ENVIRONMENTAL ASSESSMENT

FOR

BP SOLAR ARRAY PROJECT

BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

U.S. DEPARTMENT OF ENERGY

Office of Science

Brookhaven Site Office

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1.0 PREFACE

This Environmental Assessment (EA) presents an analysis of the potential environmental consequences of the United States (U.S.) Department of Energy (DOE) providing access, through an easement, to BP Solar for the construction of a proposed 37 megawatt (MW) photovoltaic facility and a smaller 1-2 MW, Laboratory dedicated array at Brookhaven National Laboratory (BNL) and compares the potential impacts to the No Action Alternative.

Alternatives considered but not assessed are also described. This EA will be used to determine whether a "Finding of No Significant Impact (FONSI)" to the environment would result from the construction and operation of the proposed BP Solar Array Project 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 (BSA), a limited liability company founded by Stony Brook University and Battelle, a nonprofit, applied science and technology organization. Located 60 miles east of New York City in Upton, NY, BNL conducts research in high energy and nuclear physics, chemistry, nanotechnology, environmental sciences, energy technologies and national security (See Figures 1 and 2). Among its missions, the Laboratory is charged with conceiving, designing, constructing and operating world-class, complex, leading-edge research facilities in response to the mission needs of DOE and to a large community consisting of university, industry, government and international users [SER].

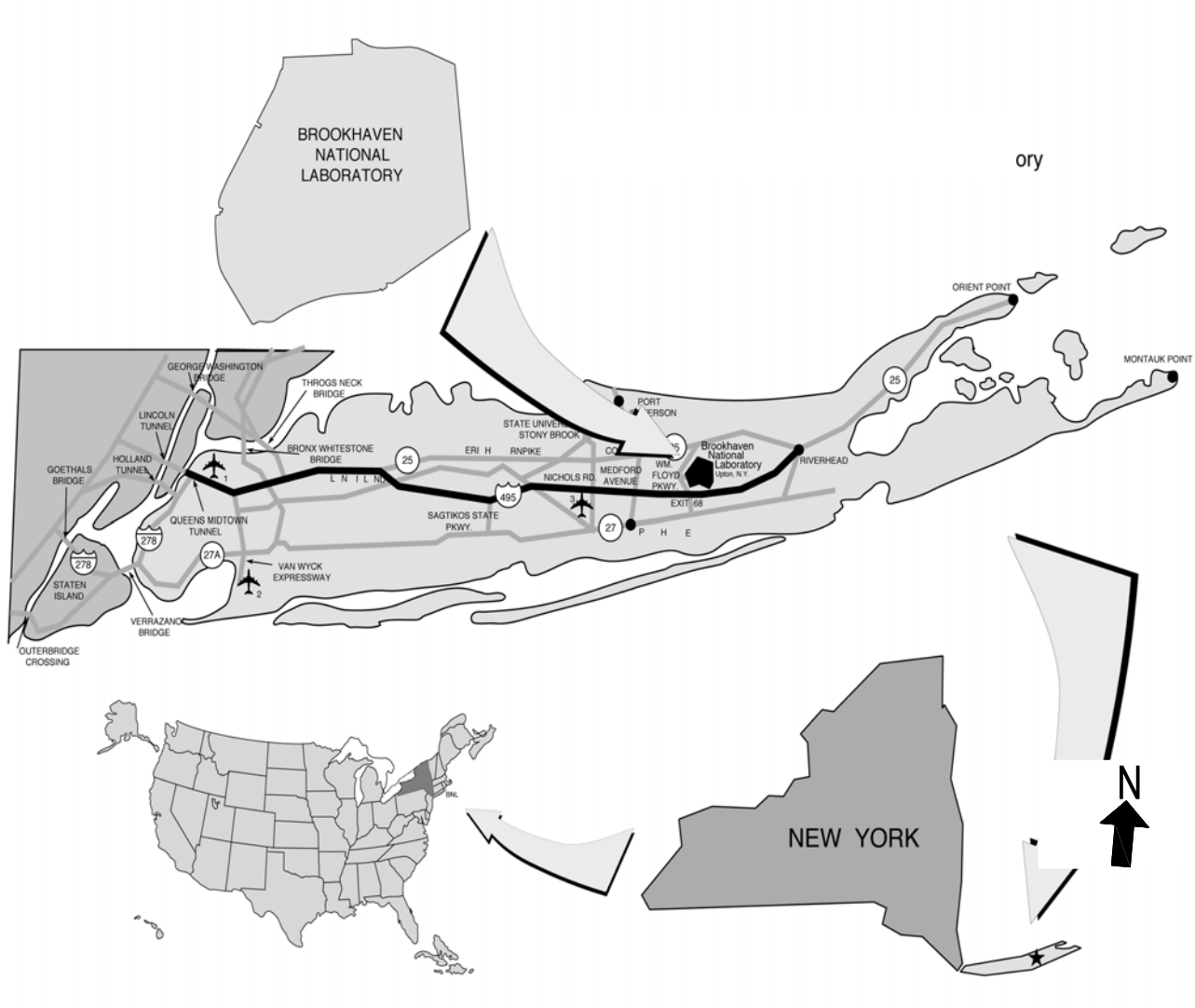

Figure 1 - Regional View of Brookhaven National Laboratory Location

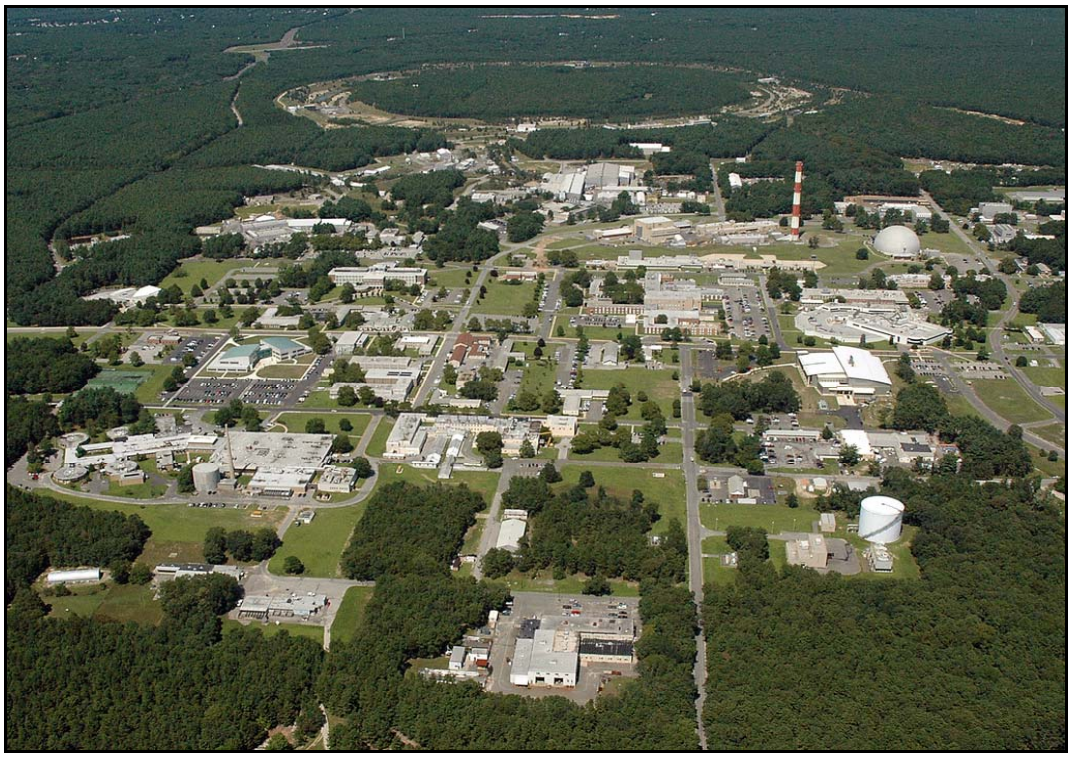

Figure 2 - Aerial View of Brookhaven National Laboratory Core Developed Area

If constructed, the proposed BP Solar Project would be located on approximately 200 acres and would encompass two large-scale commercial solar photovoltaic (PV) arrays totaling approximately 37 MW, and potentially a smaller Laboratory dedicated array of 1 to 2 MW, with an associated support building. This project grew out of solicitation by the Long Island Power Authority (LIPA) to diversify its portfolio with renewable energy sources. LIPA publically solicited companies for proposals to provide solar-generated power on Long Island. In that solicitation, DOE offered BNL property as a host site for a project that would meet LIPA's needs. BP Solar's successful proposal to LIPA for a 37 MW photovoltaic system on the federal property resulted in negotiations between DOE and BP Solar for access to the site for construction and operation of the system. The project supports DOE's renewable portfolio and the Department's vital goals of reducing dependence on fossil fuels and encouraging research and development in energy technologies. Additionally, this proposed solar project is consistent with NY State's goal to meet 45 percent of its electricity needs through improved energy efficiency and renewable sources by the year 2015.

The proposed solar project at BNL promotes the use of non-polluting, renewable solar energy technology in the largest-scale photovoltaic project in the Northeast. Power generated by this array will be placed into the LIPA grid and is expected to help LIPA meet its ever-increasing electric demand. Because of the size of the proposed project, it presents an unprecedented opportunity to obtain data and practical experience in areas such as power intermittency effects on the utility grid, technological and material efficiency, power storage and climate. This data would be vital to supporting the business case for the proliferation of large solar arrays across the U.S. The data obtained from this array could also be vital to the research and development efforts designed to improve solar technologies and impacts on large utility electric grids. In addition, the project would provide the opportunity to explore new research collaborations and launch educational and community outreach programs on solar energy as a renewable energy source. As partial

consideration for use of the federal property, BP Solar may sponsor Work for Others projects at BNL that would allow BSA to perform research or other technology work for BP Solar, a non-DOE entity, on a fully reimbursable basis.

While no specific upgrades to the solar arrays or project footprint are planned at this time, it would be reasonable to expect that technological advances may warrant changing or modifying some of the solar arrays or its associated equipment in the future to achieve improved efficiency. At the end of operational life, estimated to be about 40 years, the arrays would be dismantled and disposed of as part of a planned decommissioning process. All support structures and associated electrical hardware (wiring, conduit, towers, etc.) would also be removed. The land would then be available for future BNL operations, restoration, or remain open to natural re-growth.

Summary of BP Solar Project estimated parameters:

- Total generation capability of 37 MW direct current (DC) - Solar arrays would consist of approximately 167,712 PV modules, each about 5.5 x 3.3 x 0.016 feet (1,667 x 1,000 x 50mm), weighing 43 pounds (lbs) (19.4kg), and having a standard rating of 220 watts.

- Estimated annual output of 1,200 Megawatt hours (MWH) per MW PV, for a total of 44,400 MHW per year.

- Two-500 kilowatt (kW) inverters and a 1-mega volt-amps (MVA) 200/13.8 kilovolt (kV) transformer would be located on each of thirty two 270-square foot (25 square meters) concrete equipment pads located throughout the arrays.

- A 15kV outdoor, metal-clad, switchgear, which is to be shelter-aisle or enclosed in an equipment building with a concrete pad of approximately 250-square foot (23 square meters).

- A 13.8/69 kV transformer, mounted on a 2,500-square foot (232 square meters) concrete pad, mounted on a pad with associated circuit breakers, disconnect switches, and a small (12’ x 24’) control enclosure on nearby pads all totaling 2000-square foot (186 square meters), would connect the solar array facility via transmission line to the LIPA substation located adjacent to the BNL property, south of the Long Island Railroad (LIRR) tracks.

- Fencing would enclose solar arrays and associated equipment.

- Laboratory - dedicated 1 to 2 MW solar arrays.

- Laboratory - dedicated array support building about 2,000 square feet (186 square meters).

This EA analyzes the potential environmental impacts of DOE’s granting an easement to BP Solar to construct and maintain a 37 MW solar generating system and a 1 to 2 MW Laboratory dedicated array, and the No Action Alternative.

In the No Action Alternative, the BP Solar Project would not be constructed and operated at BNL. This alternative would maintain the current conditions on the BNL site. An alternative suitable location would need to be located in order to provide the local region with a photovoltaic source of electric power. If no other site exists the power anticipated to be generated from the BP solar project would need to be supplied through either conventional means, such as fossil fuel-burning power plants or imported from outside the region.

When considering potential locations for the proposed solar project, DOE and BSA utilized three primary criteria to evaluate potential sites. These criteria included 1) proximity to the LIPA substation, 2) avoidance of Core Pine Barrens areas, and 3) minimizing impacts to the environment. Additional considerations for placement included minimizing conflicts with future Laboratory development and existing infrastructure. The following alternative locations within the BNL site were initially considered and ultimately eliminated for various technical reasons: Laboratory West Boundary, Laboratory Southern Area, Dispersed Open Areas, and Rooftop Deployment. These rejected alternatives were not assessed as part of this EA.

A summary of the potential environmental impacts of the No Action Alternative and the proposed BP Solar Project is presented below in Table 1. Full analysis of these topics is covered in the Environmental Impacts section.

Table 1 - Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the BP Solar Project Proposed Action

Comparison Factors	No Action: BNL Current Operations	Proposed BP Solar 37 MW Project
General Information	No change from the existing BNL operations.	Construct 37 MW Solar Photovoltaic Array project: A footprint of 200 acres; 32 270-square-foot concrete pads with transformers and inverters; 15kV outdoor, metal-clad, switchgear which is to be shelter-aisle or enclosed in an equipment building with a concrete pad of approximately 250-square foot; a 13.8/69kV transformer with associated circuit breakers, disconnect switches, and a small (12' x 24') control enclosure mounted on pads totaling 2,000-square-feet; connection to existing LIPA grid at off-site substation 8ER. Construct a 1-2 MW Laboratory dedicated array and 2,000 sq. ft. support building; array potentially tied into on-site BNL electrical grid.
Ecological Resources	Minimal expansion of invasive flora at project site could pose long-term negative impact to ecology.	<u>Construction Effects on Vegetation</u> - Disturbance of about 200 acres of land, including removal of approximately 153 acres of trees - Minimal grading and topsoil replacement would allow most understory plants to recover; native grasses or understory vegetation would also be planted. Removal of existing invasive plant species would, at minimum, slow their expansion (into adjacent wetlands, in particular). <u>Construction Effects on Threatened, Endangered, and Special Concern Species</u> – Project would meet NYSDEC protocols for tiger salamander breeding habitat. May have minimal impacts on the eastern tiger salamander beyond the 1,000 foot (304.8 meters) protection zones around known habitats. Established buffers and procedures should minimize impacts to tiger salamanders and other amphibians; temporary impacts on eastern box turtles due

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Comparison Factors	**No Action: BNL Current Operations**	**Proposed BP Solar 37 MW Project**
		to construction disturbance. Fencing design may allow movement of reptiles throughout the entire area; mature forest removal would force nesting raptors to move to other suitable habitat. Overall, construction would have a minimal impact on threatened, endangered, and special concern species <u>Operation Effects on Threatened, Endangered, and Special Concern Species</u> - Planting native understory may increase numbers of host plants for rare butterflies; fencing would prevent entry of deer allowing understory vegetation to mature and seed, providing improved habitat for many threatened and endangered species. <u>Construction Effects on Migratory Birds</u> - Tree clearing and temporary understory vegetation disturbance would have a moderate effect on migratory songbirds and raptors; construction noise may disturb nesting birds; tree removal in late summer would result in some nest destruction. Timing forest clearing can minimize direct impacts; while clearing would remove available habitat, it affects 4.2% of the available habitat on the BNL site and 95.8% of available habitat remains unaffected; removal of existing fences and open areas would temporarily affect eastern blue bird nest boxes. Nest boxes can be installed on new fencing. <u>Operation Effects on Migratory Birds</u> - Slight effects on migratory birds due to increased edge habitat, improved deer-free understory, and increased fence lines for placement of nest boxes. Increased edge habitat may result in slight increases in the number of brown-headed cowbirds parasitizing songbird nests. <u>Construction Effects on Mammals</u> - Tree removal would result in mammals dispersing to surrounding forests; displaced deer would cause added stress on surrounding forests, primarily due to existing over abundance; other medium sized animals would be displaced with little effect on their populations. <u>Operation Effects on Mammals</u> - Minor positive effects on small and medium sized mammals due to fences keeping deer out of the area and improved understory.

