ENVIRONMENTAL ASSESSMENT

FOR

WASTE WATER TREATMENT MODIFICATIONS FOR IMPROVED EFFLUENT COMPLIANCE

BROOKHAVEN NATIONAL LABORATORY UPTON, NEW YORK

U.S. DEPARTMENT OF ENERGY

Office of Science

BROOKHAVEN SITE OFFICE

JUNE 24, 2011

DOE/EA-1854

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1.0 INTRODUCTION

The United States (U.S.) Department of Energy (DOE) has prepared this Environmental Assessment (EA) to evaluate the potential environmental consequences of upgrading the Brookhaven National Laboratory (BNL) Sewage Treatment Plant (STP) to ensure that effluent discharges comply with the July 2009 modification to the site's State Pollutant Discharge Elimination System (SPDES) permit (No. NY0005835).

The preferred alternative is to eliminate discharges from the STP to the Peconic River, and direct them to a groundwater recharge system.

Other alternatives considered both assessed and 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 discontinuing STP discharges to the Peconic River and routing them to groundwater recharge 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). BSA is a limited liability company, formed between Battelle Memorial Institute and The Research Foundation of State University of New York (SUNY) on behalf of Stony Brook University (SBU). 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 (BNL 2010b).

BNL is served by a Sewage Treatment Plant (STP) located in the North Central part of the 5,265 acre facility (Fig. 3). The STP is approved for operation under a State Pollutant Discharge Elimination System (SPDES) Permit issued by New York State (Permit Number NY 0005835). This permit establishes regulatory limits for various chemical constituents contained in the effluents currently being discharged to the Peconic River, a Class C Freshwater, located just to the north of the STP. In July 2009, the New York State Department of Environmental Conservation (NYSDEC) modified BNL's SPDES permit. As part of the permit modification, the NYSDEC proposed new water quality based effluent limits (WQBELs) for copper, iron, lead, nickel, zinc, and mercury for discharge through Outfall 001 to the Peconic River. The modified permit also required BNL to implement a Quantification and Removal (Q&R) Study and a Mercury Minimization Program to identify sources of copper, iron, lead, mercury, nickel, and zinc and determine the available treatment alternatives or disposal alternatives to achieve the proposed WQBELs at Outfall 001. The results of these studies are the basis for this environmental assessment (D&B, 2010a, b).

If the preferred alternative is authorized to proceed, then BNL would begin the process of designing the new filtration system and recharge basins along with the work planning and permitting necessary to carry out the project in its entirety in order to meet the permit requirements under the NYSDEC approved timeline.

