

ENVIRONMENTAL ASSESSMENT

FOR

THE CONSTRUCTION AND OPERATION

OF THE

CLINICAL ALPHA RADIONUCLIDE
PRODUCTION FACILITY

BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK



U.S. DEPARTMENT OF
ENERGY

Office of Science

BROOKHAVEN SITE OFFICE

February 2024

DOE/EA-2210

Table of Contents

1.0	INTRODUCTION	1
2.0	SUMMARY	1
3.0	PURPOSE AND NEED	9
4.0	ALTERNATIVES	9
4.1	Alternative 1 – Conversion of Building 870 for Radioisotope Production	9
4.1.1	Project Location and Description.....	9
4.2	Alternative 2 – No Action	12
4.3	Alternative 3 – Development and Construction of New Facility	12
5.0	AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS	13
5.1	Site Description	13
5.2	Ecology	14
5.2.1	Affected Environment.....	14
5.2.2	Effects of Alternatives on Ecological Resources.....	17
5.3	Water	19
5.3.1	Affected Environment.....	19
5.3.2	Effects of Alternatives on Water Resources	20
5.4	Land Use, Demography, and Environmental Justice	21
5.4.1	Affected Environment.....	21
5.4.2	Effects of Alternatives on Land Use, Demography and Environmental Justice	25
5.5	Socioeconomic Factors	25
5.5.1	Affected Environment.....	25
5.5.2	Effects of Alternatives on Socioeconomic Factors	25
5.6	Transportation Conditions	26
5.6.1	Affected Environment.....	26
5.6.2	Effects of Alternatives on Transportation Conditions	26
5.7	Cultural Resources	26
5.7.1	Affected Environment.....	26
5.7.2	Effects of Alternatives on Cultural Resources.....	27
5.8	Air Quality	27
5.8.1	Affected Environment.....	27
5.8.2	Effects of Alternatives on Air Quality	27
5.9	Climate	27
5.9.1	Affected Environment.....	27
5.9.2	Effects of Alternatives on Climate.....	28
5.10	Visual Quality	28
5.10.1	Affected Environment.....	28
5.10.2	Effects of Alternatives on Visual Quality	29
5.11	Parkland	29
5.11.1	Affected Environment.....	29
5.11.2	Effects of Alternatives on Parkland.....	29

5.12	Noise	29
	5.12.1 Affected Environment	29
	5.12.2 Effects of Alternatives on Noise.....	30
5.13	Industrial Safety and Occupational Health	30
	5.13.1 Affected Environment	30
	5.13.2 Effects of Alternatives on Industrial Safety and Occupational Health.....	32
5.14	Radiological Characteristics	33
	5.14.1 Affected Environment	33
	5.14.2 Effects of Alternatives on Radiological Characteristics	34
5.15	Natural Hazards	35
	5.15.1 Affected Environment	35
	5.15.2 Effects of Natural Hazards on Alternatives	36
5.16	Intentional Destructive Acts	37
	5.16.1 Affected Environment	37
	5.16.2 Intentional Destructive Acts, Effects on Alternatives	37
5.17	Utilities	38
	5.17.1 Affected Environment	38
	5.17.2 Effects of Alternatives on Utilities	38
5.18	Electric and Magnetic Fields (EMF)	38
	5.18.1 Affected Environment.....	39
	5.18.2 Effects of Alternatives on EMF	39
5.19	Waste Management and Pollution Prevention	39
	5.19.1 Affected Environment	39
	5.19.2 Effects of Alternatives on Waste Management and Pollution Prevention.....	39
5.20	Commitment of Resources	40
	5.20.1 Commitment of Resources under Alternative 1 and Alternative 3.....	40
	5.20.2 Commitment of Resources under the No Action Alternative	40
5.21	Sustainability	40
	5.21.1 Affected Environment	40
	5.21.2 Effects of Alternatives on Sustainability	40
5.22	Upgrades, Decommissioning and Restoration	40
5.23	Cumulative Impacts	41
5.24	Connected Actions	42
6.0	ACRONYMS, INITIALS, AND ABBREVIATIONS	43
7.0	LIST OF AGENCIES CONTACTED AND PRESENTATIONS TO STAKEHOLDERS	45
	7.1 Agencies Contacted	45
	7.2 Stakeholder Presentations	45
8.0	REFERENCES	46

LIST OF TABLES

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative, the Preferred Alternative, and New Construction Alternative 5
Table 2: Low Income Status in Communities Adjacent to BNL Site24
Table 3: Common Noise Exposures.....30
Table 4: Recent History of Earthquakes within approximately 50 miles of Long Island (USGS 2023)36

LIST OF FIGURES

Figure 1: Regional View of Brookhaven National Laboratory Location 2
Figure 2: Aerial View of Brookhaven National Laboratory Core Developed Area..... 3
Figure 3: Waste Management Complex, Building 870 (right center at arrow). 4
Figure 4: Proposed floor plan for CARP facility with air handling building addition. 11
Figure 5: Location of Alternative 3 Proposed Facility (red rectangle to the east of bldg. 870). ... 13
Figure 6: Land Use within 1 mile of the BNL border.23
Figure 7: Estimated population of communities within one mile of BNL.....24
Figure 8: Total Recordable and Days Away or Restricted Rates for BNL.31
Figure 9: Effect of DART injuries in number of days for each type.....32

1.0 INTRODUCTION

The United States (U.S.) Department of Energy (DOE) has prepared this Environmental Assessment (EA) to evaluate the potential environmental consequences of either constructing a new facility or upgrading Building 870 to create a facility called the Clinical Alpha Radionuclide Producer (CARP), which would provide radiochemical processing infrastructure at Brookhaven National Laboratory (BNL) for the processing of radioisotopes from irradiated targets. Building an entirely new facility allows for efficient design and construction whereas upgrading an existing nuclear Hazard Category 3 building will require building modifications to add hot cells and other infrastructure needed for radiochemical processing to produced isotopes currently under sourced or produced outside of the U.S.

The Preferred Alternative is to develop a design that will result in the upgrade of Building 870 that was previously designed as a Hazard Category 3 nuclear facility for the processing of mixed waste. A Hazard Category 3 nuclear facility is defined as having the potential for only significant localized consequences. The design of the CARP would include hot cells and radiochemical processing equipment necessary to meet the scientific mission of the Department of Energy resulting in meeting national radioisotope needs supporting multiple applications.

Alternatives considered are described. This EA will be used to determine whether a “Finding of No Significant Impact (FONSI)” to the environment would result from the development and upgrade of Building 870 with upgrades and enhancements to support radiochemical processing operations of CARP, or whether an Environmental Impact Statement (EIS) must be prepared.

This document complies with the National Environmental Policy Act (NEPA) of 1969, as amended (42 USC 4321-4347); the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500-1508); and the DOE NEPA Regulations (10 CFR 1021).

2.0 SUMMARY

BNL is a national laboratory overseen and primarily funded by the Office of Science (SC) of the DOE, and operated and managed by Brookhaven Science Associates, LLC (BSA). BSA is a limited liability company, formed between Battelle Memorial Institute and The Research Foundation of the State University of New York (SUNY) on behalf of Stony Brook University (SBU). Located 60 miles east of New York City in Upton, NY, the Laboratory operates cutting-edge large-scale facilities (See Figures 1 and 2) for studies in physics, chemistry, biology, medicine, applied science, and a wide range of advanced technologies. BNL’s world-class research facilities are also available to university, industrial, and government personnel from around the world. The Laboratory integrates sustainable operations and environmental stewardship into all facets of its research and operations and is committed to managing its programs in a manner that protects the local ecosystem and public health (BNL 2023).

This EA analyzes the potential environmental impacts associated with:

- The No Action Alternative in which no modifications for establishing the CARP facility would occur. Current radioisotope production would continue but would not be able to meet current demand or add new or increased radioisotope production.
- Convert Building 870, a former Hazard Category 3 nuclear facility, to establish the Clinical Alpha Radionuclide Production facility to process targets irradiated from the

Brookhaven Linac Isotope Producer (BLIP) and from other facilities to produce radioisotopes.

- Construct a new Hazard Category 3 nuclear facility, from the ground up, for processing targets irradiated from the BLIP and from other facilities to produce radioisotopes.

In the No Action Alternative, BNL would continue to operate the radioisotope production program in its current configuration and continue all activities within the current facilities for the foreseeable future.

A summary of the potential environmental impacts of the alternatives is presented in Table 1. Full analysis of these topics is covered in the Environmental Impacts section of this document.