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Comparison Factors	**No Action: BNL Current Operations**	**Proposed BP Solar 37 MW Project**
		Construction Effects on Reptiles and Amphibians - Minimal impacts on reptiles and amphibians due to construction equipment and loss of forage and mating habitat. Minimizing understory vegetation disturbance would lessen impacts. Operation Effects on Reptiles and Amphibians - Slight improvements for reptile and amphibian species due to increased habitat for mole salamanders, tree frogs, snakes; maintaining habitat for turtles should result from increased understory. Proposed fencing would support movement of small animals including reptiles and amphibians. Construction Effects on Pine Barrens - Clearing approximately 153 acres (62 hectares) of trees would have minimal impact on the overall quality of the Central Pine Barrens ecosystem; the proposed project is fully within the Compatible Growth Area on the BNL site and falls well within the 65% clearing standard established under the Central Pine Barrens Land Use Plan. Operation Effects on Pine Barrens - Little, if any, overall effect on the surrounding Pine Barrens; precipitation recharge to groundwater would not be affected due to use of native vegetation underneath the solar arrays and minimal impermeable surfaces.
Water Resources	No change from the existing BNL site conditions.	No expected impacts to any groundwater or surface water resource during project construction or operation. Construction – Storm water and silt runoff management would include silt fencing and stabilized rock construction entrances; potential modification of existing drainage and new/modified New York State Pollutant Discharge Elimination System (SPDES) outfall permit; estimated 2,000 gallons of water per day usage for dust mitigation; relocation or modification of existing water sampling wells, as necessary; Wild, Scenic and Recreational Rivers Act Permit and a Wetlands Permit, issued by the New York State Department of Environmental Conservation (NYSDEC), would be required; and a NYSDEC construction storm water permit may also be necessary. Operation – Soil erosion potential minimized by planting native low-growing groundcover under/around arrays; estimated 500,000 gallons of water per year for cleaning

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		PV panels (0.1 percent of current BNL water usage). Utilize existing hydrant or former irrigation supply well; existing BNL water supply would be adequate; slight increase in impermeable surfaces (concrete equipment pads, Laboratory dedicated array Support Building) of approximately 12,890 square feet (1,178square meters), all noncontiguous; any hazardous materials storage would be managed under Suffolk County Article 12 controls. Likely modification of existing permits or acquisition of a project specific SPDES permit from the NYSDEC. While no decision has been made, pending further investigation, brownfield areas may be used for the Laboratory dedicated array and support building. If brownfield areas were used, there could be a slight increase in impermeable surfaces due to the use of ballasted systems made of concrete to support the solar panels and parking area/roadway (10,890 sq. ft.).
Land Use, Demography, and Environmental Justice	No change from the existing BNL site conditions.	Land use within the proposed project footprint would change from currently forested and open areas to groups of fenced solar arrays; no change in activities/operations performed on other areas of the BNL site; no effect on off-site land use or demographics. <u>Operation</u> - Laboratory dedicated array may result in a small increase in scientific and support staff estimated at less than 20 individuals, along with visiting research personnel. <u>Use of Brownfields</u> - Considered within industrial uses identified in BNL Land Use and Institutional Control Program. Could potentially reduce amount of forested land needed for solar arrays. <u>Environmental Justice</u> - No environmental justice impact or negative economic or health effects on any potentially affected population are anticipated.
Socioeconomic Factors	No change from the existing BNL site conditions and operations.	<u>Construction</u> - The project would benefit construction and manufacturing sectors with secondary benefits through jobs, wages and spending. It may also provide work and training opportunities for small and emerging businesses. The estimated construction workforce would be approximately 200 full-time employees. <u>Operation</u> – The BP arrays would employ two full-time

Table 1 - Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the BP Solar Project Proposed Action		
Comparison Factors	**No Action: BNL Current Operations**	**Proposed BP Solar 37 MW Project**
		operations and maintenance personnel. The Laboratory dedicated array could employ up to 20.
Transportation	No change from the existing BNL site conditions.	Construction – Temporary increase in construction equipment, delivery vehicles and worker vehicles; use of alternative southeast access gate would increase vehicle traffic on local road (North Street); elimination of firebreak/access roads within project footprint. Operation – None.
Cultural Resources	Outhouse structure would remain at extant location. Two Camp Upton World War I (WWI) concrete foundations would remain intact.	Construction – Removal/relocation of outhouse structure (circa WWI era shed, relocated and converted to privy post 1921); demolition of two Camp Upton WWI concrete foundations. Architectural and archaeological surveys of outhouse site were performed; archaeological survey of Camp Upton WWI Remount Area was performed. Archaeological work was sufficient to conclude that no further archaeological investigations are recommended. Operation – None.
Air Quality	Reduced airborne emissions from conventional fossil fuel plants would not be realized. .	Construction – Temporary increase in emissions due to construction equipment, delivery vehicles and worker vehicles; generation of airborne dust ($PM_{2.5}$ and PM_{10} emissions) from grading and vehicle traffic on unpaved surfaces - dust generation controlled by water spraying on soil surfaces and stabilized rock construction entrances; minimal grading actions would reduce particulate emissions. Operation – None.
Climate	Fossil fuel plant GHG emissions would contribute to potential cumulative affects on climate change.	Construction – Temporary increase in vehicle exhaust emissions during construction would minimally increase greenhouse gas (GHG) emissions; removing 153 acres (62 hectares) of trees and vegetation would eliminate absorption/storage source, but minimally impact climate. Operation – The 40-year project lifetime avoids emissions of about 1,238,015 metric tons of CO_2 into the atmosphere from conventional generating means; overall beneficial effect on GHG emissions.
Visual Quality	No change from the existing BNL site conditions.	Operation – Southern edge of the south array would be visible from passing LIRR trains for approximately 1,100 feet (335 meters) and from residential properties located immediately south of the tracks, (primarily when the trees

Table 1 - Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the BP Solar Project Proposed Action		
Comparison Factors	**No Action: BNL Current Operations**	**Proposed BP Solar 37 MW Project**
		are bare); array would be visible from aircraft. Overall, the project would not be expected to have an adverse visual impact either on or off-site.
Noise	No change from the existing BNL site conditions.	Construction – Temporary increase in noise levels would minimally impact residential properties immediately south of the LIRR tracks. Operation – None.
Industrial Safety and Occupational Health	No change from the existing BNL site conditions.	Construction - Hazards typical for mid- to large-scale construction activity such as electrical, mechanical, noise and lifting – Hazards minimized by adherence to federal, state, and local regulations, Occupational Safety and Health Administration (OSHA) regulations, general contractor safety plans applicable electrical and fire codes, etc. Operation – Common electrical safety hazards - The remote location of the site, the fenced enclosure and warning placards would minimize exposure of the BNL staff, visitors, and public to potential electrical safety hazards. Use of Brownfields - Potential exposure to contaminants - Ballasted solar arrays would be used over capped land fill areas. Areas were remediated to industrial standard and proposed use is within industrial use identified in BNL Land Use and Institutional Controls Program - Work planning and control measures would further reduce risk.
Radiological Characteristics	No change from the existing BNL site conditions.	Construction and Operation – None. Use of Brownfields – Potential exposure to contaminants - Ballasted solar arrays would be used over capped landfill areas; areas were remediated to industrial standards - Work control measures further reduce any potential risk in other brownfield areas As Low As Reasonably Achievable (ALARA).
Natural Hazards	No change from the existing BNL site conditions.	Operation – Potential structural failure of an array due to natural phenomenon such as earthquakes, hurricanes, or wildfire could result in physical damage to the array. There is low probability of a hurricane and very low probability of an earthquake; construction is to building code standards; solar arrays do not contain any hazardous materials; located in very low population area; existing wildfire controls are adequate.

Table 1 - Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the BP Solar Project Proposed Action		
Comparison Factors	**No Action: BNL Current Operations**	**Proposed BP Solar 37 MW Project**
Intentional Destructive Acts	No change from the existing BNL site conditions.	The Proposed Action would not offer any targets of opportunity for terrorists; additionally, the potential for vandalism is reduced by fencing, random security patrols and inspections.
Utilities	The LIPA electric grid would not receive 37 MW of electricity produced by solar PV arrays. The BNL internal electric grid would not receive 1 to 2 MW of electricity produced by solar PV arrays.	Construction – None. Operation - Electrical power from the solar arrays would be connected to the regional grid via the LIPA substation located adjacent to the Laboratory's south border. The LIPA electric grid would receive up to 37 MW of electricity. Laboratory dedicated array would potentially provide 1-2 MW of solar generated power to the Laboratory's internal electrical grid.
Electric and Magnetic Fields (EMF)	No change from the existing BNL site conditions and operations.	EMF would be well below New York State Public Service Commission guidelines.
Waste Management and Pollution Prevention (P2)	No change from the existing BNL site conditions and operations.	Construction - One-time construction wastes including cleared trees and brush, concrete and steel debris from obsolete structural features - Trees suitable for timber would be recycled; unsuitable tree material would be mulched on-site or composted for topsoil; any hazardous materials (such as temporary fuel storages) would be managed under Suffolk County Article 12 controls. Operation – None.
Commitment of Resources	No change from the existing BNL site conditions.	Construction – Temporary increase in fuel demand for construction machinery. Operation - Reduced need on utility grid for electricity generated through conventional means. Subsequent reductions in the demand for fossil fuels, and water resources to support these conventional generating methods; slight increase in water demand, estimated at 500,000 gallons per year (0.1 percent of current BNL water usage), for cleaning arrays.
Decommissioning and Restoration	Not applicable.	Structures and fencing removed and materials recycled; land would be available for future BNL operations or remain open to natural re-growth/restoration; restoration would utilize native pine barrens species in accordance with BNL Natural Resource Management Plan.

In summary, the analysis of potential environmental effects from the construction and operation of the BP solar array project indicates a net positive benefit to the environment. The key negative environmental impacts to the ecological resources (i.e. trees, endangered species, and migratory birds) are due to the land disturbance. Some of these impacts are minimal and may be reduced with mitigative actions proposed. The positive aspects include promotion of clean energy and future reduction of carbon emissions, improved management of invasive plants, the maintenance of a habitat conducive for endangered and common species, and local socioeconomic advantages during site construction and operation.

3.0 PURPOSE AND NEED

The proposed action is for DOE to grant an easement for a solar photovoltaic project by BP Solar, using BNL as a host site. The solar arrays would produce clean, renewable energy and support the DOE's mission to reduce dependence on fossil fuels, facilitate research and development of renewable energy technologies and advance development of energy efficiency. The United States considers energy independence a top national priority and has committed to reducing its need for foreign energy sources and the burning of fossil fuels that add to production of GHGs which result in global climate change.

The proposed project encompasses a large-scale commercial solar PV array totaling approximately 37 MW and potentially a 1 to 2 MW Laboratory dedicated array located on the campus at BNL. The electricity generated from the proposed 37 MW array would be transmitted from the array to LIPA which publicly solicited companies for proposals to provide needed solar-generated power on Long Island. DOE volunteered the BNL federal property as a host site for a proposed project. LIPA's interest in BP Solar's proposal led BP Solar, in turn, to seek DOE approval for access to construct and operate its solar arrays on the BNL federal property.

The proposed solar project at BNL promotes the use of non-polluting, renewable solar energy technology in the largest-scale photovoltaic project in the Northeast. In addition to generating electric power, the project would provide data and practical experience in areas such as PV efficiency, batteries, energy storage, climate, and environmental impacts. This data would be vital to the research and development efforts designed to improve solar technologies and impacts on large utility electric grids. The project would also provide the opportunity to explore new research collaborations and launch educational and community outreach programs on solar energy as a clean and renewable energy source.

4.0 DESCRIPTION OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

4.1 Proposed Action

The proposed project involves DOE granting an easement to BP Solar to construct a large-scale commercial solar photovoltaic array of approximately 37 MW which would cover approximately 200 acres (80.94 hectares) of the BNL federal site. Electricity generated by these arrays would be connected into the regional utility power grid. In addition, a Laboratory dedicated array of 1 to 2 MW may be constructed and connected to the on-site BNL electric grid. The arrays would utilize, where possible, areas already cleared (agricultural fields, firebreaks, and brownfields), as well as require clearing of an estimated 153 acres (62 hectares) of trees. A building to support the Laboratory dedicated array may also be constructed.

4.1.1 Project Site Location

The proposed project would cover an area in the south central to southeast and east central portions of the BNL property within the Compatible Growth Area as delineated by the Core Pine Barrens and Compatible Growth Areas line (see Figure 3). The proposed area is divided into north and south sections. The north section is composed of approximately 78.5 acres (32 hectares) and is located in the vicinity of the former experimental agricultural fields. The south section is located just north of the line delineating Core Pine Barrens from Compatible Growth areas and mostly east of First Street. The south section is approximately 111 acres (44.92 hectares). Additionally, brownfield[1] areas composed of the Former Landfill, Interim Landfill, Slit Trench, and Glass Holes is available for possible placement of solar panels and/or Laboratory dedicated array facility. This area is immediately west of the southern portion identified above. The brownfield areas cover approximately 18.26 acres (7.84 hectares) and may be used within the controls established in the BNL Land Use Controls Management Plan [BNL 2009a].

While the overall size of the proposed project area is not expected to change appreciably from that depicted in Figure 3, the specific tracts of land may vary. Any minor changes to the specific tracts of land would be within the scope and established criteria set forth in the EA.

4.1.2 BP Solar Arrays

The BP solar arrays would be comprised of individual solar modules, such as the BP3220 modules, or a comparable solar module. The module would have dimensions of approximately 5.5 x 3.3 x 0.016 feet (1,667 x 1,000 x 50mm) weigh 43 lbs (19.4kg), and have a standard rating of 220 watts (W). Approximately 167,712 modules would be used to obtain a total project capability of about 37 MW of direct current (dc). The modules are generally considered to have a lifetime of upwards of 40 years.

The modules would be arranged into sub-arrays consisting of four vertical rows of six modules. The 24 modules would be attached to a steel I-beam support structure that would be anchored with two steel I-beam driven posts. These posts would be driven approximately 15 feet (4.6 meters) below the surface of the soil. The spacing between sub-array rows would be approximately 29 feet (8.84 meters). The gap for shading between the back of one mount and the front of the next would be approximately 18.5 feet (5.64 meters).

[1] Brownfields are defined as abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination [DOE 1999]

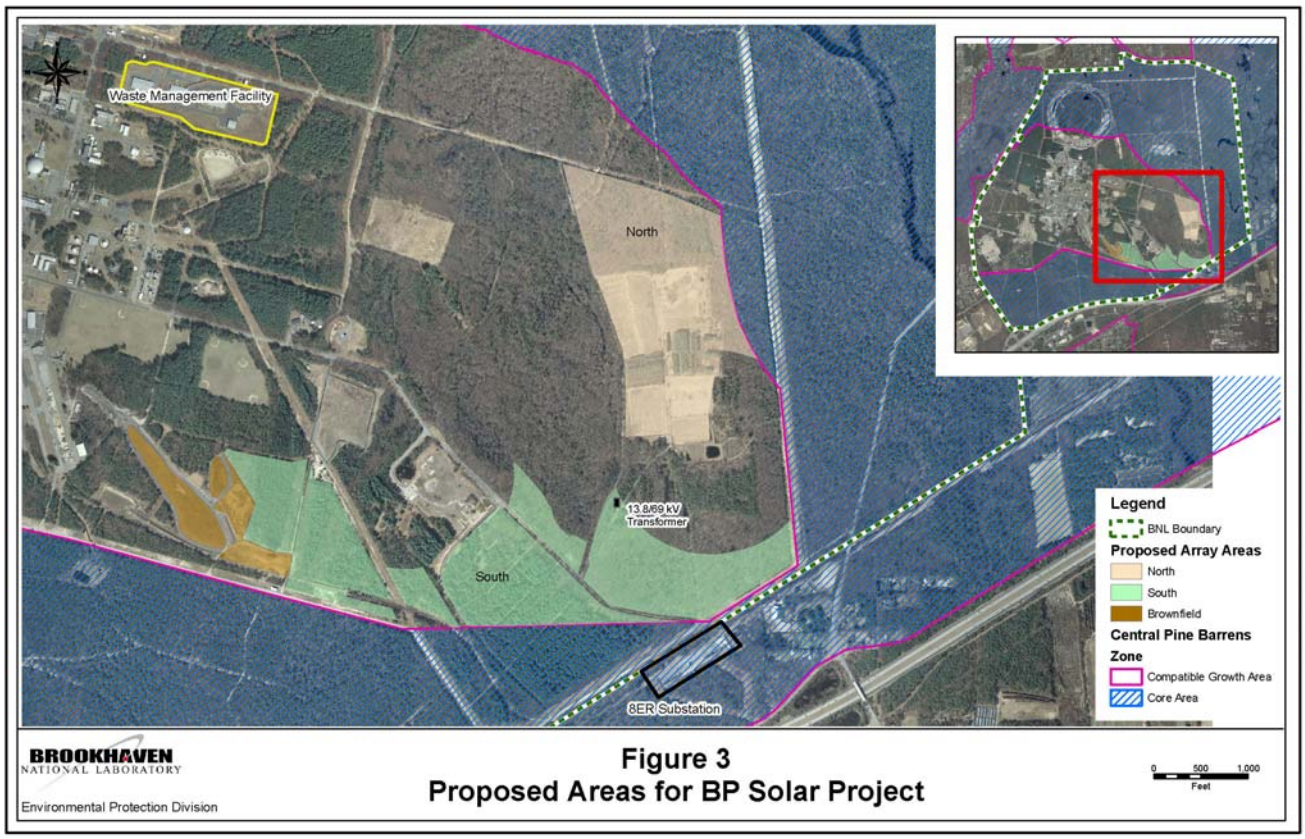


Figure 3
Proposed Areas for BP Solar Project

Strings of modules would be wired together in series. Fused combiner boxes with disconnect switches would connect strings of modules and lead to 32 concrete equipment pads of about 100 square feet (9.3 square meters) each, placed around the array. Each equipment pad would contain two inverters and one MVA transformer. It is anticipated that the wiring between the modules and equipment pads would be trenched. Conductors would combine at 15kV outdoor, metal-clad, switchgear on a 250 square-foot concrete pad. A 13.8/69 kV transformer, with associated circuit breakers, disconnect switches, and a small (12' x 24') control enclosure mounted on pads totaling 2,000-square-feet,, would then step up the power and supply it via transmission line to the LIPA 8ER substation located across the LIRR track from BNL. The 69kV transmission line would likely be run underground, including three conduit lines, one for fiber optics and two for power distribution (one active and one spare) that would be run under the LIRR tracks. Reference Section 4.1.6 Connected Actions for details on the LIPA Interconnect at substation 8ER. The locations of the 13.8/69 kV transformer and LIPA substation 8ER are shown in Figure 3. A fence designed to comply with the National Electric Code (NEC) requirements would be installed around the perimeter of the solar array areas. Fencing may contain small openings that would allow access for small animals.