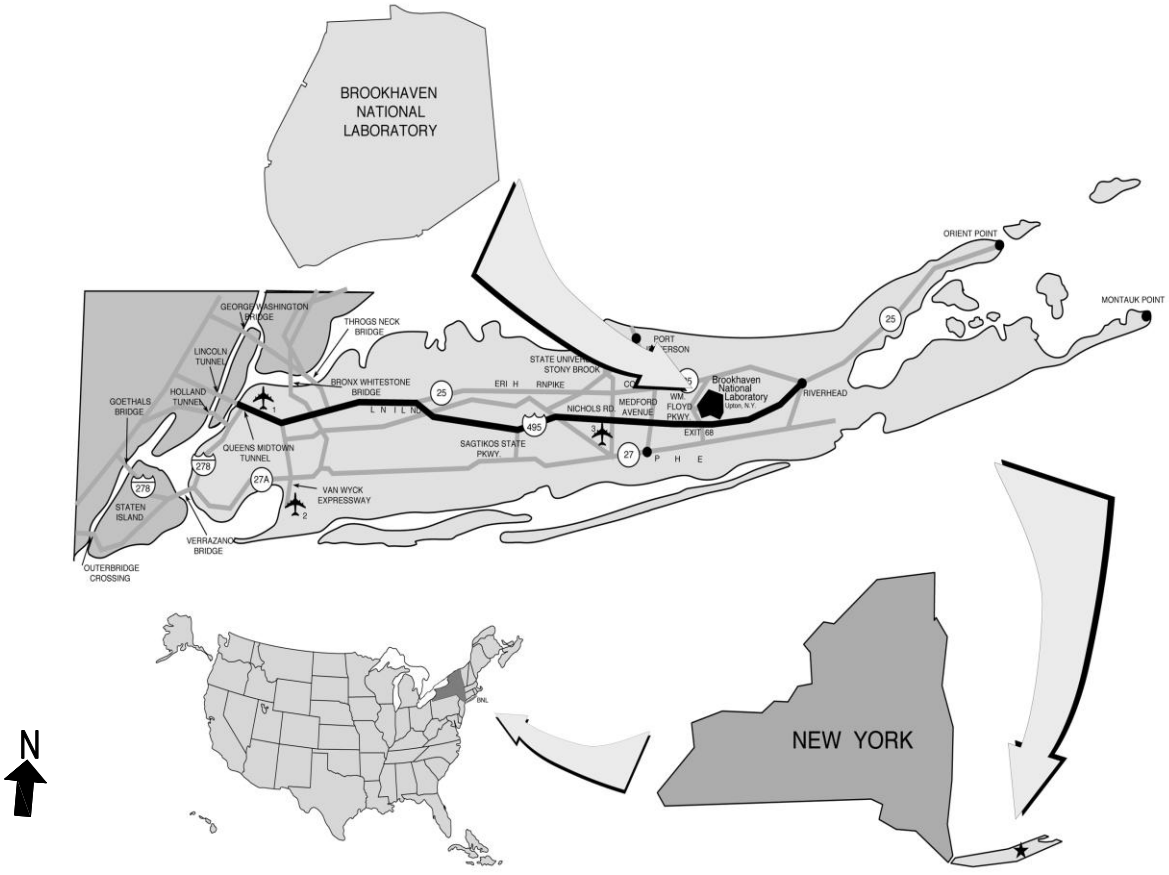

Figure 1: Regional View of Brookhaven National Laboratory Location

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

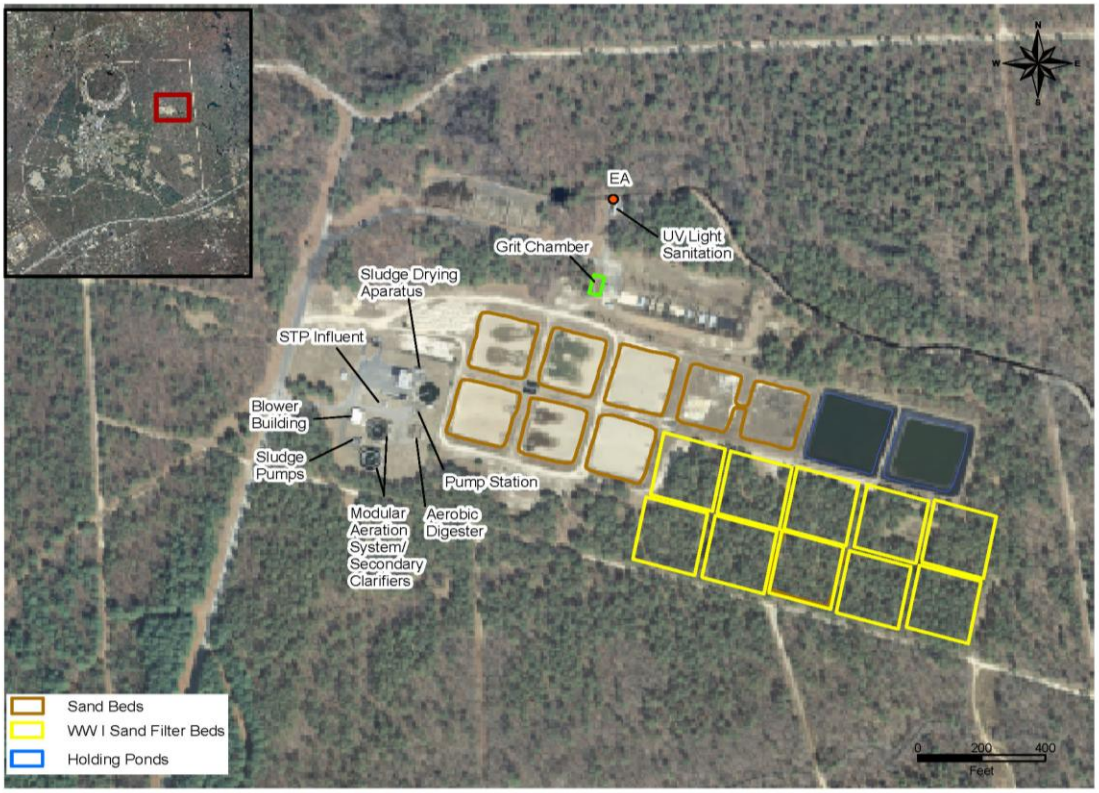

Figure 3: Aerial View of the Sewage Treatment Plant with WW I era sand filter beds identified.

Summary of Discharge to Groundwater Parameters:

- BNL would improve its current level of wastewater treatment through installation of a new post-aeration filtration system, thereby removing the existing sand filters from the treatment process and removing a significant source of metals from the effluent.

- Four to five acres of former WW I era sand filter beds or other appropriate area would be cleared of vegetation and developed into recharge basins to receive STP discharges.

- BNL would continue to identify and implement source control options to reduce concentrations of priority metals from waste streams.

- The current sand filter beds would be isolated from the Peconic River and the surface areas restored to native vegetation.

- The UV light sanitation system, settling chamber, Building 580, discharge headwall, and discharge piping would be removed or abandoned in place. (Note: the status of Building 580 is dependent on the removal of gauging stations).

- The Peconic River gauging stations EA, HM-N, HM-S, and HQ would either be removed or modified to allow improved passage for fish migration after discharges are directed to a groundwater recharge system.

- The need for the UV light sanitation system will be evaluated for potential installation at the main STP site. If needed it would be placed after the new post-aeration filtration system to sanitize the effluent prior to groundwater discharge.

This EA analyzes the potential environmental impacts associated with:

- Adding post aeration filtration to the STP and redirecting discharges from the Peconic River to a groundwater recharge system

- The No Action Alternative in which no modifications to the STP or its discharge are made, and an

- Enhanced treatment alternative with continued discharge to the Peconic River.

In the No Action Alternative, BNL would continue to operate the STP in its current configuration and continue to discharge effluents to the Peconic River. While BNL continually seeks ways to improve its treatment of wastewater through reducing contributions of contaminants from waste streams (i.e. source controls), the waste water would continue to pass through the sand filter beds which contain residual metals, especially mercury. The current level of treatment will not allow BNL to meet the WQBELs proposed in the new SPDES permit issued by the NYSDEC. Therefore, BNL would be in near continual violation of the permit resulting in significant fines, the potential for shutdown of the STP and closure of the Lab, or both.

Under the Enhanced Treatment alternative, BNL would install a new treatment system using polythiocarbonates to chelate metals from waste water; install a post-aeration filtration system that would reduce the amount of particulates in the discharge; and the effluent would be discharged directly to the Peconic River, by-passing the sand filter beds, a known source of mercury and other metals. This alternative would require BNL to conduct feasibility studies to determine the toxicity of sulfur compounds associated with the polythiocarbonate on aquatic organisms found in the Peconic River.

