Public Invited to Comment on BGRR Cleanup

The U.S. Department of Energy (DOE) and Brookhaven National Laboratory (BNL) have developed a cleanup plan for the Brookhaven Graphite Research Reactor (BGRR). This cleanup plan is known as the Proposed Remedial Action Plan (PRAP).

Operating from 1950 to 1968, the Brookhaven Graphite Research Reactor was the world's first reactor constructed solely for scientific research on the peaceful uses of the atom.

The public is invited to review the PRAP and to send comments on the PRAP to DOE during the formal public comment period, which runs from August 2 through September 3, 2004.

If you wish to learn more about the cleanup plan, to ask questions, or to give your input on the plan, then please write to us or join us at one of the following meetings:

Information Sessions
August 17, 2004 2-4 p.m.
Brookhaven National Laboratory
Berkner Hall

August 19, 2004 7-9 p.m.
Brookhaven National Laboratory
Berkner Hall

Public Meeting
August 24, 2004 7-9 p.m.
Brookhaven National Laboratory
Berkner Hall

Please note that all visitors to Brookhaven Lab age 16 and older must present photo identification for admission to the Laboratory.

After the public comment period ends, DOE will carefully consider the public's input. The DOE will then recommend a cleanup remedy to the U.S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). DOE must then receive agreement on the proposed remedy from EPA and concurrence from NYSDEC.

Based on your comments, the final remedy may be changed from the proposed remedy. The decision will be detailed in a Record of Decision (ROD). A Responsiveness Summary, which will summarize the public's comments and DOE's responses to them, will be attached to the ROD.

WHY CLEANUP IS RECOMMENDED

Operating from 1950 to 1968, the Brookhaven Graphite Research Reactor was the world's first reactor constructed solely for scientific research on the peaceful uses of the atom. As shown in Figure 1 on page 2, the BGRR complex consists of several structures and systems that were used to operate and maintain this research reactor. Some parts of the equipment and structures are still contaminated.

During its operation, the BGRR used radioactive fuel to create the chain reactions necessary to perform the research. The chain reactions occurred within the graphite "pile," which is located inside Building 701.

A thick biological shield, which minimized radiation within the building, surrounds the pile. Air was pulled from the roof through two large ducts downward past the pile to cool the reactor. Cooling air then exited through below-ground and above-ground ducts. Spent fuel was transferred from the pile to the canal before being disposed of off Brookhaven's site.

As the result of the BGRR's past operations, some parts of the equipment and structures are still contaminated. The BGRR currently contains

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For more information about Brookhaven Lab, go to www.bnl.gov on the World Wide Web.

For more information on the BGRR cleanup, please contact:

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approximately 8,047 Curies of radioactive contaminants, including hydrogen-3 (tritium), carbon-14, and fission products cesium-137 (Cs-137) and strontium-9 (Sr-90). The pile and biological shield contain over 99 percent of the remaining radiological inventory in the BGRR complex.

INTERIM CLEANUP ACTIONS

Interim cleanup actions completed or in progress account for the removal of about 47 Curies of contaminants, as summarized in Table 1 below. About 8,044 Curies, or most of the remaining 8,047 Curies are bound within the graphite pile and biological shield.

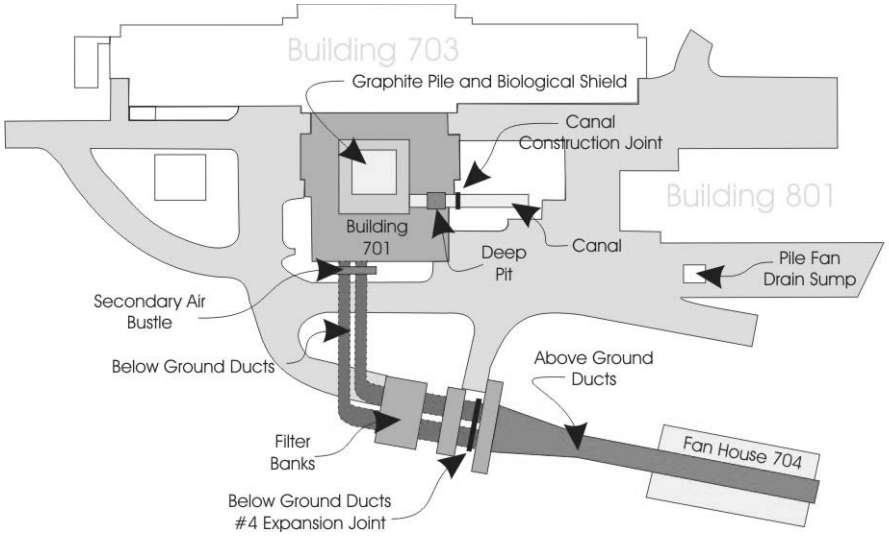

FIGURE 1. THE BGRR COMPLEX

BGRR CLEANUP ALTERNATIVES

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, which is also known as the Superfund Act) requires that the cleanup remedy that is selected must protect human health and the environment. The cleanup remedy also must be cost-effective, comply with other laws, and, to the greatest extent practical, use permanent solutions, alternative treatment technologies, and resource-recovery alternatives.