4.1.3 Operation and Maintenance

Operation and maintenance of the system would involve replacement of modules, repair of inverters, and other supporting equipment, which would be expected to occur on a limited basis at certain points during the system's estimated 40-year life cycle. The area would be left unplowed from snow during the winter months except for when maintenance is necessary. Modules would likely be cleaned twice the first year. After the first year, modules would be cleaned 0-2 times annually depending on their location relative to pollinating trees and based on the results from the first year. Routine maintenance would also include periodic mowing of the ground cover to discourage invasive species and maintain vegetation heights at less than 2 feet (0.61 meters).

4.1.4 Laboratory Dedicated Array

It is envisioned that a separate array with a generating capacity of approximately 1-2 MW would be constructed by BP for BNL's sole use. This array would serve several purposes but principally would provide BNL with a source of power and allow for research activities related to solar photovoltaic technologies. The array would be tied into BNL's internal electric grid. The research conducted at this dedicated array would be multi-faceted in that BNL anticipates that it would provide climate, grid and efficiency data. It would also potentially serve as a test-bed for energy storage technologies (capacity and cycle testing, and different storage technologies), performance testing of systems in conditions of northern latitudes, module technology comparisons (e.g. multi-crystalline, thin film, etc.), inverter studies (comparisons between manufacturers, technologies and long-term inverter and module testing), shading tests, solar monitor development, ground-mount structural systems development, and possibly tracker testing and development.

The space required for the proposed Laboratory dedicated array is expected to be between 5 and 10 acres and may be developed as one large array or as a segmented array with the potential configuration of 750 kW and 250 kW. Whether the dedicated array is one large array or a segmented array, the BNL dedicated array would be in one location with potentially small spaces between the panels. A support building, of approximately 2,000 square feet (186 square meters), would also be located adjacent to the BNL dedicated array. Potential locations being considered for the BNL dedicated array include the southeast corner of the current Waste Management Facility (WMF) complex, and a portion of the brownfield area described in Section 4.1.1.

The operation of the BNL dedicated array would require the interconnection of the array with the electric grid on-site. This would require the extension of, at a minimum, electric service to either of the two potential sites proposed for this array. Additionally, water and sanitary facilities would be required should a building be necessary for housing bench-top experimental testing and evaluation systems associated with the BNL dedicated array.

4.1.5 Future Upgrades

While no specific upgrades to the solar arrays or project footprint are planned at this time, it would be reasonable to expect that future technological improvements may warrant changing some or all PV panels in order to achieve improved efficiency. It is also conceivable that future upgrades, employing similar updated technologies, could be proposed to expand the arrays beyond their current proposed footprint. Any future upgrades would be reviewed through established NEPA procedure.

4.1.6 Connected Actions

LIPA Interconnect at substation 8ER

The substation (LIPA Substation 8ER) would require very minor modifications to connect the solar energy source to the energy distribution grid. The substation modifications include the addition of two 69 kV disconnect switches, a 69 kV gas circuit breaker, 69 kV potential transformer, revenue metering, metering potential transformers and current transformers, and related control and protection relaying. All modifications would occur entirely within the substation footprint.

The new transmission cable to be installed from the solar arrays located on the BNL site to the LIPA substation will be approximately 900 feet (274 meters) between the BNL property line and the LIPA substation 8ER point of connection. The portion of this cable beneath the LIRR easement (consisting of two conduit lines beneath the LIRR tracks -- one active and one spare) would be constructed below ground using horizontal directional drilling.

Work for Others

The easement agreement between DOE and BP Solar for siting the BP Solar Array project at BNL may include BP Solar providing funding (consideration for the use of the federal property) to the Laboratory to support a Work for Others (WFO) program.

The Work for Others program would allow BSA to perform work for BP Solar, a non-DOE entity, on a fully reimbursable basis. WFO activities may involve use of the Laboratory dedicated array for research described in Section 4.1.4, or other research and development unrelated to solar power. WFO projects are reviewed individually under the existing NEPA review procedure.

Tiger Salamander Breeding Pond Enhancement

The current configuration of the Tiger Salamander breeding pond located, adjacent to the transmission line from the North array field, does not allow it to retain water year-round. The lack of persistent water retention prevents salamanders from developing, thus resulting in a population sink. In order to take advantage of solar array construction resources in the immediate area, the following habitat enhancements would be performed: Existing earthen berms, currently about 3 feet (1 meter) high, and 100 feet (30.5 meters) long, around the pond perimeter would be removed; the area would be regraded to allow water flow into the pond from surrounding wetlands; native vegetation would be planted in the affected area.

4.1.7 Decommissioning and Restoration

Solar PV arrays have an estimated lifetime of about 40 years. At the end of operational life, or substantially reduced efficiency, the arrays would be dismantled and disposed of as part of a planned decommissioning process. All support structures, fencing, and associated electrical hardware (wiring, conduit, towers, etc.) would also be removed. The land would then be available for future BNL operations or restoration, including natural re-growth. The power purchase agreement between BP Solar and LIPA to operate the solar PV arrays at BNL is currently for 20 years. At the end of 20 years:

- The agreement could be extended for an additional time period.
- The agreement could end as scheduled, whereupon the solar project could then be transferred to another entity to operate or upgrade.
- The agreement could end as scheduled, whereupon the solar facility would be dismantled and the federal property would be restored.

4.2 No Action Alternative

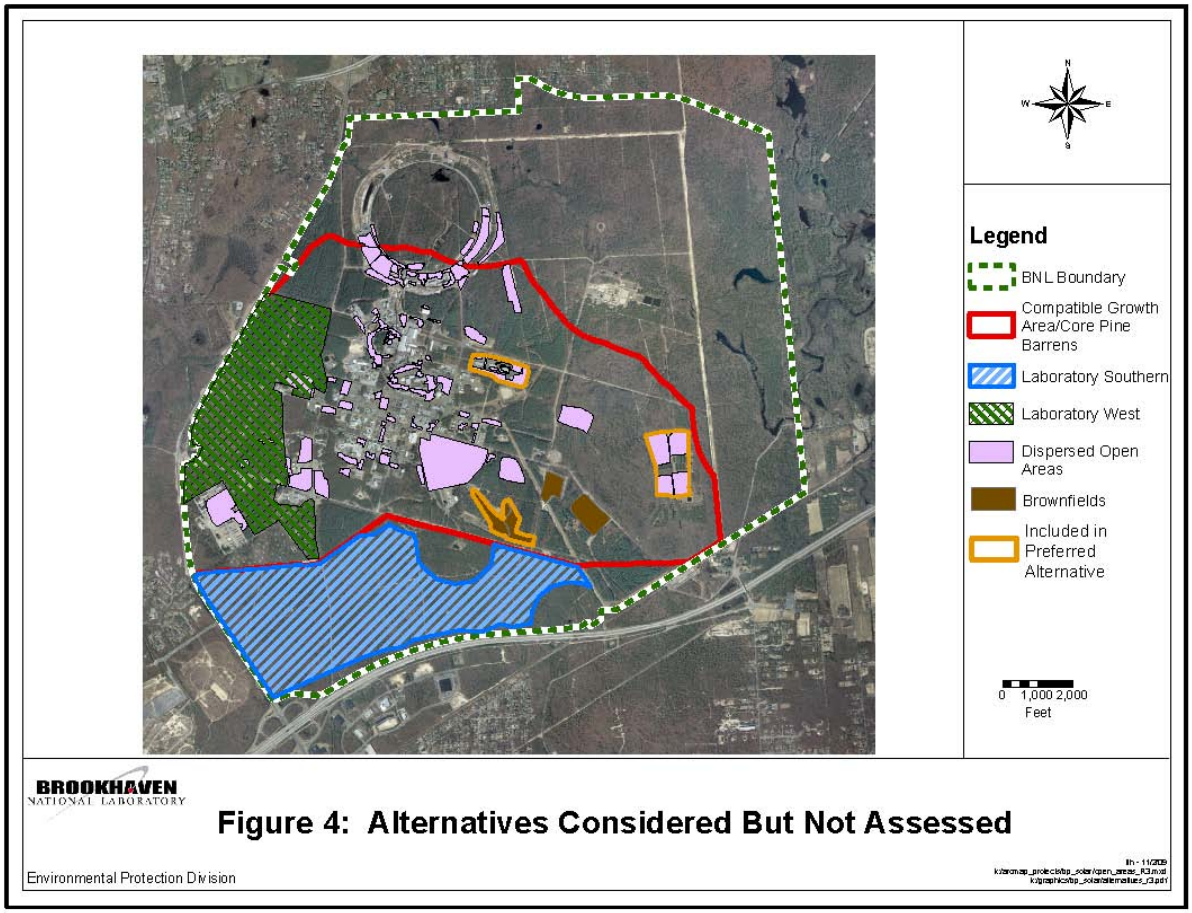
The No Action Alternative would maintain the current conditions and operations on the BNL site.

4.3 Alternatives Considered But Not Assessed

As the DOE and BSA considered the Laboratory site as a potential host location for the photovoltaic systems described in the LIPA Request for Proposal, a number of alternatives were reviewed but rejected. When considering potential locations, DOE and BSA considered three primary criteria for potential sites. These criteria were 1) proximity to the LIPA grid, 2) avoidance of Core Pine Barrens areas, and 3) minimizing impacts to the environment. Additional considerations for placement included minimizing conflicts with future Laboratory development (BNL Master Plan [BNL 2004]) and existing infrastructure. The following alternatives were initially considered and ultimately eliminated for the reasons described below (Reference Figure 4).

Laboratory West Boundary

The West Boundary would include much of the area along the William Floyd Parkway and north of Princeton Avenue. It is within the Compatible Growth Area of the Pine Barrens and does not contain any wetlands. The 377 acre (153 hectare) area is composed of a mix of native pine barrens forests and white pine plantings that protect WWI trenches that are eligible for listing on the National Register of Historic Places (NRHP). This alternative was rejected due to the exposure of the area to traffic on the William Floyd Parkway, disturbance of WW I trench systems, and interference with future Laboratory development. Future Laboratory development in the area potentially includes rerouting of the front gate road, new construction for Facility Operations, and a potential Visitors Facility (BNL Master Plan). The location is also approximately 2.75 miles (4.42 kilometers) from the LIPA substation located on the BNL south boundary along the LIRR.



Laboratory Southern Area

The 585 acre (237 hectare) area south of Princeton Avenue and the south firebreak was considered due to the large expanse of open space with few wetlands. There is limited development, restricted primarily to Upton Road and several access roads for access to groundwater treatment systems. This alternative was rejected because it is wholly within the Core Preservation Area of the Central Pine Barrens and has little fragmentation.

Dispersed Open Areas

There are numerous open areas of lawn, ball fields, and previously disturbed areas associated with past construction or demolition, adding up to approximately 310 acres (125 hectares). Some of these areas include locations within the apartment complex, open fields near the front gate, meteorology fields, and lawn areas around buildings, disturbed spaces within the RHIC ring, the ecology fields, the biology fields, and brownfields. Much of the open space was removed from consideration because it is either currently being developed [National Synchrotron Light Source (NSLS II) – 50 acres (20 hectares)], is scheduled for other construction planned within the BNL Master Plan, may cause significant infrastructure issues (access to or interference with utilities), or may be needed for future uses associated with facility scientific mission [e.g., Relativistic Heavy Ion Collider (RHIC) ring areas] – Reference Table 2 below. Approximately 23.6 acres (9.6 hectares) of the brownfield area

was rejected as sites for construction due to issues associated with either residual radiological contamination [15.6 acre (6.3 hectare) former hazardous waste management facility] or configuration of the brownfield that is not conducive to building solar arrays [8 acre (3.2 hectare) current landfill]. Additionally, utilizing all of the dispersed open areas would require development of numerous segregated small solar arrays tied together and then connected to the LIPA substation located approximately 1.75 miles (2.82 kilometers) from the center of the Laboratory's core developed area. Due to the combination of distance, segregation, and existing infrastructure interference, having numerous segregated arrays would not be within the developer's feasible project parameters.

Of the 310 acres (125 hectares) of open areas, about 58 acres (23.5 hectares) are included within the Preferred Alternative, encompassing 31.6 acres of Biology Fields, 8 acres associated with the current Waste Management Facility, and 18.3 acres of brownfields. The remaining 252 acres were not assessed further for the reasons mentioned above.

Table 2 – Dispersed Open Areas

Area	Acres (hectares)	Limitation
NSLS-II project site	50 (20 hectares)	Currently being developed
Brownfields	23.6 acres (9.6 hectares)	Residual contamination and/or site contour
Miscellaneous	142.5 acres (58 hectares)	Combination of: Planned/future scientific or support mission; interference with existing infrastructure; distance/segregation of arrays
Main entrance and apartment area lawns	36 acres (14.6 hectares)	Distance/segregation of arrays
Biology Fields	31.6 acres (12.8 hectares)	Included within Preferred Alternative
Current Waste Management Facility	8 acres (3.2 hectares)	Included within Preferred Alternative
Brownfields	18.3 acres	Included within Preferred Alternative

Rooftop Deployment

While BNL has numerous flat rooftops that could be utilized for the installation of solar arrays, this was not considered viable since the proposed BP Solar project is designed to generate 37 MW of electricity for LIPA and not for the Laboratory. This method of deployment would require extensive modifications to roof structures to support the weight of the arrays and use of rooftops would also require that energy generated be directed through existing meters on the buildings (net metering), or that a subgrid system with numerous electric junctures be established to allow generated energy to enter the LIPA grid. A diffuse sub-grid system would create substantial difficulties coexisting with BNL's extensive utility systems. Further, it would require major construction issues trying to install the required infrastructure around BNL's underground utility systems (electric, steam, sanitary, storm, water, communications, etc.)

5.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

This section describes the general environment in the areas proposed for installation of the photovoltaic arrays, along with specific environmental elements that may be affected by the proposed action. The effects of the preferred alternative on each of these elements are presented within each subsection. Section 5.23 describes the environmental effects of the No Action Alternative. For additional information on the BNL site, including detailed environmental monitoring results, please refer to the Annual Site Environmental Report (SER).

5.1 Site Description

The BNL site encompasses a total of 5,265 acres (2,131 hectares) with most principal facilities located near its central developed area, which occupies approximately 1,656 acres (670 hectares). The balance 3,609 acres (1,460 hectares) of the site are largely wooded and part of the Long Island Pine Barrens. The central portion of the BNL site is within the compatible growth area as designated by the Central Pine Barrens Joint Planning and Policy Commission (Pine Barrens Commission), while the areas outside the central portions of the Laboratory are designated as Core Preservation Area by the Commission. BNL, as a federal site, is not bound by NY State Environmental Conservation Law Article 57 establishing the Central Pine Barrens. However, DOE works within the spirit of the law whenever possible.

The proposed location for the BP Solar arrays is in the south-central and southeast portion of the BNL site just west of the eastern-most fire-break and just north of the southern-most fire-break (see figure 3) and is contained within the Pine Barrens Compatible Growth Area (see section 5.2). A portion of the area has been used as experimental agricultural and forestry fields, for farming prior, and as an Army camp (Camp Upton) prior to the BNL site being acquired by the Atomic Energy Commission in 1947. In addition, a small observatory building, about 120 square feet (11 square meters) in size, and previously use by the former BNL Astronomy Club, is located in the eastern experimental field. The observatory would be relocated prior to or removed as part of the proposed action. Other parts of the proposed site consist of white pine/fir trees that were planted over the former WWI Remount Facility and areas of native Pine Barrens habitat. The proposed construction site is gently sloped, with most of the area ranging in elevations from 40 to 90 feet (12–18 meters) above sea level. The geologic makeup of the project site (and the Laboratory) is primarily glacial sands.

A potential site being considered for the Laboratory dedicated array is an 8-acre (3.2 hectare) area located in the southeast corner of the current Waste Management Facility (WMF) complex – Reference Figure 3. This fenced area consists of planted/maintained grass and asphalt, and has water, sanitary, and electrical utilities. Another site being considered for the Laboratory dedicated array is the Chemical/Animal Pits and Glass Holes area described in the Use of Brownfields section below.

Use of Brownfields

Additional areas under consideration for siting solar arrays include two brownfield locations (Reference Figure 3.) The Former Landfill Areas is about 10 acres (4.85 hectares) encompassing the Former Landfill, Interim Landfill, and Slit Trench. The Chemical/Animal Pits and Glass Holes Area is approximately 8 acres (3.2 hectares). These areas have undergone environmental restoration under the Comprehensive Environmental Response, Compensation & Liability Act (CERCLA) and are currently managed by the BNL Land Use and Institutional Controls Program. The Former Landfill Areas were capped with

impermeable geomembrane fabric to prevent precipitation from entering the landfill waste and possibly leaching contaminants into the groundwater [BNL 2009b]. Approximately two feet (0.61 meters) of soil covering the cap serves as a protective barrier. Radiological and mercury soil contamination in the Chemical/Animal Pits and Glass Holes Area were remediated to industrial standards.

These brownfield areas primarily consist of open landscape surrounded by woodlands, with the exception of the National Synchrotron Light Source-II (NSLS-II) construction-site located to the northwest. Elevations in the brownfields range from a high of about 85 ft (26 meters) above sea level at the top of the Former Landfill mound, gradually sloping to the southeast to approximately 72 feet (22 meters) above sea level. Grasses 1-3 feet (0.3-1 meters) high cover the landfill mounds, while the other areas are essentially barren or have minimal vegetation.

5.2 Ecology

5.2.1 Existing 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 early to mid-1990s called the Site Wide Biological Survey; the establishment of a Wildlife Management Plan in 1999; the Natural Resource Management Plan in 2003; 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 not-for-profit Foundation for Ecological Research in the Northeast (FERN), a non-profit organization. Additionally, from May-July 2009, BNL staff and biologists walked through the area to further examine the fauna and found that conditions had not appreciably changed from prior studies.

