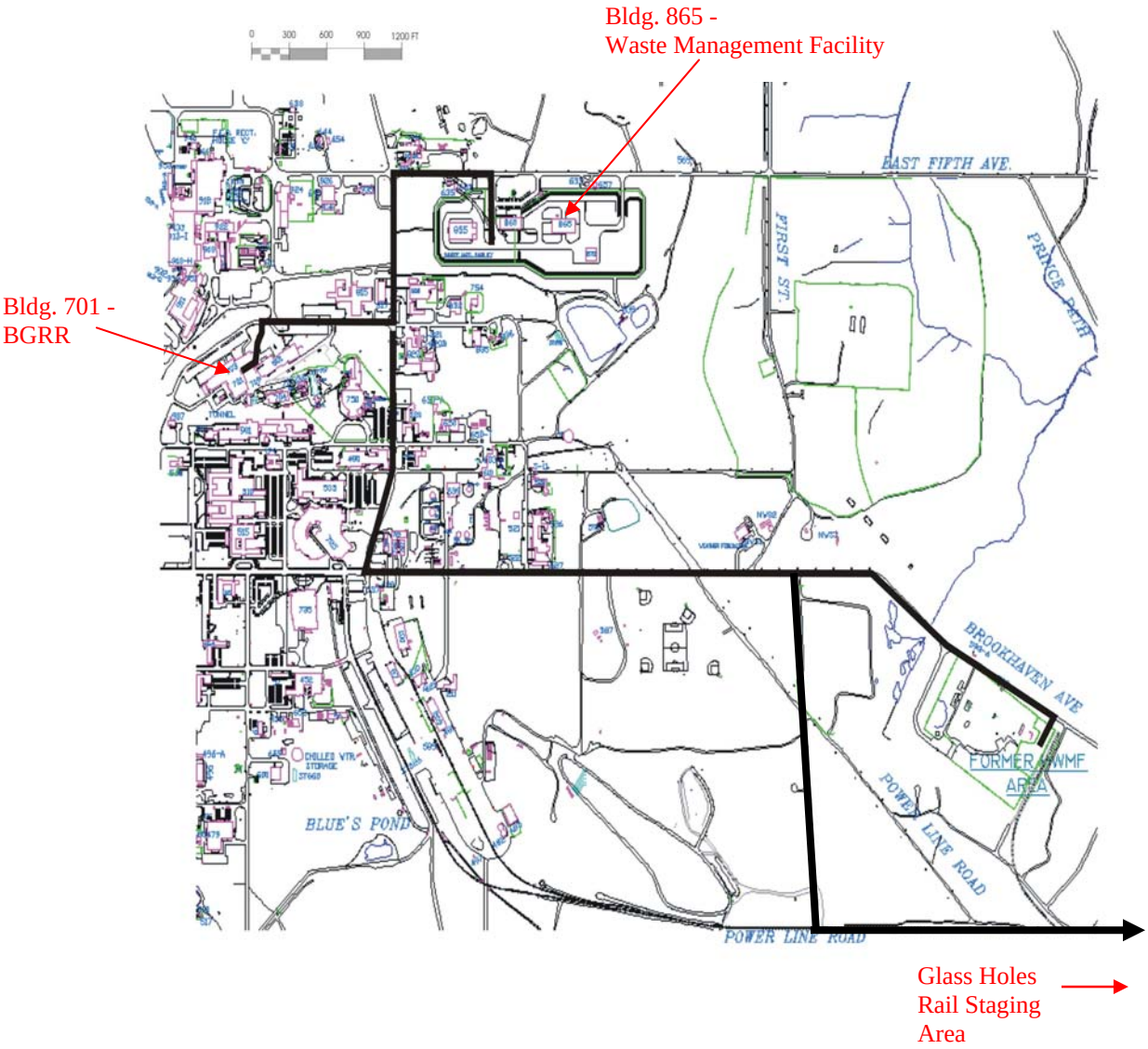
12.5 Funding and Contracting Requirements for the DOE's Wastes

Before planning for an off-site shipment, the ERP Division Support Services General Manager must ensure that there is funding available and contracts in place to cover the costs of treatment and disposal.

13.0 REFERENCES

1. Brookhaven Graphite Research Reactor Bioshield Removal Specifications
2. 10 CFR 835, Occupational Radiation Protection
3. 10 CFR 830.120, Quality Assurance Requirements
4. 49 CFR 172 through 179, Transportation Requirements
5. DOE Order 435.1, Radioactive Waste Management, US DOE, Office of Environmental Management
6. DOE Manual 435.1-1, Radioactive Waste Management Manual, US DOE, Office of Environmental Management, June 19, 2001
7. BNL SBMS Environmental Management System Description for Environmental Management and Hazardous Materials Transportation
8. BNL SBMS Subject Area's for Hazardous, Radioactive and Mixed Waste Management
9. ERD Operations Procedure Manual
10. BNL SBMS Subject Areas for Hazardous Materials Transportation On- and Off-site
11. WMD-003 Low Level Radioactive Waste Certification Program, BNL, September 2001
12. BGRR Record of Decision, March 17, 2005
13. Nevada Test Site & Envirocare of Utah Waste Acceptance Criteria
14. Carter Valley Landfill and Onyx Waste Acceptance Criteria
15. Radioactive Waste Management Basis Document
16. CERCLA
17. Integrated ERP Waste Management Plan
18. ER-OPM-1.3

Figure 1
On-site waste transportation routes



APPENDIX C

Contractor Qualification Requirements

Attachment C

Brookhaven Science Associates, LLC

Procurement and Property Management Division
Brookhaven National Laboratory

BIDDER QUALIFICATION REQUIREMENTS AND DOCUMENTATION SUBMITTAL REQUIREMENTS

IFB No. PFH07
Brookhaven Graphite Research Reactor (BGRR)
Graphite Pile and Biological Shield Removal Project

1. General

Only bidders that meet BSA's qualification requirements provided in Sections 2 and 4 below will be considered for award. The bid shall include all of the required qualification documentation described in Section 3 below, to objectively demonstrate that the bidder meets these qualification requirements.

In addition, the bid shall include a description of the technical approach to completing the work, and shall clearly and thoroughly address the key performance attributes and expectations described in the specifications (Attachments 2 and 3) and summarized in Section 4 below.

BSA will consider the consolidated qualifications of the bidder's team, including its proposed subcontractors, in determining whether the bidder meets BSA's qualification requirements. The bidder shall be obligated to use all subcontractors proposed in its bid that have been proposed to meet BSA's qualification requirements, unless otherwise approved by BSA.

The bidder shall complete Attachment D, *Required Documentation Submittal Checklist*, and submit it as part of the bid along with supporting documentation.

2. Qualification Requirements

A. *Corporate Experience*

The bidder's team shall have ten (10) or more years of reactor decontamination and decommissioning (D&D) experience, which shall include the demolition of radiologically activated and contaminated reactor components. The bidder's team must have experience with all aspects of this work including work planning and tool design, remote reactor component segmentation and material handling, remote waste packaging, contamination control and ALARA. The bidder's team shall have ten (10) or more years of experience with all aspects of radioactive

waste packaging and management. The bidder's team shall have completed at least three (3) nuclear decommissioning projects during the past ten (10) years involving: 1) Work in radiologically harsh environments (i.e. work area radiation levels greater than 10 rem per hour, and loose contamination levels greater than 100,000 dpm; 2) The use of multiple barriers of contamination control; 3) The qualification, deployment and use of remotely operated dismantlement and material handing technologies; 4) Radioactive waste packaging; and 5) Total contract values greater than $10 Million.

B. *Key Personnel Qualifications and Experience*

1. Corporate Official

The bidder shall designate a home office Corporate Official responsible for oversight of the project. This Corporate Official shall have thorough knowledge of the bidder's corporate policies and procedures, and shall have the responsibility and authority for ensuring that the work is performed in accordance with the contract and these corporate policies and procedures. The Corporate Official shall be extensively involved with, and shall have approval authority for the bidder's bid. The bidder's Corporate Official shall have reactor D&D and other nuclear D&D and cleanup experience.

2. Project Manager

The successful bidder will be required to locate the Project Manager full time on the BNL site. The Project Manager candidate shall have a BS degree or equivalent in engineering, environmental sciences or a related field, and a minimum of fifteen (15) years of experience, which shall include ten (10) or more years of reactor and nuclear facility D&D experience. The candidate 's experience shall include disassembly of highly contaminated and activated reactor components and experience with remote reactor component segmentation and material handling, design, installation and operation of ventilation systems, and waste packaging. The candidate shall be proficient in all facets of project management including scheduling, resource assignment, tracking and reporting, and problem solving. The candidate shall have participated in preparation of the bid. (In lieu of a degree, the candidate must have an additional ten (10) years training and/or work experience of the type described above.)

3. Field Superintendent

The successful bidder will be required to locate a full-time Field Superintendent on the BNL site. The bidder's Field Superintendent candidate shall have a BS degree in engineering, environmental sciences or a related field and a minimum of ten (10) years of field D&D experience including multi-shift operations, remote segmentation tooling design and qualification, remote reactor component segmentation and waste packaging, ventilation system operation, and contamination control. The candidate shall have participated in preparation of the

bid. (In lieu of a degree, the candidate must have an additional ten (10) years training and/or work experience of the type described above.)

4. Site Health & Safety (H&S) Officer

The successful bidder will be required to locate a full-time H&S Officer on the BNL site. The H&S Officer candidate shall have a minimum of ten (10) years of H&S experience in nuclear D&D, construction or environmental remediation work environments. The candidate shall have received formal training and have credentials in the areas of safety and industrial hygiene, and shall have received HAZWOPER Supervisor training. The candidate shall have experience with developing and implementing site-specific ES&H plans.

5. Radiological Engineer

The Radiological Engineer candidate shall have a BS or higher degree in engineering/environmental sciences or related field and a minimum of ten (10) years experience in the radiation protection field. Experience shall include performance as radiological engineer on reactor and other nuclear D&D projects. The candidate shall be registered in the National Registry of Radiation Protection Technologist (NRRPT) or shall be a Certified Health Physicist (CHP).

C. Safety Performance History

Every organization on the bidder's team that will be performing work removing the graphite pile and/or the bioshield, shall have a Recordable Incident Rate (RIR) less than 4.0, and an Insurance Experience Modification Rating (EMR) less than 1.0 in each of the last three (3) years (2004, 2005 and 2006).

D. Corporate Quality Assurance and Health & Safety Programs

The bidder shall have comprehensive written corporate quality assurance and health and safety programs. The bidder shall demonstrate that it has corporate programs covering Integrated Safety Management, ALARA and the complete range of safety and industrial hygiene topical areas encompassed by reactor D&D and the work described in BSA's specifications. The bidder's corporate programs shall reflect a clear commitment to, and provide for, continuous improvement and include worker involvement. The bidder's programs shall address the flow-down of quality, and health and safety requirements to subcontractors and vendors at all tiers.

3. Bidder Qualification Documentation Requirements

A. Corporate Experience

The bidder shall submit a general statement as to how and why it meets BSA's Corporate Experience requirements described in Section 2.A above. This statement

shall be supported by a detailed description of at least three (3) similar projects completed by the bidder during the previous ten (10) years. This statement shall be supported by a detailed description of at least three (3) nuclear decommissioning projects completed by the bidder during the previous ten (10) years. To be considered as representative projects in documenting the bidder's qualifications, these projects shall have involved: 1) Work in radiologically harsh environments (i.e. work area radiation levels greater than 10 rem per hour, and loose contamination levels greater than 100,000 dpm); 2) The use of multiple barriers of contamination control; 3) The qualification, deployment and use of remotely operated dismantlement and material handing technologies; 4) Radioactive waste packaging; and 5) Total contract values greater than $10 Million.

B. *Key Personnel Qualifications and Experience*

The bidder shall submit resumes for the five (5) Key Personnel identified in Section 2.B above addressing the required qualifications.

The bidder shall also include an organization chart for the project, a listing of proposed subcontractors and a description of assigned work scopes.

C. *Safety Performance History*

The bidder shall provide the Recordable Incident Rates (RIR) and Experience Modification Ratings (EMR) for itself and its project team as described in Section 2.C above for the following years: 2004, 2005 and 2006. The bidder shall provide documentation verifying these ratings and a copy of its OSHA 200/300 log(s) and total hours worked for these same years (i.e., 2004, 2005 and 2006).