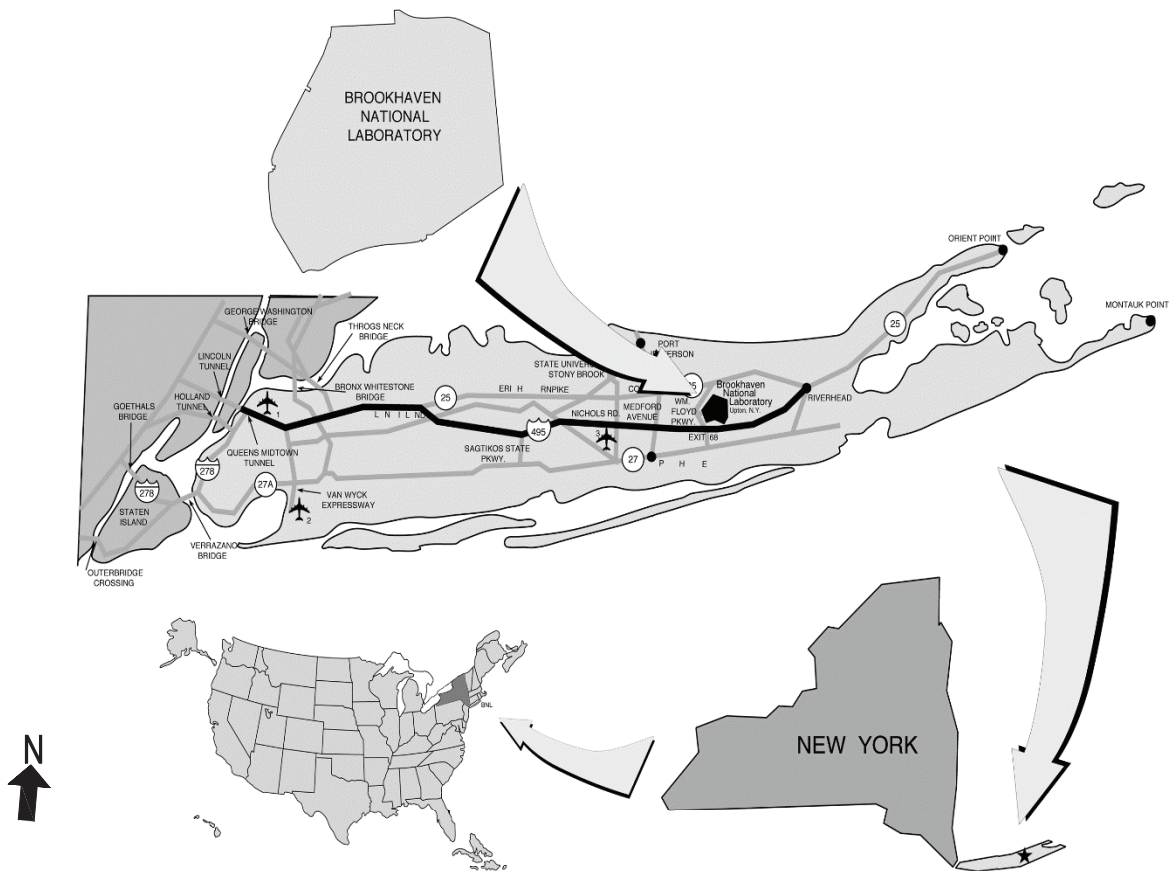


Figure 1: Regional View of Brookhaven National Laboratory Location

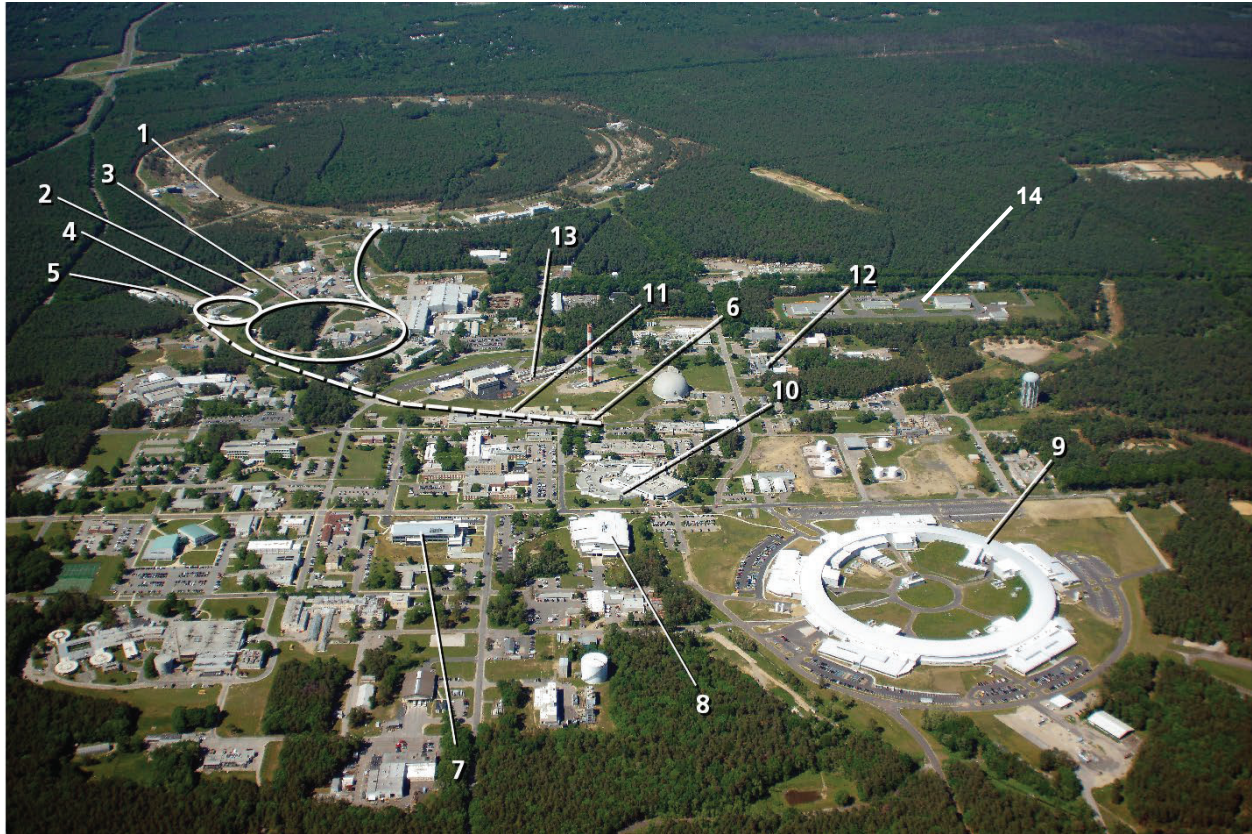


Figure 2: Aerial View of Brookhaven National Laboratory Core Developed Area

- | | |
|--|---|
| 1. Relativistic Heavy Ion Collider | 8. Center for Functional Nanomaterials |
| 2. NASA Space Radiation Laboratory | 9. National Synchrotron Light Source II |
| 3. Alternating Gradient Synchrotron | 10. Computational Science Initiative |
| 4. Alternating Gradient Synchrotron Booster | 11. Tandem Van de Graaff and Cyclotron |
| 5. LINAC and Brookhaven LINAC Isotope Producer | 12. Accelerator Test Facilities |
| 6. Tandem to Booster Tunnel | 13. Isotope Research Laboratories |
| 7. Interdisciplinary Science Building | 14. Waste Management Complex |



Figure 3: Waste Management Complex, Building 870 (right center at arrow).

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative, the Preferred Alternative, and New Construction Alternative

Comparison Factors	The No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 3 (New Construction Alternative)
General Information	No change from the existing BNL operations.	No Change	No Change
Ecological Resources	No change from the existing BNL operations.	No Change	No Change
Water Resources	No change from the existing BNL operations.	Minimal increase in potable water usage for addition of restrooms and deionized water system.	Minimal increase in potable water usage for restrooms and deionized water system.
Land Use, Demography, and Environmental Justice	No change from the existing BNL site conditions.	No Change	No Change
Socioeconomic Factors	No change from the existing BNL site conditions and operations.	No change	No change
Transportation	No change from the existing BNL site conditions and operations.	Minor changes to transportation requirements for use of Type B containers.	Minor changes to transportation requirements for use of Type B containers.
Cultural Resources	No change from the existing BNL site conditions.	No impacts to cultural resources.	No impacts to cultural resources.
Air Quality	No change from the existing BNL site conditions.	No Change, potential radiological releases would be mitigated through air filtration systems and real time monitoring under a National Emission	No Change, potential radiological releases would be mitigated through air filtration systems and real time monitoring under a NESHAP authorization.

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative, the Preferred Alternative, and New Construction Alternative

Comparison Factors	The No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 3 (New Construction Alternative)
Climate	Standards for Hazardous Air Pollutants (NESHAP) authorization. No change from the existing BNL site conditions.	No Change	No Change
Visual Quality	No change from the existing BNL site conditions.	No Change	No Change
Parkland	No Change from the existing BNL site conditions.	No Change	No Change
Noise	No change from the existing BNL site conditions.	Routine construction noise would occur during the construction period, noise would return to normal levels during operational period.	Routine construction noise would occur during the construction period, noise would return to normal levels during operational period.
Industrial Safety and Occupational Health	No change from the existing BNL site conditions.	No Change	No Change
Radiological Characteristics	No change from the existing BNL site conditions.	Potential radiological release from hot cells mitigated through air filtration systems and real time monitoring under NESHAP authorization.	Potential radiological release from hot cells mitigated through air filtration systems and real time monitoring under NESHAP authorization.
Natural Hazards	No change from the existing BNL site conditions.	No Change	No Change
Intentional Destructive Acts	No change from the existing BNL site conditions.	Potential for intentional destructive acts mitigated through location of facilities within secure fenced compound and limited facility access.	Potential for intentional destructive acts mitigated through location of facilities within secure fenced compound and limited facility access.

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative, the Preferred Alternative, and New Construction Alternative

Comparison Factors	The No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 3 (New Construction Alternative)
Utilities	No change from the existing BNL site conditions.	Minimal increase in electric and water usage.	Minimal increase in electric and water usage.
Electric and Magnetic Fields (EMF)	No change from the existing BNL site conditions and operations.	No Change	No Change
Waste Management and Pollution Prevention (P2)	No change from the existing BNL site conditions and operations.	Reuse and recycling of materials would be maximized where possible. Modifications would use, to the greatest extent technically feasible and practicable, Federal sustainable design and operations principles for existing buildings in accordance with the Guiding Principles. Increased processing of targets for radioisotope production may lead to increases in radiological activity resulting in modifications to operations and or reclassification of Building 865 at Waste Management.	Reuse and recycling of materials would be maximized where possible. New construction would meet High Performance Sustainable Buildings requirements. Increased processing of targets for radioisotope production may lead to increases in radiological waste resulting in modifications to operations and or reclassification of Building 865 at Waste Management.

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative, the Preferred Alternative, and New Construction Alternative

Comparison Factors	The No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 3 (New Construction Alternative)
Commitment of Resources	No change from the existing BNL site conditions.	Upgrading Building 870 would require steel, concrete, wood, copper, etc., and the associated structures needed to support the establishment of the CARP. Operation would utilize electricity and water.	Building a new facility would require steel, concrete, wood, copper, etc., and the associated structures needed to support the establishment of the CARP. Operation would utilize electricity and water.
Sustainability	No change from the existing BNL site conditions.	Upgrading Building 870 would utilize Federal sustainable building principles to meet as many of the principles as possible. Reuse of an existing building would lessen need for new materials for construction.	Construction of a new facility would fully meet applicable requirements of Federal sustainability principles.
Decommissioning and Restoration	No change from the existing BNL site conditions	Decommissioning and restoration activities would be planned to minimize impacts.	Decommissioning and restoration activities would be planned to minimize impacts.

3.0 PURPOSE AND NEED

The mission of the Department of Energy's Isotopes R&D and Production program (DOE IRP) is to produce and/or distribute radioactive and stable isotopes that are in short supply, including by-products, surplus material and related isotope services. DOE IRP supports and upgrades the infrastructure required to produce and supply priority isotope products and related services; conducts R&D on new and improved isotope production and processing techniques which can make available priority isotopes for research and applications; supports workforce development; ensures robust domestic supply chains; and works to reduce U.S. dependency on foreign supply to ensure national preparedness.

The purpose of the CARP is to deliver a fully functional at minimum Hazard Category 3 nuclear facility at Brookhaven National Laboratory including hot cells and associated equipment for processing radioisotopes that meet the guidelines for use in humans and handling waste from that processing. The CARP is necessary to enable the production demand that is projected for the nation as well as furthering research efforts. This will allow advancement of our understanding of nuclear and radiochemistry; further fundamental science and technological innovations; and advance isotope production and nuclear services to support the national security of the U.S.

The DOE has identified a national need for the design and construction of at a minimum Hazard Category 3 nuclear facility for hot cell processing of radioisotopes to address the gap in processing facilities to fulfill the increased and improved production capabilities for radionuclides meeting the national need for these materials. Radionuclides are needed for:

- Industrial applications
- Medical applications and research
- National Security
- Current unmet need for alpha emitters for clinical trials
- Ability to produce tens of Curies/batch of radioisotopes

4.0 ALTERNATIVES

4.1 Alternative 1 – Conversion of Building 870 for Radioisotope Production

4.1.1 Project Location and Description

Figure 3 depicts the location of Building 870 within the Waste Management complex. Figure 4 depicts the current conceptual design for Building 870 as the Clinical Alpha Radionuclide Production facility (CARP).

Facility modification and upgrades addressed in this EA include:

- Replacement of entire building Heating, Ventilation, and Air Conditioning (HVAC) system
- Installation of new exhaust system for preparation rooms and hot cells, including exhaust fans, high efficiency particulate air (HEPA) / high efficiency gas absorber (HEGA) filter bank enclosure, exhaust stacks, and acid scrubber system

- Replacement of entire building electrical system
- Installation of new building controls and security system
- Construction of new restroom(s) (building does not currently have restrooms)
- Upgrades to the existing fire detection / suppression system
- Construction of hot cells and installation of shielded viewing windows, manipulators, and glove boxes
- Installation of target cask/carriage frame and clamshell/port door
- Fill-in of the loading dock and closure of the open wall to house mechanical equipment
- Exterior improvements:
 - New building to house the HEPA / HEGA filter enclosure and support the exhaust fans / stack
 - New 13.8 kV underground service line to the building and step-down transformer
 - New diesel backup generator
 - New underground potable water and sanitary lines to the building
 - New fire service main and lateral

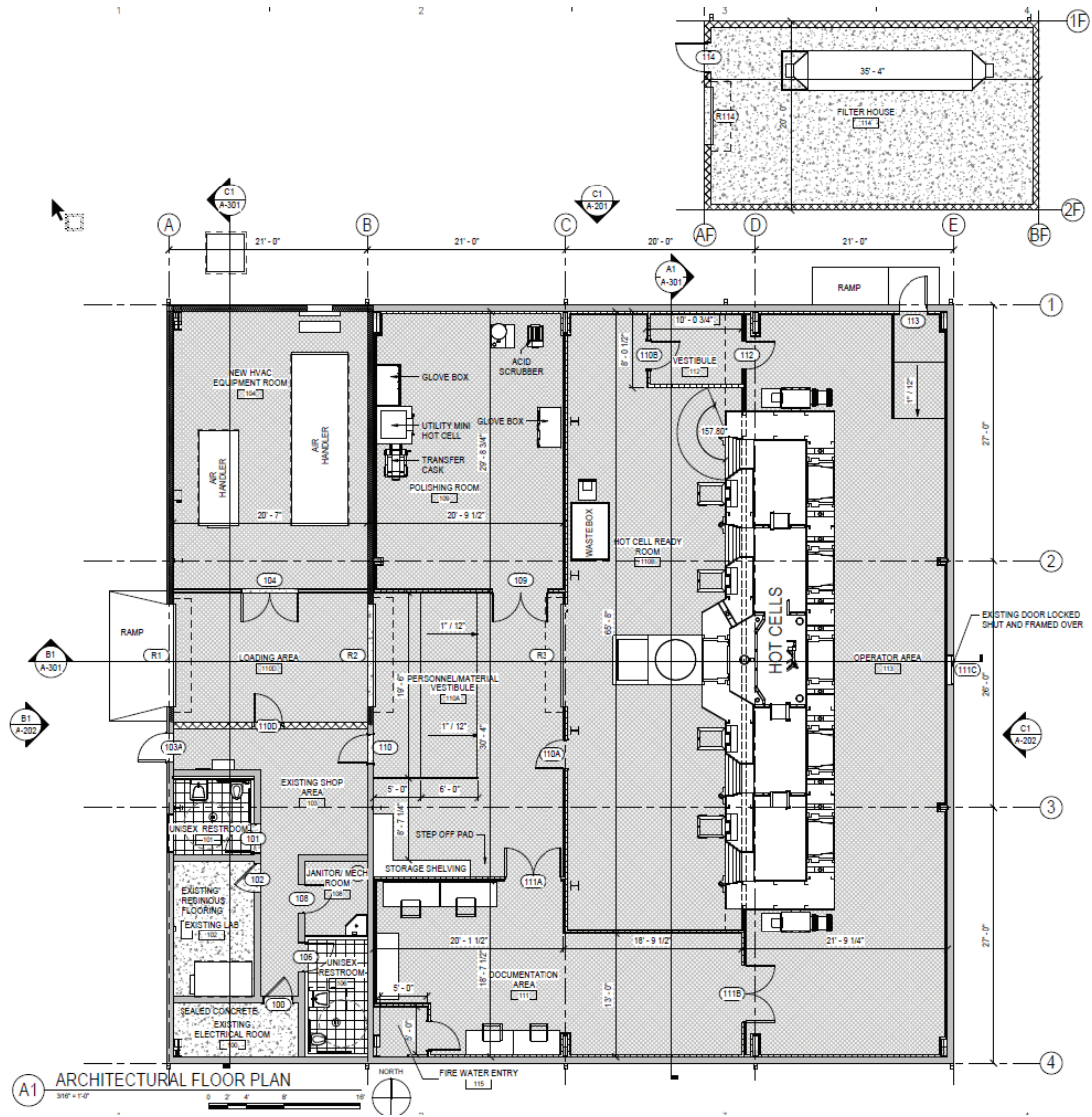


Figure 4: Proposed floor plan for CARP facility with air handling building addition.

4.2 Alternative 2 – No Action

The No Action Alternative would maintain the current conditions and operations of the radio-isotope production program. The isotope production program mission would continue for the foreseeable future, and in addition to the routine maintenance and modifications of facilities and equipment, could include the development of facility upgrades within the existing Isotope Production program facilities. No additional ground disturbance would be expected under the No Action alternative.

4.3 Alternative 3 – Development and Construction of New Facility

Alternative 3 (see figure 5 for location) would add an entirely new facility within the Waste Management complex, with the new building located just to the east of Building 870. The new facility would be approximately 9,000 square feet, be designed specifically for radioisotope production, and have similar features as those proposed under Alternative 1.