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. The proposed site for the BP Solar project consists of several different habitats (the corresponding vegetation classifications are included in parenthesis) including: white pine/fir/spruce forest planted by the Civilian Conservation Corps between 1934 and 1941 (planted white pine forest); experimental tree nursery with now fully matured trees consisting of several species of conifers and other trees (planted white pine forest); native pine barrens habitats (a mix of pitch pine/oak/red maple forests); old farm fields undergoing secondary succession (pitch pine/oak/red maple complexes); areas with heavy infestations of invasive plants which exist throughout the area but primarily adjacent to roads and paths; open experimental agricultural fields (grass and successional), and unpaved roads and firebreaks. Because much of the area has been disturbed by either agriculture, WW I and WW II activities, and dense forest plantings, the understory is much less developed than in pine barrens areas with little historic disturbance. The area, including wetlands to the west and north of the proposed project area, provides suitable habitat for numerous protected species, migratory songbirds, raptors, turkeys, reptiles and amphibians, small and medium sized mammals, and deer.

Invasive Species

The area of the proposed project contains several invasive species including Japanese Barberry (*Berberis thunbergii*), Japanese Honeysuckle (*Lonicera japonica*), other honeysuckles (*Lonicera spp.*), black locust (*Robinia pseudoacacia*), phragmites (*Phragmites australis*), black and/or pale swallow-wort (*Cynanchum spp.*), and potentially kudzu (*Pueraria lobata*). These species were either intentionally introduced to the area as ornamentals (i.e. Japanese Barberry), inadvertently transported to Long Island and the BNL site by visitors, or transferred through movement by animals. The area along Brookhaven Avenue and roads within the Biology Fields area are heavily infested with invasives, and most fire-break areas within the proposed project site have Japanese Barberry and black locust present.

Threatened, Endangered, or Species of Concern

There are no known federal threatened or endangered species on BNL property. The NY State designated endangered eastern tiger salamander (*Ambystoma t. tigrinum*) inhabits a constructed wetland and periodically uses several accessory wetlands. Suitable tiger salamander habitat is protected by a 1,000 foot buffer around the primary habitat. Species listed by NY State as species of special concern using the constructed wetland and wetlands to the west and north of the proposed project include the eastern spadefoot toad (*Scaphiophus holbrokii*) and the marbled salamander (*Ambystoma opacum*). Other species of special concern in the area of the proposed project include: the eastern box turtle (*Terrapene carolina*), possibly the eastern hognosed snake (*Heterodon platyrhinos*), Cooper's hawk (*Accipiter cooperi*), and sharp-shinned hawk (*Accipiter striatus*). Three protected insect species potentially use the area adjacent to the proposed project. They include the frosted elfin butterfly (*Callophrys iris*) which historically used wild lupine (*Lupinus perennis*) along the south fire-break for breeding, mottled dusky wing butterfly (*Erynnis martialis*), a species of special concern, and the Persius dusky wing butterfly (*Erynnis persius*); a NY State designated threatened species. The two dusky wing butterflies have not been documented at BNL but utilize similar plant species as the frosted elfin and were historically in the Pine Barrens. The coastal barrens buckmoth (*Hemileuca maia maia*) may also be found in pine barrens habitat. However, this moth species requires dense stands of shrub oak (*Quercus ilicifolia*), which is not prevalent in the proposed project area. In addition, recent surveys provided no indication of the buck moth within the proposed area. No NYS threatened or endangered plant species are known to exist within the proposed project area.

Migratory Birds

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 March through September annually since 2000. Over the nine years of data collection a total of 110 species have been documented. Additionally, birding has been an avid pastime for many BNL employees. Between 1948 and the present, more than 185 bird species have been documented on-site and approximately 85 species routinely utilize the BNL Site for nesting. Of the six bird survey transects located on BNL, two cover habitats similar to those in the area proposed for siting the proposed solar arrays.

The planted pine/fir forests along the southern part of the proposed project site typically have around 27 species with around 56 species using this forest type over the past nine years. The most common bird species in this forest type include black-capped chickadee (*Poecile atricapillus*), American robin (*Turdus migratorius*), American crow (*Corvus brachyrhyncos*), bluejay (*Cyanocitta cristata*), chipping sparrow (*Spizella passerina*) , pine warbler (*Dendroica pinus*), ovenbird (*Seiurus aurocapillus*), eastern or rufous-sided towhee (*Pipilo erythrophthalmus*), eastern wood peewee (*Contopus virens*), tufted titmouse (*Baeolophus bicolor*), and goldfinch (*Carduelis tristis*). Raptors using this forest type include red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), and great horned owl (*Bubo virginianus*). The eastern screech owl (*Otus asio*) is also likely to use this forest type. Woodpeckers using this forest type include red-bellied (*Melanerpes carolinus*), downy (*Picoides pubescens*), hairy (*Picoides villosus*), and northern flicker (*Colaptes auratus*).

The mixed habitat of open fields, wet forest, and upland forest associated with the northern area of the proposed project provide suitable habitat for a more diverse species assemblage. Between 2000 and 2008, 95 species of bird have been identified during surveys in this area with an average of approximately 50 species per year seen or heard. Species routinely identified in this area include those listed above and eastern bluebird (*Sialia sialis*), field sparrow (*Spizella pusilla*), great crested flycatcher (*Myarchus crinatus*), indigo bunting (*Passerina cyanea*), house wren (*Troglodytes aedon*), northern cardinal (*Cardinalis cardinalis*), red-eyed vireo (*Vireo olivaceus*), red-winged blackbird (*Agelaius phoeniceus*), scarlet tanager (*Piranga olivacea*), tree swallow (*Tachycineta bicolor*), wood thrush (*Hylocichla mustelina*), and yellow-billed cuckoo (*Coccyzus americanus*). In addition to the raptors mentioned above, American kestrel (*Falco sparverius*), merlins (*Falco columbarius*), and eastern screech owl (*Otus asio*) have been seen using the area.

Mammals

A number of mammals utilize the various habitats at BNL, including those areas proposed for solar arrays. The largest mammal found at BNL is the white-tailed deer (*Odocoileus virginianus*), which is present in numbers exceeding 50 per square mile (19.31 per sq. kilometer). In general, there are fewer deer within the planted pine/fir plantations compared with the areas around the experimental agricultural fields, which have some of the densest deer population on-site. Other mammals on-site include small mammals (bats, mice, squirrels, rabbits) and medium-sized mammals like raccoons and red and grey fox.

Only two bat species have been confirmed on-site, the little brown bat (*Myotis lucifugus*) and the eastern red bat (*Lasiurus borealis*). The little brown bat typically utilizes buildings for maternity colonies and utilizes trees along streams and water bodies for summer foraging. This bat has been seen utilizing open water areas on-site. The eastern red bat utilizes trees and forested areas for roosting and foraging. This bat is occasionally seen on-site.

Small mammal species found on-site include the meadow jumping mouse (*Zapus hudsonius*), white-footed mouse (*Peromyscus leucopus*), least shrew (*Cryptotis parva*), short-tailed shrew (*Blarina brevicauda*), meadow vole (*Microtus pennsylvanicus*), house mouse (*Mus musculus*), eastern chipmunk (*Tamias striatus*),

grey squirrel (*Sciurus carolinensis*), southern flying squirrel (*Glaucomys volans*), groundhog (*Marmota monax*) and eastern cottontail rabbit (*Sylvilagus floridanus*).

Reptiles and Amphibians

The BNL site is home to 28 species of reptiles and amphibians. The various species are distributed throughout the Laboratory site but may be localized depending on their habitat requirements. Reptiles like the eastern box turtle (*Terrapene carolinensis*) may be found in virtually all habitats on-site, while many species of snakes and other turtles are localized near wetland resources. Frogs and toads are isolated around wetlands 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 (*Ambystoma t. tigrinum*), marbled salamander (*A. opacum*), red-spotted newt (*Notophthalmus viridescens*), and red-backed salamander (*Plethodon cinereus*).

Pine Barrens

The BNL site is within the Central Pine Barrens of Long Island. This area has been designated a protected area under NY State Environmental Conservation Law Article 57. While federal lands within the Central Pine Barrens are not bound by the law, the DOE and the Laboratory attempt to work within the spirit of the law when planning and implementing projects. The Central Pine Barrens is an area of approximately 105,000 acres and is divided into a Core Preservation Area of approximately 55,000 acres where development is proscribed and limited, and the Compatible Growth Area (CGA) of approximately 50,000 acres, where development is allowed but must meet a series of standards and guidelines established in the Land Use Plan for the Central Pine Barrens [CPB]. The proposed photovoltaic project at BNL is entirely within the CGA and is expected to meet the established standards and guidelines.

5.2.2 Effects of Preferred Alternative on Ecological Resources

Effects on Vegetation during Construction

The proposed project would result in disturbance to approximately 200 acres (80.94 hectares) of land through clearing and grading in preparation for construction. The construction would follow a phased approach in which enough area to construct 3 megawatts of generating capacity would be completed at a time (approximately 15 acres or 6.07 hectares). As the construction of one phase is started, the clearing for the next phase would begin. Overall, construction would impact vegetation within the proposed areas with the majority of effects on trees (overstory).

Based on existing construction design, trees would be cut, stumps removed and holes filled in, with as little disturbance to understory vegetation as possible. The initial effects would be removal of trees. The age of the oldest trees within the proposed project area is estimated to be about 80 years. An estimated 153 acres (62 hectares) of trees would be removed, which constitutes approximately 3% of the entire BNL site and approximately 4% of the Laboratory's forested area. More specifically, the clearing for construction would result in 21.5 acres (8.7 hectares) of Civilian Conservation Corps (CCC) planting being removed compared to 468 acres (189.4

hectares) existing on the BNL site; 129.5 acres (52 hectares) of pine barrens forests compared to 3,532 acres (1,429 hectares) of this forest type on the BNL site; and the removal of 4 acres (1.62 hectares) of matured nursery trees. Removing the overstory would be considered a permanent impact during the estimated 40 year project lifetime as the area of the solar arrays would have to be maintained free of trees to prevent shading of the arrays. Elimination of trees, overstory layer, within the array areas displaces tree nesting birds and tree dependent small mammals to other forested areas on the BNL property.

Clearing would likely have a temporary impact on understory plants, but most would recover as long as the root mass is not disturbed and soils are not heavily compacted due to movement of construction equipment. Under existing construction plans, areas where grading is required to meet specifications, top soils would be removed, grading accomplished and top soils replaced with subsequent planting of native grasses or understory vegetation, such as huckleberry and low-bush blueberry. Areas that currently lack understory vegetation due to dense forest canopy would have native grasses, lupine, or understory vegetation planted.

Additionally, clearing would include the removal of various invasive plant species that if not removed could result in operational and maintenance problems in the future. The removal of invasive plants from the proposed area decreases the potential that these plants would expand further into the Pine Barrens to the east of the proposed area or into adjacent wetland areas.

Effects on Vegetation during Operation

Since operation of the proposed solar arrays is dependent on an open view of the sky, vegetation management would be an integral part of maintenance activities within the proposed project area. Various tree species would likely grow from root material left behind during the clearing process. These “volunteer” trees would be periodically removed. Various understory plants may grow taller than the estimated two-foot height limit for vegetation under the solar arrays. When plants approach that height limit, mowing or trimming would be required. Grasses would likely be cut back to a few inches high, while understory plants like low bush blueberry and black huckleberry would be cut back to heights of 6 – 12 inches (0.15 – 0.3 meters) high. Mowing would not be expected to occur more than twice per year for grasses and once per year for understory vegetation. Increase in density and variety of understory plants would improve this vegetation type which provides habitat for a host of other species. The proposed project would likely have long-term positive effects for these plant species.

While most invasive plants in the area would be removed during clearing, many may persist through remnants of roots or seeds within soils and would have to be managed to minimize effects on the solar arrays and the native vegetation used under the arrays. Continued long-term management of invasive plants would provide assurance of control that would prevent expansion of invasives to natural habitats in the areas surrounding the arrays. Control of invasives may be by manual, mechanical, or chemical means. Use of herbicides may require special permits from NYSDEC in areas in proximity to wetlands. Laboratory policy is to utilize Integrated Pest Management (IPM) as an approach in minimizing pesticides use. Use of IPM

would result in long-term reductions in the number and type of invasive species that could move into other pine barrens habitats.

Effects on Threatened, Endangered, or Species of Concern during Construction

A portion of the South end of the North Array, about 12 acres (5 hectares), would be constructed within the 1,000 foot (304.8 meters) protection zone surrounding a constructed wetland designed as eastern tiger salamander habitat. Because this area currently consists of open fields, with additional fields to the north, it is not considered suitable for tiger salamanders. Approximately four acres (2 hectares) of solar panels in the South Array would also be located slightly within the 1,000 foot (304.8 meters) protection zone of a known tiger salamander habitat. A barren utility right of way (Power Line Road) situated between the proposed project area and salamander habitat make the site unsuitable for tiger salamanders. NYS draft guidance for eastern tiger salamander breeding ponds recommends that 50 percent of the area within 1,000 feet (304.8 meters) and 100 percent of the area within 535 feet (163 meters) be maintained as available habitat to the salamanders [NYSDEC].

While arrays would be located within the 1000 foot protection zone of two separate habitat areas, the project would continue to be meeting the NYSDEC protocol. Locating arrays within the two identified protection zones was evaluated and determined to be permissible by the NYSDEC. Recent research indicates these salamanders moving as much as 1,250 feet (381 meters) from breeding ponds to forage (*V. Titus pers. comm.*). Therefore, construction of the proposed solar arrays may have a minor impact on the tiger salamander beyond the 1,000-foot (304.8 meters) protection zones around known habitats primarily consisting of loss of existing wooded habitat, but also potential inadvertent injury/kills. Existing processes, such as digging permits, would identify and inform project personnel of the potential for salamander sightings and instruct them to contact BNL natural resource personnel. Following construction, potential salamander habitat would be reestablished through native vegetation, such as grasses, low bush blueberry, and huckleberry, planted under the solar array canopy. Routing and installation of a transmission cables from the north array to the 13.8/69 kV transformer pad, and then on to the LIPA substation would utilize existing unpaved fire break roads or be performed in areas disturbed for solar array placement (e.g., installation would include trenching and burying the cables under the solar arrays). This alternative was proposed to take advantage of an already disturbed area with no vegetation by trenching down the middle of the existing road and burying the cable. This approach would overlap with a 100 foot (31 meter) wetland buffer area, but avoids an alternative path that would require clearing trees within a 535 foot (163 meter) tiger salamander habitat buffer. Installation actions would require a NYSDEC wetlands permit and would incorporate protective measures such as silt barriers, hay bales, etc.

Following cable installation, the roadway would be returned to its pre-project state, with no impacts anticipated during system operation. Due to the short duration of the trenching and cable installation activity (less than 1 week) over an existing roadway, adverse impacts to the tiger salamander would not be anticipated. Overall, due to established buffers and procedures, construction should result in minimal impacts to tiger salamanders and other amphibians. Disturbance from construction would temporarily impact eastern box turtles. However, proposed fencing design is expected to allow movement of reptiles throughout the entire area.

Current habitats for threatened and endangered butterfly species are of marginal quality and require disturbance for maintenance. Disturbance from construction may result in potential expansion of appropriate host plants (wild lupine) in areas adjacent to existing plants.

Removal of approximately 153 acres (62 hectares) of mature forest would impact nesting raptors, forcing them to move from the proposed construction-site to other suitable habitat either on BNL property or within nearby pine barrens forest. Cooper's Hawks and other small raptors would likely utilize extensive white pine forests on the BNL site, as would owls. Overall, construction would have a minor negative impact on threatened, endangered, and special concern species.

Effects of Operations on Threatened, Endangered, and Special Concern Species

Operations would have little additional effects and may have slight positive effects on threatened, endangered, and special concern species beyond the effects of construction. Management of native vegetation (mowing, cutting, invasive species removal, etc.) may result in increased numbers of host plants for rare butterflies. Fencing would prevent entry of deer allowing understory vegetation to mature and seed, which may provide improved habitat for many threatened and endangered species.

Effects of Construction on Migratory Birds

Clearing of trees and temporary disturbance of understory vegetation would result in a moderate negative effect on migratory song-birds and raptors. Noise from construction and movement of vehicles and workers may cause disturbance of some nesting birds. Removal of trees would result in some destruction of nests if clearing occurs during late spring and summer months. Timing the clearing of forests can minimize direct impacts. While clearing would remove available habitat, it affects 4.35 percent of the available habitat on the BNL site. Removal of existing fences and open areas for the construction of the proposed solar arrays would have temporary effects on eastern blue birds which utilize nest boxes within the area. Nest boxes would be replaced once construction is completed.

Effects of Operation on Migratory Birds

Operations of the proposed project would likely have slight positive effects on migratory birds due to increased edge (forest to clearing interface) habitat, improved deer free understory, and increased fence lines for placement of nest boxes. Increased edge habitat may result in slight increases in the number of brown-headed cowbirds parasitizing songbird nests.

Effects of Construction on Mammals

Since over-abundant deer populations have already impacted small mammal populations, removal of trees would have minor effects on mammals. Species most likely affected include flying squirrels, grey squirrel, and white-tailed deer that would be dispersed to surrounding forests. Displaced deer would cause added stress on surrounding forests, and would suffer increased stress due to the effects of

overabundance. Other medium sized animals would be displaced with little effect on their populations.

Effects of Operations on Mammals

The operation of the proposed project would likely have minor positive effects on small mammals and medium-sized mammals due to fences keeping deer out of the area. As the understory will be improved, food for small mammals will increase and they, in turn, will become food for medium-sized mammals.