D. *Corporate Quality Assurance (QA) and Health & Safety (H&S) Programs*

The bidder shall submit copies of its Corporate QA and H&S programs as described in Section 2.D, above. Its programs shall meet BSA's requirements described in the IFB, terms and conditions, and specifications incorporated in the IFB.

4. Technical Approach Documentation Requirements

The bid shall include a detailed and thorough description of the bidder's technical approach to complete the work. In general, this technical description will demonstrate the understanding of the work and that all of BSA's technical and contract requirements are satisfied. BSA will not rank or grade the bidder's technical approach description. However, BSA will use the bidder's technical description to determine whether the bid meets BSA's minimum requirements in all aspects. BSA may reject any bid which does not provide a technical description that meets BSA's requirements based on BSA's review and analysis of the bid.

BSA's technical and performance requirements are described throughout its technical specifications. The bidder shall thoroughly review these requirements in developing its submittal. Key areas to be specifically addressed in the bidder's technical description are described below.

A. *Compliance with BGRR Documented Safety Analysis (DSA), Technical Safety Requirements (TSR), and Fire Hazard Assessment (FHA)*

The bidder shall clearly demonstrate that its graphite pile and biological shield removal approach methodology, etc. are in compliance with all of the requirements, conditions, controls and assumptions expressed in the DSA, TSR, and FHA.

Specifically, the bid shall clearly demonstrate how the bidder's methodology shall satisfy the following TSR Operational Limits and Surveillance Requirements:

- The number of metal waste containers present on the BGRR site containing radioactive graphite waste outside the confinement envelope and ventilation system shall be limited to ten or less.
    - Surveillance – At the end of each shift
- Upper portion of the confinement envelope and ventilation system (above the worker platform) maintained at a negative pressure of greater than 0.05 in. WC with respect to building 701.
    - Surveillance - Prior to dust-generating operations or personnel entry to the confinement envelope and ventilation system
- Installed HEPA filters and associated housings will have a minimum of 99% efficiency.
    - Surveillance – Annually and prior to installation or replacement

The bid shall clearly demonstrate how the bidder's methodology satisfies the following TSR Administrative Controls:

- The minimum number of staff required to be present at the BGRR site during dust-generating operations and handling of radioactive graphite waste:
    - One Field Engineer or Work Package Manager (BSA)
    - Two Operators or Technicians (Contractor)
    - One Radiological Control Technician (BSA)
- Access controls are established prohibiting personnel who have not been properly trained from entering defined work zones.
- Flammable material shall not be present inside the confinement envelope and ventilation system while the facility is in the operation mode. Flammable material shall be supervised by a fire watch inside the contamination control envelope and ventilation system while the facility is in the warm standby mode.

- Vehicle fueling activities shall not be performed within 50 ft of Building 701 or radioactive graphite waste that is staged onsite.
- Personnel shall not be present inside the biological shield cavity during dust-generating operations.
- Radioactive graphite waste outside the confinement envelope shall be in closed metal waste containers.
- Operations, maintenance, and other events shall be evaluated for their impact on the biological shield structure's structural integrity, confinement capability, ability to maintain a negative pressure differential with respect to Building 701, and ability to prevent fire propagation.

B. *ALARA*

The bidder shall provide a description of its technical approach to use time, distance and shielding to maintain personnel exposures ALARA. Technical concepts and innovations shall be described in detail along with the bidder's administrative controls and reviews to reduce radiation exposure. BSA reminds the bidder that it has established a zero entry policy for personnel entry into the biological shield and a 1000 mrem per year limit for personnel radiation exposure as set forth in its technical specifications included herein.

C. Contamination Control

The bidder shall provide a detailed description of its contamination control plans to meet BSA's performance requirements. The bidder shall provide a thorough description of the contamination control envelope and other engineered safeguards, the use of tools and equipment that inherently minimize the generation of dispersible dismantlement fines, the use of fixative coating systems and all of its proposed innovations to preclude the spread of contamination from outside of the biological shield.

D. Design, Fabrication and Qualification of Special Tools

The bidder shall provide a full and detailed description of its planned and systematic actions that will ensure that all special tools will perform safely, reliably and as designed and intended.

E. Waste Packaging

The bidder shall provide a thorough description of its plan to package waste and meet BSA's performance requirements.

F. Project Coordination

The bidder shall provide its overarching strategy for coordinating the work of its team. The bidder's description shall include the identification of all proposed

subcontractors, a detailed description of the division of responsibility, and the bidder's plan to flow BSA's technical and contract requirements down to its subcontractors.

G. *Project Oversight*

The bidder shall provide a description of its plan for providing home office oversight of the project.

APPENDIX D

ERP OPM 3.2 Work Planning and Control

ERP Operations Procedures Manual

3.2 WORK PLANNING AND CONTROL

Text Pages 1-15
Attachments: 7

Approved:  Date: 10/25/07

ERP Director
Les Hill

Preparer: B. Lein

ERP-OPM-3.2, Revision 1

ONLINE COPY – ERP OPERATIONS PROCEDURES MANUAL

REVISION LOG

SECTION	PAGE #	REV. #	DATE	REASON FOR REVISION
3.2	6 and 7	1	10/25/07	Added guidance to clarify when Work Instructions can be used in lieu of Work Procedures.
4.2, 4.3, 4.4, 4.5 and 4.6	7, 8 and 9	1	10/25/07	Added administrative controls for prohibited activities, and for the use of flammable, combustible and hazardous materials.
All	All	1	10/25/07	Editorial/format corrections throughout the procedure.

3.2 WORK PLANNING AND CONTROL

1.0 PURPOSE AND SCOPE

The purpose of the Environmental Restoration Projects (ERP) Work Planning and Control procedure is to ensure all work performed within ERP is reviewed, planned and controlled in a manner that meets the requirements of the Brookhaven National Laboratory (BNL) Standards Based Management System (SBMS) Subject Area, "Work Planning and Control for Experiments and Operations" (Reference 1) and is compliant with the Brookhaven Graphite Research Reactor (BGRR) and High Flux Beam Reactor (HFBR) Safety Basis Documents (SBDs) and Facility Use Agreements (FUAs).

All work performed under the authority of ERP will undergo planning and control to the rigor set forth within this document. Authorized ERP work includes remediation, decommissioning, characterization, construction, maintenance, modification and all other related work performed by ERP staff as well as external BNL organizations and non-BNL personnel (including BNL subcontractors) working on ERP projects.

Activities associated with routine surveillance and maintenance within ERP facilities were considered during the development of the facility specific SBDs and the Department of Energy – Safety Evaluation Report (DOE-SER) approval process. ERP facility specific Surveillance and Maintenance (S&M) Manuals define the scope of routine activities. Because of their inherent repetitive nature, planning and control measures applicable to work involving routine maintenance, surveillance and operations activities do not require issuance of a Work Permit as defined in this procedure.

2.0 RESPONSIBILITIES

2.1 ERP Director

2.1.1 Shall appoint the ERP Work Control Manager (WCM).

2.1.2 Shall provide leadership to ensure line management ownership of the work planning and control system.

2.1.3 Shall serve as chairperson of the Safety Review Committee (SRC) and have final approval authority for all Field Work Packages.

2.2 ERP Decontamination and Decommissioning (D&D) Operations Manager

2.2.1 Shall resolve technical issues regarding D&D project work activities (radiation protection, waste management, health and safety, etc.).

2.2.2 Shall review and approve Field Work Packages and forward them to the SRC for final approval.

2.2.3 Shall provide oversight of work planning and control for project D&D work activities.

2.2.4 Shall assist project personnel in generating Work Permits and associated work documentation.

2.2.5 Shall remain cognizant of project work activities by inspecting work in progress and completed work as appropriate.

2.2.6 Shall determine whether work activities should be temporarily halted for review of work practices and/or a Lessons Learned session.

2.3 ERP D&D Support Manager

2.3.1 Shall resolve technical issues regarding facility maintenance and support services (radiation protection, waste management, health and safety, etc.).

2.3.2 Shall review and approve Field Work Packages and forward them to the SRC for final approval.

2.3.3 Shall provide oversight of work planning and control for facility maintenance work activities.

2.3.4 Shall assist project personnel in generating Work Permits and associated work documentation.

2.3.5 Shall remain cognizant of project work activities by inspecting work in progress and completed work as appropriate.

2.3.6 Shall determine whether work activities should be temporarily halted for review of work practices and/or a Lessons Learned session.

2.4 ERP WCM

2.4.1 Shall appoint Work Control Coordinators (WCC) for each ERP facility.

2.4.2 Shall monitor the performance of the Work Planning and Control by participating in the ERP Self Assessment Program.

2.4.3 Shall upgrade and maintain the ERP Work Planning and Control procedure.

2.4.4 Shall ensure that personnel are trained on the requirements of this procedure.

2.4.5 Shall coordinate with other Laboratory WCMs through periodic meetings to promote consistency across the site in applying the graded approach to work control and hazard analysis.

2.4.6 Shall review all Work Permits and associated work documentation for completeness, job feedback and lessons learned.

2.4.7 Shall assist the WCC in the screening of work and determination of the work planning effort required.

2.5 ERP WCC

2.5.1 Shall initiate all Work Permits and maintain the Work Permit Logbook.

2.5.2 Shall assist Subject Matter Experts (SMEs) in the preparation of supporting work documentation (e.g., Radiological Work Permits (RWPs), Job Risk Assessments (JRAs), digging permits).

2.5.3 Shall designate the Primary Reviewer.

2.5.4 Shall notify the facility Building Manager of any activity that may impact the facility.

2.5.5 Shall notify the facility Building Manager of changes that would affect the Environment, Safety and Health (ES&H) concerns and the crosshatching of the facility's Key Plan.

2.5.6 Shall review Work Permits for completeness and verify that the work area has been returned to an acceptable condition.

2.5.7 Shall submit completed Field Work Packages to the WCM for filing.

2.6 ERP Safety and Industrial Hygiene (S&IH) Manager

2.6.1 Shall assist project personnel in generating Work Permits, JRA and associated work documentation.

2.6.2 Shall serve as a member of the Work Permit Review Team.

2.6.3 Shall provide safety and industrial hygiene oversight throughout the planning and conduct of work.

2.7 ERP Authorization Basis Engineer (ABE)

2.7.1 Shall review all Field Work Packages and Work Permits for potential impact on facility SBD and compliance issues.

2.7.2 Shall perform Unreviewed Safety Issue Determination (USID) screening on all Work Permits and develops associated Safety Evaluations as needed.

2.7.3 Shall serve as a member of the Work Permit Review Team.

2.8 ERP Environmental Compliance Representative (ECR)

2.8.1 Shall review all Work Procedures and Work Instructions for environmental management concerns and compliance issues.

2.8.2 Shall serve as a member of the Work Permit Review Team if environmental compliance issues are identified.

2.9 ERP Radiation Protection Manager (RPM)

2.9.1 Shall review all Work Procedures and Work Instructions and develops radiological control requirements.

2.9.2 Shall prepare RWP and support development of JRAs to address radiological controls.

2.9.3 Shall serve as a member of the Work Permit Review Team if radiological issues are identified.

2.10 ERP Quality Management Services (QMS) Manager

2.10.1 Shall perform assessments of the ERP Work Planning and Control to verify compliance with BNL SBMS and the ERP Operations Procedures Manual (OPM) requirements.

2.10.2 Shall report to the ERP Director the results of assessments along with recommendations.

2.11 ERP Work Package Manager (WPM)

2.11.1 Shall plan and develop Work Procedures and Work Instructions and serve as a member of the Work Permit Review Team.

2.11.2 Shall assist SMEs in the preparation of supporting work documentation (e.g., RWPs, JRAs, digging permits).

2.11.3 Shall coordinate the review, comment resolution, and approval process of the Field Work Packages.

2.11.4 Shall perform configuration control of the approved Field Work Packages.

2.11.5 Shall elicit worker feedback during work and at the completion of the job and incorporate improvements and/or Lessons Learned into the Work Permit and associated work documentation.

2.11.6 Shall review completed Field Work Packages prior to submittal to the WCC for closeout.

2.12 ERP Field Engineer (FE)

2.12.1 Shall assist the WPM to plan and develop Work Procedures and Work Instructions.

2.12.2 Shall assist SMEs in the preparation of supporting work documentation (e.g., RWPs, JRAs, digging permits).

2.12.3 Shall assist the WPM in the coordination, review, comment resolution, and approval process of the Field Work Packages.