Facility construction addressed in this EA includes:

- Construction of new building including site preparation, foundation, and structure
- Installation of exhaust system for preparation rooms and hot cells, including exhaust fans, HEPA / HEGA filter bank enclosure, exhaust stacks, and acid scrubber system
- Installation of building electrical system
- Installation of building controls and security system
- Restrooms
- Fire detection / suppression system
- Construction of hot cells and installation of shielded viewing windows, manipulators, and glove boxes
- Installation of target cask/carriage frame and clamshell/port door
- New 13.8 kV underground service line to the building and step-down transformer
- New standby diesel generator
- New underground potable water and sanitary lines to the building
- New fire service main and lateral



Figure 5: Location of Alternative 3 Proposed Facility (red rectangle to the east of bldg. 870).

5.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

This section describes the general environment in the area for the proposed alternatives along with specific environmental elements that may be affected. The effects of each alternative on these elements are presented within each subsection. All alternatives have similar effects; therefore, the description of effects will be for all alternatives unless there is a variance between alternatives. Variable effects under any specific target will be parsed out and a description of the effects will be detailed. For additional information on BNL, including detailed environmental monitoring results, please refer to BNL's annual Site Environmental Report (SER) (BNL 2023) available at www.bnl.gov/esh/env/ser.

5.1 Site Description

BNL encompasses a total of 5,265 acres (2,131 hectares) with most principal facilities located near its central developed area, which occupies approximately 1,820 acres (737 hectares). The remaining 3,445 acres (1,394 hectares) of the site are largely wooded and part of the Long Island Central Pine Barrens (CPB) region. The CPB is divided into two areas 1) the compatible growth area (CGA) where development is allowed but must meet minimum standards; and 2) the core preservation area (CPA) where development is not allowed except under rare exceptions. The central portion of BNL is within the CGA as designated by the Central Pine Barrens Joint Planning and Policy Commission (Commission), while the areas outside the central portions of the Laboratory are designated as CPA by the Commission. The Peconic River is the major surface water feature found on the BNL site. Its headwaters start west of the BNL site, and it flows eastward through the Relativistic Heavy Ion Collider (RHIC), then begins

to flow southeast from the RHIC complex leaving the site near the southeast corner of BNL. The onsite portions of the Peconic River have been designated as “Scenic” by the New York State Department of Environmental Conservation (NYSDEC) under the New York State Wild, Scenic, and Recreational Rivers Act (NYS WSRRA). Under the Act, the NYSDEC has established a 0.5-mile (0.8 km) buffer on either side of the river which limits certain activities and development that are not compatible with the designation. BNL, as a federal enclave, is not bound by NY State Environmental Conservation Law (ECL) Article 57 establishing the Central Pine Barrens or the NYS-WSRRA. However, DOE works within the spirit of these laws whenever possible by conducting review of standards and/or applying for appropriate permits. Both Alternative 1 and 3 are fully within the CGA, not within the 0.5-mile Peconic River buffer and therefore are unlikely to result in any impacts within the CPA or Scenic River Corridor.

The Waste Management complex sits in the central area of the Lab and is surrounded by mostly managed lawn, with forests to the north and east consisting of white pine (*Pinus alba*) to the north and a mix of white pine and typical pine barrens vegetation (pitch pine [*Pinus serrotina*] and various oak [*Quercus spp.*] species) and both areas containing ericaceous (*Vaccinium spp.*) understory. The area to the south and west is composed mostly of the BNL campus consisting of buildings and lawns. Immediately to the south of the eastern end of the Waste Management complex is a group of recharge basins that receive stormwater from the area to the west of it and once through cooling water from the Alternating Gradient Synchrotron (AGS) complex.

5.2 Ecology

5.2.1 Affected Environment

The Laboratory has a comprehensive understanding of the various ecological resources present on-site through multiple efforts including an extensive biological investigation conducted in the mid-1990s called the Site Wide Biological Inventory (Lawler, et. al, 1995); the Natural Resource Management Plan (NRMP) (BNL, 2021); the establishment of the Upton Ecological & Research Reserve (Upton Reserve) in 2000; and the subsequent studies conducted under both the Upton Reserve and Natural Resources Program as well as volunteer work conducted by the Foundation for Ecological Research in the Northeast (FERN) now the Foundation for Research and Stewardship of the Long Island Pine Barrens Maritime Reserve (FOREST), a non-profit organization.

Vegetation

Vegetation at BNL is for the most part typical of the Pine Barrens in which the site is situated. A 2003 aerial photo analysis of vegetation on-site identified 12 vegetation classes. Vegetation ranges from open lawns and early successional vegetation areas associated with the constructed portions of the Laboratory, to mature forests and pine plantations. Historically, much of the forested area of the BNL site has been disturbed by tree cutting for fuel (cord wood industry 1800s) to extensive site-wide clearing of trees for the establishment of Camp Upton during World War I (WW I). The forests are in various stages of succession depending on when disturbance last occurred. More than 350 species of plants have been identified on the BNL site with thirty-three of these being identified as NY State designated threatened, endangered, rare, or exploitably vulnerable. None of the rare plants are known to be within the proximity of the proposed project areas.

Peconic River and Wetland Resources

What is now known as the Peconic River on the BNL site was considered swamp or wetlands prior to WW I. Starting with construction during WW I the wetlands were trenched or ditched to facilitate drainage and water flow to reduce the number of mosquitoes and related mosquito borne diseases. The on-site sections of the Peconic River and its tributaries continue to show evidence of these trenching activities with ditches ranging from 6 to 12 feet (1.8 to 3.6 meters) wide and up to 4 feet (1.2 meters) deep along with side cast sediment. This ditching extends from an area west of the William Floyd Parkway, through the BNL site including the RHIC area, and past the BNL eastern boundary.

Besides the Peconic River there are numerous wetlands on the BNL site that support various reptile and amphibian species, birds, mammals, and various plant species. Of the various wetlands, six are considered large enough to be classified as jurisdictional wetlands under the Clean Water Act.

Invasive Species

The area of the proposed project contains several invasive species including Japanese Barberry (*Berberis thunbergii*), black locust (*Robinia pseudoacacia*), Asiatic bittersweet (*Celastrus orbiculatus*), Japanese stilt grass (*Microstegium vimineum*), black and/or pale swallowwort (*Vincetoxicum ssp.*), and phragmites (*Phragmites australis*). These species were intentionally introduced to the area as ornamentals (e.g., Japanese Barberry), inadvertently transported to Long Island and BNL by visitors, or transferred through movement by animals. The proposed project area has invasive species isolated to the lawns around buildings and along roadways (swallowwort and black locust); and areas in and near recharge basins (e.g., barberry, bittersweet, and phragmites).

Threatened, Endangered, or Species of Concern

The Northern long-eared bat (*Myotis septentrionalis*) was determined to be endangered under the federal Endangered Species Act in March 2023. This is the only federally threatened or endangered species known on the BNL property. Other federally threatened or endangered species listed for the Long Island region are located some distance away either in coastal areas or the Hempstead Plains to the west. The NY State designated endangered eastern tiger salamander (*Ambystoma t. tigrinum*) inhabits multiple wetlands on BNL including one of the basins to the south of the proposed CARP facility. The Monarch butterfly (*Danaus plexippus*) is a federal candidate species for listing. It has experienced significant population declines in recent decades and relies on the presence of milkweed for egg laying and development of larvae (caterpillars). Monarchs are routinely seen on the BNL site utilizing milkweed found in multiple locations around the Lab. The peregrine falcon (*Falco peregrinus*) is known to utilize the BNL site and has been documented nesting on site in 2019, 2020 and 2021. This species typically hunts smaller birds and rodents and is not expected to utilize areas within the vicinity of the CARP facility. Species listed by NY State as species of special concern that are present in the area of the proposed CARP facility include the eastern spadefoot toad (*Scaphiopus holbrookii*), eastern hognosed snake (*Heterodon platyrhinos*), and the eastern box turtle (*Terrapene c. carolina*). Other species of special concern that may periodically be seen in the proposed project are the Cooper's hawk (*Accipiter cooperi*), and the sharp-shinned hawk (*Accipiter striatus*). A full listing of threatened, endangered, special concern species and species of greatest conservation need may be found in the annual SER (BNL 2023).

Migratory Birds including Eagles

Under the Laboratory's Natural Resource Management Plan, bird surveys have been conducted through all of the major habitat types on site. Surveys have been conducted from April through August annually since 2000, and a total of 134 species of birds have been documented. Between 1948 and the present, 216 bird species have been documented on-site and approximately 85 species routinely utilize BNL for nesting. A number of migratory birds listed by the U.S. Fish & Wildlife Service (FWS), through the iPAC system, as birds of conservation concern or special status are known on the BNL site including the bald eagle (*Haliaeetus leucocephalus*), blue-winged warbler (*Vermivora pinus*), chimney swift (*Chaetura pelagica*), eastern whip-poor-will (*Antrostomus vociferus*), lesser yellowlegs (*Tringa flavipes*), prairie warbler (*Dendroica discolor*), red-headed woodpecker (*Melanerpes erythrocephalus*), and wood thrush (*Hylocichla mustelina*). These birds may utilize the Lab site and potentially be found near the proposed CARP facility.

Other species identified by the FWS, through the iPAC system, but are not known on the BNL site either due to lack of appropriate habitat or not documented include Black Skimmers (*Rynchops niger*), bobolink (*Dolichonyx oryzivorus*), prothonotary warbler (*Prontocharitrea citrea*), and rusty blackbird (*Euphagus carolinus*).

Mammals

A number of mammals utilize the various habitats at BNL, including the forests surrounding the proposed CARP facility. The largest mammal found at BNL is the white-tailed deer (*Odocoileus virginianus*), which is present in numbers exceeding 30 per square mile (12 per square kilometer). Recent implementation of deer management has significantly lowered the number of deer within the constructed portion of the BNL campus. BNL also provides habitats for small mammals such as bats, mice, squirrels, rabbits and medium-sized mammals such as groundhogs (*Marmota monax*), raccoons (*Procyon lotor*), red fox (*Vulpes velox*), and grey fox (*Urocyon cinereoargenteus*). Virtually all known mammal species found on the BNL site may utilize the area around the proposed CARP facility.

Since 2011 BNL has been documenting presence of bats on the BNL site. Bat species identified include the federally endangered northern long-eared bat, little brown bat (*M. lucifugus*), eastern small-footed bat (*M. leibii*), tricolored bat (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), silver-haired bat (*L. noctivagans*) and hoary bat (*L. cinereus*). All but the small-footed and tricolor bats have been confirmed through capture or observation. Although, both bats have been documented using acoustic surveys. All of these species may utilize trees during summer and bats in the genus *Myotis* may utilize poorly sealed buildings during other seasons.

Reptiles and Amphibians

BNL is home to 28 species of reptiles and amphibians. The various species are distributed throughout BNL but may be localized depending on their habitat requirements. Reptiles like the eastern box turtle may be found in virtually all habitats on-site, whereas many species of snakes and other turtles are localized near wetland resources. Frogs and toads are isolated around wetlands and recharge basins during breeding periods but may be found moving away from wetlands to forage for food during the late spring through summer months. Several salamander species can be found in and adjacent to wetland areas on-site. These salamanders include the NY State designated endangered eastern tiger salamander, marbled salamander (*A. opacum*),

red-spotted newt (*Notophthalmus viridescens*), and red-backed salamander (*Plethodon cinereus*). Additionally, four-toed salamanders (*Hemidactylium scutatum*) are known to inhabit specific habitats along the Peconic River containing tussock sedge (*Carex stricta*) and/or sphagnum mosses (*Sphagnum sp.*).

Fish

There are six species of fish historically known from the Peconic River on BNL including the NY State designated threatened banded sunfish (*Enneacanthus obesus*), pumpkinseed (*Lepomis gibbosus*), bluegill (*Lepomis macrochirus*), chain pickerel (*Esox niger*), largemouth bass (*Micropterus salmoides*), creek chubsucker (*Erimyzon oblongus*), and brown bullhead catfish (*Ameiurus nebulosus*). The swamp darter (*Etheostoma fusiforme*), a NY State designated threatened species is also known to use the Peconic River but has not been confirmed within the onsite stretch of the river. These species of fish utilize a variety of habitats within the river from slow moving backwater areas to deep open water pools. During high flow periods fish have been documented as far upstream as the ponds within the RHIC complex. In these rare cases fish had to overcome multiple barriers to fish passage. In general fish can only move up and downstream during extreme high water and flow periods which typically occur every 10 to 15 years. Since the Laboratory stopped discharging water from the Sewage Treatment Plant (STP) in November 2014 the flow of water offsite has decreased, and offsite flows have not occurred since 2015. Without routine flows, the only species of fish documented on site are pumpkinseed and chain pickerel.

5.2.2 Effects of Alternatives on Ecological Resources

None of the alternatives will result in significant changes in water use, electricity use, and increases in sewage. The operation of the proposed CARP facility (Alternative 1 and Alternative 3) would not likely result in radiological releases impacting ecological receptors due to installation of air filtering systems and other safeguards to be put in place to prevent releases. BNL's experience with the use of engineering and administrative controls at the Radionuclide Research and Production Lab at Building 801 have shown that they are effective at preventing environmental releases. The proposed facilities are within the built environment of the Lab and are some distance from wetland and river resources.

Effects on Vegetation

The CARP is wholly within the CGA of the CPB located on the BNL site. There is a potential need to remove small trees that have emerged within the lawn areas in the eastern portion of the Waste Management complex in the vicinity of Building 870 that is also the proposed site for Alternative 3. Since the area has already been cleared for the construction of the Waste Management facilities (bldgs. 855, 860, 865, and 870) the area is considered 'developed' under the Land Use Plan for the Central Pine Barrens.