The four cleanup alternatives for the BGRR that are described in the PRAP were developed by DOE with input from EPA, NYSDEC, New York State Department of Health, and the Suffolk County Department of Health Services. All the alternatives include the completion of actions that are currently underway or planned, followed by long-term response actions, which include infiltration management, surveillance, and maintenance and institutional controls. The four alternatives are summarized as follows and are compared in Table 2 on the top of page 3.

Alternative A: Stabilization and Source Management

Alternative A, Stabilization and Source Management, relies upon actions already taken and additional actions that are now in progress or planned. This alternative depends upon infiltration management, surveillance and monitoring, and institutional controls to manage the residual radioactive materials, which include the reactor pile and biological shield.

Using conservative assumptions, it was calculated that it would take the long-lived radioactive isotopes within the pile approximately 87,000 years to decay to unrestricted levels. This calculation was performed to allow for a comparative analysis of the various BGRR remediation alternatives and was not intended to establish definitive institutional control durations. However, institutional controls, including land-use restrictions, would help ensure that the remaining radioactive materials can be managed to prevent inadvertent direct exposure and future migration to the soil regardless of these calculated durations.

Long-term activities would include annual reporting, routine inspection and surveillance of the BGRR facility, scheduled upkeep and maintenance, infiltration management, groundwater monitoring, and

TABLE 1. BGRR INTERIM CLEANUP ACTIONS

YEAR	MATERIAL ADDRESSED	ACTION TAKEN	WASTE GENERATED
1997-99	water in below-ground ducts	pumped out water and repaired ducts	58,000 gallons of contaminated water
1999-2000	equipment pipes and other material at the graphite pile	removed from reactor bldg.	3 cubic meters of contaminated debris and 39 metric tons of contaminated shielding
	fan-house fans, motors, valves, and instruments	removed from fan house	68 metric tons of contaminated debris
	concrete pile-fan sump, pipes, and soil	removed old sump and diverted drain lines	240 cubic meters of contaminated debris and soil
2000-02	above-ground concrete ducts, and instrument-house pipes and equipment	removed ducts, sealed duct openings, and removed material from instrument house	250 cubic meters of contaminated debris
2001-02	equipment, pipes, structural material, asphalt, concrete, and soil	removed material from canal and water-treatment houses	2,200 cubic meters of contaminated debris and soil
2002-04	below-ground duct-cooling coils, exhaust filters, and primary liner system*	remove from the two ducts and compact on site	8.2 cubic meters of contaminated metal debris, 880 cubic meters of primary liner-system debris, and 24 cubic meters of exhaust filers

*Removal of the filter elements and contaminated steel in the below ground ducts is ongoing and expected to be completed by October 2004.

TABLE 2. COMPARISON OF REMEDIAL ALTERNATIVES

	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D
total radiological inventory removed	47 Curies	8,091 Curies	8,093 Curies	8,094 Curies
total radiological inventory remaining	8,047 Curies	3 Curies	1.5 Curies	<1 Curie
total cost	$53.5 million	$93.3 million	$96.8 million	$149.3 million

provisions requiring removal of any contaminated soils or components that may become accessible during future excavation.

This is not the preferred alternative because more than 99 percent of the contamination would remain on the Laboratory's site.

Alternative B: Pile and Biological Shield Removal

Alternative B, Pile and Biological Shield Removal, includes not only the scope of Alternative A, but also the removal of the pile and biological shield.

Characterization of deep, inaccessible areas is difficult because of the presence of buildings and structures. Therefore, using conservative assumptions, it was calculated that it might take as long as 266 years for the decay of the deeply buried contamination to meet the surface-soil cleanup standards for industrial land use and another 100 years to reach the standards for unrestricted use. This calculation was performed for comparison purposes and was not intended to establish definitive institutional control durations. However, institutional controls, including land-use restrictions, would help ensure that the remaining radioactive materials can be managed to prevent inadvertent direct exposure and future migration to the soil regardless of these calculated durations.

If these soils were to become accessible, perhaps by the removal of the buildings, then they would be managed based on the actual distribution, depth, and concentrations of the residual radioactive material encountered. Given the depth of these soils and the clean overburden, the concentrations of Cs-137 and Sr-90 would be significantly reduced when mixed with the clean overburden. Institutional controls can be effective in managing this residual contamination.

Long-term activities would include: annual reporting, routine inspection and surveillance of the BGRR facility, scheduled upkeep and maintenance, infiltration management, groundwater monitoring, and provisions requiring removal of any contaminated soils that may become accessible during future excavation or component removal.