2.12.4 Shall perform configuration control of the approved Field Work Packages.

2.12.5 Shall elicit worker feedback during work and at the completion of the job and incorporate improvements and/or Lessons Learned into the Work Permit and associated work documentation.

2.12.6 Shall assist the WPM in the review of completed Field Work Packages prior to submittal to the WCC for closeout.

2.13 ERP Work Permit Primary Reviewer

2.13.1 Shall establish the Work Permit Review Team.

2.13.2 Shall ensure that the supporting documentation (e.g., JRA, RWP, digging permit) within the Field Work Package is complete.

2.13.3 Shall obtain approval signatures from the Work Permit Review Team.

2.14 ERP Work Permit Review Team Members

2.14.1 Shall review and provide comments on Field Work Package materials relevant to their field of expertise.

2.14.2 Shall assist the primary reviewer in ensuring that the supporting documentation (e.g., JRA, RWP, digging permit) within the Field Work Package is complete.

2.15 Work Requesters (Non-ERP personnel)

2.15.1 Shall provide an accurate description of the Scope of Work and provide detailed plans, instructions, procedures, etc., commensurate with the complexity of the work.

2.16 Workers

2.16.1 Shall comply with the terms of the Work Permit and associated documentation.

2.16.2 Shall serve on the Work Permit Review Team when requested.

2.16.3 Shall promptly cease work and place the work area in a safe condition in the event that the work as prescribed in the Field Work Package cannot be followed as written.

2.16.4 Shall provide feedback during and at the completion of a job, for continuing improvement in the current job as well as future job planning.

3.0 PREREQUISITES

3.1 With the exception of activities identified within ERP facility specific S&M Manuals, all ERP work activities shall be controlled by a Work Permit.

3.2 Written guidance identifying the authorized scope of work and methodology to perform the work must be submitted with each Work Permit as part of the associated work documentation. Types of documents authorized for use include Work Procedures, Work Instructions, and operating manuals.

3.2.1 Work Procedures shall be developed and maintained in accordance with ERP-OPM-1.3, “Work Procedure Development and Requirements” (Reference 2).

3.2.2 Work involving multiple, integrated tasks require the use of Work Procedures.

3.2.3 Work involving a discrete task may be performed utilizing Work Instructions in lieu of Work Procedures in accordance with the following:

- Work Instructions are developed to guide specific tasks within the defined work scope of a Work Permit.
- A discrete task shall be identifiable, short in duration, or routinely performed by the service provider.

- Work Instructions may be used to implement the S&M activities identified within the BGRR and HFBR S&M Manuals.

- Work Instructions shall be developed in accordance with Attachment 1 – Work Instruction (Sample).

- Work Instructions other than those for S&M activities are considered void upon completion of the job and filed as a part of the Work Permit.

3.2.4 Routine maintenance performed within the scope of the facility specific S&M Manuals may utilize pre-approved Departmental procedures in lieu of ERP Work Procedures and Work Instructions.

- When utilized, a copy of Departmental procedures originating outside of ERP must be included as part of the work documentation.

3.2.5 Operating manuals provided by manufacturers and equipment suppliers may be used to supplement Work Procedures or Work Instructions.

- When utilized, a copy of an operating manual with applicable sections highlighted must be included as part of the Field Work Package.

3.3 Work Permits shall be screened in accordance with ERP-OPM-3.3, "Unreviewed Safety Issue Determination" (Reference 3). Clarifications and/or answers to questions needed in regard to interpretations of the administrative controls and limits shall be formally documented.

3.4 All work shall be reviewed for potential impact on the facility specific SBDs and FUA.

3.5 All work planning shall include reviewing DOE/BNL Lessons Learned for applicable events that relate to the work activity.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Personnel assigned to the various positions within this procedure are identified in Attachment 2 - Designation of Work Permit Primary Reviewers.

4.2 Field Work Package documents shall be reviewed to ensure none of the following HFBR SBD prohibited activities are contained within their scope:

- The presence including the storage or use of fuels (e.g., propane, diesel, and gasoline) on the Experimental Level of Building 750, including the presence, storage or use of equipment that are powered by these fuels.

- Intrusive activities performed on the containers holding the beam plugs or collimators (i.e., transfer casks, Beam Plug Storage Facility).

- Any activity that results in a physical change to the HFBR reactor vessel, Beam Plug Storage Facility, transfer casks or biological shield.

- Any physical activity associated with the activated control rod blades, reactor vessel internals, beam plugs, and other activities affecting the thermal shield and biological shield structures.

- No cranes will be operated over the biological shield or reactor vessel, the Beam Plug Storage Facility or the transfer casks.

4.3 Field Work Package documents shall be reviewed to ensure none of the following BGRR SBD prohibited activities are contained within their scope:

- Welding/torch cutting on or within 18 inches of the biological shield.

- Bringing additional radioactive material into the BGRR facility, excluding the temporary introduction of sealed sources to calibrate instruments, or sealed sources to image inaccessible areas.

4.4 Field Work Package documents containing activities involving the use of flammable materials shall be subject to the following restrictions as described in the HFBR SBDs:

- Best management practices will be used to preclude the need for and limit the use of flammable materials in Building 750 required to perform work activities.

- If required, flammable materials in Building 750 shall be limited to only the quantities required to complete work activities, and excess or residual quantities of flammable materials will be removed from Building 750 upon work activity completion.

- Flammable materials shall not be left unsupervised in Building 750. Flammable materials shall either be under the direct supervision and control of HFBR workers, or stored in the approved Flammable Material Storage Locker located on the Building 750 Experimental Level.

4.5 Field Work Package documents containing activities involving the use of combustible materials shall be subject to the following limitations as described in the BGRR and HFBR SBDs:

- Best management practices will be used to limit the need for, entry and use of combustible materials in connection with work activities.

- If required, combustible materials shall be limited to only the quantities required to complete work activities, and excess or residual quantities of combustible materials will be removed upon work activity completion.

4.6 Field Work Package documents shall be reviewed to ensure that hazardous materials are limited to only the quantities required to complete work activities, and excess or residual quantities of hazardous materials are removed upon work activity completion.

4.7 WPM/FEs shall ensure that personnel assigned to perform work governed by the Work Permit have completed all specified training, related to the hazards identified, prior to the start of work.

4.8 Field oversight of work shall be in accordance with ERP-OPM-3.4, "Field Activity Oversight" (Reference 4).

4.9 Original Work Permits shall be printed on green paper.

5.0 PROCEDURE

NOTE 1: *The process by which a Work Permit is developed is outlined in the Work Permit Development Flow Chart (Attachment 3).*

NOTE 2: *The Work Permit form is provided in the SBMS Subject Area, "Work Planning and Control for Experiments and Operations".*

5.1 A Work Permit is initiated by the individual(s) requesting (Work Requestor) to perform work within a facility. The Work Requestor submits the work documentation to the WCC for Work Permit initiation. Work Permits are required for ALL activities with the exception of:

5.1.1 General administrative type work.

5.1.2 Routine surveillance and operation/maintenance of infrastructure system such as lighting, heating, air conditioning, treatment system sampling, etc., that is defined in the facility specific S&M Manuals.

5.2 The WCC will enter the task into the Work Permit Logbook. Once assigned a number, the WCC completes Section 1 of the Work Permit.

5.3 The Field Work Package will be developed as follows:

5.3.1 The Work Requestor, with assistance from the WCC, shall create a new folder within the appropriate "Work Permits" folder, which is located on the BNL network at U:\Field Work Packages\Work Permits. Contained within the Work Permits folder are several sub-folders broken down by

facility (BGRR or HFBR) and type. The Work Permit Logbooks are maintained within the Work Permit folder.

5.3.2 The WCC shall complete the fields in the Work Permit Logbook and assign a Work Permit number. The new Work Permit shall be initiated and maintained electronically in the newly created folder.

5.3.3 ERP-controlled support documentation such as JRAs, USID screening forms, and Work Instructions shall be initiated and maintained electronically in the newly created folder with the Work Permit. These documents shall be identified by their associated Work Permit number.

5.3.4 ERP Work Procedures are maintained on the BNL network at U:\Field Work Packages\Work Procedures.

5.3.5 Non-ERP controlled support documentation such as Digging Permits, RWPs and Hot Work Permits, shall be prepared in accordance with SBMS requirements.

5.3.6 The Work Requestor, with assistance from the WCC, shall initiate a Work Permit form.

5.4 The Work Permit with associated work documentation attached shall be submitted to the ERP ABE for USID screening as required by ERP-OPM-3.3, "Unreviewed Safety Issue Determination."

5.5 The Work Permit with associated work documentation attached shall be submitted to the S&IH Manager for development of a JRA.

5.5.1 A JRA is required for all work performed within ERP. JRAs are maintained within the associated work permit folder.

5.5.2 If a current JRA is not on file, the S&IH Manager notifies the Work Requestor to submit a step-by-step breakdown of the work identifying the hazards associated with each step of the job and control measures to mitigate the hazard(s).

5.5.3 Using this information, the S&IH Manager, with assistance from SMEs, completes a JRA by performing a risk ranking of the work to verify adequate control measures are incorporated.

5.6 The Work Permit with the associated work documents attached is routed to the S&IH Manager, RPM, QMS Manager, ECR, Radioactive Waste Management Manager and the facility's Building Manager for preliminary review and screening.

5.6.1 Each discipline will review the work documents and identify radiation, safety, environmental, waste management and facility concerns.

5.6.2 Additionally, the review shall identify whether specific work control permit(s) (e.g., Confined Space Permit, Radiological Work Permit, Cutting/Welding Permit, etc.) are necessary.

5.6.3 Upon completion of the preliminary review, the Work Permit and associated work documents shall be returned to the WCC for compilation.

5.7 Using the feedback received from the preliminary review, the WCC completes Section 2 of the permit, identifies the Work Permit Primary Reviewer.

5.7.1 Using the guidance provided within SBMS Subject Area, "Work Planning and Control for Experiments and Operations" the WCC, with assistance from the WCM and S&IH Manager screens and categorizes the Work Permit (low, moderate or high hazard) based on the preliminary review feedback and their knowledge of S&IH issues, complexity of the task and work coordination.

5.7.2 The Work Permit Primary Reviewer assigns the Work Permit Review Team members based on the impact the work has on their respective discipline. At a minimum, the Work Permit Review Team will consist of the Work Requestor, the WCC, and the S&IH Manager.

5.8 The Primary Reviewer communicates the feedback received from the preliminary review back to Work Requester for resolution.

5.9 Upon resolving comments from the Work Permit Review Team the Work Requester submits the associated work documents to the Primary Reviewer for final review.

5.10 Upon receipt of the final Field Work Package the Primary Reviewer assembles the Work Permit Review Team for a final review. This may be accomplished as a team meeting or performed in series through independent reviews.

5.10.1 Each member of the Review Team must acknowledge the review by signing and dating the original copy of the Work Permit.

5.10.2 The signature of the Primary Reviewer on the Work Permit indicates that the hazards and risks that could impact ES&H have been adequately identified and will be controlled throughout the job in accordance with BNL requirements.

5.11 The Field Work Package must be reviewed and approved by the SRC.

5.12 Field Work Packages generated for routine maintenance performed within the scope of the facility specific S&M Manuals do not require SRC approval.

5.13 A Field Work Package pre-job briefing performed in accordance with ERP-OPM-3.4, "Field Activity Oversight" is required prior to the commencement of work. Annotate completion of this briefing by signing Section 4 of the Work Permit.

5.14 Following completion of the briefing, and when the resources and schedule allow, Section 5 is signed off by the FE (Job Supervisor) or WCC authorizing work to be performed.

NOTE 1: *The process by which a Work Permit is utilized and closed out is outlined in the Work Permit Use and Closeout Flow Chart (Attachment 5).*

NOTE 2: *When a change is made to a Field Work Package, the cognizant D&D Manager and/or the appropriate Work Package Manager shall review the change and determine whether the change is a Minor Change or Revision.*

5.15 Minor Changes shall be incorporated into a Field Work Package in accordance with the following:

- Changes shall be made to the affected Field Work Package document (e.g., Work Permit, Work Instruction, Digging Permit).
- A vertical bar shall be placed in the right or left margin of the document adjacent to the change.
- Hand markings shall be made in pen directly on the Working Copy of the document.
- Changes may bemade by the electronic generation of new page(s). If a new page is inserted, it shall be inserted into the procedure immediately following the original page(s) it revises. The original affected page shall be marked appropriately by "lining out" the portions that are superseded by the changed page.
- Both electronic and hand changes shall be initialed and dated by the Work Package Manager or cognizant D&D Manager.
- At a minimum, changes shall be reviewed by the individuals who performed the original Work Permit reviews (see 5.7.2) and the ABE. The review shall be documented on the Minor Change Review and Approval (Attachment 6).