Effects of Construction on Reptiles and Amphibians

Construction activities associated with the proposed project are expected to have minimal impacts on reptiles and amphibians. Species most affected may be the Eastern box turtle and the grey tree frog. Box turtles may have difficulty avoiding construction equipment and trees removed would result in loss of forage and mating habitat for tree frogs. Most other species would only be slightly affected since disturbance of understory vegetation would be minimized as much as possible.

Effects of Operations on Reptiles and Amphibians

The operation of the proposed project is expected to result in slight habitat improvements for reptile and amphibian species. Increased habitat for mole salamanders, tree frogs, snakes, and maintained habitat for turtles should result from increased understory. Proposed fencing may be designed to support movement of small animals, including reptiles and amphibians between the proposed project and surrounding habitats.

Effects of the Construction on the Pine Barrens

The clearing of approximately 153 acres (62 hectares) of trees would have a minor impact on the overall quality of the Central Pine Barrens ecosystem. The proposed project is fully within the Compatible Growth Area (CGA) on the BNL site and falls well within the 65% clearing standard established under the Central Pine Barrens Land Use Plan. The proposed solar project increases the cleared area of the BNL site from 26.8% to 29.8%. When the development standards are applied to just the compatible growth area, the increase in clearing changes the cleared areas from 40% to 47% of the CGA on the BNL property which is still well within the 65% clearing standard. The proposed project, if approved, would require various environmental permits including those for: New York State Wild, Scenic, and Recreational Rivers Act (WSRRA), freshwater wetlands, and construction storm water permits under the NY SPDES program. These permits would meet the requirements of the Central Pine Barrens Land Use Plan [CPB].

Effects of Operations on the Pine Barrens

The operation of the proposed project would have little, if any, overall effect on the surrounding Pine Barrens. Since the proposed project intends to utilize native vegetation underneath the solar arrays and would have minimal impermeable (concrete or paved) surfaces, the recharge of precipitation to groundwater would not be affected.

Few, if any, studies have been performed to evaluate the long-term effects of utility-scale solar array complexes on the ecosystem. Presented with this unique opportunity, the Laboratory would initiate long-term monitoring to assess resulting impacts. Potential areas of study would include: Vegetation growth under solar panels (reflective sunlight, water impingement, etc.); effects on small mammals, amphibians, and migratory birds.

5.3 Water

5.3.1 Existing Environment

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

Surface Water

The BNL site lies within the headwaters region of the Peconic River watershed. Liquid effluents from the BNL Sewage Treatment Plant discharging into the Peconic River receive tertiary treatment and conform to the criteria in the approved SPDES permit issued by the NYSDEC.

Pocket seasonal wetlands are also found throughout the site. A constructed wetland designed as habitat for the eastern tiger salamander (*Ambystoma t. tigrinum*) is within the vicinity of the area proposed for this project. Three federal jurisdictional wetlands are located approximately 1,000 feet (308 meters) northwest and up gradient from the proposed project site, and another jurisdictional wetland is just to the west of the project in the east central portion of the BNL property.

Groundwater

The BNL site is situated over a U.S. Environmental Protection Agency (EPA)-designated sole-source aquifer that is the primary source of drinking water for both on- and off-site private and public supply wells, and water for industrial use such as cooling and steam generation. Across the proposed PV array construction area, the ground surface ranges from 40 to 90 feet above mean sea level (AMSL), and the top of the water table ranges from 36 to 40 feet AMSL. Table 3, below, summarizes the land surface and water table elevations for the proposed general solar array areas, with the south array further divided into southeast and southwest sections.

Table 3 - Depth to Groundwater

Array Area	Land Surface Elevation (AMSL)	Water Table Elevation (AMSL) (1)	Depth to Water Table
Northern	40-60 feet (12-18 meters)	37-40 feet (11-12 meters)	3-20 feet (1-6 meters)
Southeast	50-60 feet (15-18 meters)	36-38 feet (11-12 meters)	14-22 feet (4-7 meters)
Southwest	60-90 feet (18-27 meters)	37-39 feet (11-12 meters)	23-51 feet (7-15 feet)

Note: Water table position based upon November 2008 measurements.

Past spills and waste-handling practices resulted in contamination of the groundwater with volatile organic compounds (VOCs) and radionuclides at various locations on the Laboratory site. The groundwater below a small portion of the proposed southwest PV array area is currently contaminated with low levels of VOCs and strontium-90 that were released to the environment from the nearby Former Hazardous Waste Management Facility and Current Landfill (CERCLA Operable Unit I) and Chemical Holes/Former Land Fill (CERCLA Operable Unit I/IV). This VOC plume is present in the deep portion of the Upper Glacial aquifer, located more than 100 feet below the water table. The strontium-90 contaminated groundwater is generally positioned within the uppermost 20 feet (6 meters) of the aquifer or 14–34 feet (4-10 meters) below land surface [BNL 2008]. The Sr-90 and VOC concentrations are below the 8 pCi/L and 5 ug/L drinking water standards, respectively. The contaminants in this area are undergoing monitored natural attenuation. In the past, the shallow groundwater in several sections of the proposed northern PV array area was contaminated with ethylene dibromide (EDB), which had been used as a fumigant in the Biology Department's agricultural fields (CERCLA Operable Unit VI). Currently, only trace levels of EDB are occasionally detected in this area.

Sixteen groundwater monitoring wells and a former irrigation supply well are located within the footprint of the proposed project area. The monitoring wells are used to periodically sample groundwater contamination plumes.

Peconic River Scenic Corridor

Approximately 40 acres (16 hectares) of the proposed project would be located within the Peconic River Scenic Corridor, which constitutes the area located within a half-mile of the river as designated by the New York State Wild, Scenic, and Recreational Rivers Act under NY Article 15, Title 27, 15-2707. Vegetative cover in the 40 acres consists of the following estimates: 5.5 acres (2.2 hectares) of mature former tree nursery stock, consisting primarily of conifers; 10 acres (6.5 hectares) of former BNL experimental fields, primarily open field grass and successional plants; 14.1 acres (5.7 hectares) of former farm fields undergoing secondary succession, primarily a mix of pitch pine, oak, and red maple; and 10.4 acres (5 hectares) of successional oak-pine mix.

5.3.2 Effects of Preferred Alternative on Water Resources

The proposed BP Solar project is not expected to impact any groundwater or surface water resources, including wetlands. The boundaries of the project are expected to be outside the 100-foot (30.5 meter) wetland buffer established by NYSDEC; with the exception of a transmission cable installed along an existing unpaved fire break road – reference section 5.2.2 *Effects on Threatened, Endangered, or Species of Concern during Construction* for additional details. Construction stormwater controls would be in place to protect wetlands. Overall rainwater infiltration and groundwater flow conditions would not be affected during construction or operations. Due to the depth of the groundwater contamination plumes, construction and operation of solar arrays in these areas would have no effect on personnel health/safety. The former irrigation supply well located in the proposed project area may be abandoned in place in accordance with an established process that conforms to NYSDEC requirements, or it may continue to be used as a source of water for periodically washing the PV arrays.

A New York State Long Island Well Permit would be obtained for well point utilization as appropriate. Groundwater monitoring wells would be evaluated on an individual basis. If a well interferes with installation of a solar array, the well could be abandoned in place, with the Laboratory maintaining the option to install a new well in a more suitable location. If the height of a well casing is an issue, casings extending up to three feet (1 meter) above the ground surface would be modified to 'flush mount' casings extending only 0.5 feet (0.15 meters) high. A sufficient number of wells would remain intact and accessible to sampling and maintenance personnel to ensure adequate groundwater monitoring capabilities. Previously abandoned wells may also be present below grade in the proposed project area. If structural features associated with the abandoned wells were encountered during construction activities, their removal would have no adverse environmental impacts.

During construction, storm water and silt runoff from project areas would be managed in accordance with the pollution prevention plan prepared under a NYS General Storm Water Permit for Construction Activities. Examples of pollution prevention measures include the use of standard erosion control mechanisms such as silt fencing and stabilized rock construction entrances. In addition, the Laboratory's Environmental Protection Division (EPD) staff would perform periodic inspections of the construction site to verify the adequacy of contractor-implemented controls. After installation, native vegetation in the form of a low-growing ground cover would be planted under/around the solar arrays to minimize the potential for soil erosion.

Existing drainage ditches from past agricultural and/or mosquito control currently aid in managing storm water flows from the area west of the constructed wetland. The surface contour and the potential tie-in of the proposed action with these ditches would be reviewed to determine the need for other storm water management methods, such as installation of culverts, water control structures (e.g., gated weir), and open channel flow measuring devices (e.g., Parshall Flume) for estimating flows. This review would also evaluate the need for establishing a new storm water outfall under the existing or new SPDES permit.

Construction of the following support features would result in a slight increase in impermeable surfaces – a total of approximately 12,890 square feet (1,178 square meters): some 32 concrete equipment pads, each about 270 square foot (25 square meters) supporting solar array inverters and transformers; a 250 square foot (76 square meter) equipment pad supporting a switchgear equipment building; a 2,000 square feet (232 square meters) concrete equipment pad for the 33MVA step-up transformer; and a 2,000 square foot (186 square meter) Laboratory dedicated array Support Building. Because these are discontinuous impervious surfaces, no adverse impacts to storm water or water infiltration would be anticipated.

Construction and operation of the below-ground electrical conduit lines, approximately 8-10 feet deep (1.2–1.8 meters), connecting the 13.8 kV transmission line from the on-site solar arrays to the existing off-site LIPA substation, would not infiltrate groundwater, which is at depth of 14-22 feet (4-7 meters). Additionally, water for horizontal directional drilling mud would be obtained from existing BNL water supplies or trucked-in sources.

It is estimated that as much as 500,000 gallons of water per year would be required for cleaning PV panels. Because this represents an increase of about 0.1 percent of current BNL site water usage, existing sources would be considered adequate. Water could be supplied from several sources including a fire hydrant located near the Former Waste Management Facility parking area or an existing agricultural well located in the north Biology Fields. Back-flow prevention hardware would be required when drawing water from the system and washing operations would be designed with water conservation efforts in mind.

Peconic River Scenic Corridor

The proposed action would remove about 40 acres (16 hectares) of trees within the Peconic River Scenic Corridor; however, at its closest point the project would remain approximately 2,000 feet (610 meters) from the river. The Wild, Scenic, and Recreational Rivers Act describes scenic rivers as: 'Those rivers, or sections of rivers, that are free of … dispersed human activities which do not substantially interfere with public use and enjoyment of the rivers and their shores'; and stipulates 'management of scenic river areas shall be directed at preserving and restoring the natural scenic qualities of such rivers'. Due to the density of trees separating the river and the project area, the solar panels would not be seen from the river or its shoreline. As a result, the project would have minimal impact on corridor and no impact on the scenic attributes of the river or its shores.

Permits

Because a portion of the proposed northern PV array area is within a half-mile of the Peconic River, and a transmission line is within 100 feet (30.5 meters) of wetlands, a Wild, Scenic and Recreational Rivers Act Permit and a Wetlands Permit would be required. Both permits are issued by the NYSDEC. Additionally, since storm water from the construction site may flow into wetlands to the west of the northern part of the project site, a NYS General Storm Water Permit for Construction Activities may be necessary. All site runoff would be managed in accordance with the pollution prevention plan prepared under that permit. Depending on final construction configuration, a storm water discharge permit would be necessary under NYSDEC SPDES requirements.

Use of Brownfields

Placing PV arrays in brownfield areas that have been capped would require the use of ballasted arrays to ensure that the cap is not penetrated. If placed on brownfields, concrete ballasts would be used to secure the PV arrays in place, eliminating the need to install in-ground anchors. Additional means of assuring cap protection may include restrictions/limitations on soil disturbance, adding soil layers, monitoring of construction techniques, and periodic post-installation inspections.

The ballasted solar arrays would add some noncontiguous impervious surfaces (concrete bases) to certain project areas. Because the ballasts would not result in a continuous impervious surface, water infiltration rates would not be affected and storm water runoff would not require engineered control mechanisms beyond those that currently exist. If the Laboratory dedicated array were located in the Chemical/Animal Pits and Glass Holes Area, additional impervious surfaces would

include about 10,890 square feet (3,716 square meters) of parking area/roadway. Storm water management issues would be evaluated through established Laboratory programs.

5.4 Land Use, Demography, and Environmental Justice

5.4.1 Existing Environment

Land Use

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, one dwelling or less per acre. To the north is a mixture of residential properties, commercial retail and service properties, and public utility services. 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, agricultural, and residential areas. The brownfield areas are designated for industrial use within established controls.

The current BNL site was established in 1947 specifically to develop and construct large-scale scientific facilities. Figure 5 "Land Use Within 1-mile of BNL Border" presents a 2007 aerial photograph of the Laboratory site and surrounding areas.

Demography

Based on the 2000 U.S. Census and associated population estimates for 2007, approximately 13,460 persons live within 1.0 miles (1.6 kilometers) of the Laboratory's boundary [Davis]. Figure 6 "Population Within1 Mile of BNL Border" shows the BNL site boundary and 1-mile extent superimposed over a map of the U.S. Census blocks, along with the estimated populations in 2007.

The Laboratory's on-site population includes approximately 3,000 employees and more than 4,300 guest researchers who visit periodically each year[2]. An average of 180 people live in temporary on-site housing, and an average of 130 guest scientists and students who visit the Laboratory stay in the dormitories.

Environmental Justice

Environmental Justice 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.

[2] NOTE: The Laboratory's on-site population is not shown on Figure 6.

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 489,255 persons, based on the 2007 LIPA Long Island Population Survey [LIPA], (448,248 based on 2000 U.S. Census data). According to the 2000 U.S. Census data, 15.2 percent of Brookhaven Town's population consisted of minorities [SC]. Using the same 2000 U.S. Census data [Tele Atlas], within 1-mile of the Laboratory's boundary the percentage of minority population is estimated to be approximately 15.9 percent [Davis]. While the percentage of minorities is slightly higher than that of the Brookhaven Town, the 0.7 percent difference would not constitute a percentage that is meaningfully greater than the general population. Therefore, the population living within 1-mile of the Laboratory border would not be defined as an environmental justice population based on minority status.

In regard to low-income status, no data was available to evaluate the income level of the discrete population living within 1-mile of the Laboratory's boundary, or corresponding to the same geographic blocks used for the population data. Income data for the year 1999 was available for specific geographic communities adjacent to

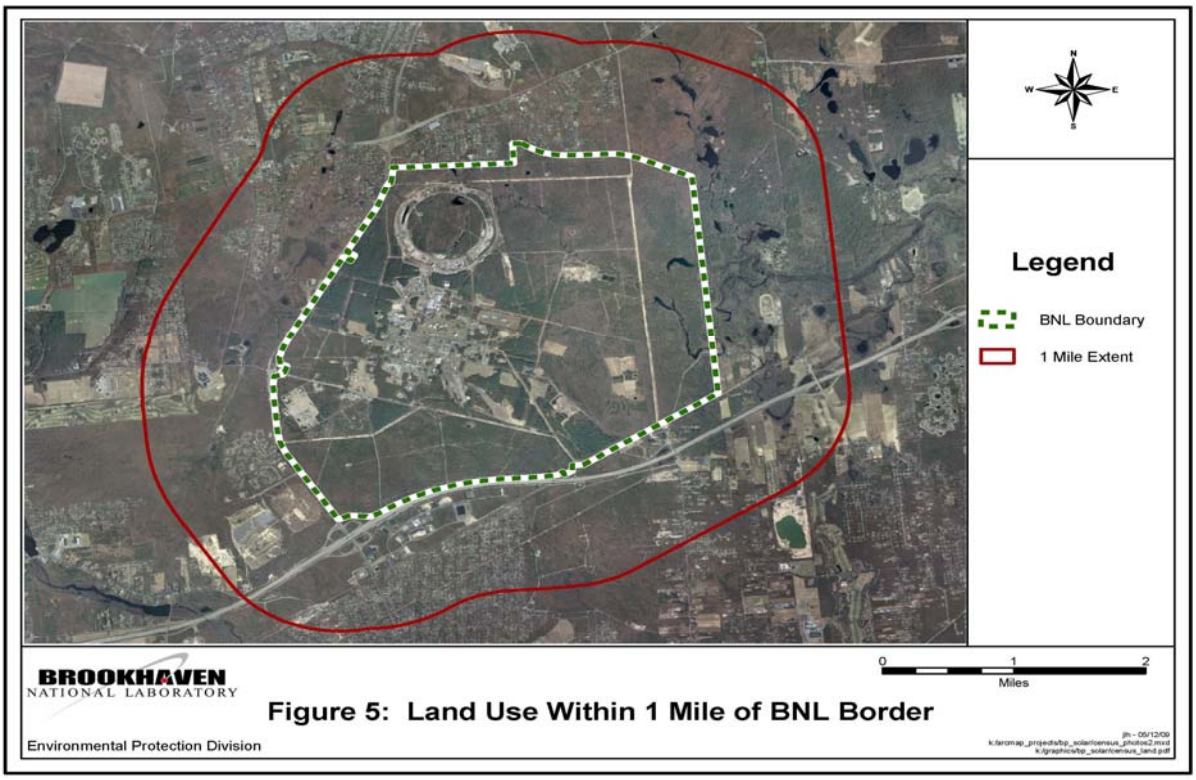
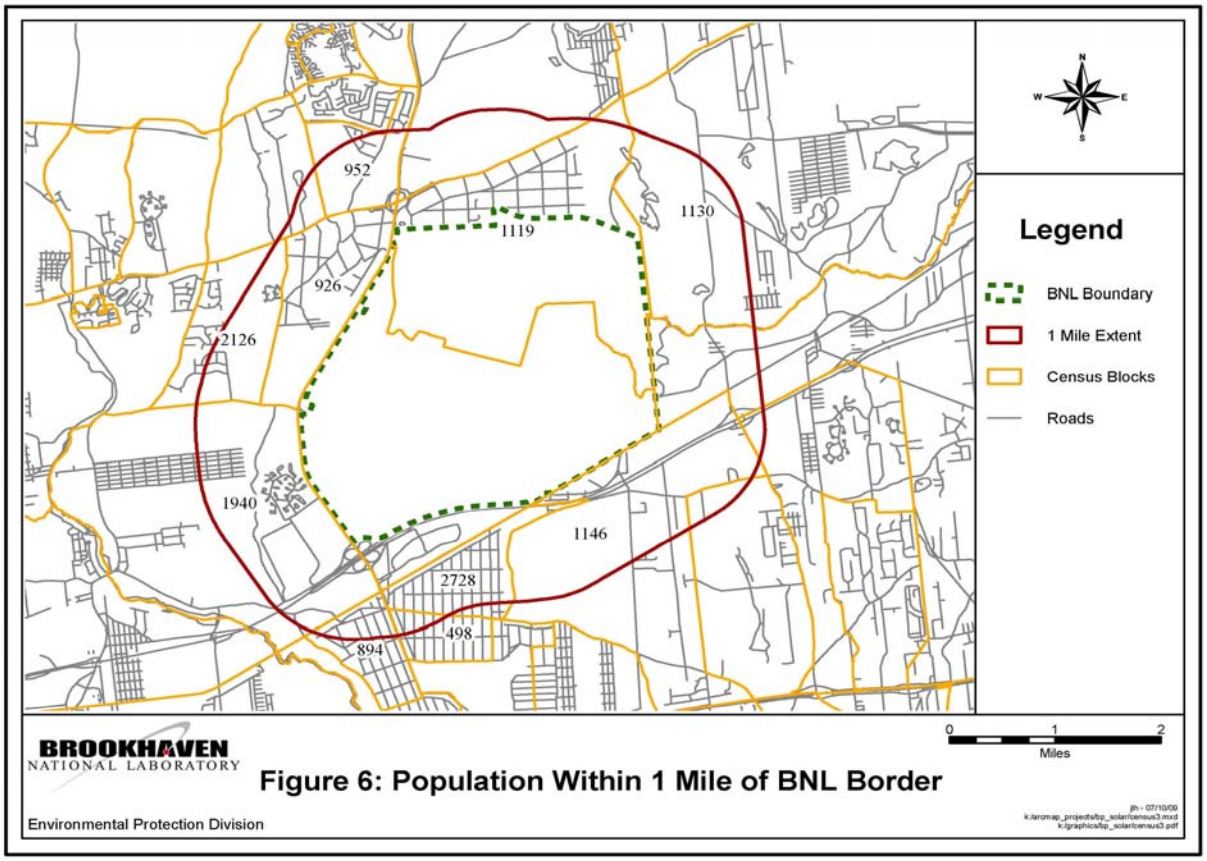