In July 2009, the NYSDEC issued BNL a new SPDES permit that proposed significant reductions in the effluent limits on a number of permitted substances. While BNL routinely meets the requirements of its permit, the new limits on six metals (copper, iron, lead, mercury, lead, and zinc) would be very difficult to achieve using current treatment methods. The new permit required BNL to conduct a quantification and removal study to identify sources of these metals, reduce inputs into the waste stream, and look at new methods for removing them from wastewater. BNL hired the Dvirka and Bartilucci engineering firm (D&B) to conduct the studies and make recommendations. Much of the analysis in this EA is supported by their work (D&B 2010a, b). The D&B reports identified multiple options for meeting the new permit limits, but recommended the discharge to groundwater option with new post-aeration filtration prior to discharge. The only other viable alternative was an enhanced treatment option utilizing the introduction of the chelating compound polythiocarbonate along with new post-aeration filtration with direct discharge to the Peconic River bypassing the sand filter beds. Both options are reviewed in this EA along with the No Action alternative. The other options identified in the D&B report were rejected as alternatives due to inability to reduce all metals to suitable levels, or because of their potential to release toxic by-products into the Peconic River, and were therefore not assessed as part of this EA.

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

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
General Information	No change from the existing BNL operations.	BNL would install a new chemical chelating system that utilizes polythiocarbonate to remove priority metals from waste water; install a new post-aeration filtration system, and route effluent discharge directly to the Peconic River in order to by-pass the existing sand filter beds which are a known source of mercury and other metals. The sand filter beds would be isolated from the Peconic River and restored using native vegetation.	BNL would install a new post-aeration filtration system, clear approximately 4-5 acres of the former WW I era sand filter beds or other suitable area and construct recharge basins. STP effluents would be redirected from the Peconic River discharge to the new recharge basins. BNL would isolate the existing sand filter beds and restore them to native vegetation. The settling chamber, UV light sanitation facility, existing pipes, Building 580, and the discharge headwall would be removed. The Peconic River gauging stations EA, HM-N, HM-S, and HQ would either be removed or modified to improve fish passage along the BNL stretch of the river. Note: the removal of Bldg. 580 is dependent on the removal of the HE gauging station. The need for the UV light sanitation will be evaluated during the design and if needed will be moved to the main STP area for installation after the new post-aeration filtration system.
Ecological Resources	Continued release of copper, iron, lead, mercury, nickel, and zinc to the Peconic River above WQBELs. Mercury would continue to leach out of the sand	Flows to the Peconic River would continue under this alternative maintaining the current flow regime. There would be a significant reduction of mercury by eliminating the use of the sand filter beds and installing a new post-aeration filter system.	Construction Effects on Vegetation - Disturbance of 4-5 acres of primarily pitch pine forest covering the WW I era sand filter beds. Operational Effects on Vegetation – The sand filter beds would be restored with native vegetation (grasses). Vegetation along the onsite stretch of the Peconic River would adapt to reduced flows within

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
	filter beds at a concentration of 70 ng/L or higher, potentially affecting biota. Peconic River flows would be maintained between the STP outfall and station HM-N even during drought conditions.	The enhanced treatment alternative would have to go through pilot studies to determine the effectiveness on metals removal and to determine toxicity of sulfur compounds released from the breakdown of the polythiocarbonate. If compounds were determined to be toxic to aquatic biota, they would have to be removed or neutralized prior to discharge. If pilot studies indicated that WQBELs could not be met, and/or effluents contained toxic substances that could not be removed or neutralized, the discharges would have to be routed to a groundwater recharge system to meet permit requirements.	the river and revert back to a system similar to that existing prior to WW I when the river was created. <u>Construction Effects on Threatened, Endangered, and Special Concern Species</u> – Minimal impact on known species present at BNL. May displace a few individuals of eastern hognose snake and eastern box turtle. <u>Operation Effects on Threatened, Endangered, and Special Concern Species</u> – Removal of discharges from the Peconic River may improve habitat for banded sunfish by increasing the amount of emergent/submergent vegetation along the perimeter of open water areas of the Peconic River. The spotted turtle may be impacted as a habitat near the east firebreak will begin functioning similar to those upstream of station EA. Other T&E species will not be affected by the action. <u>Construction Effects on Migratory Birds</u> - Tree clearing would have minor impacts due to loss of nesting habitat. Clearing would be timed to minimize impacts (i.e. winter months) if practical to do so. <u>Operation Effects on Migratory Birds</u> – New recharge basins would provide additional habitat for shorebirds like killdeer and the restoration of the sand filter beds would improve habitat for open field

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
			species like eastern bluebird, tree swallows, and sparrows. Changes to the Peconic River would result in some improved habitat for shorebirds without negative effects for other species. Construction Effects on Mammals - Removal of approximately 5 acres of mostly pitch pine forest would result in small mammals dispersing to surrounding forests; medium and large mammal populations would be minimally affected. Operation Effects on Mammals - Minor positive effects on small and medium sized mammals due to restoration of the existing sand filter beds providing added habitat and food sources. Construction Effects on Reptiles and Amphibians - Minimal impacts on reptiles and amphibians due to construction equipment and loss of forage and mating habitat. Operation Effects on Reptiles and Amphibians - Slight improvements for reptile and amphibian species due to increased habitat from restoration of the current sand filter beds and maintaining wet areas in the new recharge basins. Construction Effects on Pine Barrens - Clearing approximately 5 acres (2 hectares) of trees would