- Upon completion of the review, the change shall be documented in the Minor Change and Revision Log (Attachment 7).

- Minor Changes to Field Work Packages can be approved and issued for use in the field without prior SRC approval. However, Minor Changes shall be provided to the SRC for review at the next scheduled meeting.

- The Minor Change and Revision Log shall be maintained in the original Field Work Package.

5.16 Field Work Package Revisions shall be issued when:

- Six or more Minor Changes are incorporated into the Work Permit, Work Instruction, or other controlled supporting documents in the Field Work Package; or

- The scope, intent, or purpose of a Field Work Package has changed.

5.17 When a Field Work Package revision is required, the original Work Permit shall be closed in accordance Step 5.23, and a new Work Permit initiated.

5.18 If during the performance of the task(s), new work scope, work methods or hazards are identified that were not addressed in the original Work Permit or associated work documents, then stop the activity and inform the FE or WPM. The job will stop until the Work Permit and associated work documentation is replanned as outlined in 5.3 through 5.14.

5.19 FEs shall promote worker feedback throughout the performance of the work.

5.19.1 Feedback received during the daily tailgate meeting or throughout the days work shall be recorded by the FE utilizing the Daily Field Report as required within ERP-OPM-3.4, “Field Activity Oversight.”

5.19.2 A copy of all Field Reports containing feedback on the effectiveness of safety, health environmental protection measures, efficiency, and quality of work processes shall be forwarded to the WCC for review and incorporation into future work documents.

5.20 Following completion of all work activities the FE shall compile all associated work documentation and submit the completed Field Work Package to the WCC for review.

5.21 Based upon the feedback received throughout the job or pre-planned post-job review requirements contained within the Field Work Package, the WCC, working with the FE or WPM will determine the need for a post job review.

5.21.1 If a post job review is deemed necessary, results of the review will be documented in report form and attached to the Work Permit prior to closeout.

5.21.2 Personnel involved in the post job review shall sign Section 6 of the Work Permit.

5.22 The WCC, with assistance from the FE shall complete Section 7 by reviewing worker feedback and verifying all feedback received throughout the job has been reviewed and evaluated for incorporation into future work.

5.22.1 If practical, each worker offering feedback throughout the job should be acknowledged and informed of the outcome of the feedback.

5.22.2 Documentation of feedback received and recourse shall be filed with the completed Field Work Package.

5.23 Upon final verification that all associated work documentation is present and complete and that the work area is returned to an acceptable condition Section 8 of the Work Permit is signed and the entire Field Work Package filed in accordance with ERP-OPM-2.6, "Records Management."(Reference 5) Completion of this step effectuates the closeout of the Field Work Package.

6.0 RECORDS

6.1 The WPM, FE, or WCC retains the original Work Permit and associated work documentation until the task is completed. After completion the entire Field Work Package is filed in accordance with ERP-OPM-2.6, "Records Management."

6.2 Permanent Work Permit files shall be created and archived within 45 days of job completion. Work permit files not archived within 45 days of completion will require entry of an action item within the ERP Family Assessment Tracking System (FATS) until such time the file is archived.

6.3 All Work Permits must be maintained for 75 years in accordance with Occupational Health and Safety Assessment Series (OHSAS) 18001 - Health and Safety Record/Document Management Requirements.(Reference 6)

7.0 REFERENCES

7.1 BNL SBMS Subject Area, "Work Planning and Control for Experiments and Operations"

7.2 ERP-OPM-1.3, "Work Procedure Development and Requirements"

7.3 ERP-OPM-3.3, “Unreviewed Safety Issue Determination”

7.4 ERP-OPM-3.4, “Field Activity Oversight”

7.5 ERP-OPM-2.6, “Records Management”

7.6 OHSAS 18001 – Occupational Health and Safety Assessment Series

8.0 ATTACHMENTS

8.1 Attachment 1 – Work Instruction (Sample)

8.2 Attachment 2 – Designation of Work Permit Primary Reviewers and Review Team Members

8.3 Attachment 3 – Work Permit Development Flow Chart

8.4 Attachment 4 – Work Permit Additional Sign-on Sheet

8.5 Attachment 5 - Work Permit Use and Closeout Flow Chart

8.6 Attachment 6 – Minor Change Review and Approval

8.7 Attachment 7 – Minor Change and Revision Log

9.0 DEFINITIONS

9.1 Field Work Package. Work planning and implementation documents including but not limited to JRAs, approved USIDs and USID screening documents, primary work permits, adjunct work permits (e.g., RWPs, Hot Work Permits, Digging Permits, etc.), Work Procedures and Work Instructions.

Attachment 1

Work Instruction (Sample)

BGRR WORK INSTRUCTION	Work Permit No. # **DD-WP-302-013**	Date Effective 05/30/07
	Author: T. Doyle Reviewed/Date: T. Jernigan Approved/Date: T. Daniels	
Document Title: **Inspection and Weighing of Bldg. 701 10-ton Overhead Crane**		

1. PURPOSE

1.1 The purpose of this procedure is to provide directions to perform the prerequisite inspection to return the Bldg. 701 10-ton overhead crane to service for restricted use and to safely determine the weight of the Bldg. 701 10-ton overhead crane hoist.

2. SCOPE

2.1 The following activities will be performed:

- Inspection of the crane to return to service for restricted use.
- Positioning the hoist trolley to a position on the south end of the gantry beam.
- Lockout/Tagout (LOTO) of all power to the crane.
- Determining the weight of the hoist trolley using low-profile load cells.

2.2 This Work Instruction includes the following activities:

- Prerequisites
- Previous Lessons Learned
- References
- Safety Requirements
- Tools, Equipment and Special PPE
- Work Instructions
- Records

Work performed outside the scope of this Work Instruction must be pre-planned as outlined within ERP OPM 3.2, “Work Planning and Control”.

3. PREREQUISITES

3.1 Bldg. 701 10-ton Overhead Crane Inspection

NOTE: *The Bldg. 701 overhead crane has been placed "out of service" since 2005 due to lapse of the annual inspection requirements and several OSHA discrepancies. The following step prescribes the prerequisite inspection of the crane in order to return the crane to service to support its refurbishment in accordance with BSA Contract.*

3.1.1 Perform inspection of the Bldg. 701 overhead crane in accordance with SBMS requirements.

Plant Engineering (EP) Hoisting & Rigging Inspector:
Name (print): _____
Signature: _____ Date:_____

3.1.2 Upon completion of the crane inspection, post the following signs at the crane walkway entry and in the crane control cab:

NOTICE – RESTRICTED USE THE BLDG. 701 OVERHEAD CRANE USE IS RESTRICTED TO OPERATION AND MATERIAL HANDLING ACTIVITIES ASSOCIATED WITH THE REFURBISHEMENT OF THE CRANE

3.1.3 Bldg. 701 10-ton overhead crane inspected and ready for restricted use.

EP Hoisting & Rigging Inspector - Initial: _____ Date:_____
ER Field Engineer - Initial: _____ Date:_____

3.2 A Radiological Work Permit (RWP) has been issued for this work.

ER Field Engineer - Initial: _____ Date:_____

NOTE: *This prerequisite SHALL be completed after trolley has been located to its southernmost location, step 8.1.1.*

3.3 Post an area not less than 50' x 50' in size on elevation 110' directly beneath the work location of the Bldg. 701 10-ton overhead crane hoist trolley.

ER Field Engineer - Initial: _____ Date:_____

4. PREVIOUS LESSONS LEARNED

See Attachment 1.

5. REFERENCES

- Attachment 2, Load Cell Placement
- ERP-OPM-2.6, "Records Management"
- ERP OPM-3.2, "Work Planning and Control"
- ERP-OPM-3.4, "Field Activity Oversight"
- KoneCranes, Inc. "Accident Prevention Plan and Workplace Safety & Health Program", January 3, 2007.
- EP-ES&H-103, "Lockout/Tagout Requirements"
- ERP-OPM-2.8, "Lockout/Tagout"

6. SAFETY REQUIREMENTS

- Post area on elevation 110' beneath the work area "Danger – Overhead Work in Progress".
- EP personnel will perform all crane operation.
- CranePro personnel shall comply with KoneCranes, Inc. "Accident Prevention Plan and Workplace Safety & Health Program".
- Personnel not involved in the work shall keep clear of the work areas.
- The Job Risk Assessment shall be attached to this Work Instruction.

7. TOOLS, EQUIPMENT, and SPECIAL PPE

- Gloves, Safety Glasses, Safety Shoes, and other PPE as prescribed by the JRA.
- Three (3) Load cells, Transducer Technologies, Inc., model LPD-CT, 25K lb rating with digital readout and cables.
- Two (2) Porta-Power® lifting devices with pump, hose, and cylinder rated for 5-ton minimum capacity.
- Long-handled tool for placing east load cell (Note: Load cell location is approximately three feet (3') beyond the worker's extended arm).

8. WORK INSTRUCTIONS

NOTE 1: *The Bldg. 701 overhead crane hoist trolley will be determined by the use of three (3) load cells placed between the trolley frame and the crane bridge beam. The trolley will be required to be lifted less than ¼" from the rails to determine its weight.*

NOTE 2: *EP personnel will perform all crane operation.*

8.1 Weighing the Bldg. 701 10-ton Overhead Crane

8.1.1 Position the hoist trolley to its southernmost location on the crane bridge.

NOTE: *Lockout/Tagout shall be performed in accordance with EP-ES&H-103, "Lockout/Tagout Requirements" until such time as ERP-OPM-2.8, "Lockout/Tagout" is approved. Any Lockout/Tagout after this approval shall be performed under the ERP-OPM-2.8.*

8.1.2 At Bldg. 703 440V MCC, OPEN breaker 4A, "701 Crane", to isolate 440V power to building 701 overhead crane and apply LOTO to breaker.

LOTO applied – FE Initial: _____ Date: _____

8.1.3 Verify power to crane isolated by verifying zero voltage at the line side of crane disconnect located elev. 110', adjacent to the east rollup door.

_____ Volts - PE Electrician Initial: _____ Date: _____

NOTE: *Refer to Attachment 2 for load cell locations.*

WARNING 1: Personnel injury/fall hazard – All work shall be performed from the crane catwalks. Personnel shall not climb on the trolley or lean over catwalk handrail.

WARNING 2: Personnel injury/pinch hazard – Keep hands clear of trolley wheels when placing Porta-Power® cylinders and load cells.

8.1.4 Using a permanent marker, mark the location for each of the load cells at the following locations:

8.1.4.1 Two (2) load cells (north and south), each located between the west trolley frame member and the bridge beam, adjacent to the trolley rail, with south load cell located 6" – 8" north from the centerline of the south trolley axle and the north load cell located 6" – 8" south from the centerline of the north trolley axle.

8.1.4.2 One (1) load cell positioned on the east crane beam, each located between the east trolley frame member and the bridge beam, adjacent to the trolley rail equidistant between the two trolley axles (4'-10.5" ref. from centerline of either axle).

8.1.5 Using two (2) Porta-Power® cylinders placed adjacent to the locations marked above, SLOWLY lift the west side of the trolley 1/4" to 3/8" and insert one (1) load cell at each of the marked locations.

8.1.6 Release the pressure on the Porta-Power® cylinders to lower the trolley until the full weight is bearing on the each of the west load cells and remove one (1) the Porta-Power® devices.

8.1.7 Using (1) Porta-Power® cylinder placed adjacent to the location marked above, SLOWLY lift the east side of the trolley 1/4" to 3/8" and insert one (1) load cell at the marked location using the long-reach tool.

8.1.8 Release the pressure on the Porta-Power® cylinder to lower the trolley until the full weight is bearing on the east load cell; do not remove the Porta-Power® device.

8.1.9 Record the weight at each load cell and calculate total trolley weight.

a. East Load Cell: _____ lbs
b. West Load Cell (north): _____ lbs
c. West Load Cell (south): _____ lbs

Total Trolley Weight (a + b + c) = _____lbs
ER Field Engineer - Initial: _____ Date:_____

8.1.10 Using (1) Porta-Power® device placed adjacent to the location marked above, SLOWLY lift the east side of the trolley until there is approx. 1/8" clearance between the load cell and the trolley frame.