Figure 5: Land Use Within 1 Mile of BNL Border



the BNL boundary through the Suffolk County government website [SC]. It must be noted that these communities extend six to eight miles beyond the site boundary, and encompass a much larger population than the areas associated with the population data. In two of the four communities evaluated, the percentage of low-income families was slightly higher than that of Brookhaven Town. Evaluating the combined population of the four adjacent communities, the poverty status for families is approximately 4.4 percent.

Table 4 - Low Income Status in Communities Adjacent to BNL Site

Town or Community	Population (2000)	Poverty Status in 1999 – Families*	Population in Poverty Status
Brookhaven Town	448,248	3.9 %	17,482
Ridge	13,380	4.4 %	589
Shirley	25,395	5.5 %	1,397
Manorville	11,131	2.4 %	267
Yaphank	5,025	3.3 %	166
Combined total (Communities Only)	54,931	4.4 %	2,419

* The U.S. Census Bureau defined the average poverty threshold as a maximum annual income of $16,895 or less for a family of four for the year 1999 [U.S. Census, 1999]

While 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 0.5 percent difference may not constitute a percentage that is meaningfully greater than the general population. Therefore, the population living within 1-mile of the Laboratory border would not be defined as an environmental justice population based on low-income status.

5.4.2 Effects of Preferred Alternative on Land Use and Demography

Land use within the proposed project footprint would change from currently forested and open areas to groups of fenced solar arrays. The effects of installation and operation of the proposed solar arrays would not change the type of activities/operations performed at other areas of the BNL site, and would have no effect on off-site land use or demographics. Operation of the Laboratory dedicated array would result in a small increase in scientific and support staff estimated at less than 20 individuals, along with visiting research personnel.

Use of Brownfields

Siting solar arrays on the brownfield locations identified in Section 5.1 would be within established industrial uses identified in the BNL Land Use and Institutional Controls Program. Utilizing the brownfields would not alter the land use activities/operations performed at other areas of the BNL site or the demography on-site or off-site. Utilizing the open brownfield areas would valuably utilize formerly-contaminated land and further provide an ecological benefit by reducing the potential amount of forested land needed for the proposed solar arrays, while continuing to ensure their long-term protection.

Environmental Justice

The analysis indicates that the proposed action would not be located in the vicinity of a population having a meaningfully higher percentage of minorities or low-income persons. Additionally, the Preferred Alternative, including potential use of brownfield areas, would have no environmental justice impacts because there would be no anticipated negative economic or health effects on any potentially affected population. Therefore, there would be no disproportionate impacts to either low-income or minority populations.

5.5 Socioeconomic Factors

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

5.5.1 Existing Environment

BSA employs approximately 3,000 full and part-time personnel and has over 4,300 visiting scientific researchers annually. An additional 40,000 members of the public visit the Laboratory site each year as part of educational and group tours, conferences and events. Direct spending of $454.4 million by BSA in fiscal year 2004 caused a total output of goods and services to the region to expand by more than $800 million. It is estimated that earnings increased by more than $308 million and more than

7,700 secondary jobs were created throughout the economy. Projected spending for fiscal years 2005-2014 could total almost $5.6 billion. More than 91,000 jobs would be created, and virtually all industries, including some of the state's key manufacturing industries, would benefit from spending by the Laboratory [Kamer].

5.5.2 Effects of Preferred Alternative on Socioeconomic Factors

Total project funding of the proposed action, estimated at $200-250 million, would directly impact the local and regional economies. Secondary economic benefits would also be realized through increased personal spending, wages and the spending of non-local workers during their stay in the area.

It is estimated that the proposed action would require a workforce of approximately 200 full-time employees during the construction phase, with two full-time operations and maintenance managers after system start up.

5.6 Transportation Conditions

5.6.1 Existing Environment

Laboratory staff and the majority of visitors commute in their own private or rental vehicles. The Laboratory operates and maintains a fleet of approximately 340 vehicles, ranging from cars and light trucks to delivery, construction, and heavy equipment machines. Included in the BNL fleet are 77 alternative-fuel vehicles, which account for 48% of the light duty vehicles and roughly 23% of all of the vehicles. The general public is restricted from access to the BNL site unless participating in a scheduled event. Commercial delivery, construction and service contractor vehicles are permitted access to the site as necessary.

Routine access to the BNL site from surrounding areas is available primarily through several major roadways including the Long Island Expressway (LIE or I-495) and the four-lane divided William Floyd Parkway (County Road 46). Normal entry/egress is through the Main Gate located at the intersection of Longwood Road and William Floyd Parkway, along the western border of the BNL site. The BNL site can also be accessed through a normally locked gate located on the fire-break road in the southeast corner of the property. The areas proposed for siting the solar arrays are easily accessible through existing unpaved firebreak and access roads. The potentially affected areas also encompass a network of these fire-break and access roads.

The Laboratory maintains an on-site railroad spur branching off the LIRR. The spur is primarily used for transporting waste off-site, but could also be utilized for material/equipment delivery.

5.6.2 Effects of Preferred Alternative on Transportation Conditions

Preferred Alternative

Construction activities associated with the preferred alternative would result in a temporary increase in the number of vehicles entering and exiting the BNL site each day, including workers, material deliveries, and waste transport. The magnitude of the increase would vary depending on the timing of the specific construction phase. During clearing operations, heavy construction vehicles such as bulldozers and tree-harvesting machines would be brought on-site and remain only for their specific period of use.

Preparatory and construction activities may be conducted simultaneously in separate sections. For example, clearing and land preparation would be initiated on a specific section. Once that section is cleared and prepped, array construction would commence and the clearing/prep work would be performed simultaneously in a different section. If conducted in this fashion, with four simultaneous on-site operations, anticipated traffic accessing the site is presented in Table 5.

Once the solar arrays become operational, it is estimated that two full-time personnel would require access to conduct routine operations and maintenance activities. The capacity of the major access routes to the Laboratory, are considered more than adequate to handle the temporary increase in traffic. Once on-site, access to the construction areas are provided through a designated traffic route. The primary site roadways utilized by Laboratory staff and researchers would be avoided.

Table 5 - Anticipated Project Traffic Accessing BNL Site in a 24-Hour Period

A. 50 Passenger Vehicles twice a day
B. Truck Traffic: • Site Clearing: 10 Trucks per day • Structure: 5-10 Trucks per day • Array Module Delivery: 2-3 Trucks per Day
Anticipated traffic is based on 2 delivery trucks with 40 feet (12 meter) trailer beds, and 50 passenger vehicles/work trucks.

This route would be the current one used by delivery trucks to the BNL site and is capable of conveying vehicles of this size. Several of the fire-break and access roads located within the project footprint would be eliminated to facilitate and optimize solar array placement. Perimeter fire-break and access roads around the project areas would be maintained to ensure adequate accessibility in the event of a wildland fire or other emergency. Laboratory emergency response personnel would also evaluate all proposed roadway reductions.

Alternative Access Point - Because the proposed action would be located in the south and southeast portion of the Laboratory property, an alternative access point onto the

Laboratory site may be considered. The normally locked gate at the southeast corner of the site, near the intersection of the East Firebreak and South Boundary Road, opens onto a local road, North Street. Vehicles using this access point would likely exit the LIE at Exit 69 Wading River Manor Road, proceed north about 1/2 mile, then turn left onto North Street and travel approximately two miles to the southeast access gate. Utilizing this alternative access point would temporarily increase the vehicle traffic on this local road. A security post would be established during times when this gate would be accessed.

Railroad spur - The on-site railroad spur may be available for transporting BP Solar project waste off-site, or for material/equipment delivery. Utilizing the rail line would reduce the number of trucks transporting materials on the local highways. The logistics and practicality of using the railroad would need to be further evaluated by the project staff, and the availability of the spur coordinated with other shipments to or from the BNL site.

5.7 Cultural Resources

5.7.1 Existing Environment

The *Cultural Resource Management Plan for BNL* (CRMP) [BNL 2005] identifies the Laboratory's historic and cultural resources, and describes the strategies developed to manage them in accordance with applicable laws and regulations. Because most of the proposed project site has seen minimal disturbance since the founding of BNL, there may be a moderate to high potential for the presence of 20th century archeological deposits, including the eras of WWI (1917-1921) and World War II (1940-1946) Camp Upton, and the Civilian Conservation Corps (1934-1939) [Merwin].

The southern area proposed for construction overlays the WWI Remount Facility. This facility was the location where horses and mules were housed prior to deployment of the American Expeditionary Force to Europe and had a number of buildings that housed Remount Facility staff and at least one building that was identified as a YMCA structure. In 2004, the NY State Historic Preservation Officer (SHPO) concurred with the DOE's determination that all WWI period Camp Upton features at BNL, including trenches and foundations, are eligible for listing in the NRHP. In the northern area several out buildings (outhouses) are known to have been present with one still standing in the woods north of the biology field. These features often contain artifacts indicative of the era when they were most used.

5.7.2 Effects of Preferred Alternative on Cultural Resources

BNL performs its cultural resources analyses pursuant to Section 106 of the National Historic Preservation Act. Integrated into the BNL CRMP are recommendations by the Institute for Long Island Archaeology (ILIA) that address the potential for land disturbance/development within the footprint of the former WWI Camp Upton [Bernstein]. Because of the moderate to high potential for the presence of 20th century archeological deposits in the World War I Remount Facility and outhouse area, construction and land preparatory activities in these areas may have some unavoidable adverse effects. Therefore, archeological and data recovery surveys of the WWI Remount Facility and outhouse areas, were performed and documented, as

described below. The scope of archaeological work was sufficient to conclude that no further archaeological investigations are recommended.

WWI Remount Facility area: A stage I archeological survey of the proposed project area [approximately 33 acres (13.2 hectares)] was performed by the ILIA in order to assess the overall potential of the area for the presence of cultural resources. This involved both a surface inspection and subsurface testing. The surface inspection entailed a walkover of the entire project area. Subsurface testing involved the excavation of small shovel test pits (STPs) on a closely spaced grid system, in accordance with NY State guidelines.

Privy (outhouse) area: An architectural and archeological data recovery/assessment of the standing Civilian Conservation Corps (CCC) era privy was conducted in accordance with Section 106 of the National Historic Preservation Act. The architectural documentation was designed to meet the standards of the Historic American Buildings Survey (HABS). The archeological survey included excavation of the outhouse pit to document the potential presence of artifacts, and required removal of the privy structure from its rotted sill.

Archaeological Survey Results

WWI Remount Facility - Archival research and archaeological investigation for the location of the proposed BP Solar Array Project indicates that the project area witnessed virtually no discernable use until the early 20th century, when Camp Upton was constructed as a WWI cantonment. Subsurface testing entailed the excavation of shovel test pits in the proposed project area. None of the shovel tests contained an undisturbed soil sequence, reflecting extensive earth-moving activities in the parcel during the 20th century. No prehistoric Native American artifacts or features were encountered. The Stage 1 survey yielded early 20th century Euro-American artifacts (mostly nails, coal, and slag), both probably associated with WWI and/or CCC activities. Two features, WWI Camp Upton concrete building foundations, potentially eligible for listing in the NRHP are located within the proposed project area. The foundations were documented and determined to have no further research potential. While the proposed action would have adverse impact to theses two WWI features, the foundations would be removed, the scope of archaeological work performed was sufficient to conclude that no further archaeological investigations are recommended [Bernstein 2009a].

The extant outhouse structure (privy) was photographed and drawn to scale. There were few artifacts in the privy deposit, and most were architectural debris. Several shovel test pits were made in an effort to identify additional privy deposits that may be present in the area, but none were discovered. Because questions regarding the privy site's age, context, and associations still exist, and because there may be other nearby privy vaults that could yield additional information, cultural resource personnel would monitor the 0.5 acre site if grading/construction work would disturb the soil greater than six inches deep. No further investigations are recommended elsewhere in the parcel [Bernstein 2009b].

Artifacts resulting from the surveys will be appropriately curated and stored as prescribed in the BNL CRMP.

The former BNL Astronomy Club observatory building, constructed in the early to mid-1980s, and the Mixed Waste Handling Building 870, constructed in 1997, are less than 50 years old and have no extraordinary historic significance. Therefore, these structures are not subject to the evaluation requirements delineated in Section 106 of the National Historic Preservation Act.

The current WMF area is located in a highly developed area of the BNL site and has experienced substantial ground-disturbing actions. Archaeological surveys would not be required due to the very low potential for the presence of archeological deposits.

Use of Brownfields

Due to the substantial ground-disturbing actions conducted in the brownfield areas, both during their use as waste disposal sites and during the CERCLA-related remediation, there is a very low potential for the presence of archeological deposits. Therefore, archaeological surveys are not required, and locating PV arrays in these areas would have no adverse effect on any potential cultural resource.

5.8 Air Quality

5.8.1 Existing Environment

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

The local air quality management in the New Jersey-NY-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, and particulate matter less than 10 microns in diameter (PM_{10}), lead, and carbon monoxide (CO). The region is considered a non-attainment area for ozone. 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. A NY subset of the region, which includes Kings, Queens, NY, Rockland Westchester, Nassau, and Suffolk counties, is considered a nonattainment area for the 24-hour PM-2.5 (particulate matter less than 2.5 microns in diameter) standard.

5.8.2 Effects of Preferred Alternative on Air Quality

Exhaust from construction, worker, and material delivery vehicles, and other equipment during construction of the proposed site, such as portable electrical generators would result in localized, short-term increases in CO and NOx emissions. Airborne dust ($PM_{2.5}$ and PM_{10} emissions) would also be generated as a result of excavation and vehicle traffic on unpaved surfaces. During construction, fugitive dust generation would be controlled, as needed, by spraying water on soil surfaces and installing stabilized rock construction entrances. Current plans for site grading would maintain the existing grade where possible and leave topsoil in place. Reducing grading actions would minimize particulate emissions. Refer to Section 5.6.2 Transportation Conditions for additional information on the estimated number

of vehicles expected. A review of construction operations would be performed to determine if the potential emissions of the project would exceed pollutant thresholds required in 40 CFR Part 93 Subpart B. If a conformity analysis is necessary under the regulation, calculations would be done to determine the potential impact of construction emissions on regional air quality. Any permit (e.g., NYSDEC Air Facility Permit), mitigation or regulatory actions identified as a result of the analysis would be implemented, as necessary.

Once construction is complete, planting native short-growing shade-tolerant grass species for ground cover below the PV arrays would minimize fugitive dust emissions. When operational, the solar PV array facility would not be a source of criteria pollutants. Solar technologies produce near-zero carbon dioxide emissions, which would be a beneficial impact to the regional air quality (Refer to Section 5.9 Climate for additional details).