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
			have minimal impact on the overall quality of the Central Pine Barrens ecosystem; the proposed project is within the Core Preservation area, but the restoration of approximately 10 acres (4 hectares) to grasslands benefits a much needed habitat within the Pine Barrens. Operation Effects on Pine Barrens - Little, if any, overall effect on the surrounding Pine Barrens; discontinuing discharges to the Peconic River will not affect flows east of BNL; discharging to groundwater will not have significant impact to groundwater quality.
Water Resources	No change from the existing BNL site conditions. Surface waters would continue to receive STP effluents with Mercury at ~70ng/L concentration along with other metals above WQBELs.	This alternative would result in an approximate 20% increase in the amount of effluents going to the Peconic River due to by-passing the sand filter beds where approximately 20% of the water that enters them percolates to ground water. The perched mound of groundwater under the sand filter beds would gradually dissipate. A malfunction of the metering system used to apply the polythiocarbonate could potentially send toxic material to the Peconic	Construction – No impacts would occur to surface or groundwater during the construction phase. Storm water and silt runoff management would include appropriate construction storm water controls; the proximity to the Peconic River would require obtaining a wetlands and scenic river permit, as well as a construction storm water permit. Operation – Discontinuing discharges to the Peconic River would result in the river functioning as it did before WW I; flows east of BNL would not be changed from the current state and onsite flows between gauging station HE and HQ would become seasonally intermittent. The groundwater mound under the current sand filter beds would eventually dissipate and the new groundwater recharge system would likely create a new groundwater mound that

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
		River.	would join existing groundwater which would travel south and east from the STP area. No significant impacts would occur to groundwater and no production wells would be impacted from the recharge system due to added filtration of wastewaters prior to discharge. The current wastewater effluent quality meets all NYS groundwater effluent standards.
Land Use, Demography, and Environmental Justice	No change from the existing BNL site conditions.	The sand filter beds would be isolated and restored with native vegetation under this alternative. Construction – would result in creation of approximately 20 temporary jobs. Operation – this project will not result in any new permanent jobs.	Land use associated with the preferred alternative would change from forested to cleared (5 acres) and 10 acres of existing sand filter beds would be restored with native plants resulting in a net addition of 5 acres as green space. Construction – Improvements to and construction of the recharge basins at the STP would create an estimated 20 temporary jobs. Operation – This project will not result in any new permanent jobs. Use of Brownfields – No brownfields will be used for this project but the current sand filter beds will be restored to native vegetation. Environmental Justice - No environmental justice impact or negative economic or health effects on any potentially affected population are anticipated.

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
Socioeconomic Factors	No change from the existing BNL site conditions and operations.	Construction - The project would benefit construction and manufacturing sectors with secondary benefits through jobs, wages and spending. The estimated construction workforce would be approximately 20 full-time employees. Operation - None	Construction - The project would benefit construction and manufacturing sectors with secondary benefits through jobs, wages and spending. The estimated construction workforce would be approximately 20 full-time employees. Operation – None
Transportation	No change from the existing BNL site conditions.	Construction – Minor temporary increase in construction equipment, delivery vehicles and worker vehicles. Operation – None.	Construction – Minor temporary increase in construction equipment, delivery vehicles and worker vehicles. Operation – None.
Cultural Resources	No change from the existing BNL site conditions.	No change from the existing BNL site conditions.	No change from the existing BNL site conditions.
Air Quality	No change from the existing BNL site conditions.	Construction – Negligible increase in emissions due to construction equipment, delivery vehicles and worker vehicles; generation of airborne dust. Operation – No change from the existing BNL site conditions.	Construction – Negligible increase in emissions due to construction equipment, delivery vehicles and worker vehicles; generation of airborne dust. Operation – No change from the existing BNL site conditions.
Climate	No change from the existing BNL site conditions.	Construction – Minor temporary increase in vehicle exhaust emissions during construction	Construction – Minor temporary increase in vehicle exhaust emissions during construction would minimally increase greenhouse gas (GHG)

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
		would minimally increase greenhouse gas (GHG) emissions; recovering 10 acres (4 hectares) of sand filter beds to native grasses would provide minimal positive benefit. Operation – No change from the existing BNL site conditions.	emissions; removing 5 acres (2 hectares) of trees would likely not impact climate and would be partially offset by the addition of approximately 10 acres (4 hectares) of native vegetation. Operation – No change from the existing BNL site conditions.
Visual Quality	No change from the existing BNL site conditions.	Construction – The addition of a small structure for the new post-aeration filtration system and polythiocarbonate metering system would not be visible from the Peconic River. Due to proximity a scenic river permit would be required for construction work. Operation – The closest visual target is the Peconic River which is not visible from the main area of the STP.	Construction – Removal of structures near and along the Peconic River may temporarily alter the Scenic aspects of the river. Addition of a small structure for the new post-aeration filtration system would not be visible from the river. A scenic river permit would be required for construction work. Operation – The closest visual target is the Peconic River which is not visible from the area of the new recharge basins and vice versa.

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
Park Lands	Continued release of mercury and other metals that may affect the use of the river on Suffolk County Park lands and open space east of BNL.	Construction – Continued discharge would not result in an appreciable difference in impacts to park lands.	Operation – Start of river flow would continue to occur at or near the BNL east boundary as it does in dry years and therefore would likely only have minor effects on park lands east of BNL.
Noise	No change from the existing BNL site conditions.	Construction – Minor temporary increase in noise levels, they would be unlikely to impact nearest residential area approximately 6,000 ft. (1,829 meters) to the southeast. Operation – None.	Construction – Minor temporary increase in noise levels, they would be unlikely to impact nearest residential area approximately 6,000 ft. (1,829 meters) to the southeast. Operation – None.
Industrial Safety and Occupational Health	No change from the existing BNL site conditions.	Construction - Hazards typical for small 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 safety	Construction - Hazards typical for small 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 safety hazards associated with STP operations - The remote location of the site, the fenced enclosure and warning placards would minimize exposure of the BNL staff, visitors, and public to potential safety hazards.