8.1.11 Remove the load cell, lower the trolley to the track and remove the Porta-Power cylinder.

8.1.12 Repeat steps 8.1.10 and 8.1.11 above to remove the two (2) Porta-Power® cylinders from beneath the west side of the trolley frame.

8.1.13 Remove all tools and equipment from the work area and perform housekeeping to remove any debris and trash and remove all work area postings.

8.1.14 All work steps complete:

ER Field Engineer - Initial: _____ Date:_____

9. RECORDS

- Upon completion of this activity, the work supervisor shall complete Sections 6 and 7 of the Work Permit and submit the form to the BGRR Work Controls Coordinator (WCC) for close-out as outlined in ERP-OPM-3.2, "Work Planning and Control".
- File the completed Field Work Package in accordance with ERP-OPM-2.6, "Records Management".

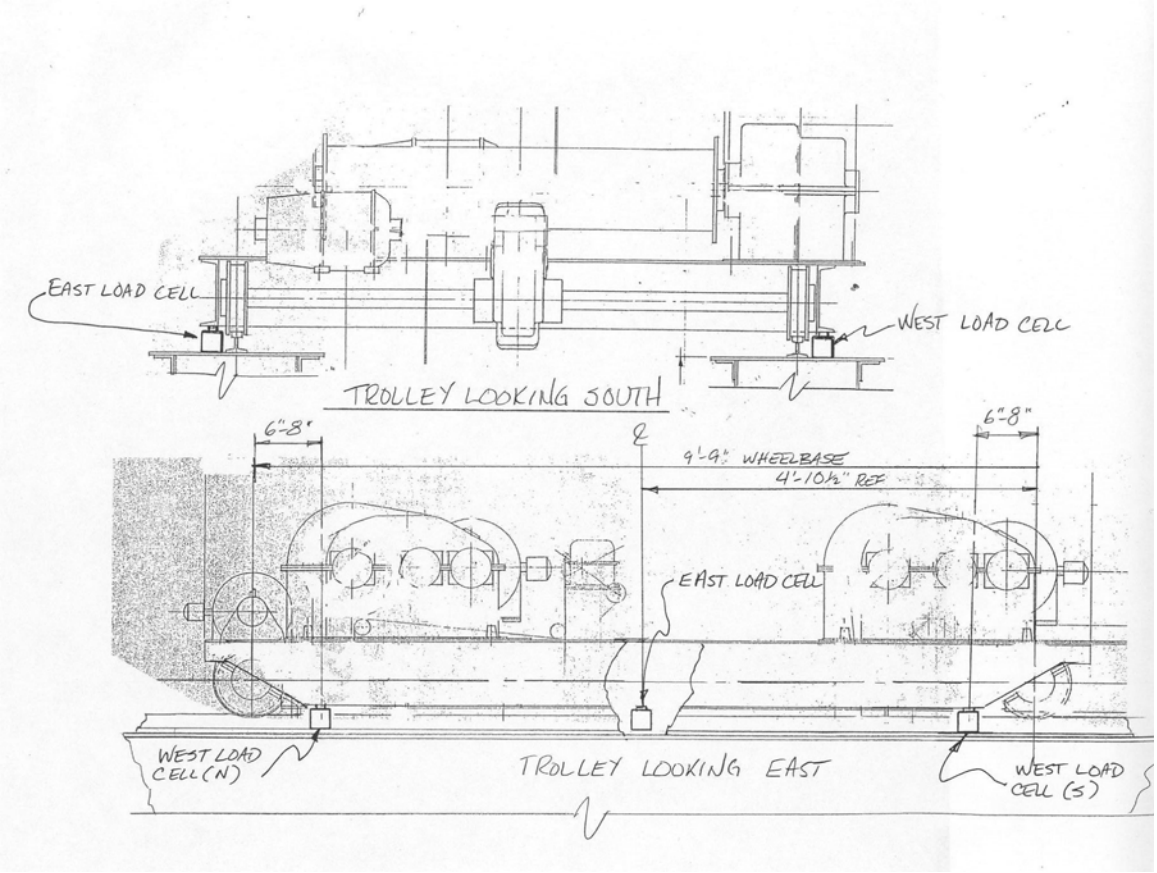
Attachment 1

Lessons Learned

(Insert appropriate Lessons Learned here – see SBMS Subject Area "Lessons Learned")

Attachment 2

Load Cell Placement



Attachment 2

Designation of Work Permit Primary Reviewers and Review Team Members

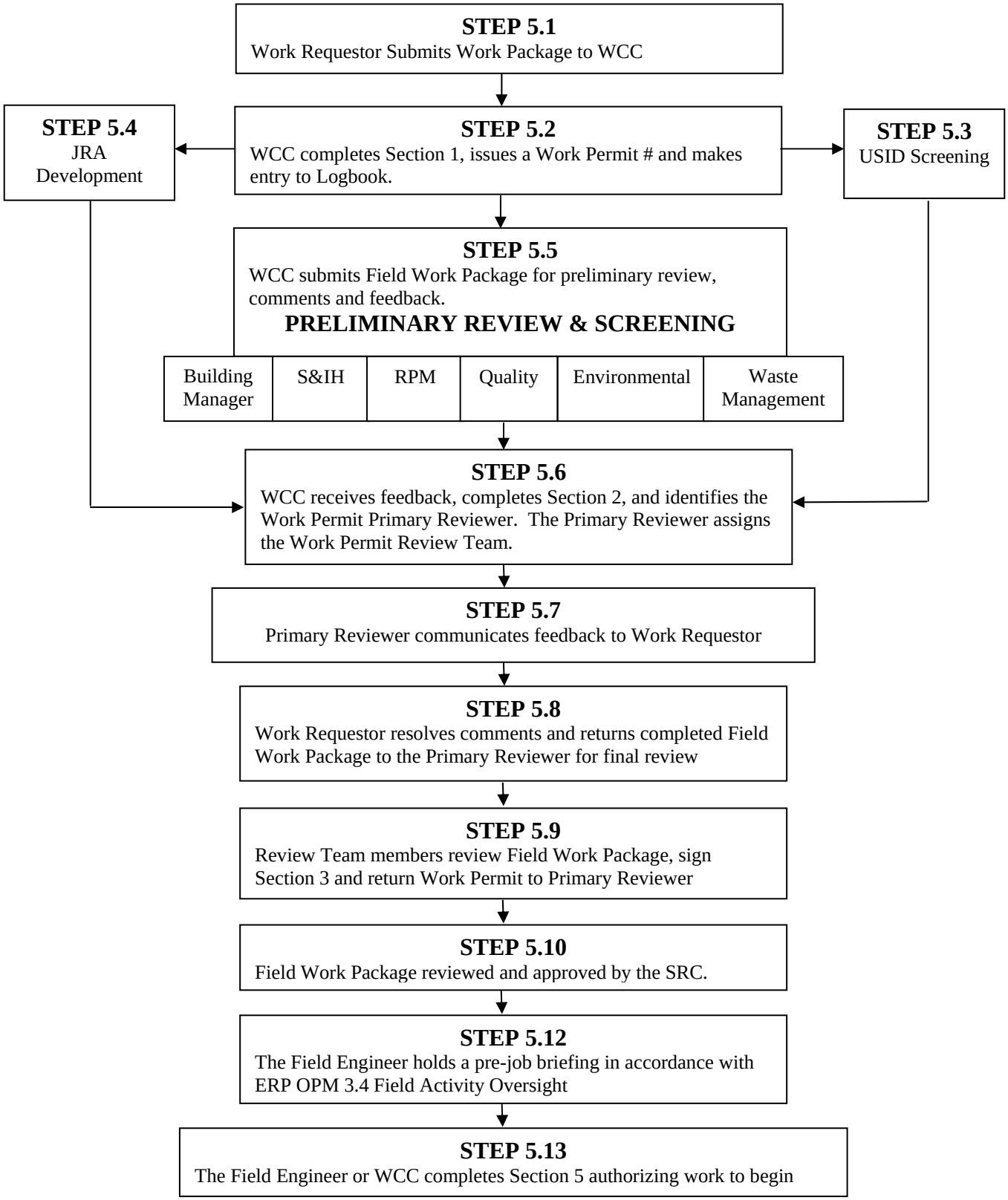
PRIMARY REVIEWERS

ERP Work Control Manager
ERP Work Control Coordinator
ERP D&D Operations, Manager
ERP D&D Support Manager
ERP Field Engineer
ERP Work Package Manager

WORK PERMIT REVIEW TEAM

*Work Permit Requestor
ERP Work Control Manager
ERP Work Control Coordinator
ERP S&IH Manager
ERP D&D Operations Manager
ERP D&D Support Manager
ERP Radiation Protection Manager
ERP Quality Management Services Manager
ERP Authorization Basis Engineer
ERP Environmental Compliance Representative
ERP Radioactive Waste Manager
*Must be part of team

Attachment 3
Work Permit Development Flow Chart



Attachment 4

Work Permit Additional Sign on Sheet

Work Permit Number _____

This is an extension of Work Permit Form Section 4. Job Site Personnel fills out this section.

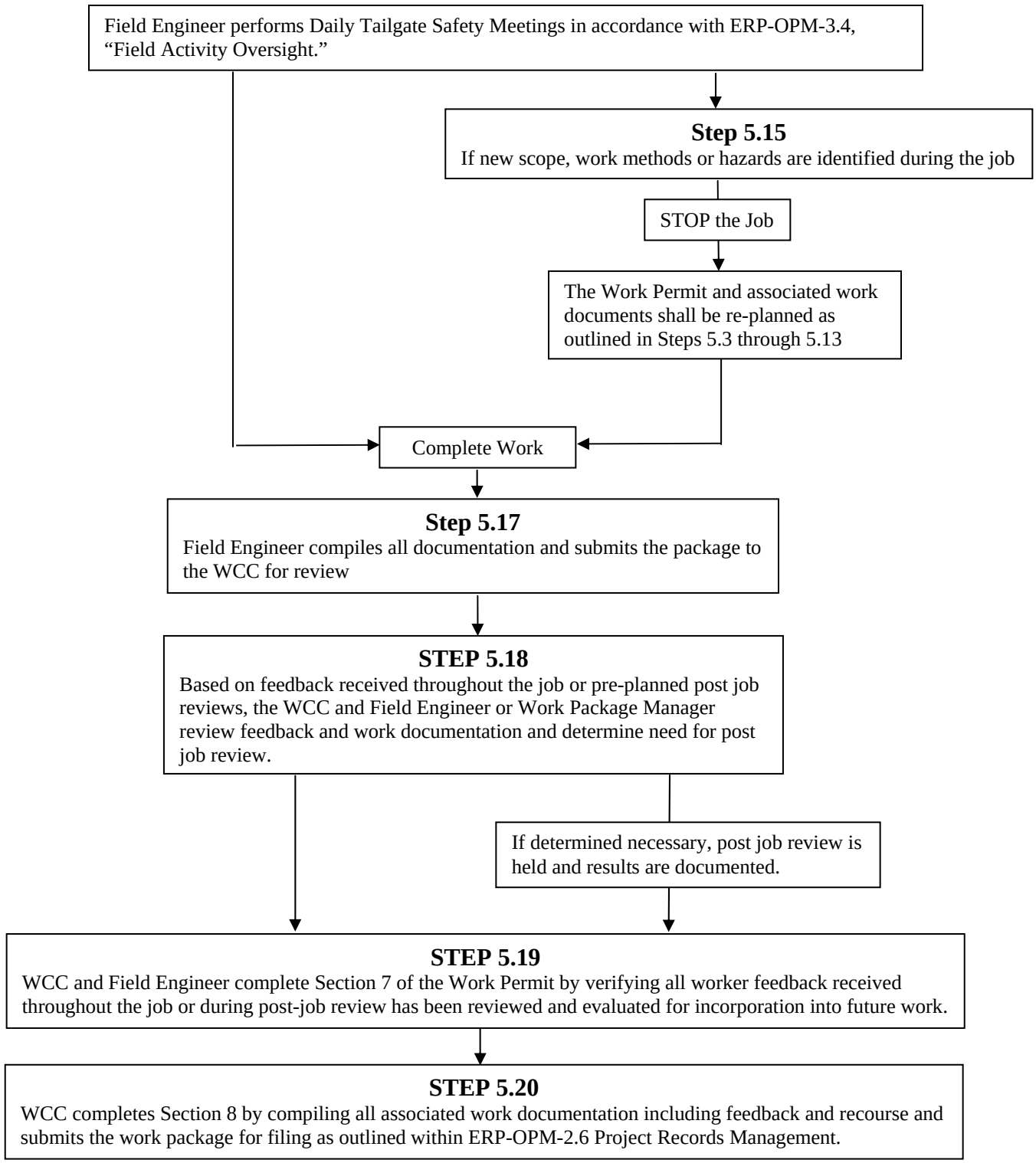
Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including attached permits).

