

July 15, 2011

Ms. Terri Kneitel
U.S. Department of Energy
Brookhaven Site Office
53 Bell Avenue, Bldg. 464
Upton, NY 11973

DOE CONTRACT NO. DE-AC05-06OR23100
SUBJECT: TYPE A VERIFICATION REPORT FOR THE BROOKHAVEN
GRAPHITE RESEARCH REACTOR ENGINEERED CAP,
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK
DCN: 5098-SR-07-0

Dear Ms. Kneitel,

U.S. Department of Energy (DOE) Order 458.1 requires independent verification (IV) of DOE cleanup projects (DOE 2011). The Oak Ridge Institute for Science and Education (ORISE) has been designated as the responsible organization for IV of the Brookhaven Graphite Research Reactor (BGRR) Engineered Cap at Brookhaven National Laboratory (BNL) in Upton, New York. The IV evaluation may consist of an on-site survey (Type A Verification) or a document and data review (Type B Verification). DOE and ORISE determined that a Type A verification for the BGRR Engineered Cap was appropriate based on the initial survey unit classification, the walkover surveys, and the final analytical results provided by the Brookhaven Science Associates (BSA).

The BGRR Engineered Cap surveys began in December 2010 and were completed in May 2011. Survey activities by BSA included gamma walkover scans and sampling of asphalt, concrete, and underlying and excavated soils in accordance with the BSA Work Procedure (BNL 2011a). BSA obtained core samples at depths up to two feet from each survey unit prior to performing soil excavation. BSA then used the core sample results to bound the potential areas of contamination and the engineered cap. Additionally, the core samples were used to quantify the radionuclides of concern (ROC) and to provide an estimate of the potential volume of waste generated during remediation.

BSA stockpiled the excavated soils during remediation to be used as backfill once remediation was completed. Excavated soils were surveyed and sampled to minimize waste disposal volumes. Upon completion of remediation, and if the results of the stockpiled soils met the site cleanup goals, the remediated areas were backfilled using the excavated soils (BNL 2011a).

Gamma walkover scans conducted prior to the final status survey (FSS) identified two isolated soil locations with elevated radioactivity following the removal of concrete from the south side of Building 701 (BNL 2011b). Samples collected from these locations resulted in the removal of additional soil from each location. BSA's post-remediation walkover surveys were expanded to include a 10-foot radius around the excavated locations. Two post-remediation soil samples were collected and analyzed with onsite gamma spectroscopy equipment. These samples were also

included with the FSS samples that were analyzed at an offsite facility for the primary ROCs (i.e., cesium-137, strontium-90, and radium-226) (BNL 2011b, c, and d). Analysis included full spectrum gamma spectroscopy and Sr-90 analysis for all samples. Alpha spectroscopy was performed for sample batches and liquid scintillation performed for tritium, carbon-14, and nickel-63 concentrations for FSS samples (BNL 2011e).

BSA submitted the FSS data and analytical results to demonstrate that remediation efforts complied with the specified cleanup goal of less than or equal to 15 millirem per year (mrem/yr) above background to a resident in 50 years (BNL 2011a). ORISE has reviewed the project documentation and FSS data for the BGRR Engineered Cap. The highest concentrations of the primary ROCs reported were 1.32 picocuries per gram (pCi/g) for Cs-137 and 2.03 pCi/g for Sr-90, with both ROCs having the qualifier for the sample result as less than the minimum detectable activity (MDA). For Ra-226, the highest detected concentration was 0.671 pCi/g. Other potential secondary contaminants were below their respective MDAs. Therefore, ORISE is of the opinion that BSA has provided sufficient evidence to demonstrate compliance with the 15 mrem/yr cleanup objectives.

Please contact me via my information provided below, or Evan Harpenau at (865) 241-8793, should you have any questions or require additional information.

Sincerely,



Phyllis C. Weaver
Health Physicist Project Manager
Survey Projects

PCW:bf/jc

Enclosure

cc: S. Roberts, ORISE/IEAV
T. Vitkus, ORISE/IEAV
E. Harpenau, ORISE/IEAV
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File/5098

Distribution approval and concurrence:	Initials
Technical Review	WCA

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REFERENCES

- Brookhaven National Laboratory (BNL). Work Procedure; *Final Status Survey (FSS) Procedure for the BGRR Engineered Cap, Rev. 1*. April 4, 2011a.
- Brookhaven National Laboratory. Survey Data; *Remediation surveys during BGRR EC project*. May 26, 2011b.
- Brookhaven National Laboratory. E-mail from M. Hollander (BNL) to E. Harpenau (ORISE); *Discrepancies with the BGRR Engineered Cap Data*. June 14, 2011c.
- Brookhaven National Laboratory. E-mail from M. Hollander (BNL) to E. Harpenau (ORISE); *Fw: Engineered Cap Soil Samples (050311-008/009/001/002 and 003)*. June 15, 2011d.
- Brookhaven National Laboratory. E-mail from M. Hollander (BNL) to P. Weaver (ORAU); *Brookhaven COC#31311 FSS – Follow Up Response*. July 12, 2011e.
- U.S. Department of Energy (DOE). DOE Order 458.1, Chg 1, Radiation Protection of the Public and the Environment. Washington, DC. March 8, 2011.