Effects on Peconic River and Wetland Resources

Due to the distance to the Peconic River and nearest wetland resources, the CARP Facility is not expected to have any effect on these resources from construction and operations.

Effects on Invasive Species

Disturbance of the area within the Waste Management complex where Building 870 is located may increase potential for invasive plant species to invade after construction is completed. Existing small trees within the area consist of black locust, an invasive species, and construction activities would provide an opportunity to reduce the presence of this invasive.

Effects on Threatened, Endangered, or Species of Concern

The recharge basins to the south of the proposed CARP facility receive stormwater runoff from the Waste Management complex while the one tiger salamander pond to the south of the proposed facility receives runoff from the area immediately surrounding the pond and from areas to the west of the pond. Tiger salamanders utilizing the pond would not be expected to be impacted from any of the alternatives. Other NY threatened or species of concern would likewise not be impacted from any of the alternatives as no significant changes to surrounding habitats would occur.

The northern long-eared bat (federally endangered) primarily utilizes trees for roosting during summer months. Winter hibernacula are suspected to occur somewhere on Long Island and possibly at BNL. This bat has been documented on the BNL site as early as March suggesting that there may be a small population of this bat historically overwintering either on or in the vicinity of BNL. Bats in the genus *Myotis* are known to enter and utilize buildings. In existing buildings, when bats are found or reported as nuisance animals, they are captured, when possible, and released without harm. Building 870, while not recently in use, has been maintained secure and tight. Inspections of the building have not shown the presence of bats. The trees in the immediate surrounding area within the compound are of very small diameter and are not likely to support summer roosting. If removal of trees becomes necessary for the construction of the CARP facility, appropriate consultation with the U.S. Fish and Wildlife Service through the iPAC system will be completed, and tree removal will be completed between December 1 and February 28 to avoid any impacts to northern long-eared bats, or an incidental take permit will be obtained if tree removal cannot be scheduled between these dates. Prior to the start of building renovations, Building 870 will be inspected for the presence of bats.

Other threatened and endangered (T&E) species identified through the iPAC system, piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufus*), utilize coastal systems and are not present on the BNL site and therefore would not be affected under any of the alternatives.

The candidate species, eastern monarch butterfly (*Danaus plexippus*), is present on site and utilizes milkweed for laying eggs and larval use. Monarchs are not expected to be affected by any of the alternatives. BNL does actively plant for pollinator species and actively works to protect milkweed resources for monarch use. BNL also utilizes integrated pest management (IPM) to limit the use of pesticides that might impact desirable invertebrates.

Effects on Migratory Birds including Eagles

None of the three alternatives would be expected to affect migratory birds as none of the habitat in the area surrounding the proposed facility would be disturbed and no radiological emissions would be expected with monitoring controls in place and the use of HEPA/HEGA filters to remove particulates.

Effects on Mammals

None of the three alternatives would be expected to affect mammals as fencing would keep out deer. Smaller mammals like rodents would not be affected even in the immediate vicinity to the proposed facility as no radiological emissions would be expected with engineering and monitoring controls in place and the use of HEPA/HEGA filters to remove particulates.

Effects on Reptiles and Amphibians

None of the three alternatives would be expected to affect reptiles and amphibians. While eastern box turtles are known to enter the Waste Management complex through gaps under gates, and salamanders have been seen in storm drains, no radiological emissions would be expected with engineering and monitoring controls in place and the use of HEPA/HEGA filters to remove particulates. Liquid effluents would be restricted to sanitary discharges going to the STP and monitoring controls would prevent radiological release to the environment. Stormwater releases to Recharge Basin HO or surface flow would not be expected to contain radiological components due to controls.

Effects on Fish

Due to distance from the Peconic River the CARP facility would have no impact on fisheries resources.

5.3 Water

5.3.1 Affected Environment

Water resources associated with BNL include both surface water and groundwater.

Surface Water

BNL lies within the headwater region of the Peconic River watershed. The Peconic River is a groundwater fed stream. Standing and flowing water is observed during periods of high precipitation and high-water table conditions. During extended periods of low precipitation, the Peconic River and its associated wetlands can be completely dry. Starting in late 2014 all discharges to the Peconic River from the STP were diverted to groundwater recharge basins. As a result, the Peconic River has reverted to a naturally functioning stream similar to hydrologic conditions present prior to 1917 when the first STP was established.

Coastal plain ponds and ephemeral wetlands are also found throughout the site and provide habitat for a number of wildlife species including tiger and other salamanders, frogs, toads, and reptiles. The Peconic River and its associated wetlands are the key wetland features at BNL. The closest wetlands to the proposed facilities are approximately one-third of a mile (535 meters) away. Several recharge basins are also found within the developed portion of the BNL site with some providing habitat to various wetland dependent species and are further discussed under impact to ecological resources in Section 5.2.2 above.

Scenic River Corridor

The onsite portions of the Peconic River have been designated as “Scenic” by the NYSDEC under the *New York State Wild, Scenic, and Recreational Rivers Act* (NY WSRRA). Under the Act, the NYSDEC has established a 0.5-mile (0.8 km) buffer on either side of the river which limits certain activities and development that are not compatible with the designation. Any actions causing disturbance within the river channel or within 100 ft. (30 m) of a designated wetland would require freshwater wetlands permit and/or a NY WSRRA permit from the NYSDEC. The proposed facilities under the alternatives being considered fall outside the boundaries of the Scenic River Corridor.

Groundwater

BNL is situated over a U.S. Environmental Protection Agency (EPA)-designated sole-source aquifer system that is the primary regional source of drinking water. The underlying groundwater is further classified by New York State as Class GA groundwater, which is defined as a source of potable water. Federal drinking water standards, NYS drinking water standards as well as NYS ambient water quality standards (AWQS) for class GA groundwater are used as goals for groundwater protection and remediation.

Groundwater flow directions across the BNL site are influenced by natural drainage systems: eastward along the Peconic River, southeast toward the Forge River, and south to southwest toward the Carmans River. Pumping from on-site supply wells and recharge basins affect the direction and speed of groundwater flow, especially in the central, developed areas of the site. The main groundwater divide on Long Island is aligned generally east–west and lies approximately one-half mile north of the Laboratory. Groundwater north of the divide flows northward and ultimately discharges to the Long Island Sound. Groundwater south of the divide flows east and south, discharging to the Peconic River, Peconic Bay, south shore streams, Great South Bay, and Atlantic Ocean.

BNL has an extensive groundwater monitoring and protection program with more than 700 permanent monitoring wells. All major facilities with potential for impacts to groundwater have monitoring wells including a network of monitoring wells for the Waste Management complex. Groundwater monitoring is conducted to verify that the Waste Management facility is not impacting groundwater. Results of groundwater monitoring are published annually in the SER (BNL, 2023).

BNL utilizes its own wells and distribution system for potable and process water. Groundwater is currently pumped from 4 wells, including wells 11 and 12 within close proximity (located outside of the Waste Management complex fence to the north), to the proposed facilities, that produce approximately 1,320 million liters (348.7 million gallons) per year of water for use as potable water, in cooling towers, and once through cooling water.

5.3.2 Effects of Alternatives on Water Resources

Effects on Surface Waters

Since the proposed facilities are not within proximity to wetlands there would be no effects on surface waters from any of the alternatives. Even with potential to increase impervious surfaces due to construction of a new facility, the surrounding lawns would allow for the infiltration of

water to the ground limiting any surface flows to only the most intense rains. Those flows would then be directed to the stormwater system that is directed to recharge basins where they would add to groundwater. Sediment controls during construction would prevent soil and silt from entering recharge basins.

Effects on Scenic River Corridor

Since the Waste Management complex and the proposed CARP facility are outside the half mile scenic river corridor, there would be no effects to the Peconic River wetlands or scenic river corridor.

Effects on Groundwater

Although BNL is situated above a sole source aquifer, construction and operation of the CARP facility should not affect groundwater quality. The BNL Standards Based Management System Subject Areas "Liquid Effluents" and "Spill Response" provide rules related to discharges and protection of groundwater and cleanup requirements for spills. BNL strictly adheres to requirements for protection of groundwater and provides immediate cleanup of spills. The extensive groundwater monitoring well network and program provide significant data to track potential contamination. If groundwater contamination is detected, immediate actions occur to prevent degradation of groundwater resources. Results of groundwater monitoring are reported annually in Chapter 7 and Volume II of the annual SER (BNL 2023). To date no effects to groundwater have been detected resulting from operations within the Waste Management complex or from BNL's radionuclide processing facilities.

Potable water used by BNL, and surrounding communities comes from the underlying EPA designated sole source aquifer system. Protection of the aquifer requires scrutiny of all operational programs on water consumption and potential contamination. The water consumption by the proposed CARP facility would be limited to de-ionized/distilled water for processes and domestic uses and would not significantly increase pumping rates for the potable water system. The majority of the water used by the CARP facility, except for process waters sent out as waste, would be returned to the aquifer through the sanitary system and the STP.

Electric usage and energy requirements will likely result in the need for a new emergency generator to ensure no loss of power during a grid outage. This generator would have a permitted above ground fuel oil tank that could leak. However, the likelihood of impact to surface or groundwater is low due to requirements for double walled tanks, spill containment, and routine inspections.

5.4 Land Use, Demography, and Environmental Justice

5.4.1 Affected Environment

Land Use

The current BNL site was established in 1947 specifically to develop and construct both small and large-scale scientific facilities. Figure 6 "Land Use within 1 mile of the BNL border" presents a 2023 aerial photograph of the Laboratory site and surrounding areas. Land use to the east, within one mile (1.6 kilometers) of the Laboratory, consists of preserved open space, public and private land dedicated to public recreation, and low-density residential areas of one

dwelling or less per acre. To the north is a mixture of residential properties, commercial retail and service properties, public utility services, and open space. Schools and churches, open space, and low-to-medium density residential areas are found to the west. To the south are commercial and industrial properties, vacant land, and medium-to-high density residential areas of two or more dwellings per acre. On-site land use consists of open space, scientific, industrial and commercial, and residential areas. The onsite brownfield areas are designated for industrial use within established controls.

Demography

Based on the 2020 U.S. Census, approximately 10,302 persons live in communities within one mile of the Laboratory. Figure 7 shows BNL boundary and 1-mile extent superimposed over a map of the communities with estimated population.

The Laboratory's on-site population includes approximately 2,750 employees and more than 5,000 guest researchers who visit each year. On a daily basis an average of 184 people live in temporary on-site housing and during the summer months an average of 200 additional guest scientists and students who visit the Laboratory stay in the dormitories.

Environmental Justice

Environmental Justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies.

Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the adverse environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies. Federal agencies must identify and address disproportionately high and adverse effects of federal projects on the health or environment on minority and low-income populations (Executive Order 12898). An environmental justice population is defined as a population being at least half minority status or at least half low-income status, or this status is meaningfully greater than the general population. A minority is defined as Black or African American, Hispanic or Latino, Asian, American Indian and Alaskan Native, Native Hawaiian and other Pacific Islander.

BNL is situated within the Town of Brookhaven which has a population of 485,773 persons, based on the 2020 U.S. Census data. According to the 2020 U.S. Census data, approximately 12 percent of Brookhaven Town's population consisted of minorities and 6.9 percent of the population live in poverty (Table 2). The northeast corner of BNL meets the boundary of the Town of Riverhead which has a population of 35,902 based on the 2020 census of which approximately 30 percent are minority and 9.2 percent live in poverty. Poverty levels within the two townships are compared to 6.1 percent of people in Suffolk County that live in poverty.

Using the U.S. EPA's EJ Screen web-based mapping tool, of the 10,302 individuals living within 1-mile of the Lab, approximately ten percent are black, ten percent Hispanic, and eighty percent white. The annual average per capita income is \$57,515.

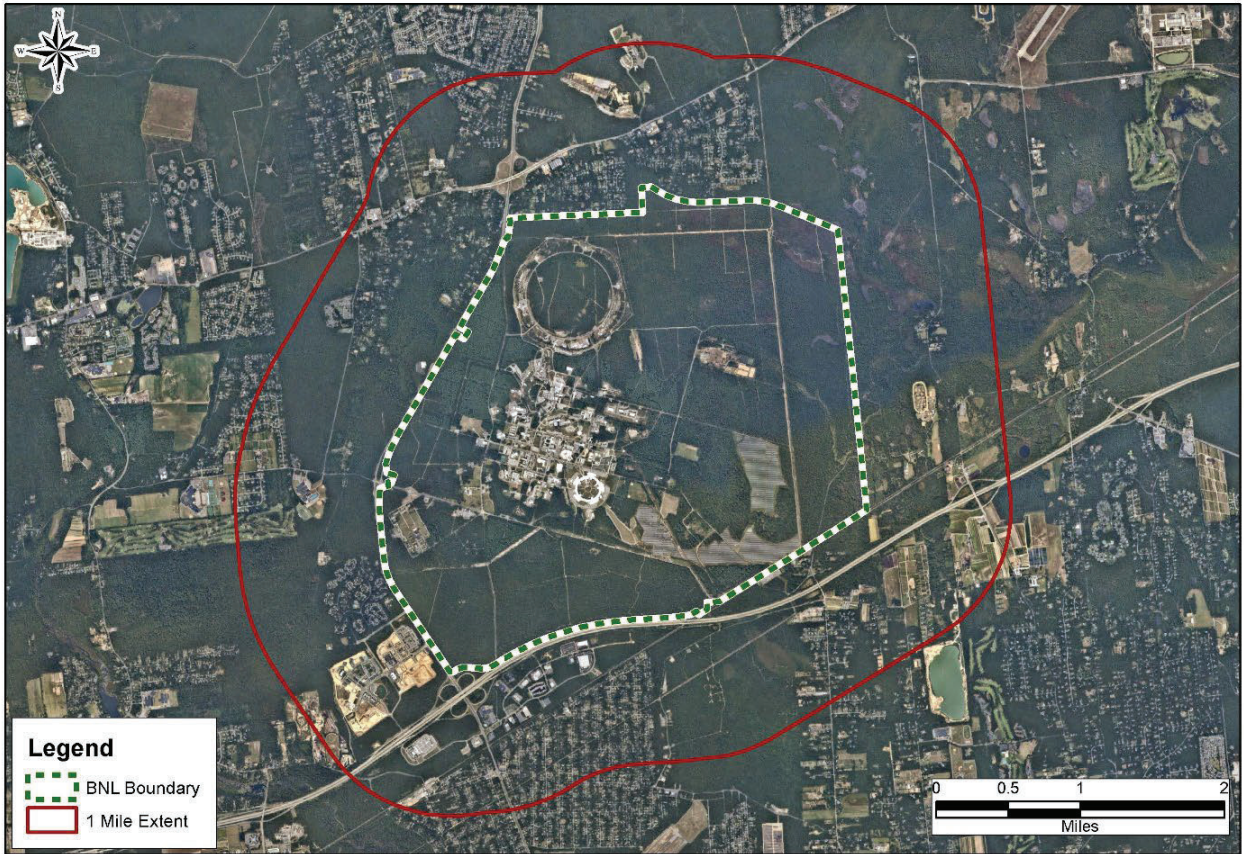


Figure 6: Land Use within 1 mile of the BNL border.