5.9 Climate

5.9.1 Existing 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, 1975; 1978].

BNL has been recording weather data since August 1948 to serve the needs of this DOE site. The average yearly precipitation is 48.75 inches (123.8 centimeters) and the average yearly snowfall is 30.5 inches (77.47 centimeters). The average monthly temperature is 50.2˚ Fahrenheit (10.1˚ Celsius). Additional historical meteorological data are available from the BNL Meteorology Services webpage.

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. A growing body of evidence points to anthropogenic (manmade) sources of greenhouse gases (GHG), such as carbon dioxide (CO_2), as major contributors to climate change. Additional greenhouse gases include methane (CH_4), nitrous oxide (N_2O), 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/EA-1662]. 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 CO_2, are the main source of accelerated climate change [DOE 2009]. Terrestrial carbon sequestration is the process through which CO_2 from the atmosphere is absorbed by trees, plants and crops through photosynthesis, and stored as carbon in biomass (tree trunks, branches, foliage and roots) and soils. Forests and soils have a large influence on atmospheric levels of CO_2, essentially helping to mitigate man-made CO_2 emissions [EPA 2006].

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, CO_2 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 CO_2. The GWP for N_2O is 310. Carbon dioxide equivalent is a measure that expresses, for a given mixture and amount of greenhouse gas, the amount of CO_2 that would have the same GWP [Haile].

5.9.2 Effects of Preferred Alternative on Climate

Current methodology is not able to directly correlate GHG emissions from discrete projects to any specific impact on climate change. However, constructing and operating a large-scale PV solar array on the BNL site may affect GHG emissions in multiple ways. The temporary increase in vehicle exhaust emissions during the project construction phase, described in Section 5.8 Air Quality, may provide minimal contribution to increased GHG emissions.

Removing approximately 153 acres (52 hectares) of trees, out of some 3,607 acres (1,460 hectares) of on-site forested area, as part of the proposed action would eliminate a carbon absorption/storage source that is estimated to sequestrate an average of about 5.5 metric tons CO_2 equivalent per acre each year (13.6 metric tons CO_2 equivalent/hectare/year) or 842 metric tons of CO_2 equivalent each year for the entire stand of trees. Over 40-years, the estimated life of the solar arrays, the ability to sequestrate about 33,680 metric tons of CO_2 equivalent would not be realized. In comparison, the net sequestration in all US forests, urban trees and agriculture in 2001 totaled an estimated 840 million metric tons of CO_2 equivalent [EPA 2006]. Removing a carbon storage source of this size would not be expected to have a direct impact on climate change.

In comparison, the proposed 37 MW solar arrays would have a beneficial savings effect on GHG emissions by producing electricity with near-zero carbon dioxide emissions. If conventional means such as burning fossil fuels were used to generate an equivalent amount of electricity, about 30,950 metric tons of CO_2 per year would be emitted into the atmosphere.

Additional GHG and criteria pollutants discharged by conventional generating methods are presented in the table below:

Table 6 - EPA eGrid Output Emissions Rates for Long Island Region [eGrid]

	Emissions Avoided for a 37 MW Project
Greenhouse Gases	**(CO_2 equivalent metric tons /yr)**
Carbon Dioxide (CO_2)	30,950
Methane (CH_4)	2
Nitrous Oxide (N_2O)	0
Criteria Pollutants	**(metric tons/yr)**
Nitrogen Oxides (NOx)	33
Ozone Season NOx (May-Sept)	30
Sulfur Dioxide (SO2)	76

Over an estimated 40-year life of the project, the discharge of about 1,238,015 metric tons of CO_2 into the atmosphere from conventional means would be avoided. Considering the positive impact of the project lifetime CO_2 emissions avoidance (1,238,015 metric tons of CO_2 equivalent), along with the adverse loss of sequestration volume (33,680 metric tons of CO_2 equivalent), indicates that the proposed action would have an overall beneficial effect on GHG emissions and climate.

5.10 Visual Quality

5.10.1 Existing 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 100-foot (30.5 meter) tall meteorological tower. Current visual features of the proposed project area consist primarily of a wooded pine and oak landscape, with a mix of open fields located in the north array section.

A small cluster of four or five residential homes are situated immediately south and within 200-500 feet (61-152 meters) of the LIRR track that borders the Laboratory's southern boundary.

From these properties, the current view to the northwest includes narrow wooded buffers, less than 10 feet (about 3 meters) wide, on each side of the tracks. Seasonal views, from November to April when the trees are bare, include the southeastern edge of wooded area proposed for the south array.

Views From LIRR Looking North

Views From North Street Looking North

Use of Brownfields

Current visual features associated with the brownfield areas encompass an open landscape surrounded by woods. The open areas present views of grasses, one to three feet (0.3 -1 meter) high, covering the Former Landfill and Interim Landfill mounds, with the remaining areas essentially barren or with minimal vegetation. An exception to this view is the NSLS-II construction-site that is visible to the northwest.

5.10.2 Effects of Preferred Alternative on Visual Quality

The surface elevation of proposed locations for the BP solar arrays would be equal to or slightly less than that of BNL's core developed area. The solar arrays would be constructed to a maximum height of about 11 feet (3.3 meters). Because the proposed location is in the central south and southeast portion of the Laboratory property, and approximately three-quarters to one mile (1,207 to 1,609 meters) away, the majority of arrays would not be visible from the Laboratory's central developed area. If solar arrays were situated on the former landfill area, they may be visible from the future NSLS-II facility and associated grounds.

NY Department of Environmental Conservation (DEC) Guidance "Assessing and Mitigating Visual Impacts" (DEP-00-2, Issuance Date: July 31, 2000) states that:

> "Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Significant aesthetic impacts are those that may cause a diminishment of the public enjoyment and appreciation of an inventoried resource, or one that impairs the character or quality of such a place."

A visual analysis was conducted in a manner consistent with the referenced DEC Guidance. Out of the 15 aesthetic resource categories listed in the DEC guidance, two inventoried resources, located on the Laboratory property, were evaluated for potential visual impacts from the proposed action. – (Associated DEC aesthetic resource category is identified in parentheses): The WW I Camp Upton Training Trenches (A property on or eligible for inclusion in the National or State Register of Historic Places); and the Peconic River (Rivers designated as National or State Wild, Scenic or Recreational).

At its closest point, the proposed solar arrays would be approximately 2,200 feet (671 meters) from the nearest Camp Upton training trench, and 2,000 feet (610 meters) from the Peconic River. However, due to the density of trees separating the trenches and river from the project area, the panels would not be seen from either aesthetic resource.

Off-site

The majority of the proposed solar arrays would not be seen from off-site due to their low vertical profile and the extensive wooded buffer surrounding the Laboratory property. However, the southern edge of the south array would be located adjacent to the Laboratory's southern boundary and immediately north of the LIRR Ronkonkoma to Greenport line tracks. This group of arrays would be visible from passing trains for approximately 1,100 feet (335 meters). Ridership on this line is relatively low. Based on the current LIRR schedules, no more than eight trains travel

by the site weekdays, and no more than four trains on weekends [LIRR]. Each train usually has two to four train cars per trip.

The same group of arrays would also be visible from a few of the residential properties situated immediately south of the LIRR tracks, though primarily from November to April when the trees are bare. The nearest public road to the proposed project area is North Street, which runs southwest to northeast and at its closest point would be approximately 600 feet (183 meters) from the southeast corner of the south array. The combination of roadway elevation and existing trees within the residential properties and LIRR buffers would make it difficult for the PV arrays to be seen from a vehicle traveling along North Street. Without leaves on the trees it may be possible to see the southeast corner of arrays for an estimated distance along North Street of about 200-300 feet (61-91 meters). No known inventoried aesthetic resources are located off-site within the potential visual field of the proposed solar arrays.

The proposed action would be visible from aircraft flying over or near the Laboratory and via satellite. The solar array design would include an anti-reflective coating that increases the light transmittance by reducing reflectance at the glass surface. This coating may also reduce any potential reflective glare visible from the arrays. Based on the increasing use of PV arrays at commercial and military airports around the world, reflective glare would not be expected to have an adverse impact on aircraft.

Overall the Proposed Action would not be expected to have an adverse visual impact either on or off the Laboratory property.

5.11 Noise

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.

5.11.1 Existing Environment

The majority of the proposed project area, located more than one mile (1.6 km) from the core developed sector of the Laboratory, is surrounded primarily by woodlands. There is a wide range of existing noise sources present in the area of the proposed solar array. The types of sources that contribute to ambient noise levels may include: street traffic such as cars, trucks, buses, rail traffic, aircraft over-flights, commercial and industrial noise sources, noise from existing power lines, residential noise sources, and rural environment sources (wildlife, etc.).

On-site noise sensitive receptors may include the occasional BNL employee jogging, biking, walking or performing work, such as well-drilling or environmental sampling. Two potentially sensitive receptors were identified with respect to noise impacting a

horse farm just south of the site, across the LIRR track and adjacent to the LIPA substation, and a residence along North Street about 3,000 feet (914.4 meters) east of the northeastern corner of the south array [ERM].

The closest home is roughly 250 feet (76.2 meters) from the southern edge of the project site, with other houses located about 800 feet (244 meters) way. At its closest point, the project would be about 2,000 feet (610 meters) from the Peconic River. Public access is not permitted on this section of the river located on DOE property. Private homes and public lands in the vicinity, located approximately 1.5 miles (2.4 km) from the project area, may also be considered noise sensitive receptors.

For a more rigorous assessment of the impacts of site-generated noise on local residents, a noise monitoring survey was conducted for two days in July 2009 at the horse farm located adjacent to the BNL site. A sound level meter was placed on a tripod near the northern fence line of the horse farm, at its closest point to the proposed construction activities. During daytime periods (7 am to 7 pm), the median sound reading at the site was 51.6 dBA. The highest noise readings with no time constant applied were as high as 113 dBA, and the maximum sound level during a time-weighted period was 87.5 dBA – both were measured when the LIRR trains pass by.

5.11.2 Effects of Preferred Alternative on Noise

Construction activities associated with the proposed solar arrays would result in temporary increases in ambient noise levels for approximately 16 months. A variety of construction equipment such as tree harvesters, graders, dozers, trenchers, pile drivers, dump trucks, and delivery trucks would generate noise intermittently during daylight hours. Noise levels from construction-sites measured approximately 90 dBA at a distance of 50 feet (15.24 meters) from the center of the site [CERL]. Sites in flat-lying areas with minimal vegetation experience noise attenuation at a rate of 6 dBA for each doubling of distance between the source and the receptor [CERL]. A receptor located one mile (1.6 km) away from the proposed site would hear noise levels at approximately 45 dBA and therefore would not be negatively impacted by construction activities. A receptor located 200-800 feet (61 - 244 meters) from the construction-site would experience noise levels at approximately 78-66 dBA, respectively. Noise levels at the Peconic River's closest point would be about 60 dBA. These estimated noise levels are considered conservative values because the proposed project site is generally surrounded by woodlands, thereby attenuating the levels to a greater degree, resulting in lower noise levels. The loudest noise levels anticipated for the 50-60 percussive pile drivings per day would be around about 101 dBA, 50 feet (15 meters) away from the source. The levels would attenuate to about 89 dBA at the property line of the horse farm, and less than 67 dBA at the closest North Street residence.

For comparison noise levels are commonly compared to typical noise sources encountered in public are shown in Table 7.

Table 7 - Common Noise Exposures

Sound Source	Pressure Decibels dBA
Large rocket engine (nearby)	180
Jet takeoff (nearby)	150
Pneumatic riveter	130
Jet takeoff (200 feet)	120
Construction noise (10 feet)	110
Subway train (100 feet)	100
Heavy truck (50 feet)	90
Average factory	80

Sound Source	Pressure Decibels dBA
Normal conversation (3 feet)	60
Quiet office	50
Library	40
Soft whisper (16 feet)	30
Rustling leaves	20
Normal breathing	10
Hearing threshold	0

NY Department of Environmental Conservation (DEC) 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."

As can be seen from a preliminary assessment of the data, peak sound levels at the fence line of the horse farm predicted even during pile driving activities (89 dBA) would be substantially less than peak sound levels already experienced at the site, and would represent less than a 6 dBA increase over background levels (87.5 dBA) experienced when the LIRR trains pass by. As construction moves to other portions of the site, the noise generated during pile driving would quickly fall to less than peak background noise – at 500 ft. (152 meters) the noise resulting from pile driving would be 81 dBA.

Common noise sources during construction would include grading, bulldozing, and truck loading and unloading. At 200 feet (61 meters), these would generate noise impacts of approximately 70 dBA, which would fall to 65 dBA at 500 feet (152 meters) and 50 dBA at 2,500 feet (762 meters). The average background at the horse fence line was approximately 51.5 dBA. Thus, when construction work is closer than approximately 2,000 feet (610 meters), it would result in a greater than 6 dBA increase in noise over background.

During worst-case times (highest noise activities, activities taking place near to the southern or eastern boundaries of the project site), there would be occasions when the NYSDEC guidance of 6 dBA is exceeded. However, these situations would not have a major adverse effect because the construction phase would be limited to 16 months, and only during a small fraction of those 16 months would the highest noise

generating activities be taking place at the southern or eastern-most portions of the site.

Heavy equipment would generate noise that could affect the project-site workers during construction. Construction equipment typically emits noise in the 85 dBA to 135 dBA range. Laboratory safety programs and the construction contractor would require workers to wear hearing protection in accordance with OSHA regulations. Operational noise from the solar panel arrays and associated maintenance activities would be negligible and would likely be inaudible against ambient levels.

5.12 Industrial Safety and Occupational Health

5.12.1 Existing Environment

The area proposed for the PV arrays is currently undeveloped, consisting of woods, open fields and unpaved roads. As a result, the predominant industrial safety and occupational health (IS&H) concern is motor vehicle accidents during inclement weather (ice or heavy rains), sprains, strains, and falls sustained by employees while exercising, and insect bites during environmental field operations such as sampling and well drilling. The Laboratory maintains an Occupational Medical Clinic staffed with doctors and nurses to evaluate and treat non-emergency injuries, as well as an extensive emergency management program that encompasses planning for and response to accident events. The on-site Fire-Rescue Group includes trained Emergency Medical Technicians (EMTs) and response vehicles.

5.12.2 Effects of Preferred Alternative on Industrial Safety and Occupational Health

Construction and trade workers would be exposed to safety and health hazards faced at similar construction sites. Potential impacts to the health and safety of the workers would be minimized by adherence to federal, state, and local regulations, OSHA regulations, and general contractor safety plans. Electrical work would conform to applicable electrical and fire code requirements. No unusual construction site considerations are expected during the installation and maintenance of the proposed solar power arrays and associated equipment.

BNL employees and the general public would not be adversely impacted by the construction and operation of the proposed solar array project. The remote location of the site and construction of a fenced enclosure would minimize exposure of the Laboratory staff, visitors, and public to potential safety hazards at the site.

Use of Brownfields

The primary residual chemical surface contaminant of concern in the Chemical/Animal Pits and Glass Holes Area is mercury. Residual mercury levels in the soils were remediated to meet industrial standards. Locating solar arrays in this area would be considered within the industrial uses identified in the BNL Land Use and Institutional Control Program. The Glass Holes Area is currently being used as a site composting operation. Reference Section 5.13.1 regarding the potential use of capped landfill areas.

5.13 Radiological Characteristics

5.13.1 Existing Environment

The radiological characteristics of the BNL site are presented below as an overview of Laboratory's monitoring efforts in order to provide a baseline for potential environmental effects.

The radiological characteristics of Laboratory operations are determined through routine and permit-based monitoring efforts. Water discharged from the STP is routinely monitored at the plant's Peconic River Outfall. In 2007, all effluents were found to be less than the Safe Drinking Water Act 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 uses 10 recharge basins permitted under SPDES 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 ranges and that there were no gamma-emitting radionuclides detected. In 2007, there was a single, low detection of tritium in the discharge to Recharge Basin HT-W, which receives once-through cooling water and cooling tower blow down. The maximum concentration detected was 430 pCi/L, which is approximately 2 percent of the drinking water standard. [SER]. There were no radionuclides detected in 2008.

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 10millirem/yr for the airborne pathway. The effective dose equivalent from all air emission sources at BNL for 2007 was calculated to be 0.06millirem, far below the allowable limit [SER].

The Former Hazardous Waste Management Facility (FHWMF) was cleaned up in 2005 to industrial standards. Areas to the northeast and southeast of this area are proposed for development. Recent monitoring has resulted in additional clean up of small areas outside of the FHWMF in 2009, with potential additional clean-up being necessary.

The radiological characteristics of groundwater contamination plumes in the vicinity of the proposed action are discussed in Section 5.3 Water.

Use of Brownfields

The Chemical/Animal Pits and Glass Holes Area have been remediated to meet industrial cleanup goals. While remaining radioactivity in the soil includes a mixture of Cesium-137 (Cs-137) and Strontium-90 (Sr-90), current soil conditions meet worker exposure guidelines for radioactivity. The glass holes area is currently being used as a site composting operation.

The landfill areas have been capped to prevent site workers, employees, visitors, and wildlife from being exposed to the subsurface contamination. Contaminated soils

and materials are present below these capped areas. These landfills are currently monitored and maintained by mowing the grass, keeping the cap intact and monitoring landfill gas and groundwater.

5.13.2 Effects of Preferred Alternative on Radiological Characteristics

As presented in Section 5.3 Water, constructing solar arrays in the proposed locations would not affect the hydrologic or radiological characteristics of the groundwater plumes. Due to the plume depths and proposed construction methods, there would be no potential for worker exposure during construction, operational or decommissioning activities.