This is not the preferred alternative because, under some circumstances, contamination remaining in soil could reach groundwater.

Alternative C: Removal of the Pile, Biological Shield, Fuel-Canal Structure, and Reasonably Accessible Soils

Alternative C includes all of the work within Alternative B plus the removal of accessible pockets of contaminated soil and the canal structure. However, because of the complexity of Building 701's foundation and the potential for disrupting the building's structural integrity, soils located within or below Building 701's foundation would not be removed.

This alternative would result in the removal of a total of 8,093 Curies from the BGRR complex, including all of the long-lived radioisotopes. Approximately one and a half Curies, which are predominantly Cs-137 and Sr-90, would remain in contaminated structures below Building 701 and within the below-ground ducts. Since these contaminants are bound within concrete, embedded within steel, or located within areas that are currently inaccessible, they are not considered a groundwater-contamination source term.

Using conservative assumptions, it was calculated that it might take as long as 180 years for the decay of the inaccessible soil contamination to meet the surface-soil cleanup standards for industrial land use and another 100 years to reach the standards for unrestricted use. As for the other alternatives, this calculation was performed for comparison purposes and was not intended to establish definitive institutional control durations. However, institutional controls, including land-use restrictions, would help ensure that the remaining radioactive materials can be managed to prevent inadvertent direct exposure and future migration to the soil regardless of these calculated durations.

If these soils were to become accessible, perhaps by the removal of the buildings, then they would be managed based on the actual distribution, depth and concentrations of the residual radioactive material encountered. Institutional controls can be effective in managing this residual contamination. Long-term activities would include annual reporting, routine inspection and surveillance of the BGRR facility, scheduled upkeep and maintenance, infiltration management, groundwater monitoring.

Alternative C is the preferred alternative because it represents the best balance of the EPA's criteria for selecting remedies under CERCLA, and it best addresses the overall protection of human health and the environment.

Alternative D: Greenfield

Alternative D, Greenfield, includes the complete removal of the BGRR structure, systems, and components, plus the removal of underlying soils necessary so as to reach the soil-cleanup levels for industrial land use. Because of the potential for residual radioactivity within deep soils, long-term response actions would include performing groundwater monitoring and surveillance to ensure the effectiveness of this remedy. Upon completion, this alternative would result in the removal of all radioactivity to meet the surface-soil cleanup standards for industrial use.

Using conservative assumptions, it was calculated that, if the remaining contaminated soils within the BGRR complex were remediated to the Operable Unit 1 soil-cleanup standards of 67 pico-Curies per gram (pCi/gm) for Cs-137 and 15 pCi/gm for Sr-90, then it would take approximately 100 years to allow the contaminants to decay to acceptable levels for unrestricted land use.

However, following the excavation of the remaining contaminated

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soils, the risk to human health and the environment would be evaluated based on the actual distribution, depth, and concentrations of the residual radioactive material encountered. The duration and need for institutional controls would be determined based on the results of this evaluation. If needed, long-term activities would include routine inspection and surveillance of the property, infiltration management, and groundwater monitoring.

This is not the preferred alternative because it would cost about $50 million to remove approximately one Curie of contamination. If this contamination were to become accessible, perhaps by the removal of the buildings, then it would be managed based on the actually observed radiological conditions.

THE PREFERRED ALTERNATIVE

Alternative C, Removal of Pile, Biological Shield, Fuel Canal Structure, and Reasonably Accessible Soils, is the preferred cleanup remedy because it represents the best balance of the EPA's criteria for selecting remedies under CERCLA, and it best addresses the overall protection of human health and the environment.

This alternative results in the removal of the pile, the biological shield, fuel-canal structure, and contaminants that pose a threat of exposure through excavation of soils and potential migration to groundwater. It provides a significant reduction in the threat to human health and the environment at a relatively small increase in the cost and duration compared to only removing the pile and biological shield.

THE COMMUNITY'S ROLE IN THE SELECTION

The community has played and continues to play an important role in selecting cleanup alternatives. Therefore, to ensure that community expectations are considered in making the decision on cleaning up the BGRR, DOE encourages the public to submit its input on the PRAP during the formal public comment period, which runs between August 2 and September 3, 2004.

To submit your comments before the end of the comment period, please do one of the following:

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fax: (631) 344-3444
mail: Mr. Michael Holland, Site Manager
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WHERE TO FIND THE PROPOSED PLAN

The Proposed Remedial Action Plan (PRAP) and an accompanying Feasibility Study are available at http://www.bnl.gov/bgrr on the World Wide Web, and at the following libraries:

- BNL Research Library
  Building 477
  Brookhaven National Laboratory
  Upton NY 11973
  (631) 344-3483
- Mastics-Moriches-Shirley Community Library
  301 William Floyd Parkway
  Shirley NY 11967
  (631) 399-1511
- U.S. EPA Region II Library
  290 Broadway
  New York NY 10007
  (212) 637-4296