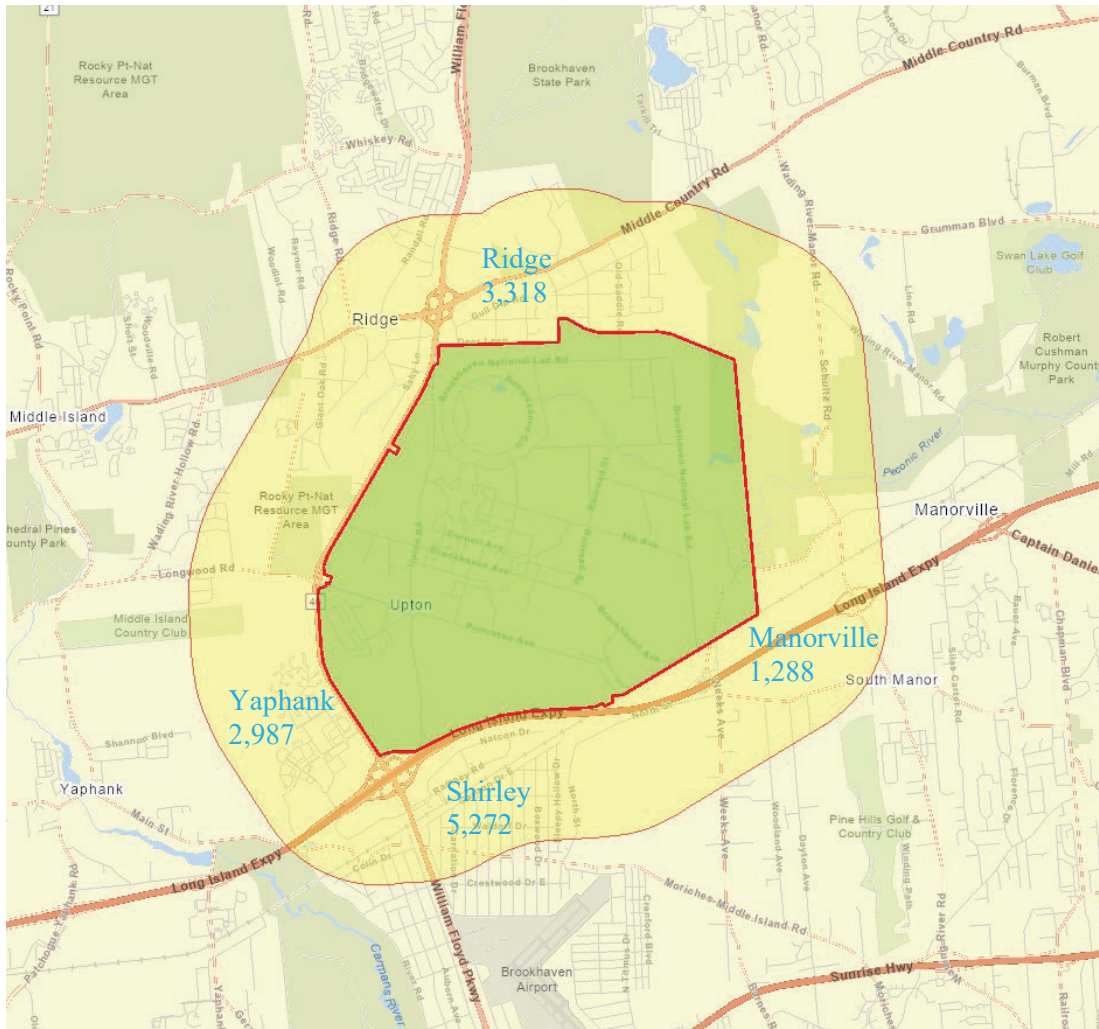


Figure 7: Estimated population of communities within one mile of BNL.

Table 2: Low Income Status in Communities Adjacent to BNL Site

Town or Community	Population (2020)	Poverty Status in 2020 – Individuals*	Population in Poverty Status
Brookhaven Town	485,773	6.9 %	33,518
Ridge	13,271	7.4 %	982
Shirley	26,360	7.7%	2,030
Manorville	14,317	10.1 %	1,446
Yaphank	5,974	3.9 %	233
Combined Total (Communities Only)	59,922	7.3 %	4,691

*The U.S. Census Bureau defined the average poverty threshold as a maximum annual income of \$29,950 or less for a family of four for the year 2022 (U.S. Census, 2023).

The percentage of low-income families is slightly higher for the combined populations of the four communities bordering BNL than that of Brookhaven Town. The 0.4 percent difference is indicative of the variability of economic status found within the Town of Brookhaven. The poverty level for the Town of Brookhaven overall decreased since last census while the poverty level for the community of Manorville increased.

Overall, the population living within one mile of the Laboratory border would not be defined as an EJ population based on minority or low-income status. In reviewing the U.S. EPA Environmental Justice web-based screening tool there are no EJ communities in the immediate vicinity of the Lab. The two EJ screening factors of highest concern are ozone and proximity to a superfund site. Ozone is a factor affecting the entire Long Island region and the Laboratory is a superfund site.

5.4.2 Effects of Alternatives on Land Use, Demography and Environmental Justice

Under all of the alternatives there would be no change from the existing conditions related to land use, demographics, or environmental justice.

5.5 Socioeconomic Factors

Socioeconomic factors describe the local economy and employment that may be influenced by the Proposed Action.

5.5.1 Affected Environment

The Laboratory employs approximately 2,750 full- and part-time personnel and has over 5,000 visiting scientific researchers annually. With a fiscal year 2022 budget of \$704 million, the Lab has a significant economic impact on New York State. An additional 40,000 members of the public visit the Laboratory site each year as part of educational and group tours, conferences and events. In 2022, Lab employee salaries, wages, and fringe benefits accounted for approximately \$428 million, or 60 percent of its total budget. Supporting local and state businesses whenever possible, the Lab spent approximately \$118 million in 2022 on goods and services in New York State alone, \$116 million of that on Long Island (BNL 2023).

5.5.2 Effects of Alternatives on Socioeconomic Factors

Under all alternatives the Laboratory will continue to employ approximately 2,800 full and part-time personnel, and visiting scientific researchers annually will increase due to user facilities like National Synchrotron Light Source II (NSLS-II), Center for Functional Nanomaterials (CFN), RHIC, construction of the Electron-Ion Collider (EIC), etc. Public visits to the Laboratory site each year will continue as part of educational and group tours, conferences, and events. Under Alternatives 1 and 3, direct spending by BNL will increase as will the total output of goods and services to the region during construction. Construction of the CARP facility would result in a temporary increase of 30 construction jobs. Once construction is completed, the number of jobs for the operation of the CARP facility would be approximately ten new full-time staff.

5.6 Transportation Conditions

5.6.1 Affected Environment

A 2017 traffic study for determining the traffic pattern for the Front Entrance to BNL measured peak morning volume at 630 vehicles entering the Lab and the peak afternoon volume of 434 vehicles exiting the Lab. The Lab utilizes the Front Gate and North Gate for entry to the Lab each morning and the Front, North, and South gates to expedite departures in the afternoon. Local traffic to and from the BNL site utilizes the Long Island Expressway, William Floyd Parkway, Longwood Road, and Middle Country Road (Rte. 25).

5.6.2 Effects of Alternatives on Transportation Conditions

Construction Effects on Transportation Conditions – All Alternatives

The Laboratory has experienced large construction projects over the past 15 years including the construction of the Long Island Solar Farm (LISF) and the NSLS-II. Both projects caused an undue increase in traffic delays on the roadways surrounding the Laboratory. Depending on timing, the Construction of the CARP facility could coincide with construction of the EIC. The Laboratory has small to large construction projects occurring in most years. At the same time, BNL expects gradual increases in traffic as the build out of NSLS-II beamlines continue, resulting in a gradual increase of on-site users. The traffic associated with CARP construction would not significantly change traffic to and from the Laboratory or add significantly to construction traffic associated with EIC construction.

Operational Effects on Transportation – Alternative 1 and Alternative 3

Once the CARP facility is operational, the number of shipments from offsite to BNL would increase and the number of shipments of processed radioisotopes leaving the site could increase to 50 or more per month compared to the current 20 or less shipments per month. As the number of shipments increase and the activity of materials increase, shipments may be transported in Type B shipping containers. All shipments into and out of the Laboratory would follow Department of Transportation requirements.

5.7 Cultural Resources

5.7.1 Affected Environment

The *Cultural Resource Management Plan for BNL* (CRMP) (BNL 2023) identifies the Laboratory's historic and cultural resources, and describes the strategies developed to manage them in accordance with applicable laws and regulations.

The proposed CARP facility falls within the waste management complex that was constructed in the mid-1990s. Since the facilities are less than fifty years of age, no review under Section 106 of the National Historic Preservation Act is necessary. There was extensive ground disturbance for the construction of the waste management facilities, therefore no archeological investigation would be necessary.

5.7.2 Effects of Alternatives on Cultural Resources

There would be no effect on archeological or cultural resources from any of the alternatives.

5.8 Air Quality

5.8.1 Affected Environment

The overall regional air quality is affected by a mix of maritime and continental influences. This results in the region, and BNL, being very well ventilated by winds from all directions.

The local air quality management in the New Jersey-New York-Connecticut Interstate Air Quality Control Region, which includes Suffolk County and BNL, is in attainment with most National Ambient Air Quality Standards (NAAQS) for criteria pollutants, which include sulfur dioxide, nitrogen oxides, particulate matter less than 10 microns in diameter (PM₁₀), lead, and carbon monoxide (CO). The region is considered a moderate non-attainment area for the 2015 8-hour ozone standard and a serious non-attainment area for the 2008 8-hour ozone standard. While ozone is a regulated pollutant, it is not emitted directly from sources but is formed by a combination of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) reacting with sunlight in the atmosphere. The New Jersey–New York–Connecticut Interstate Air Quality Control Region is classified as a maintenance area for the 24-hour PM 2.5 standard.

5.8.2 Effects of Alternatives on Air Quality

Under all alternatives there would be no change from current conditions and no change to air quality would be expected.

5.9 Climate

5.9.1 Affected Environment

Climate can influence several environmental parameters including regional and local air quality, storm water drainage, surface waters, and natural hazards.

The climate at the Laboratory can be characterized as breezy and well-ventilated, like most of the eastern seaboard. The Long Island Sound, the Atlantic Ocean, and associated bays influence wind directions and humidity and provide a moderating influence on extreme summer and winter temperatures. The prevailing ground-level winds are from the southwest during the summer, from the northwest during the winter, and about equal from these two directions during the spring and fall (Nagle 1978).

BNL has been recording local weather data since August 1948. The average yearly precipitation is 48.75 inches (123.8 centimeters) and the average yearly snowfall is 33 inches (83.82 centimeters). The average monthly temperature is 50.2° Fahrenheit (10.1° Celsius). (Additional historical meteorological data are available from the BNL Meteorology Services webpage at www.bnl.gov/weather.)

Climate Change

In recent years, climate change has evolved into a matter of global concern because it is expected to have widespread, adverse effects on natural resources and systems, and results in increased number and intensity of hurricanes, tornadoes, wildfires, thunderstorms, snowstorms, and ice storms (see Section 5.15 on Natural Hazards). A growing body of evidence points to anthropogenic (manmade) sources of greenhouse gases (GHG), such as carbon dioxide (CO₂), as major contributors to climate change. Additional GHGs include methane (CH₄), nitrous oxide (N₂O), halocarbons, and fluorinated compounds. Climate is usually defined as the average weather, over a period ranging from months to many years. Climate change refers to a change in the state of the climate, which is identifiable through changes in the mean and/or the variability of its properties (e.g., temperature or precipitation) over an extended period, typically decades or longer (DOE 2009a).

Ongoing climate change research was summarized in reports by the United Nations Intergovernmental Panel on Climate Change (IPCC), *US Climate Change Science Program's Science Synthesis and Assessment Products*, and the *US Global Change Research Program*. These reports concluded that the climate is already changing; that the change would accelerate; and that man-made GHG emissions, primarily CO₂, are the main source of accelerated climate change (DOE 2009a).