Use of Brownfields

Solar arrays located in capped Land Fill Areas would be anchored in place using concrete ballasts to prevent damage or penetration of the protective cap and potential exposure to radiological and chemical contaminants. Based on the Chemical/Animal Pits and Glass Holes Area cleanup level to industrial standards, there would be minimal risk of worker exposure to contaminants during construction, operational or decommissioning activities. In addition, radiological and work control measures would be utilized to further reduce any potential risk. Examples of control measures include, but are not limited to, adding additional soil layers, administrative controls on soil disturbance at specific depths, restrictions on in-ground pile removal, and radiological monitoring.

5.14 Natural Hazards

5.14.1 Existing 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]. Tornadoes and hailstorms are extremely rare on Long Island. Thunderstorms, snowstorms, and ice storms do occasionally occur and have the potential to cause damage to facilities.

The banks of the Peconic River, which traverse portions of the eastern side of the BNL site, are within the Federal Emergency Management Agency (FEMA) designated 100-year floodplain [FEMA].

Earthquakes on Long Island are extremely rare, and no active earthquake-producing faults are known in the Long Island area [Hoey]. Long Island lies in a zone 2 or moderate damage seismic probability area and it is assumed that an earthquake of Modified Mercalli VII could occur [HFBR EIS]. A recent history of earthquakes in the central Long Island area is presented below [USGS]:

Table 8 - Recent History of Earthquakes in the Central Long Island Area

Year	Date	Intensity - Modified Mercalli
1925	Feb 25	I-III
1929	Nov 18	I-III
1935	Nov 1	I-III
1937	Jul 18	I-III
1944	Sep 5	I-III
1950	Mar 29	I-III
1951	Jan 25	I-III
1985	Oct 19	IV-V (4-5 on Richter scale)

The likelihood of a serious earthquake in the BNL area is slight and seismologists expect no significant earthquakes in the foreseeable future [Hoey].

The Central Pine Barrens and community types within BNL are fire dependent systems that experience periodic wildfire events. Wildfires, direct flame and smoke could affect BNL operations. The BNL Wildland Fire Management Plan (WFMP) includes recommendations for periodic mechanical tree thinning and prescribed fire (controlled burns) to reduce potential fuel loading and the effects of unanticipated wildfire ignitions [BNL 2003b]. Prescribed burns, totaling about 16 acres (6.5 hectares), have been performed in two out of the last five years. The WFMP 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.

5.14.2 Effects of Natural Hazards on Preferred Alternative

At the closest point, the proposed solar arrays would be approximately 2,000 feet (610 meters) from the Peconic River and 10 feet (3 meters) higher in elevation. The potential may exist for some seasonal flooding in the north array area due to its proximity (approximately 100 feet or 30.5 meters) to wetlands. However, damage to the arrays would not be expected because the arrays would be supported at a minimum of 2 feet (0.6 meters) off the ground.

The solar arrays and associated electrical infrastructure would be designed and built to applicable codes and standards, including the ability to withstand 120 mph (193 kph) hurricane winds. Structure failure of an array due to natural phenomenon would result in physical damage to the array. The solar arrays do not contain any hazardous materials, so there would be no fluids to cause insult to personnel or the environment. Because the arrays would be located away from densely populated areas of the Laboratory site and the surrounding community, human health and safety issues (i.e., injuries) would likely have a low probability of occurring as a result of structural failure.

The potential for wildfires to affect and damage solar panels and associated electrical equipment would be similar to other BNL structures. Clearance between the arrays

and the nearest forested/vegetation area would reduce the potential for fire spread. Existing BNL wildfire control and response measures identified above would also apply to the solar area project areas.

5.15 Intentional Destructive Acts

Construction and operation of the proposed large-scale solar photovoltaic array project on the BNL site would not involve the transportation, storage, or use of radioactive, explosive, or toxic materials. Consequently, it is highly unlikely that saboteurs or terrorists would view construction or operation of the arrays as a potential target. The project location is not near any national defense infrastructure or in the immediate vicinity of a major inland port, container terminal, freight trains, or nuclear power plants. In addition, fencing and random patrols by the Laboratory Police and inspections by vendor personnel mitigate the potential for destructive acts. The Proposed Action would not offer any targets of opportunity for terrorists or saboteurs to inflict adverse impacts to human life, heath, or safety.

5.16 Utilities

5.16.1 Existing Environment

Few utilities are present within the footprint of the proposed project site because these areas have remained largely undeveloped since the inception of BNL in 1947, with the exception of some experimental agricultural programs. A natural gas line enters the site above ground at the southeast gate off North Street, proceeds underground along the south side of the South Boundary Road utility easement, then runs northwest along Powerline Road to the steam plant. As part of an existing utility easement, overhead 13.8 kV high voltage power lines run along the following firebreak roads bordering the proposed solar array sites: Fifth Avenue, East Firebreak, South Boundary Road, and Powerline Road. Other electric lines near the project areas include:

- 2400 Volt line running underground along the firebreak roads north and west sides of the South Array.
- Abandoned underground 480 Volt line along the firebreak road north of the South Array.
- Control wiring about 2.5 feet (0.76 meters) below grade along Powerline Road

Abandoned terra cotta sewer lines and circular brick manholes, dating from WWI Camp Upton are located in the proposed project area that overlay the WWI Remount Facility.

An existing electrical substation (8ER), operated by LIPA, is located south of and adjacent to the LIRR tracks located along the Laboratory's south border.

5.16.2 Effects of Preferred Alternative on Utilities

As presented in Section 4.1, the intent of the proposed BP solar array project is to provide 37 MW of power to the LIPA electric grid system. During periods of peak electrical demand, typically middle of day, hottest period, operation of the proposed BP solar arrays would result in a reduced need for extra energy generated through conventional means. The electrical configuration is detailed in Section 4.1. Power from the 37 MW BP solar arrays would be connected to the grid via the LIPA substation located adjacent to the Laboratory's south border. Three conduit lines, one for fiber optics and two for power distribution (one active and one spare), would be run under the LIRR tracks to connect the transmission line from the BP solar array 13.8/69kV transformer to the substation. Refer to Section 5.19.1 for further details.

The proposed Laboratory dedicated array may provide 1 to 2 MW of solar-generated power to the Laboratory's internal electrical grid. Depending on its final location, either the Chemical/Animal Pits and Glass Holes Area or current WMF yard, a transmission line would be run from a transformer/inverter pad to a BNL substation located on Cornell Avenue, or near East Fifth Avenue. Water, sanitary, and electric utilities would be run from existing lines to a new dedicated array support building. Renovating Building 870 to serve as the support building would utilize existing utilities. Newly routed lines would be located in previously disturbed areas.

Temporary trenching for utility line installation would be returned to grade following installation.

All existing modern underground utility lines would be located and marked prior to initiating construction actions. If any abandoned WWI sewer lines and manholes are encountered during construction, they would be removed.

5.17 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 United States. The applicable electric field strength standards established by the New York State Public Service Commission (PSC) are set forth in the 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].

5.17.1 Existing Environment

Overhead high-voltage electric power lines are currently present in the vicinity of the proposed action, including a 13.8 kV LIPA line running along an existing utility easement to LIPA substation 8ER, and a 69kV line from the substation 8ER to the BNL onsite substation. The power lines were constructed and are maintained according to applicable requirements. There has been no indication to date of any environmental effects from EMF associated with these lines.

5.17.2 Effects of Preferred Alternative on EMF

Engineering design of the proposed project thus far has not been completed in sufficient detail to provide specific EMF levels. However, electric and magnetic fields associated with the proposed action would be significantly below the 200 mG and 0.5 kilovolts per foot (1.6 kV/m) guidelines, and would not be expected to have any adverse health effects.

5.18 Waste Management and Pollution Prevention

5.18.1 Existing 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 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 860) 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 Site Environmental Report [SER].

5.18.2 Effects of Preferred Alternative on Waste Management and Pollution Prevention

Waste products resulting from construction activities would include cleared trees and brush, concrete and steel debris from obsolete structural features.

Trees suitable for timber would be identified and options evaluated to recycle or gain maximum benefit from the trees. Options may include, but are not limited to, shipping the wood to an energy recovery facility, and working with companies that produce wood products directly from supplied trees. Trees unsuitable for timber harvest and remaining tree material, such as limbs, tree tops, etc., would be mulched on-site or composted for topsoil.

If the construction contractor would need to maintain a temporary fuel storage tank on-site for refueling construction vehicles, the facility is required to conform to the requirements of Suffolk County Department of Health – Article 12, Toxic and Hazardous Materials Storage and Handling Controls [Article 12].

The principal goal of the proposed action is to provide clean, renewable electricity produced by solar PV arrays to LIPA. Providing solar generated electricity to the grid lessens the demand for electricity produced though conventional means, such as fossil fuel burning plants, thereby lowering airborne emissions. Section 5.8 Air Quality presents additional detail on the effects of the proposed action on air emissions.

5.19 Commitment of Resources

Construction

Construction activities would result in a temporary increase in fuel use to power the construction vehicles and an estimated 2,000 gallons of water per day for dust control.

Operations

Operation of the proposed BP solar arrays would advance the DOE's vital mission of meeting the nation's energy goals from clean, renewable energy sources and result in a reduced need on the LIPA grid for electricity generated through conventional means. Overall, there would be reductions in the demand for fossil fuels and water resources used to support these conventional power generating methods. It is estimated that as much as 500,000 gallons of water per year, representing a 0.1 percent increase in current BNL water usage, would be required for cleaning PV panels.

5.20 Connected Actions

5.20.1 LIPA Interconnection at Substation 8ER

Because below ground horizontal directional drilling would be used to construct the transmission line from the BNL properly line to LIPA Substation 8ER, the removal of any vegetation would not be required and there would be no impacts to surface conditions. The short route also would not cross any wetlands or any special habitat areas for threatened or endangered species. Additionally, water for horizontal directional drilling mud would be obtained from existing BNL water supplies or trucked-in sources.

The modifications to the substation and the work to construct the transmission line would involve approximately 20 vehicle trips per day (or less) over a one-month period. LIPA would complete an Environmental Assessment Form (EAF) under the NY State Environmental Quality Review Act (SEQRA). Accordingly, the construction of the transmission cable between the BNL property line to the LIPA Substation 8ER and the minor modifications to the LIPA substation would not result in any environmental impacts other than those that have already been disclosed in the EA and EAF, and, overall, would not result in any significant adverse impacts to the environment.

5.20.2 Work for Others

As consideration in the easement agreement between DOE and BP Solar for allowing BP access and use of the federal BNL property, BP Solar may provide funding to the Laboratory to support a Work For Others (WFO) program in research and development of solar technology. The WFO program would allow BSA to perform work for BP Solar, a non-DOE entity, on a fully reimbursable basis. WFO projects utilizing the Laboratory dedicated array are included within the scope of this EA.

5.20.3 Tiger Salamander Breeding Pond Enhancement

Proposed improvements to the area surrounding the subject Tiger Salamander breeding pond would enhance the immediate habitat by enabling persistent water retention. Larval salamanders in the pond would subsequently be able to develop to maturity.

Enhancement actions would be scheduled so that the work would not occur during salamander breeding/foraging periods. In addition, the BNL digging permit process would alert construction personnel to tiger salamander awareness and reporting protocols. A wetlands permit would be obtained from the NYSDEC for the enhancement actions.

5.21 Future Upgrades

While no specific upgrades to the proposed solar arrays or project footprint are planned at this time, it is reasonable to expect that technological advances may warrant changing some or all PV panels or associated equipment in order to achieve improved efficiency. Replacing or upgrading panels on the same or similar support structures, located within the current proposed footprint, would not be expected to have any adverse environmental impacts. Future upgrades that would expand the arrays beyond the current proposed footprint would be reviewed through established NEPA procedure.

5.22 Decommissioning and Restoration

Decommissioning activities would be performed as part of a planned process. It is reasonable to assume that most of the steel, fencing, and hardware would be recycled. After restoration to its pre-project condition, minus expected wear and tear, the land would then be available for future BNL operations or remain open for restoration and natural re-growth. Restoration actions, including planting native pine barrens species, would be developed and implemented in accordance with the BNL Natural Resource Management Plan [BNL 2003a].

5.23 Cumulative Impacts of the Proposed Action

Beyond a temporary increase in vehicle fuel usage during the construction phase, the proposed action would require either none or minimal fuel or water resources. When considered along with previously planned and evaluated actions at BNL, the cumulative impacts would have a negligible effect on the environment.

Reasonably foreseeable projects planned for the Laboratory site are estimated to require the removal of about 206 acres (83 hectares) of trees as shown in Table 8 below.

Table 9: Estimated Tree Removal for Future BNL Projects

Project	Estimated Tree Removal Acres (hectares)
National Synchrotron Light Source-II	8 acres (3.2 hectares)
Interdisciplinary Science Buildings I and II	None
Relativistic Heavy Ion Collider II (RHIC-II)	<5 acres (2 hectares)
e-RHIC	25-35 acres (10-14 hectares)
Revised Main Gate Entrance Road	2-5 acres (1-2 hectares)
BP Solar Array	153 acres (62 hectares)
TOTAL	206 acres (83 hectares)

The total amount of tree removal required for the anticipated BNL projects identified above would amount to approximately 3.7% of the BNL property. This would increase the cleared area of the BNL site from about 26.8% to 30.5%, which is well within the Central Pine Barrens Land Use Plan guidelines.

Overall the cumulative impact of these environmental aspects would have negligible effects on the environment.

5.24 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, DOE would not provide an easement for construction and operation of a proposed 37 MW solar array to produce energy.

Land use and demography on-site and off-site would remain in its current configuration under the No Action Alternative.

The No Action Alternative would have minimal impact on the ecology at the BNL site. These minimal impacts would result from the continued encroachment of invasive species that would likely occur.

By not performing the proposed action, the Laboratory, and local/regional economies would not realize the benefits gained from direct power purchasing, an increased demand for labor, or related secondary benefits. Similarly, the LIPA electric grid would not receive 37 MW of ‘clean’ renewable electricity produced by solar PV arrays. The 37 MW demand would then be satisfied with electricity generated through conventional means such as fossil fuel plants, along with the associated airborne emissions, and demand for fuels, water, and other resources.

6.0 ACRONYMS, INITIALS, AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
AMSL	Above Mean Sea Level
BER	Brookhaven Executive Roundtable
BHSO	Brookhaven Site Office (DOE)
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates, LLC.
CAC	Community Advisory Council
CAP	Clean Air Assessment Package
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRMP	Cultural Resource Management Plan
dBA	Decibel
DEC	Department of Environmental Conservation
DOE	Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields
EMS	Environmental Management System
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
EPD	Environmental Protection Division
ESH	Environment, Safety and Health
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GeV	Giga-[Billion] Electron Volt
gpd	Gallons Per Day
ILIA	Institute of Long Island Archaeology
IR	Infrared
ISM	Integrated Safety Management
ISO	International Organization for Standardization
kV	Kilovolt
kVA	Kilo volt-amp
kW	Kilowatt
lbs	Pounds
LIPA	Long Island Power Authority
LIRR	Long Island Railroad
MEI	Maximally Exposed Individual
meV	Milli-[thousandth] electron Volt
mG	milligauss
mgd	Million gallons per day
mrem	Milliroentgen equivalent man (see below for “rem”)
MW	Megawatt
MWH	Megawatt Hours
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Act

NRHP	National Register of Historic Places
NRMP	National 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
NYSPDES	New York State Pollutant Discharge Elimination System
OHSAS	Occupational Health and Safety Assessment Series
OSHA	Occupational Safety and Health Administration
P2	Pollution Prevention
pH	Activity of Hydrogen Atoms in Solution
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 [standard unit that measures the effects of ionizing radiation on humans]
SBMS	Standards Based Management System
SC	Suffolk County
SER	Site Environmental Report
SEQRA	New York State Environmental Quality Review Act
SPDES	State Pollutant Discharge Elimination System
SPL	Sound Pressure Level
STP	Shovel Test Pit
TS	Tiger Salamander
U.S.	United States
USC	United States Code
USGS	Untied States Geological Survey
VOC	Volatile Organic Compound
WFMP	Wildland Fire Management Plan
WWI	World War I
WSRRA	Wild, Scenic, and Recreational Rivers Act
yr	Year

7.0 LIST OF PREPARERS

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8.0 LIST OF AGENCIES CONTACTED AND PRESENTATIONS TO STAKEHOLDERS

8.1 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

Additional copies of the draft EA were also sent to the following agencies for information only:

Town of Brookhaven Supervisor's Office – Farmingville, NY
Central Pine Barrens Joint Planning and Policy Commission – Great River, NY
Congressman Tim Bishop's Office - Coram, NY
Long Island Regional Planning Board – Hauppauge, NY
Suffolk County Department of Health Services – Yaphank, NY
Suffolk County Executive's Office – Hauppauge, NY
LIPA - Uniondale, NY

8.2 Stakeholder Presentations

Presentations related to planning and development of the proposed BP Solar Project were provided to the following stakeholder groups:

Brookhaven Executive Roundtable (BER)

The BER is a forum for frequent, routine and executive-level communications about BNL. Represented on the BER are the major stakeholders associated with BNL, including the owner, operator, and jurisdictional, regulatory, oversight, community and political interests. Presentations about the BP Solar Project were provided to the BER on April 22, and September 23, 2009.

BNL Community Advisory Council (CAC)

The CAC consists of approximately 27-member organizations representing business, civic, education, employee, environment and health organizations. Members meet monthly, 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 [http://www.bnl.gov/community/CAC.asp]. Presentations about the BP Solar Project were provided to the CAC on April 15, and September 10, 2009.

The Central Pine Barrens Joint Planning and Policy Commission was contacted and a presentation was provided on September 16, 2009.

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