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
		hazards associated with STP operations - The remote location of the site, the fenced enclosure and warning placards would minimize exposure of the BNL staff, visitors, and public to potential safety hazards.	
Radiological Characteristics	No change from the existing BNL site conditions.	Construction – None. Operation – Potential exposure to contaminants – existing monitoring systems would be maintained to detect any radiological contaminants in waste water that would allow the contaminated effluent to be diverted to the STP holdup ponds preventing damage to the environment.	Construction – None. Operation – Potential exposure to contaminants – existing monitoring systems would be maintained to detect any radiological contaminants in waste water that would allow the contaminated effluent to be diverted to the existing STP holdup ponds preventing potential damage to the environment.
Natural Hazards	No change from the existing BNL site conditions.	Operation – minimal change from the existing conditions due to addition of polythiocarbonate metering system and post-aeration filtration system. There is low probability of a hurricane and very low probability of an earthquake; construction is to building code standards; under the enhanced treatment alternative there is a slight risk of hazardous	Operation – Potential structural failure of the new filtration system and groundwater recharge basins is no different than failure of the existing STP from natural phenomenon such as earthquakes, hurricanes, or wildfire. There is low probability of a hurricane and very low probability of an earthquake; construction is to building code standards; under the preferred alternative no new hazardous materials would be available for release due to natural hazards.

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
		chemicals being released (e.g. polythiocarbonate).	
Intentional Destructive Acts	No change from the existing BNL site conditions.	No reason to expect destructive acts under this alternative, but presence of polythiocarbonate could result in deliberate release to local waters.	The Proposed Action would not offer any targets of opportunity for terrorists or vandalism, random security patrols and inspections would lessen any opportunity for such acts.
Utilities	No change from the existing BNL site conditions.	Construction – Minimal for equipment operation. Operation – Electricity would be needed to power the new filtration system and polythiocarbonate metering system.	Construction – Minimal for equipment operation. Operation – Electricity would be needed to power the new filtration system and may be offset depending on whether ultraviolet sanitation was maintained or not. No other utilities would be affected.
Electric and Magnetic Fields (EMF)	No change from the existing BNL site conditions and operations.	No change from the existing BNL site conditions and operations.	No change from the existing BNL site conditions and operations.
Waste Management and Pollution Prevention (P2)	No change from the existing BNL site conditions and operations.	Unused or expired chemicals may have to be disposed of and continued periodic disposal of STP sludge material would occur.	Construction - One-time construction wastes including cleared trees and brush, concrete and steel debris from removal of structures. Operation – Continued periodic disposal of STP sludge material.
Commitment of Resources	No change from the existing BNL site conditions.	Construction – Temporary increase in fuel demand for construction machinery. Operation – No significant change from the existing BNL site conditions.	Construction – Temporary increase in fuel demand for construction machinery. Operation – No significant change from the existing BNL site conditions.

Table 1: Summary of Potential Environmental Impacts and Controls for the No Action Alternative and the Preferred Alternative (Discharge to Groundwater).			
Comparison Factors	**No Action: BNL Current Operations**	**Enhanced Treatment**	**Discharge to Groundwater**
Decommissioning and Restoration	Not applicable.	Current sand filter beds would be restored using native vegetation.	Current sand filter beds would be restored using native vegetation.

The key negative environmental impacts to the ecological resources (i.e. trees, endangered species, and migratory birds) are due to the land disturbance. The key positive impacts are; the elimination of discharges through the sand filter beds reducing mercury on average of 70 ng/L; the restoration of approximately 10 acres (4.0 hectares) of existing sand filter beds to native vegetation; the removal of discharge water to the Peconic River that may not meet WQBELs in the future; and allowing approximately 2600' of the Peconic River to function as it did prior to World War I. Diverting STP discharges to a groundwater recharge system will allow the long term operation of the STP and BNL into the foreseeable future.

3.0 PURPOSE AND NEED

The purpose is to upgrade the BNL Sewage Treatment Plant (STP) to ensure that effluent discharges comply with the July 2009 modification to the site's State Pollutant Discharge Elimination System (SPDES) permit (No. NY0005835). The proposed project must ensure that BNL can either effectively treat both process and municipal sewage to reduce the concentration of copper, iron, lead, mercury, nickel, and zinc to achieve the water quality based effluent limits (WQBELs) established by the July 2009 modified permit, or maintain the current or improved treatment levels but redirect the effluent discharge from the Peconic River to a new nearby groundwater recharge area. BNL must meet these new limits or have an alternate discharge in place by July 2014. Failure to meet new limits could result in significant violations of the permit requirement, and possibly result in subsequent fines, as well as eroding BNLs environmental quality record and leadership in the local community.

To support this effort, during 2009-2010 BNL conducted a quantification and removal study for reducing the concentration of copper, iron, lead, mercury, nickel and zinc, and developed a Mercury minimization plan. The studies determined that reductions in metals concentrations could be made, but not to the concentrations required under WQBELs. Therefore, alternate treatment systems and/or alternate discharge must be considered in order to attain the required limits.