Various GHGs differ in their potential contribution to global warming. The global warming potential (GWP) compares the relative ability of each GHG to trap heat in the atmosphere over a certain period. According to guidelines, CO₂ is the reference gas with a GWP of 1. Based on a period of 100-years, the GWP of methane is 21, implying that a ton of methane is 21 times more effective in trapping heat than a ton of CO₂. The GWP for N₂O is 310. Carbon dioxide equivalent is a measure that expresses, for a given mixture and amount of GHG, the amount of CO₂ that would have the same GWP (Hailey 2008).

5.9.2 Effects of Alternatives on Climate

Neither Alternative 1 or 3 would have a significant effect on climate due to the incorporation of engineering to reduce energy consumption, reduction of release of GHGs, and sustainable building techniques.

There would be no additional GHGs added to the environment directly as a result of the No Action Alternative.

5.10 Visual Quality

5.10.1 Affected Environment

Large scientific facilities and structures have been constructed and operated at BNL since the late 1940s. Such structures have included research reactors with a 310-foot (94.5 meter) exhaust stack located on the highest point of the BNL site and a 280-foot (85 meter) tall meteorological tower. Current visual features of the proposed project are similar to other conventional construction at BNL within the CGA of the Long Island Central Pine Barrens and would be outside of the scenic river corridor of the Peconic River.

5.10.2 Effects of Alternatives on Visual Quality

Under all alternatives, visual quality would not be affected.

5.11 Parkland

5.11.1 Affected Environment

Brookhaven National Laboratory is in close proximity to town (Smith Estate), county (Hubbard County Park and Open Space), and New York State parklands (Brookhaven State Park). Federal parklands are located to the south and include the William Floyd Estate and Fire Island National Seashore and wilderness area.

The Smith Estate is located approximately 0.25 miles (0.4 kilometers) west of the Laboratory's west boundary and is surrounded by pine barrens habitat. County parkland and open space is located along the entire east boundary and much of the north boundary of the Laboratory. Brookhaven State Park is located approximately 2 miles (3.2 kilometers) north of BNL, and access is off the William Floyd Parkway. This park was established in the early 1970s through a donation of land from the Department of Energy to New York State. Prior to the donation, the land was part of BNL and its predecessor Camp Upton. The William Floyd Estate and Fire Island National Seashore are located 7 to 8 miles (11.2 to 12.8 kilometers) south of BNL.

5.11.2 Effects of Alternatives on Parkland

Under all alternatives no effects to parkland would occur.

5.12 Noise

5.12.1 Affected Environment

Noise is defined as unwanted sound that interferes with normal activities, or in some way reduces the quality of the environment. Response to noise varies according to its type, perceived importance, appropriateness in the setting and time of day, and the sensitivity of the individual receptor. The EPA developed an index (threshold) to assess noise impacts from a variety of sources using residential receptors. If daytime noise values exceed 65 decibels (dBA), residential development is not recommended (EPA 1974). Noise sensitive receptors are defined as the occupants of a facility or a location where a state of quietness is a basis for use or where excessive noise interferes with the normal use of the facility or location. Typical noise sensitive receptors include schools, hospitals, churches, libraries, homes, parks, and wilderness areas. Table 3 presents noise sources and measurement in Pressure Decibels (dBA) for comparison. Typical construction noise at ten feet is 110 dBA.

Table 3: Common Noise Exposures

Sound Source	Pressure Decibels dBA	Sound Source	Pressure Decibels dBA
Large rocket engine (nearby)	180	Normal conversation (3 feet)	60
Jet takeoff (nearby)	150	Quiet office	50
Pneumatic riveter	130	Library	40
Jet takeoff (200 feet)	120	Soft whisper (16 feet)	30
Construction noise (10 feet)	110	Rustling leaves	20
Subway train (100 feet)	100	Normal breathing	10
Heavy truck (50 feet)	90	Hearing threshold	0
Average factory	80		

New York State Department of Environmental Conservation (NYSDEC) Guidance “Assessing and Mitigating Noise Impacts” (DEP-00-1, Issuance Date: October 6, 2000, Revised: February 2, 2001) states that:

“Increases ranging from 0-3 dBA should have no appreciable effect on receptors. Increases from 3-6 dBA may have potential for adverse noise impact only in cases where the most sensitive of receptors are present. Sound pressure increases of more than 6 dBA may require a closer analysis of impact potential depending on existing Sound Pressure Level (SPLs) and the character of surrounding land use and receptors.”

5.12.2 Effects of Alternatives on Noise

Routine construction noise would occur during the construction period for Alternatives 1 and 3, decibel levels would return to normal levels during operational period. Construction noise would have minimal impact on staff working in the nearest building (Bldg. 865) located 200 ft away and little to no impact to workers in the nearest office building (Bldg. 860) located 600 feet away and little to no impact other onsite receptors. The operation of the CARP facility would have none to minimal impact to other onsite receptors and no impact to off-site receptors.

5.13 Industrial Safety and Occupational Health

5.13.1 Affected Environment

The graphed results that follow are for Brookhaven National Laboratory and reflect the overall injury statistics for total recordable injuries (TRC) and days away, restricted, or transferred work (DART) for the past ten years. Figure 8 represents the TRC and DART rates while Figure 9 represents the impacts to productivity due to days away from work and restricted workdays. Days away represent lost time from work while restricted workdays allow for some work while a worker is recovering from injury.

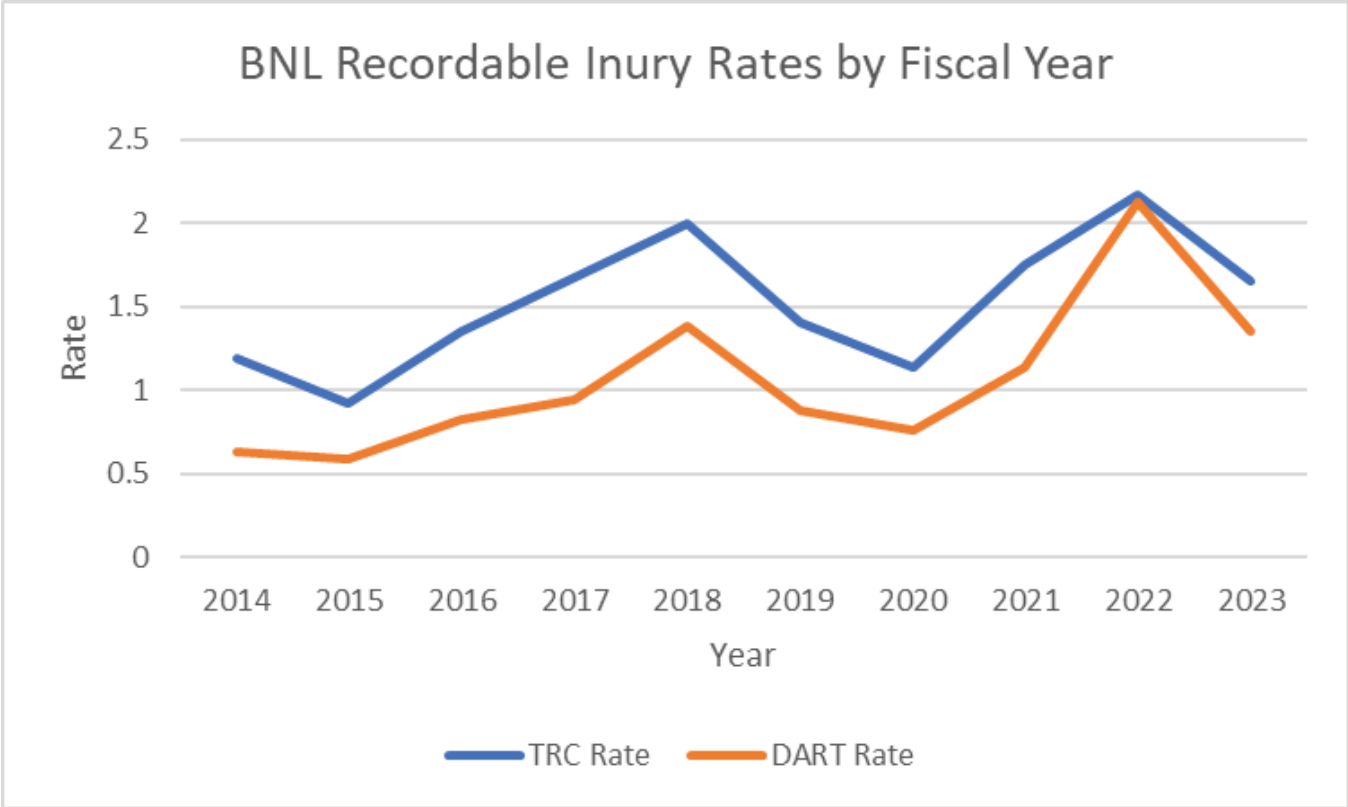


Figure 8: Total Recordable and Days Away or Restricted Rates for BNL.

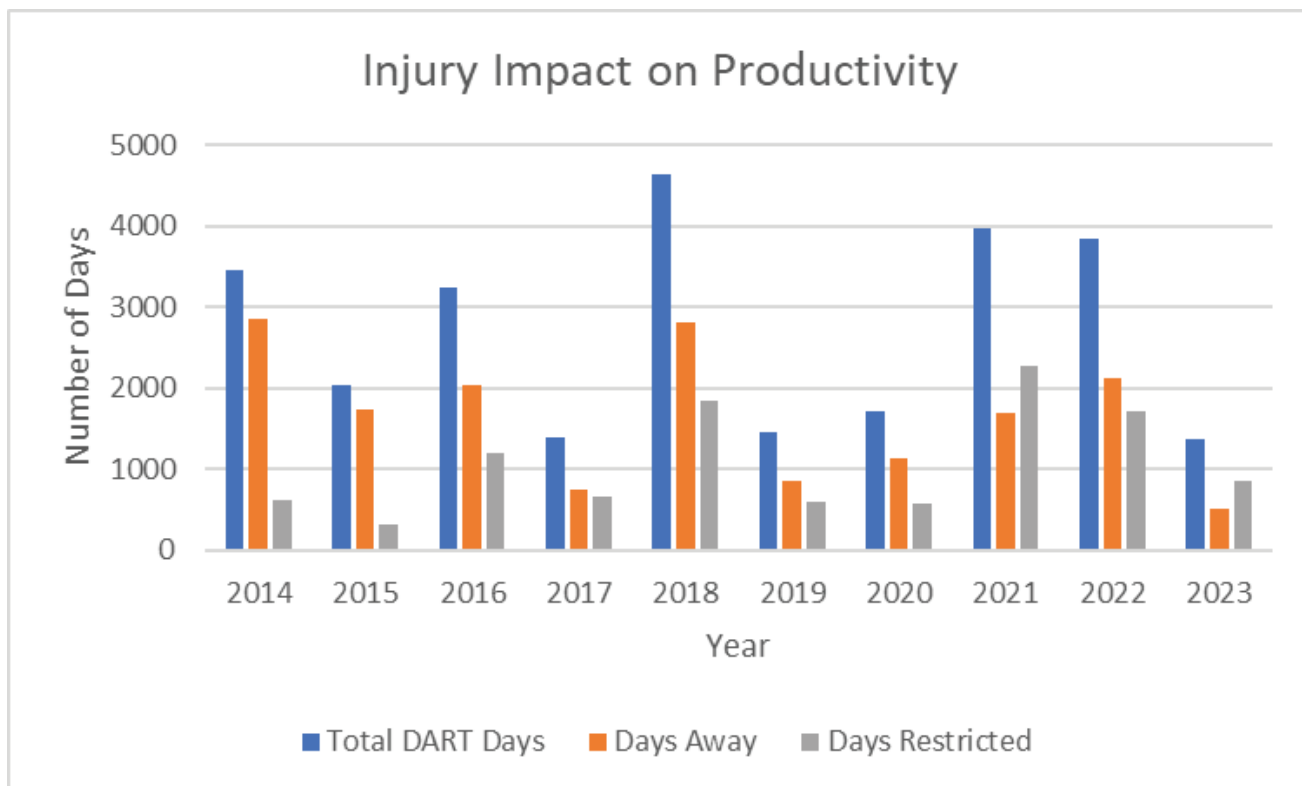


Figure 9: Effect of DART injuries in number of days for each type.

5.13.2 Effects of Alternatives on Industrial Safety and Occupational Health

Under Alternative 1 and Alternative 3, the following would be expected under both construction and operation:

Construction

Industrial hazards associated with the construction phase of the Proposed Action would be typical of those experienced at any general small-scale construction activity; these would include electrical, mechanical, elevated work, noise and lifting hazards. Prior to the start of construction, the selected contractor would establish a Health and Safety Plan with BNL. The contractor would be required to comply with applicable BNL Environment, Safety and Health (ESH) Standards, DOE Orders and regulatory requirements. The contractor would establish an Accident Prevention Program as well as an Environmental Protection Program that would include:

- Use of containment for spill intervention
- Proper storage and handling of hazardous materials
- Proper documentation of operations, maintenance and repair of equipment
- Retention systems for leaking and loose fluids, and
- Overnight storage of vehicles on concrete or asphalt

In addition, a review would be performed to identify all pertinent ESH issues that must be addressed during construction and would include:

- Environmental review
- Industrial hygiene issues
- Industrial safety review
- Operational requirements
- Facility issues
- Operational readiness evaluation
- Waste management

Operation

Industrial and experimental hazards associated with the CARP operations would include fire, electrical, non-ionizing radiation and ionizing radiation, noise, confined spaces, material handling, use and storage of gases and chemicals, and toxic metals such as lead. Integrated Safety Management (ISM) or its equivalent at the time of CARP operations and requirements for operation as a Hazard Category Three nuclear facility would provide the structure for work planning conducted at the CARP. Work would be defined, the hazards to the workers/environment/equipment would be identified, the resulting risks for injury would be assessed, the controls to minimize or mitigate these hazards and reduce the risks would be developed, the work would be conducted within the scope of the controls, and feedback and improvement for the next cycle would be provided. Analysis by industrial hygienists would be used to assess a worker's exposure to a particular hazard and would allow a choice of substituting a less hazardous condition, an engineered control, an administrative control or personal protective equipment to bring the risk to the worker to a minimal level.