Workers	**Life #**

Workers are encouraged to provide feedback on ES&H concerns or on ideas for improved job work flow.

Attachment 5

Work Permit Use and Closeout Flow Chart



Attachment 6

Minor Change Review and Approval

Minor Change Number: _____ Date: _____

Reason for Change:

Affected Documents (list):

Document	Affected Page(s)	Comments

Work Permit Review Team Review:

Title	Name (print)	Signature	Date
Primary Reviewer			
ES&H Professional			
Other			
Other			
ABE			
Work Control Coordinator			
Service Provider			
Work Package Manager			
D&D Manager			

Attachment 7

Minor Change or Revision Log

SECTION	PAGE #	REV. #	DATE	REASON FOR MINOR CHANGE OR REVISION

PLEASE CLICK HERE TO SEND READING ACKNOWLEDGEMENT EMAIL

APPENDIX E

BGRR Local Emergency Plan

ERP Operations Procedures Manual

5.1 BGRR LOCAL EMERGENCY PLAN

Text Pages 1 - 13
Attachments - 4

Approved: _____ Date: 11/26/07

ERP Director
Les Hill

Preparer: R. Deschamps

ERP-OPM-5.1, Revision 1

REVISION LOG

SECTION	PAGE #	REV. #	DATE	REASON FOR REVISION
1.0	2	1	11/26/07	Defined training requirements for access.
2.0	2, 4	1	11/26/07	Removed Laboratory Emergency Supervisor and added the Crisis Manager. Also added the radiation Protection Manager and his responsibilities.
3.0	5, 6	1	11/26/07	Added additional information to the Facility Contents Section.
4.0	6, 7	1	11/26/07	Added additional information to the Radiation and Fire Hazard sections.
7.0	10	1	11/26/07	Added new Section, Emergency Response, and reference to the new Emergency Response OPM.
13.0	12, 13	1	11/26/07	Added additional information to the Training and Access section.
All	All	1	11/26/07	Editorial/format corrections throughout the procedure.

Table of Contents

5.1 BGRR LOCAL EMERGENCY PLAN

1.0 PURPOSE AND SCOPE

The purpose of this procedure is to provide guidance and direction to visitors, Environmental Restoration Projects (ERP) personnel, contractors, and workers for safe access and egress from the Brookhaven Graphite Research Reactor (BGRR) Complex structures during their visit or work activities. The BGRR Complex includes Buildings 701 - Reactor Building, Building 702 - Reactor Biological Shield and Building T-895 - Duct Service Building (DSB).

The scope of this procedure includes: access and unescorted access control, key or key card control, hazard survey, and emergency response, as they relate to BGRR building access and control.

Routine access/egress routes into Building 701 exist on the 110 ft. elevation east and west access doors. Corridors within the building route traffic to either the reactor highbay radiological control points, or the main stairwells or elevator to office space and conference areas on the 133 ft. and 143 ft. elevations. Unrestricted access to the non-radiological portions of Building 701 requires completion of the ERP General Employee Training (GET). Additional training, specific to the hazards and risks of the planned work, is required for access to the radiological areas within Building 701.

For the BGRR facility floor plans and evacuation routes see Attachments 1 through 4.

2.0 AUTHORITIES AND RESPONSIBILITY

2.1 Crisis Manager (CM)

2.1.1 Shall supervise and coordinate actions during an operational emergency (OE).

2.2 Incident Commander (IC)

2.2.1 Shall act as the person in charge of the incident scene and the one who assumes overall responsibility for the emergency response until an OE is declared and the CM takes responsibility. All personnel at the scene of the incident report to and are responsible to the IC.

2.2.2 Shall establish the Command Post in a safe location.

2.3 ERP Director

2.3.1 Shall ensure the overall implementation of this procedure.

2.3.2 Shall assign a Local Emergency Coordinator (LEC) and an alternate LEC for ERP.

2.4 LEC

2.4.1 Shall prepare and update the Local Emergency Plan (LEP).

2.4.2 Shall review and update the Fire Response Run Card at least annually.

2.4.3 Shall coordinate emergency management issues with all other co-tenants within ERP.

2.4.4 Shall conduct an annual building fire/evacuation drill, as needed, and conduct critiques of the drills and implement corrective actions as necessary.

2.4.5 Shall identify and maintain emergency equipment.

2.4.6 Shall identify, procure, and arrange maintenance of required emergency equipment. Shall ensure routine monthly walkdowns are conducted to verify all equipment is at location and properly maintained. Shall keep the Building Manger advised of any discrepancies.

2.4.7 Shall establish an accountability process and ensure that building accountability is performed following a building evacuation and reports these results to the IC.

2.4.8 Shall identify and maintain a listing of staff in their assigned building (s) that may require assistance during an emergency and provides for assistance in safely exiting the building in an emergency.

2.4.9 Shall question personnel to determine the status of any equipment that may have been left in an energized or unsafe condition.

2.4.10 Shall ensure that emergency forces have been summoned and building alarms are sounded as required.

2.4.11 Shall maintain command and control of the scene until relieved by the IC.

2.4.12 Shall identify him/herself to the IC, and assists him/her as required in mitigating the emergency.

2.4.13 Shall ensure that the tone alert radio assigned to the building is operational and that it is brought to the assembly area, shelter-in-place area, or evacuation area as required.

2.4.14 Shall ensure that the Safety and Industrial Health (S&IH) Manager is informed of any event requiring the activation of this plan.

2.4.15 Shall revise this LEP to incorporate Lessons Learned (LL) from any ERP or Brookhaven National Laboratory (BNL) emergency or other relevant LL which would improve this procedure with regard to all ERP facilities.

2.5 BGRR Building Manager

2.5.1 Shall act as the single point of contact for coordinating all non-programmatic surveillance, maintenance, operations and project-related issues affecting the building/facility as a whole.

2.5.2 Shall assume the duties of the LEC if the LEC and alternate LEC are not present.

2.5.3 Responsible to authorize unrestricted access to the non-radiological areas of Building 701 once minimum training requirements have been completed and verified through the issuance of keys or key cards.

2.6 ERP Radiological Protection Manager (RPM)

2.6.1 Is responsible for ensuring the LEC is provided current radiological conditions to update the ERP facility Emergency Pre-plan Response Cards by completing a quarterly review.

2.7 ERP Project Administrative Manager

2.7.1 As authorized by the Decontamination and Decommissioning (D&D) Support Manager, shall order and issue keys, locks and/or key cards as required to support the Project once minimum training requirements have been completed and verified.

2.7.2 Shall maintain and administer the key or key card logbook.

2.8 ERP Training Services Manager (TSM)

2.8.1 Shall verify that the minimum training requirements have been completed prior to the authorization of unescorted access to the BGRR areas.

NOTE: *The definition of staff includes personnel who visit for administrative meetings.*

2.9 ERP Staff

2.9.1 Individual staff members in the building are responsible for activating alarms if they are aware of an emergency and for responding to alarms in a timely and orderly manner. If a building occupant is aware of an emergency in the building he/she should:

- Pull the nearest fire alarm box, **Call 2222 or 911** from an on-site phone or **631-344-2222** from an off-site phone, and briefly describe the nature and extent of the emergency.

- Warn others in the vicinity.

- Alert the Building Manager as to the nature of the emergency.

2.9.2 Shall be aware of the shelter-in-place, outdoor and indoor assembly area location for each ERP facility.

3.0 DESCRIPTION OF FACILITY ACTIVITIES

3.1 Location
The facility is located on Rutherford Drive and normally houses 35 people.

3.2 Work Performed
The work performed here consists of surveillance and maintenance (S&M) and D&D preparatory activities.

3.3 Classified Material
There is no classified material contained in this building.

3.4 Facility Contents

3.4.1 Building 701 Reactor Building houses Building 702 the biological shield and graphite pile. Building 701 also contains administrative offices and provides support to equipment and systems. It contains three floor levels plus the canal level below the main floor.

- Building 701 contains radioactive and hazardous materials and material handling equipment such as overhead cranes and fork trucks. In addition the building houses industrial equipment, elevators, heating, ventilation and air-conditioning (HVAC), office equipment, and systems such as steam, domestic water, sanitary and electrical systems.

3.4.2 The DSB is a 2200 square feet temporary structure made of corrugated metal. It is used for material storage in support of decommissioning activities.

- The DSB contains radioactive materials and material handling equipment such as overhead cranes and fork trucks.

3.4.3 The below ground ducts exhausted cooling air from the graphite pile. The remaining portion of the ducts are sealed shut but can be accessed through the opening located at the point which the ducts transition to above ground elevation.

3.4.4 The yard area outside Buildings 701 consists of asphalt-paved and dirt areas to the east, south, and west of Building 701.

3.5 Building Access

Building access is controlled for property and personnel protection. There are to be no unauthorized guests. A BNL issued key or key card is needed for access.

4.0 DESCRIPTION OF HAZARDS

4.1 Radiological Hazards

4.1.1 Building 701

- Posted Contamination, Radiation, and Radioactive Material Areas exist throughout.
- Hot Particle Areas and High Radiation Areas may be posted based on the active work.
- Radioactive contamination includes fission and activation products as well as transuranic radionuclides.

4.1.2 Building 702 (BGRR graphite pile and biological shield)

- Contains approximately 877 curies of loose and fixed activation products, fission products and transuranic radionuclides.
- Contents consisting of:
  - Graphite Pile - 775.8 Curies
  - Biological Shield – 81.3 Curies
  - Pile Base Plate – 11.2 Curies
  - Below Ground Duct (under Bldg 701) – 7.3 Curies
  - Deep Pit and fuel canal – 0.167 Curies
  - Bldg 701 interior – 1 Curie
- Shield plugs prohibit access to Building 702. Plugs are removed when graphite pile and bioshield removal activities commence.

4.2 Chemical Hazards

4.2.1 Bulk chemical inventories have been removed from the BGRR.

4.2.2 The following hazards potentially exist within the complex:

- Asbestos: Transite wall coverings, asbestos covered piping, electrical wire insulation and ducting.
- Lead: Shielding (lead shot, brick, and sheet) and lead-based paint.
- Polychlorinated Biphenyls (PCBs): PCBs exist in the facility primarily as an inherent element within aged electrical components, and paints.

Additionally, small amounts of other chemical hazards could be encountered in BGRR Facilities.

4.3 Fire Hazard

4.3.1 Building 701 is constructed using steel frame, poured concrete and brick. The roof of both the reactor bay and office complex is four-ply asphalt based roofing construction. Building 702 and T-895 are constructed of non-combustible materials.

4.3.2 The fire exposure hazard in the BGRR consists of transient flammable/combustible materials associated with performing routine maintenance or decommissioning activities. Controls are in place to limit the use and presence of flammable/combustible materials in Building 701 and 702.

4.4 Physical Hazards

4.4.1 Industrial: The BGRR is a shutdown facility, with the offices of BGRR personnel currently housed in the 701 Building. All areas of the facility are entered on a routine basis for S&M inspections.

- There is rigging equipment in the facility. This equipment shall not be placed in service until certified for use, reviewed for its intended use, and tagged accordingly.

WARNING: Personnel fall hazard, fall from heights - Access to the roof of Building 701 is restricted to prevent falls. Personnel must maintain a distance of at least 6 feet from the edge of the roof parapet unless authorization is granted via an ERP Work Permit or as part of preventive maintenance specified within the BGRR S&M Manual.

4.4.2 Falls: The absence of guardrails on the buildings' multilevel flat roofs presents a potential fall hazard.

- The Reactor bay roof was replaced in 2005 and is in excellent condition. The roof structure over the office area is in fair condition. However, visual inspection of the roof surface will not always indicate structural integrity, and some cracked roofing panels have been noted.

4.4.3 Confined Spaces: There are numerous confined spaces in and around structures at the BGRR. Confined spaces shall only be entered in accordance with a Work Permit.