4.0 ALTERNATIVES

4.1 Alternative 1 – Groundwater Recharge System (Preferred Alternative)

Under this alternative the discharge from the STP, currently being released to the Peconic River, would be rerouted to a groundwater recharge system located outside of the influence of the Peconic River. The proposed location would be to the south and east of the existing STP filter beds, and would require the construction of groundwater recharge basins, installation of a post-aeration filtration system and building, and all plumbing upgrades to route effluent to the new recharge basins. Additionally the proposed action would require the demolition and removal of the existing effluent piping system, settling box, ultra violet disinfection system, STP outfall and headwall, and Building 580 (dependent on removal of gauging stations) adjacent to the Peconic River.

4.1.1 Project Location

The new post-aeration filtration building would be located adjacent to the existing STP secondary clarifier. The new recharge basins would be

constructed south and east of the current filter beds in an area utilized as effluent filter beds during World War I (see figure 3), or in another appropriate location that would meet the recharge rate criteria after percolation testing if the World War I filter beds cannot be appropriately modified to meet recharge capabilities by removal of impermeable layers if they are found.

4.1.2 Post-aeration filtration and groundwater recharge

Effluent from the STP's secondary clarifiers would be passed through a new filtration system to remove solids. The filtered solids would be returned upstream of the secondary clarifier for retreatment or be sent to the sludge digester. The filtration system would require the construction of a building to house filters. The filters would be designed to handle peak flows, be self- cleaning, and capable of returning the solids generated either to the secondary clarifiers for retreatment or to the sludge digesters. The reutilization of the current UV disinfection system will also be evaluated during the design process. The treated water would then be directed to the new recharge basins.

The new recharge basins would be located to the south and east of the current sand filter beds; an area that consists of ten former World War I basins each approximately one acre (0.4 hectares) in size. The new recharge basins would each be designed to handle the daily average maximum discharge capacity or greater (approximately 0.6 MGD (2.27 MLD)) to accommodate periodic higher flows (e.g., rain events). The groundwater recharge basins would be designed on the basis of 10 gallons per day per square foot (4,089 liter per day per square meter) of bottom area for filtered effluent or five gallons per square foot (2,045 liters per square meter) of bottom area for unfiltered effluent. The exact sizing of each basin will be dependent on field testing for presence of low permeability (silt and clay) deposits and determining percolation rates. A nearby area shall be set aside for future 100 percent expansion/replacement of the beds. The beds would be a maximum of four feet in depth including freeboard, equipped with access ramps for ease of cleaning and with splash pads at the ends of influent piping. The recharge area would be separated into four independent basins, each sized to accommodate the average maximum discharge capacity of 0.6 MGD (2.27 MLD), with valves to allow alternate dosing and should each be operated approximately 3 months per year, with one bed in operation at all times, one available for peak flow, one drying, and one being cleaned.

Utilizing a design flow of 0.6 MGD (2.27 MLD) (assumed maximum average daily flow), and assuming that the clarified effluent is directed to the recharge basins after filtration, results in a required bottom area of at least 60,000 square feet (5,574 square meters). It is assumed that filtration of the effluent will be required to minimize the size of the recharge beds, maximize removal of solids and any metal contaminants contained therein prior to discharge, and minimize potential for fouling of the beds. The proposed area for recharge is the site of former sand filter beds used during the US Army occupancy of the site during World War I (at least 10 filter

beds or approximately 435,560 square feet (40,469 square meters)), each approximately one acre (0.4 hectares) in size. For estimating purposes, it is assumed that four or five former sand filter beds will be reconstructed to form the new recharge basins, with the remaining filter beds reserved for future expansion, if necessary. The former sand filter beds are already approximately 4 to 6 feet deep and would be reconfigured to create four recharge basins, each sized to accommodate the maximum average daily flow of 0.6 MGD (2.27 MLD). However, because the sand filters have not been used in many years, they are filled with trees and vegetation. As a result, the entire area needs to be cleared and, it is assumed that approximately one foot (0.3 meters) of soil will be scraped from the entire footprint of the recharge area to expose the sand/soil beneath the vegetated area. In addition, site grading will be required to reconstruct and form the shape of the basins.

4.1.3 Operation and Maintenance

The proposed filter system would be periodically cleaned with backwash water. The retained solids would be either pumped back upstream of the secondary clarifiers or to the sludge digester. The filter system would require periodic inspection, maintenance, and repair/replacement of pumps and filter media. The recharge basins must be maintained approximately every two years and may require the removal and replacement of surface soils (sand) to ensure continuous infiltration of the effluent.

4.1.4 Future upgrades

As described above, future expansion or replacement of recharge basins can be accomplished by utilizing additional World War I-era sand filter beds. Three of the five available WW I era sand filter beds would be converted to recharge basins under the proposed action. The remaining two beds will be identified for future upgrades or replacement of recharge basins as needed, and may be cleared of trees and vegetation.

4.1.5 Decommissioning and Restoration

As discharges are re-routed to groundwater recharge, all connections to the Peconic River from the current sand filter beds must be removed. Starting at the river the discharge pipe and headwall would be removed; the UV disinfection chamber would be abandoned in place and lighting would be removed; Building 580 would be removed (dependent on removal of monitoring weir); piping from the sand filter beds and settling chamber would be disconnected and abandoned in place; and the sand filter beds would be deactivated. Once the current filter beds are disconnected, the area would be restored with native vegetation (typically native grasses).

At such time as the STP is determined to no longer be needed or an entirely new plant is necessary, BNL would conduct appropriate planning and environmental review for the decommissioning and restoration of the STP area.