5.14 Radiological Characteristics

5.14.1 Affected Environment

The radiological characteristics of laboratory operations are determined through routine DOE required surveillance and permit-based monitoring efforts. Water discharged from the STP is routinely monitored at the plant's outfall. In 2022, all effluents were found to be less than the Safe Drinking Water Act (SDWA) limits of 4 millirem annual dose limit for gross beta, 15 picocuries per liter (pCi/L) for average gross alpha activity, and 20,000 pCi/L average tritium concentration (BNL 2023).

BNL uses 10 recharge basins permitted under New York's State Pollution Discharge Elimination System program to discharge once-through cooling water, cooling tower blow-down, and storm water runoff. Routine monitoring of these basins indicated that the average concentrations of gross alpha and beta activity were within typical background ranges, and that there were no Laboratory related gamma-emitting radionuclides detected. All samples taken from discharges to recharge basins were below the SDWA standards (BNL 2023).

BNL is subject to the requirements of 40 CFR Part 61, Subpart H National Emission Standards for Hazardous Air Pollutants (NESHAP). The U.S. EPA established a national policy on the airborne emission of radionuclides, and a dose limit to the public of 10 millirem/yr for the airborne pathway. The effective dose equivalent from all air emission sources at BNL for 2022 was calculated to be 1.19 millirem, far below the allowable limit (BNL 2023). The Brookhaven Linac Isotope Producer (BLIP) produces 99% of the short-lived radionuclides responsible for the effective dose equivalent from BNL facilities. The remaining 1% was from all other emission sources. No measurable emissions from the building 801 target processing facilities were recorded, providing an indication of what would be expected from the operation of the proposed CARP facility.

5.14.2 Effects of Alternatives on Radiological Characteristics

The CARP would have facilities with fume hoods, air filtration, and a stack serving as the single radioactive airborne emission point.

The radiological effects for Alternative 1 and Alternative 3 are presented in the following sections.

Direct Radiation for Alternative 1 and Alternative 3

Although the laboratory site is considered to be a limited access facility, service personnel from offsite and BNL non-radiation workers may work or visit near the CARP facility. Laboratory policy for such personnel is to restrict the annual dose to less than 25 mrem in one year. This goal would be accomplished through shielding and air filtration design.

To measure direct radiation from all Laboratory operations, 63 environmental thermo-luminescent dosimeters (TLDs) are deployed by BNL, of which 10 are placed in known radiation areas and 16 at off-site areas. An additional 30 TLDs are placed in a lead-shielded container for use as reference and control TLDs for comparison purposes. The average dose of all TLDs deployed in 2022 showed there was no additional contribution above the natural background radiation to on- and off-site locations from BNL operations. The annual on-site external dose from all potential sources, including cosmic and terrestrial radiation, was estimated as 61 ± 7 mrem and the annual off-site external dose was estimated as 58 ± 6 mrem (BNL 2023). Additionally, TLDs as passive area monitors will be placed around the CARP facility to measure potential exposure. Because of local shielding and air filtration, both Alternative 1 and Alternative 3 will not change annual on-site or off-site external dose.

Soil Activation and Ground Water Effects for All Alternatives

There would be no soil activation or release to groundwater from the proposed CARP facility.

Storm water runoff for Alternative 1, Alternative 3, and adjacent paved areas is either conveyed to BNL's storm water system or allowed to infiltrate directly to the ground in the lawn area surrounding the proposed facilities.

BNL has a comprehensive groundwater surveillance program that provides a means of verifying that the operational and engineered controls around facilities are effective in protecting groundwater quality. BNL maintains a network of groundwater monitoring wells around the waste management complex to verify the effectiveness of the engineered controls.

Emission of Airborne Radioactivity for Alternative 1 and Alternative 3

The proposed facility is not expected to discharge radiological air emissions due to inclusion of air filtration systems. As designs are finalized and evaluations made, air emission calculations will be made. Under 40 CFR Part 61, Subpart H National Emission Standards for Hazardous Air Pollutants, no member of the public shall receive a dose greater than 10 mrem in a year from airborne emissions. Since there is the potential for radioactive airborne emissions to exceed one percent of the 10 mrem standard (0.1 mrem) to the maximally exposed offsite individual (MEOSI) in a year, NESHAPs authorization from the US EPA to construct and operate a new emissions facility will be required. Ventilation systems with HEPA and HEGA filtration leading to the emissions point building stack will be designed to prevent or mitigate any radioactive emissions from the facility. Emissions monitoring systems will monitor all emissions for radioactivity and provide an alarm function as well as a record of emissions. The maximum possible dose to the MEOSI due to emissions from the CARP is not expected to exceed the NESHAPs standard of 10 mrem in a year.

5.15 Natural Hazards

5.15.1 Affected Environment

Natural phenomena, which could lead to operational emergencies at BNL, include hurricanes, tornadoes, wildfires, thunderstorms, snowstorms, and ice storms. Hurricanes occasionally hit Long Island, and the high wind speeds associated with them may potentially damage structures. Record high winds for BNL were recorded during Hurricane Carol in September 1954 (Hoey 1994). Tornadoes and hailstorms are rare on Long Island. Thunderstorms, snowstorms, and ice storms do occasionally occur and have the potential to cause damage to facilities.

Earthquakes centered on Long Island are extremely rare, but do occur within 50 miles of the island, and no active earthquake-producing faults are known in the immediate Long Island area (Hoey 1994). Long Island lies in a Zone 2, or moderate damage seismic probability area, and it is assumed that an earthquake of 3.0 magnitude could occur. A recent history of earthquakes within approximately 50 miles of the central Long Island area is presented below. The likelihood of a serious earthquake in the BNL area is slight and seismologists would not expect significant earthquakes to occur (Petersen, et. al. 2019).

Table 4: Recent History of Earthquakes within Approximately 50 miles of Long Island (USGS 2023)

Year	Date	Magnitude
1976	Apr 13	3.1
1978	Jun 30	2.9
1978	Sep 3	2.8
1979	Mar 9	3.1
1979	Dec 30	2.5
1980	Jan 17	2.9
1980	Oct 24	3.1
1981	Oct 21	3.8
1982	Jun 17	3.0
1985	Oct 19	3.6
1986	Apr 22	2.7
1991	Apr 12	2.7
1991	Oct 28	3.0
1992	Jan 15	2.5
2000	Aug 22	2.6
2001	Oct 27	2.6
2009	Feb 2	3.0
2014	Aug 14	2.7
2015	Aug 14	2.6
2019	Apr 9	3.0

The CPB and community types within BNL are fire dependent systems that experience periodic wildfire events either natural or from arson. Wildfires, direct flame and smoke could affect BNL operations. An arson set wildland fire burned approximately 300 acres in the northeast portion of the BNL site in 2012, and an additional 700-800 acres offsite. Approximately 95 acres of the same area were burned in 2020 from an arson set fire. The BNL wildland Fire Management Plan (FMP) includes recommendations for periodic mechanical fuels management and prescribed fire (controlled burns) to reduce potential fuel loading and the effects of unanticipated wildfire ignitions (BNL 2019). Prescribed burns, totaling about 135 acres (54.6 hectares), have been performed since 2004. The FMP also recommends that a cleared area of at least 30 feet (9 meters) be maintained between buildings and the nearest treed area. The BNL on-site fire department is manned 24-hours a day to respond to all fire emergencies and maintains mutual aid agreements with local fire departments.

5.15.2 Effects of Natural Hazards on Alternatives

All alternatives under consideration would likely be affected by natural hazards the same.

The Waste Management complex was constructed in the 1990s. During this construction, techniques were used to assure compliance with building codes, while considering seismic hazards and wind damage. Any new construction would meet all current construction code requirements and fire protection is incorporated in design requirements.

DOE Order 420.1, DOE Standard 1022-94, and DOE Standard 1023-95 provide for natural hazard categorization of structures, systems and components of the built environment. Commensurate with a graded approach to the facility, a Performance Category of PC-1 would be sufficient to describe the design criteria for the structures, systems and components built at BNL.

Adherence to the building codes at BNL (equivalent to New York Uniform Building Codes) during construction, being constructed of good-quality materials, and having structural parts securely tied together and anchored to the foundation, provides appropriate seismic hazard mitigation to comply with the criteria of PC-1.

For above ground facilities, the Long Island area basic wind speed (3-second gust) is 120 miles per hour based on Factory Mutual Data Sheet 1-28 and BCNYS figure 1609.4. The ground roughness exposure category for the area is "Exposure B". Based on the calculations, above ground buildings would have roof assemblies classified as "Class 90" rated assemblies.

Flooding from precipitation events is not likely to occur within the area of the Waste Management complex. The Peconic River floodplain is narrow, and no base flood has been determined for the area. Federal Emergency Management Agency (FEMA) flood risk maps indicate that a 100-year flood would be retained within the wetland area associated with the Peconic River.

5.16 Intentional Destructive Acts

5.16.1 Affected Environment

BNL has not historically been subject to significant intentional destructive acts. The Laboratory maintains a 24 hour a day protective security force and Fire/Rescue group to protect both personnel and property. The Security force routinely patrols the BNL campus including its more remote areas. The Fire/Rescue group's response time to alarms is typically less than 3 minutes to most locations on BNL.

The Laboratory does experience trespass situations along the north and east boundaries of the site from individuals riding all-terrain vehicles, horses, bicycles, or just walking. These have resulted in little if any vandalism on the site. The Waste Management complex is isolated with an eight-foot-high security fence that extends around the boundaries of the complex. Entry into the facilities utilizes a secure card system for access and visitors must log-in/out as part of entry/exit requirements.

5.16.2 Intentional Destructive Acts, Effects on Alternatives

It is not expected that any of the alternatives would be affected by intentional destructive acts.

The proposed CARP facility will be located within the Waste Management complex which is surrounded by security fencing with limited access. While the Waste Management complex typically operates 8 am to 5 pm five days per week, the security fencing around the facility is unlikely to be breached. Locked doors and gates are required, and they are routinely checked by BNL's protective force. Additionally, card or code access are required to access the buildings or structures and visitor log-in/out ensures only authorized individuals are in the area.

Wildland fires have occurred on the BNL site including those that have been set intentionally. Intentional fires have occurred along the north and east boundaries of the BNL site more than a mile from where the CARP facility is located. The CARP facility, being located within the Waste Management complex would have defensible space surrounding the building and the CARP facility would be constructed mostly of non-flammable materials greatly reducing any potential impact from intentionally set wildland fires.

5.17 Utilities

5.17.1 Affected Environment

Current peak electrical demand by BNL is about 60 megawatts (MW). Peak electric use at BNL for FY 2019 from BNL's Energy Management Group ranges from a low of 31 MW in December 2018 to a peak of 47 MW in June 2019. The switchover from NSLS-I to NSLS-II with increased numbers of beamlines accounted for these figures. Operating the RHIC Complex itself was metered to be about 25 MW and the future construction of the EIC would significantly increase electric usage and was addressed in the EA for the EIC.

The Laboratory pumped approximately 349 million gallons (0.94 million gallons per day) of water in 2022. That water included potable use (majority of water used), steam generation, cooling tower use and blowdown, and once through cooling water (BNL, 2023).

5.17.2 Effects of Alternatives on Utilities

The CARP facility will be connected to BNL's medium voltage power distribution system, sanitary system, potable water system, telecommunication and data system, sitewide fire alarm system and storm drainage system. Installation of new connections may result in soil disturbance to extend connections from existing utilities to the CARP facility. Disturbance would be within previously disturbed areas.

Electricity

The CARP facility is not expected to significantly increase overall electrical usage at the Lab. Increase in usage is expected to be around 54 kilowatt hours (KWH) which is minimal in comparison to the site load. A majority of this load will be due to lights, pumps, and blower fans that will provide control over the building processes.

Water

Increase water use is expected to be minimal as the CARP facility would likely have two restrooms with sinks and toilets. Deionized water systems are not expected to utilize large quantities of water.

5.18 Electric and Magnetic Fields (EMF)

There are no Federal standards limiting residential or occupational exposure to the common-utility magnetic or electric fields found in the U.S. The applicable electric field strength standards established by the New York State Public Service Commission (PSC) are set forth in

Opinion No. 78-13, issued June 19, 1978. The magnetic field standards are set forth in the PSC's Interim Policy Statement on Magnetic Fields, issued September 11, 1990.

Opinion 78-13 established an electric field strength interim standard of 0.5 kilovolts per foot (1.6 kilovolts per meter (kV/m)) for electric transmission lines, at the edge of the right-of-way, 3.3 feet (1 meter) above ground level, with the line at the rated voltage. The Interim Policy established a magnetic field strength interim standard of 200 milligauss (mG), measured at 3.3 feet (1 meter) above ground grade, at the edge of the right-of-way, at the point of lowest conductor sag (Caithness 2005).

5.18.1 Affected Environment

The local transmission lines into the BNL site operate at 13,800 volts. The National Electrical Safety Code requires vertical clearance to be 18.5 feet from the ground for transmission lines with this voltage. The oscillating magnetic field at ground level from AC current transmission has been reported to be about 0.5 to 10 mG at 60Hz.¹

5.18.2 Effects of Alternatives on EMF

Alternative 1 and Alternative 3 would require minimal additional electric power beyond what is currently provided to the BNL site. While additional power may be necessary, EMF from the increase in power would be within transmission specifications.