WARNING: Personnel shock hazard - Do not touch any electrical wiring or transfer equipment unless specifically addressed in an assigned work package.

4.4.4 Energy Sources: The facility is powered by a single 480-volt electrical feed with dry-type step-down transformers for lighting distribution. The switchgear is aged and must be operated with extra caution. Written authorization and work instructions are required for all 480-volt switchgear operations. All electrical lines should be considered energized until proven otherwise. The transformer station outside of Building 701, at the southwest corner, was permanently de-energized in January 2000.

- There are some missing conduit enclosures, light bulbs, and fixture covers on items that may contain energized wires.

5.0 NOTIFICATIONS

5.1 LEC
Bruce Lein
BNL Ext. 2188; Home Phone # 631-588-8512; Cell Phone # 631-922-5911

5.2 Alternate LEC
Fred Sauerbrun
BNL Ext. 2760; Home Phone # 631-886-1285; Cell Phone # 631-484-0194

5.3 Environmental, Safety and Health (ES&H) Coordinator
Brian Heneveld
BNL Ext. 4721; Home Phone # 516-799-7555; Cell Phone # 631-774-6615

5.4 S&IH Manager
Brian Heneveld
BNL Ext. 4721; Home Phone # 516-799-7555; Cell Phone # 631-774-6615

5.5 Radiation Protection Manager
Robert Deschamps
BNL Ext. 4714; Cell Phone # 845-797-9551

5.6 D&D Support Manager
Fred Petschauer
BNL Ext. 7498; Home Phone # 631-929-5996, Cell Phone # 631-484-0190

5.7 D&D Operations Manager
Tom Daniels
BNL Ext. 4752; Home Phone # 631-281-5488; Cell Phone #631-831-7662

5.8 BGRR Building Manager
Dean Atchison
BNL Ext. 7854, Home Phone # 631-929-8398, Cell Phone # 631-831-0159

5.9 ERP Director
Les Hill
BNL Ext. 8631, Home Phone # 631-474-3209, Cell Phone # 631-834-3936

6.0 EMERGENCY SIGNALS

6.1 Laboratory Emergency Signals
The sounding of the site sirens indicates the existence of a site emergency.

6.1.1 Warning Signal - This consists of the continuous sounding of the site sirens for five minutes. Proceed immediately to the Indoor Assembly Area (mail box area, 143' level) and await instructions.

6.1.2 Evacuation Signal - This consists of the intermittent sounding of the site sirens for five minutes. Evacuate the site immediately in accordance with the Laboratory Emergency Plan.

NOTE: *The Tone Alert Radio must be placed in an area that is constantly manned or in an area that is accessible to occupants of the buildings.*

6.1.3 Tone Alert Radio

- Location: Elevation 143 ft. of Building 701, Office 2A near window.
- Responsible Individual: Project Administrative Manager.

6.1.4 Telephone Numbers for Emergency Communications

- Indoor Assembly Area – Near the mailboxes on elevation 143 ft. in Building 701 – ext. 4432.
- Shelter In Place – The conference room on elevation 143 ft. in Building 701 – ext. 8273.

6.2 Building Emergency Signals

The building alarms consist of ringing of the fire alarm bells. Ringing of the bells is activated automatically by a network of heat detectors or by pulling the red fire alarm pull-boxes located throughout the building.

6.2.1 Upon hearing the building alarm, all persons shall immediately evacuate the building and proceed to the Outdoor Assembly Area (West Laydown Area). The LEC shall meet the emergency response personnel at the Command Post. There are no hearing impaired personnel identified in the building.

6.3 Emergency Telephone: **Ext. 2222 or 911**

Any individual may call the Laboratory Emergency Number. Anyone who does so should:

- State the nature and extent of the emergency.
- Give the location including building and room.
- Give your name and a call back number.

7.0 EMERGENCY RESPONSE

7.1 ERP-OPM-5.6, "Emergency Response Procedure" (Reference 1) provides immediate response actions and required interface with the BNL site Emergency Response Organization (ERO) including Emergency Services, Police, Medical and Radiological Controls in responding to incidents, emergencies and off-normal occurrences at the ERP projects.

7.2 ERP-OPM-5.6 describes the required actions for emergency or an incident at ERP projects including the following:

- Medical Emergencies
- Fire
- Spill
- Radiological events – building evacuation due to airborne radioactivity, contamination spread and/or elevated radiation levels

8.0 INDOOR ASSEMBLY AREA

8.1 The Indoor Assembly Area (see Attachment 1) is located near the project staff mailboxes on elevation 143 ft. of Building 701. Gather in this area for personnel accountability and to await further instructions.

8.2 The LEC will assign someone to operate the telephone and take attendance for accountability.

9.0 OUTDOOR ASSEMBLY AREA

9.1 The Outdoor Assembly Area (see Attachment 4) is located at the West Laydown Area just outside the entrance of Building 701. Personnel will meet there for accountability and to await further instructions.

9.2 In case of inclement weather, the Alternate Outdoor Assembly Area will be the Main Lobby of Building 703.

10.0 SHELTER IN PLACE

10.1 In the event of a hazardous materials release where assembly and evacuation is not the preferred protective action, personnel will be directed to seek shelter. The shelter area is selected so that it affords maximum protection for personnel.

10.2 The Shelter In Place Area (see Attachment 1) is the Building 701 conference room on 143 ft. level. The LEC shall ensure that the Tone Alert Radio is brought to the conference room.

11.0 ACCOUNTABILITY FOR PERSONNEL

11.1 In the event of a building evacuation of the BGRR, the LEC will use the BGRR occupancy list, project work documentation provided by project construction/field engineers, and cell phones to account for all personnel.

11.2 Accountability will include inquiries about repair/maintenance staff, contractor, and visitors. Field Engineers shall account for their personnel and report their results to the LEC.

11.3 Personnel shall remain in the assembly area until they have been accounted for and instructed to return to work by the IC. The LEC will report results of accountability to the IC and the ERP Director.

11.4 Handicapped and Hearing-impaired Individuals must notify their immediate supervisor prior to working in this facility. The supervisor is responsible for notifying this individual in the event of an emergency. The supervisor should then notify the LEC or Alternate in the event of an emergency that all individuals are or are not accounted for.

12.0 BUILDING EMERGENCY EQUIPMENT

12.1 There are fire extinguishers and fire alarm pull boxes located on every elevation in Building 701.

12.2 There are radiation detection equipment check sources and decontamination materials located on the 110 ft. elevation.

13.0 TRAINING AND ACCESS

13.1 Training Requirements

13.1.1 In addition to job-specific training for Project work, the Laboratory requires a minimum set of required ES&H training modules for all personnel. Training requirements for unrestricted access to the non-radiological areas of the BGRR is completion of ERP GET.

13.2 Building Access

13.2.1 Employees, contractors, guests, or any person requiring unrestricted access into non-radiological areas of the BGRR Facility, shall complete ERP Generic GET and be issued a key/key card for access.

13.2.2 All untrained personnel shall be escorted while within areas other than non-radiological.

13.2.3 Hard hats, safety glasses with side shields, and safety shoes are required for access to posted work areas within the BGRR.

13.2.4 Casual visitors should not be given access by ERP personnel that may be coincidentally leaving the building at the time the visitor arrives. All visitors must receive authorization from a specific ERP point of contact to enter Building 701.

13.2.5 All personnel entering BGRR Complex buildings shall obey all signs and postings.

13.2.6 All BGRR buildings are locked. Access to any of the buildings is by use of a key or key card. Access doors shall be secure at all times. In the event that a door(s) must remain open for an extended period of time to facilitate work efforts, it is the responsibility of the work package Field Engineer to ensure proper personnel building access and egress during that time, and that the door(s) are again locked when work is complete.

13.3 Key and or Key Card Control

13.3.1 The D&D Support Manager, Building Manager, and Administrative Staff are the ERP representatives authorized to request a key and or key card.

13.3.2 The D&D Support Manager and the Project Administrative Manager shall authorize Administrative Staff, or designee, to issue keys and or key cards to individuals once minimum training requirements have been verified.

13.3.3 The ERP TSM shall verify the minimum training requirements are completed prior to authorization of issuance of keys and or key cards.

13.3.4 The ERP Administrative staff assigns a key and/or key card to qualified personnel and maintains a log of the assignments.

13.3.5 When access is no longer needed, required, or denied, the key and/or key card shall be surrendered to Administrative Services or designee.

13.3.6 Fire-Rescue maintains a key to gain entry to the building.

14.0 DRILLS

14.1 Emergency drills shall be conducted annually and as determined necessary by the LEC. Critiques of the drill should be conducted within 30 days of the drill.

15.0 RE-ENTRY

15.1 In the case of an incident, re-entry into affected areas shall be at the discretion of the IC, CM (as applicable), Radiological Controls Division Facility Support Representative and the LEC.

15.2 In the case of a declared OE, termination of emergency shall come from the Emergency Operations Center (EOC) and the CM.

16.0 REVIEW AND UPDATE

16.1 This plan shall be reviewed annually and updated as necessary by the LEC. Reviews are required but not limited to:

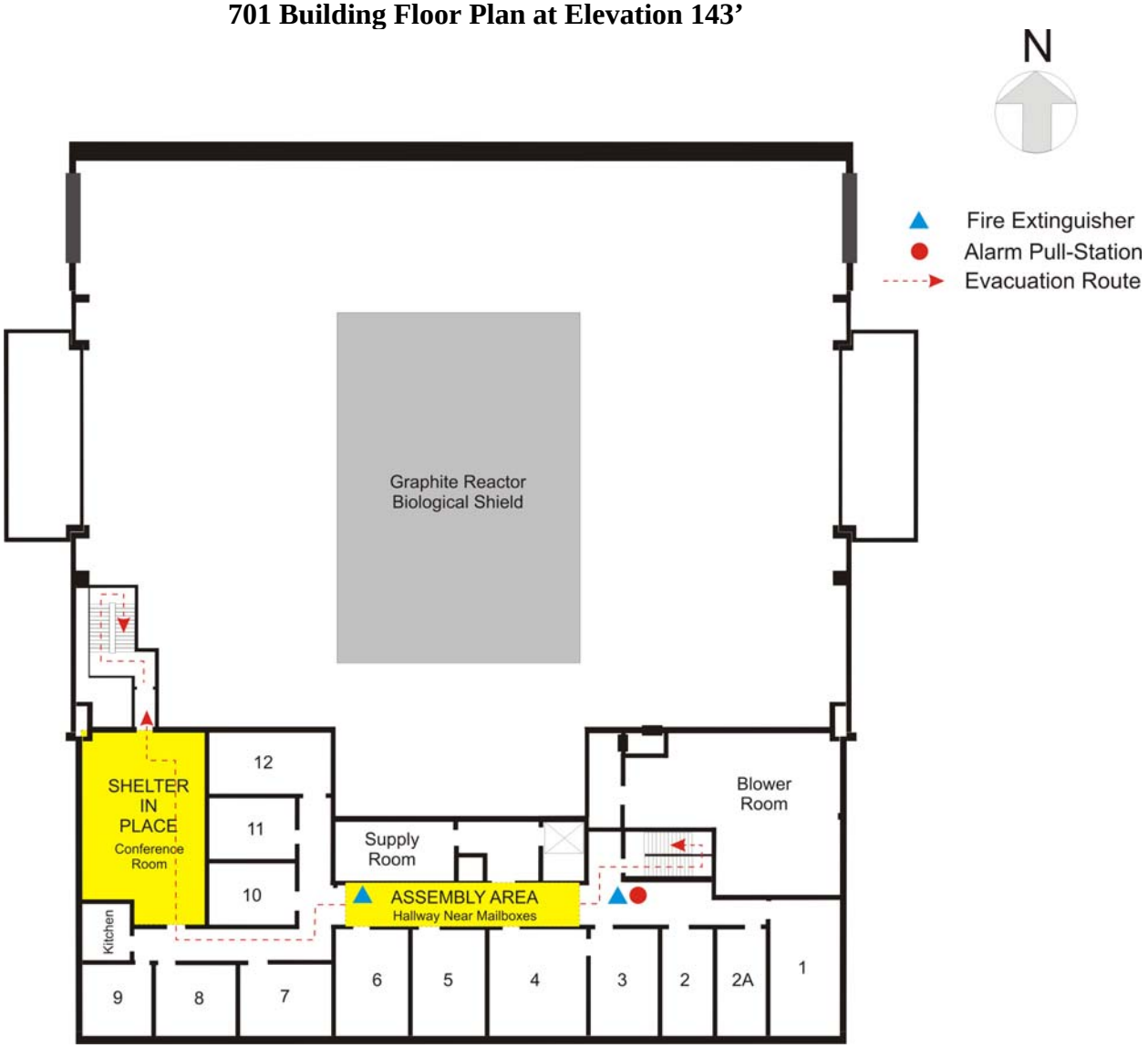
- After an actual event or incident.
- When the building is physically modified.