4.1.6 Connected Actions

Removal or alteration of Peconic River Gauging Stations
BNL currently maintains river gauging/monitoring stations along the Peconic River to evaluate the impacts that the STP discharges have on water quality and flow characteristics (stations HE, EA, HM-N, HM-S, and HQ) (Figure 4). Once STP effluents are directed to groundwater, these gauging stations will no longer be needed. The New York State Department of Environmental Conservation (NYSDEC) is interested in removing impediments to fish migration along the river, and has requested that the Parshall flume gauging stations be either removed or modified to better accommodate fish passage.

Removal of the flumes would involve dismantlement and potentially removing monitoring stations (block houses) at the gauging stations. Removal of the HM-N and HQ gauging station may also require the installation of culverts under the East Firebreak and Z-path.

Modification of the flumes could alternatively require the design and installation of a series of step up pools at each gauging station to allow fish to move up and down stream during periods of high water. Modification at HM-N would likely require significant alteration in the culvert under the east firebreak to accommodate fish passage.

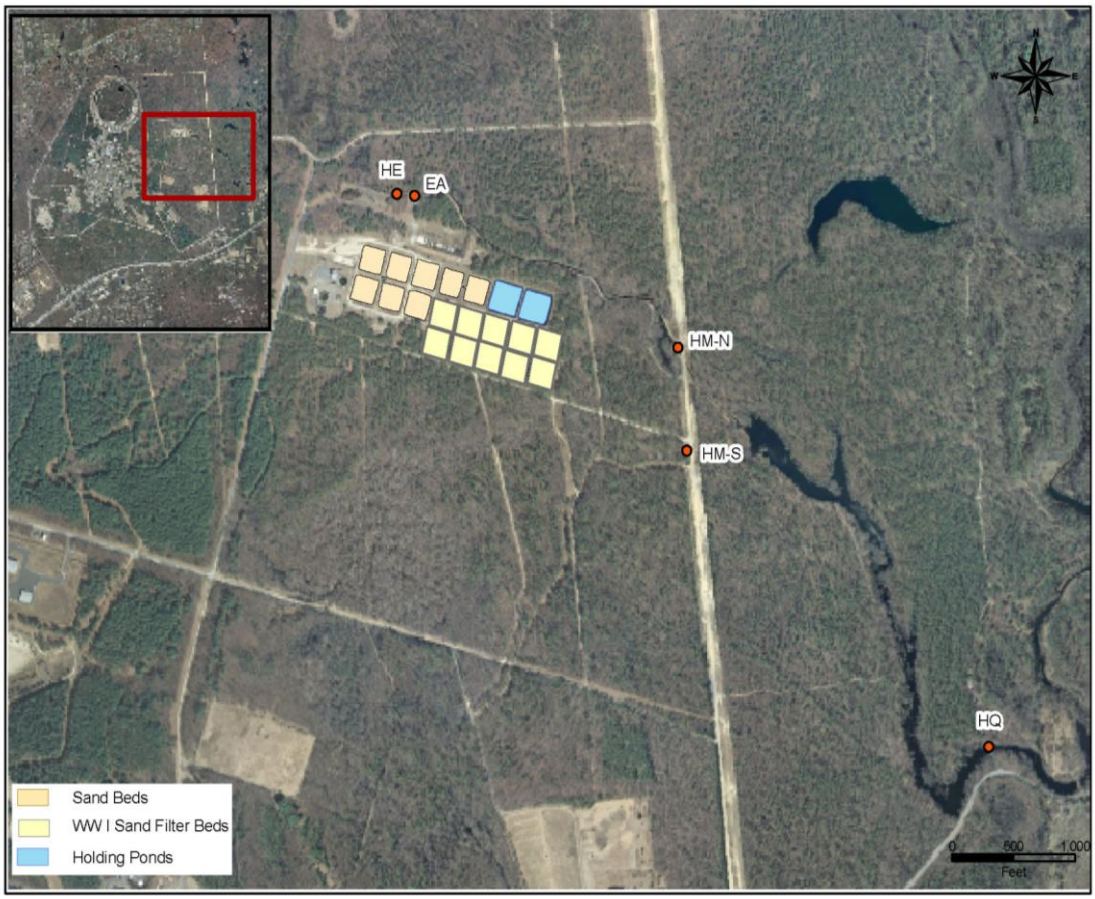

Figure 4: Aerial view of STP and Peconic River showing location of gauging stations.

4.2 Alternative 2 – No Action

The No Action Alternative would maintain the current conditions and operations on the BNL site. Under this alternative the STP would continue to operate in its present state with continued effluent discharges to the Peconic River, and measures would continue to be developed to reduce metals content in influent waters. BNL would continue to seek out source control methods and technologies that would allow the STP effluent to meet new WQBELs defined in the updated SPDES permit. However, based upon the recently completed Quantification and Removal Study and Mercury Minimization Study (D&B, 2010a,b), it is unlikely that improvements in source controls alone will allow the STP operations to achieve the WQBELs, and BNL would potentially be in continual non-compliance with the proposed limits.

4.3 Alternative 3 – Enhanced Effluent Treatment

During the recently completed Quantification and Removal Study and Mercury Minimization Study of BNL facility effluents (D&B 2010a,b), several buildings were identified as major contributors of copper, iron, lead, nickel, zinc, and mercury. Facilities identified as contributing to high metal concentrations include: Buildings 463, 555, 703, 801, 488, and 815, boiler blow down, sanitary wastes, and the STP

itself. In evaluating technologies for reducing metals in discharge waters, chemical precipitation using polythiocarbonate precipitation may be suitable for treating effluents either at their source (i.e., source control measures) or at the STP in conjunction with the conventional treatment currently provided by the plant. The polythiocarbonate would be added using metering pumps to the aeration tanks and mixed with the raw sewage. The chemical acts by precipitating the metal contaminants which are then removed via settling and filtration. Use of polythiocarbonate would require pilot testing using the current effluent to determine the effectiveness and toxicity of effluents due to presence of residual sulfur and other compounds. BNL would also have to evaluate the best methodology for removing suspended solids resulting from this treatment. Under this alternative, the STP would need to be upgraded to install a chemical feed system, post-aeration filtration to remove solids, and installation of a by-pass of the current sand filter beds.