5.19 Waste Management and Pollution Prevention

5.19.1 Affected Environment

The Laboratory has implemented extensive and active pollution prevention (P2) and recycling programs that reflect the national and DOE P2 goals and policies. The Laboratory's Environmental Protection Division (EPD) is staffed with subject matter experts responsible for evaluating and implementing regulatory requirements and P2 programs. The EPD operates the Waste Management Facility (Buildings 855 and 865) where waste generated at BNL is processed and prepared for off-site shipment and disposal. Additional details of the P2 and recycling programs are described in Chapter 2 of the SER (BNL 2023).

5.19.2 Effects of Alternatives on Waste Management and Pollution Prevention

Under Alternative 1, Building 870 would be repurposed for the CARP facility allowing re-use of the exterior structure. Interior appurtenances would be removed, re-used or recycled, and hot cells, offices, restrooms, etc. would be built to the requirements of isotope production. Under Alternative 3 an entirely new building would be constructed to meet the needs of isotope production. Construction under both scenarios would implement U.S. Green Building standards for sustainability. Under both scenarios, once operations begin sustainable practices would be utilized to minimize waste. However, as a nuclear facility, radiological waste would be generated and transferred to Building 865 for temporary storage, characterization, packaging, and transfer to a licensed radiological waste facility.

¹ Biological Effects of Power Frequency Electric and Magnetic Fields, Congress of the United States, Office of Technology Assessment, NTIS # PB89-209985, 1989.

5.20 Commitment of Resources

5.20.1 Commitment of Resources under Alternative 1 and Alternative 3

Construction of the CARP facility whether new construction or modification of an existing facility would require use of standard construction techniques and materials including concrete and steel. Electricity would be delivered through the onsite electric grid and water would be provided through the onsite potable water system.

5.20.2 Commitment of Resources under the No Action Alternative

The No Action Alternative would not have an effect on commitment of resources.

5.21 Sustainability

5.21.1 Affected Environment

Brookhaven National Laboratory has established a Site Sustainability Plan that is used to implement and track sustainability measures. The plan, actions, and tracking measures can be found at: <https://www.bnl.gov/about/sustainability/reports.php>.

5.21.2 Effects of Alternatives on Sustainability

Alternative 1 and Alternative 3 would include actions that improve sustainability including taking advantage of energy savings, water savings, pollution prevention, reuse, and recycling. As building and facilities are upgraded, energy efficiency is often built in, paint is low/no VOC, and materials are typically of recycled content. Thus, providing improvement on sustainability. Also see section 5.9.2 concerning GHGs.

Effects of Alternative 1 on Sustainability

Construction of the CARP facility provides opportunities for sustainability. The project will utilize the existing Building 870. The use of concrete containing fly-ash or other sustainable materials may be incorporated where possible. Where practical to do so, Federal sustainable design and operations principles for existing buildings in accordance with the Guiding Principles will be utilized.

Effects of Alternative 3 on Sustainability

Construction of an entirely new building would take full advantage of following requirements for Federal sustainable design principles to construct a highly sustainable building to meet energy efficiency.

5.22 Upgrades, Decommissioning and Restoration

The CARP is expected to operate indefinitely after construction and may periodically be upgraded to maintain functionality. As the program nears the end of operations, decommissioning plans would be developed. At that time, the Laboratory will determine the

hazards and risks associated with decommissioning, and the activities required for completing it. Environmental reviews, including NEPA, would be completed as part of the decommissioning plans. Of the utmost importance in formulating these plans is ensuring the safety of the workers, protecting the public and the environment, and complying with the applicable state, local, and federal regulations.

Upgrades

Future upgrades support operations for 15 to 20 years after construction ends and may include potential new processing equipment. Experimental upgrades for isotope processing may involve improvement of process automation, transportation, shielding, and ventilation or monitoring systems. These actions may provide general environmental and safety upgrades and improve overall operations efficiency. Most of the actions typically require the installation of new or modified processing equipment or systems within the developed portion of the existing hot cell enclosures. These actions typically result from component failures or new scientific breakthroughs.

For science and technology development efforts to continue excellence in safety, environmental protection, and efficient operations, there could be continued renovation and modernization of existing shops, offices, and mechanical / electrical infrastructure.

Decommissioning

Decommissioning plans for buildings at BNL are developed near the end of their operating lifetime or when appropriate upgrades requiring decommissioning of all, or portions of existing buildings becomes necessary. These plans would be in compliance with existing regulations and requirements at that time. Of the utmost importance will be to ensure the safety of the workers, protecting the public and the environment, and complying with the applicable local, state, and federal regulations. Key to safe decommissioning is managing the wastes from operations, or other hazardous materials that might remain in the facility after shutdown, as well as those wastes generated during decommissioning itself. Therefore, BNL will establish records during operations that identify the types and quantities of these materials. These records currently include spill reports, inventories of all chemicals, records on release events, hazardous waste records, radioactive waste records, area radiation surveys, work planning documents, and radiation work permit information.

Restoration

Once a facility has been decommissioned it will either be utilized for a new mission or it would be demolished. If the facility is demolished the site would be restored appropriately either to a natural state or to mowed lawn.

5.23 Cumulative Impacts

Besides the activities outlined under this document, recent (past 10 years) and planned projects include:

- STP upgrades with discharge to groundwater (completed 2014)
- NSLS-II, 15 acres cleared (completed 2014)

- Science User Support Center at Upton Square – 20-acre development near Lab entrance. Site clearing and construction started in 2020.
- Critical Utility Rehabilitation Project – in progress
- Electron-Ion Collider – in design

The current project along with recent (since 2014) and planned projects will impact approximately 210 acres of the BNL site with approximately 60 acres requiring clearing of natural areas. Each project has been reviewed under the requirements of NEPA to assess impacts. Cumulative impacts are not expected to result in significant negative impact to the environment.

5.24 Connected Actions

Connected Action – Transition of Building 865 to Hazard Category 3

Building 865 currently has seven (7) facility segments (six pits and the balance of the facility) that are operated as a below Hazard Category 3 nuclear facility. However, based on the potential to receive higher-activity accelerator-produced waste streams, the Hazard Category 3 nuclear facility threshold quantities could be exceeded if the Isotope Research and Production Department (IP) generates and ships waste to Building 865 without schedule constraints. Schedule constraints would halt isotope production. Transitioning Building 865 to a Hazard Category 3 nuclear facility will be essential in order to enable efficient management of the IP higher-activity accelerator-produced waste.

Connected Action – Onsite transportation will need to be upgraded for nuclear transportation.

The current Isotopes Production program utilizes Type A transportation packaging for moving nuclear materials from location to location onsite. As the program moves to a Nuclear Facility classification and processes greater quantities of Ac-225, transportation of materials will require use of Type B packaging, updating documents including the Quality Assurance Plan, and updating packaging and transportation training for qualified staff. The updated onsite transportation requirements greatly reduce potential for accidental releases of radiological material due to an accident associated with transportation. The updated requirements would apply to Alternative 1 and Alternative 3 (see section 5.6.2).

6.0 ACRONYMS, INITIALS, AND ABBREVIATIONS

AGS	Alternating Gradient Synchrotron
AWQS	Ambient Water Quality Standards
BER	Brookhaven Executive Roundtable
BHSO	Brookhaven Site Office (DOE)
BLIP	Brookhaven Linac Isotope Producer
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates, LLC
CAC	Community Advisory Council
CARP	Clinical Alpha Radionuclide Production facility
CEQ	Council on Environmental Quality
CFN	Center for Functional Nanomaterials
CFR	Code of Federal Regulations
CGA	Compatible Growth Area
CH ₄	Chemical Formula for Methane
CO	Carbon monoxide
CPA	Core Preservation Area
CPB	Long Island Central Pine Barrens
CRMP	Cultural Resource Management Plan
DART	Days Away, Restricted, or Transferred
dBA	Decibel
DOE	Department of Energy
DOE-IRP	Department of Energy Isotopes R&D & Production
EA	Environmental Assessment
ECL	Environmental Conservation Law
EIC	Electron-ion Collider
EIS	Environmental Impact Statement
EJ	Environmental Justice
EMF	Electric and Magnetic Fields
EO	Executive Order
EPA	Environmental Protection Agency
EPD	Environmental Protection Division
ESH	Environmental Safety and Health
FEMA	Federal Emergency Management Agency
FERN	Foundation for Ecological Research in the Northeast
FONSI	Finding of No Significant Impact
FOREST	Foundation for Research and Stewardship in the Long Island Maritime Reserve
FWS	U.S. Fish & Wildlife Service
GHG	Greenhouse Gas
GWP	Global Warming Potential
HEGA	High Efficiency Gaseous Absorbing Filter
HEPA	High Efficiency Particulate Air Filter
iPAC	Information for Planning and Consultation
IPCC	International Panel on Climate Change
ISM	Integrated Safety Management
KWH	Kilowatt Hour
kV/m	Kilovolt/meter
LISF	Long Island Solar Farm
MEOSI	Maximally Exposed Off-Site Individual

mG	milligauss
MGD	Million gallons per day
mrem	Millirem (see rem)
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
N ₂ O	Nitrogen Oxide
NO _x	Nitrogen Oxides
NRMP	Natural Resource Management Plan
NSLS-II	National Synchrotron Light Source-II
NY	New York
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
P2	Pollution Prevention
PC	Performance Category
PM	Particulate Matter
PSC	Public Service Commission
pCi/L	Pico-[trillionths] Curies per liter [Curie = basic unit used to describe the intensity of radioactivity in a sample of material]
rem	Roentgen equivalent man
R&D	Research and Development
RHIC	Relativistic Heavy Ion Collider
SBU	Stonybrook University
SC	Suffolk County
SDWA	Safe Drinking Water Act
SER	Site Environmental Report
SHPO	State Historic Preservation Officer
SPL	Sound Pressure Level
STP	Sewage Treatment Plant
SUNY	State University of New York
T&E	Threatened and Endangered
TLD	Thermoluminescent Dosimeter
TRC	Total Recordable Cases
U.S.	United States
USGS	United States Geological Survey
VOC	Volatile Organic Compound
FMP	Wildland Fire Management Plan
WWI	World War I
WWII	World War II
WSRRA	Wild, Scenic, and Recreational Rivers Act

7.0 LIST OF AGENCIES CONTACTED AND PRESENTATIONS TO STAKEHOLDERS

7.1 Agencies Contacted

DOE NEPA regulations, found in 10 CFR 1021.301, require that the host state be provided the opportunity to review and comment on the EA document prior to DOE's approval of the EA.

Copies of the draft EA were distributed to the following New York State offices:

New York State Governor's Office – Albany, NY

New York State Department of Environmental Conservation – Stony Brook, NY

New York State Office of Parks, Recreation and Historic Preservation – State Historic Preservation Officer

7.2 Stakeholder Presentations

Presentations on the CARP facility and the EA were provided to the BNL Community Advisory Council (CAC). The CAC consists of approximately 27-member organizations representing business, civic, education, employee, environment and health organizations. Members meet six times per year, set their own agenda, and work to reach consensus recommendations on issues of concern to them. Meetings are open to the public; each meeting has a comment period during which community members may voice their opinions and concerns (<https://www.bnl.gov/community/cac.php>). Presentations about the CARP facility were provided to the CAC on November 9, 2023.

8.0 REFERENCES

Brookhaven National Laboratory. 2021. Natural Resource Management Plan for Brookhaven National Laboratory. Brookhaven National Laboratory, Upton, NY. BNL-71870.

Brookhaven National Laboratory. 2023. Cultural Resource Management Plan for Brookhaven National Laboratory. Brookhaven National Laboratory, Upton, NY. BNL-100708-2023-FORE.

Brookhaven National Laboratory. 2019. *Wildland Fire Management Plan for Brookhaven National Laboratory*. BNL-82418-2019. Brookhaven National Laboratory, Upton, NY.

Brookhaven National Laboratory, 2023. 2022 Site Environmental Report. October 2023. Brookhaven National Laboratory, Brookhaven Science Associates, P.O. Box 5000, Upton, NY 11973-5000. BNL Report No. BNL-224793-2023-FORE

Brookhaven National Laboratory, 2023a. 2022 Site Environmental Report, Volume II, Groundwater Status Report. Brookhaven National Laboratory, Brookhaven Science Associates, P.O. Box 5000, Upton, NY 11973-5000.

Caithness Long Island, LLC. 2005. Long Island Power Authority Caithness Long Island Energy Center Final Environmental Impact Statement. June 2005.

Central Pine Barrens Joint Planning and Policy Commission. 1995. Central Pine Barrens Comprehensive Land Use Plan, Volume 1: Policies, Programs and Standards: as amended Oct. 2004.

Department of Energy. 2009a. Climate Change Considerations in Project Level NEPA Analysis. January 13, 2009.

Hailey, Solomon G, et.al. 2008. Greenhouse Gas Mitigation in Forest and Agricultural Lands: Reducing Emissions. Publication No. AE443, Agricultural and Biological Engineering Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Gainesville, Florida.

Hoey, Steve. April 1994. Brookhaven National Laboratory Natural Phenomena Hazards Evaluation. An attachment to the BNL Implementation Plan as per DOE Accelerator Order 5480.25.

Nagle, C.M. May 1978. Climatology of Brookhaven National Laboratory: 1974-1977. BNL Report No. 50857

U.S. Census Bureau. *Poverty in the United States: 2022*. U.S. Census Bureau. September 2023.
<https://www.census.gov/content/dam/Census/library/publications/2023/demo/p60-280.pdf>

U.S. Environmental Protection Agency (EPA). 1974. Information Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. USEPA/ONAC 550/9-74-004. March 1974.

Peterson, Mark D, et. al. 2019. The 2018 update of the U.S National Seismic Hazard Model: Overview of model and implications. Earthquake Spectra. Vol 36, Issue 1

U.S. Geological Survey 2023. Earthquake.usgs.gov/earthquakes/map/. Query for historical earthquakes in the vicinity of Long Island, New York.