17.0 REFERENCES

17.1 ERP-OPM-5.6, “Emergency Response Procedure”

Attachment 1

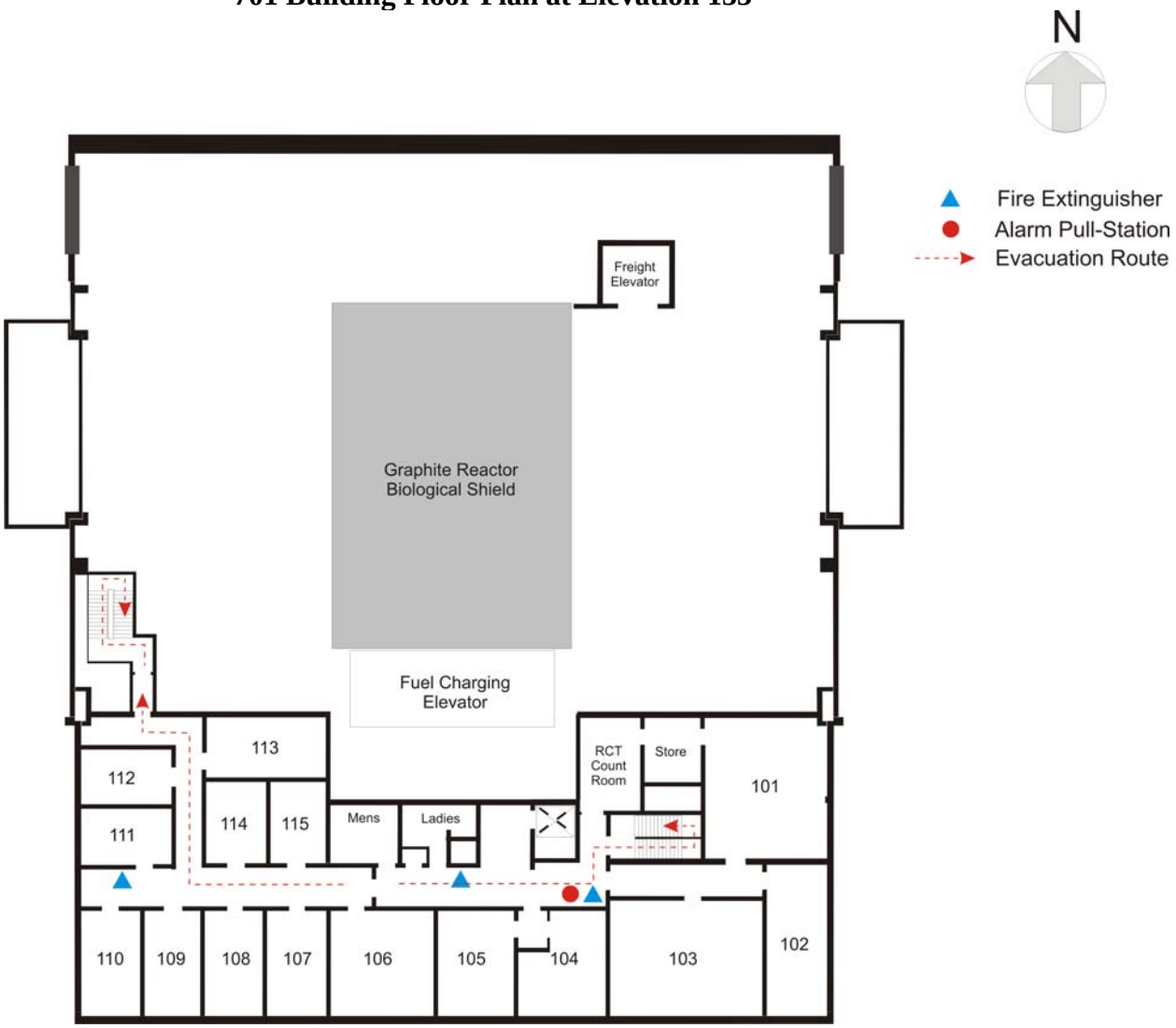
701 Building Floor Plan at Elevation 143’



Page Break

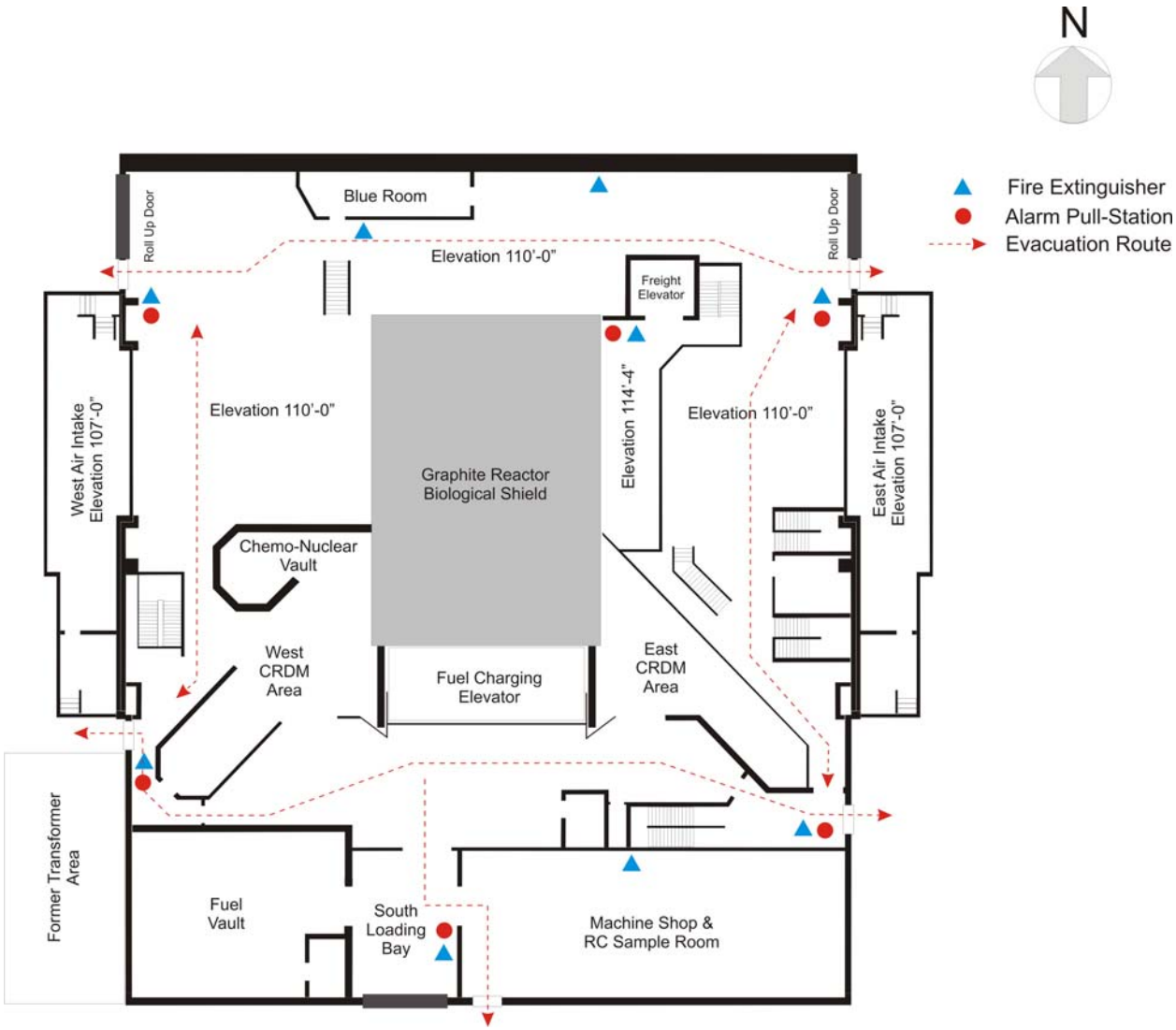
Attachment 2

701 Building Floor Plan at Elevation 133’



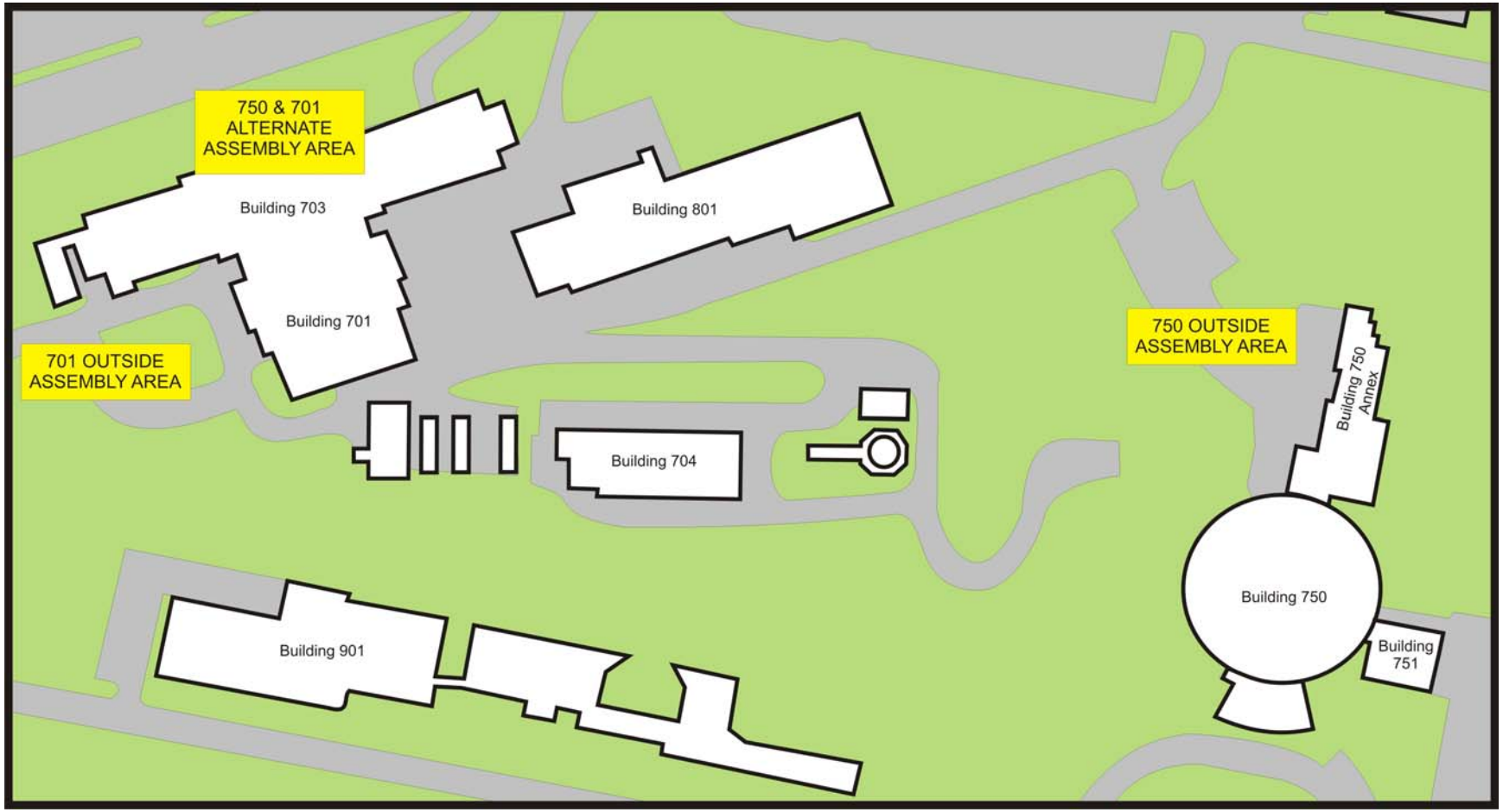
Attachment 3

701 Building Floor Plan at Elevation 110'



Attachment 4

BGRR/HFBR Outdoor Assembly Areas



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