4.4 Alternatives Considered but not Further Evaluated

As part of the requirements under the SPDES permit modifications, BNL conducted a Quantification and Removal study and a Mercury Minimization study. This work evaluated various alternatives for treatment of waste water at either the source or at the STP. A number of treatment options were reviewed and rejected including: source control (removal of metals using various treatment systems at specific buildings); various adsorption technologies used at the STP; and granular activated carbon treatment at the STP. A full description of these technologies is available in the D&B reports (D&B 2010a, b).

5.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

This section describes the general environment in the area for the proposed alternatives along with specific environmental elements that may be affected. The effects of each alternative on these elements are presented within each subsection. For additional information on BNL, including detailed environmental monitoring results, please refer to BNL's annual Site Environmental Report (BNL 2010b).

5.1 Site Description

BNL encompasses a total of 5,265 acres (2,131 hectares) with most principal facilities located near its central developed area, which occupies approximately 1,656 acres (670 hectares). The remaining 3,609 acres (1,460 hectares) of the site are largely wooded and part of the Long Island Pine Barrens. The central portion of BNL is within the compatible growth area as designated by the Central Pine Barrens Joint Planning and Policy Commission (Commission), while the areas outside the central portions of the Laboratory are designated as Core Preservation Area by the Commission. The onsite portions of the Peconic River have been designated as "Scenic" by the NYSDEC under the New York State Wild, Scenic, and Recreational Rivers Act (NYS WSRRA). Under the Act, the NYSDEC has established a 0.5 mile (0.8 km) buffer on either side of the river which limits certain activities and development that are not compatible with the designation. BNL, as a federal enclave, is not bound by NY State Environmental Conservation Law (ECL) Article 57 establishing the Central Pine Barrens or the NYS-WSRRA. However,

DOE works within the spirit of these laws whenever possible by conducting review of standards and/or applying for appropriate permits.

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 mid-1990s called the Site Wide Biological Inventory (Lawler, et. al, 1995); the establishment of a Wildlife Management Plan in 1999 (BNL 1999); the Natural Resource Management Plan (NRMP) in 2003 (BNL, 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 Foundation for Ecological Research in the Northeast (FERN), a non-profit organization. Additionally, work associated with the Peconic River Clean-up project provided extensive information concerning contaminants, sediments, fish, and vegetation associated with the river both before and after cleanup.

Vegetation

Vegetation at BNL is for the most part typical of the Pine Barrens in which the site is situated. A 2003 aerial photo analysis of vegetation on-site identified 12 vegetation classes. Vegetation ranges from open lawns and early successional vegetation areas associated with the constructed portions of the Laboratory, to mature forests and pine plantations. Historically, much of the forested area of the BNL site has been disturbed by tree cutting for fuel (cord wood industry) to extensive site-wide clearing of trees for the establishment of Camp Upton during World War I.

Peconic River

The STP area and the Peconic River consists of several different habitats (the corresponding vegetation classifications are included in parenthesis) including: native pine barrens habitats (a mix of pitch pine/oak/red maple forests); abandoned WW I sand filter beds undergoing secondary succession (pitch pine/oak complexes); bare sandy areas (current filter beds); river corridor (red maple forest grading into oak/pine forest); swamp (emergent/submergent vegetation); and open water habitat. What is now known as the Peconic River above and below the STP outfall was considered swamp or wetlands prior to World War I. During World War I, the Civilian Conservation Corps (CCC) era, and World War II, the Department of War trenched or ditched the wetlands to facilitate drainage and water flow to relieve military personnel from the onslaught of mosquitoes and related mosquito borne diseases. The on-site sections of the Peconic River and its tributaries show evidence of these trenching activities with ditches ranging from 6 to 12 feet (1.8- 3.6 meters) wide and up to 4 feet (1.2 meters) deep along with side cast sediment (Figure 6). This ditching extends from an area west of the William Floyd Parkway,

through the BNL site, and past the BNL eastern boundary. Several areas along the river contain large open areas, as well as deep water areas that tend to retain water year around in most years.

The Peconic River is a groundwater fed stream (see Discharge Modeling Report (BNL 2010a). Start of flow for the Peconic River varies from year to year and season to season.

Figure 5: Typical view along the Peconic River, note channel and side cast sediments from WW I.

In wet years start of flow may occur west of the William Floyd Parkway, whereas in dry years start of flow often begins at the STP outfall. In most years, the Peconic River sees flows originating upstream of the STP outfall for significant periods of time. These upstream flows along with contributions from the STP outfall, allows the river to flow continuously through BNL. The Peconic River also receives seasonal flow (precipitation) from a large area of the undeveloped central portion of BNL south of the STP. As conditions dry, flows dwindle or completely stop upstream of the STP outfall. During these periods, the river does not receive base flow from the aquifer, and available surface water (including the discharges from the STP) begins to infiltrate along the stream channel, preventing flows from reaching the Laboratory boundary at gauging station HQ located near North Street. Deep water areas east of the east firebreak that continue to intersect the water table even during dry period may remain wet throughout the year. Thus flow along the Peconic River at BNL is determined primarily by groundwater levels as they relate to precipitation more than on discharges from the STP (Figure 6).

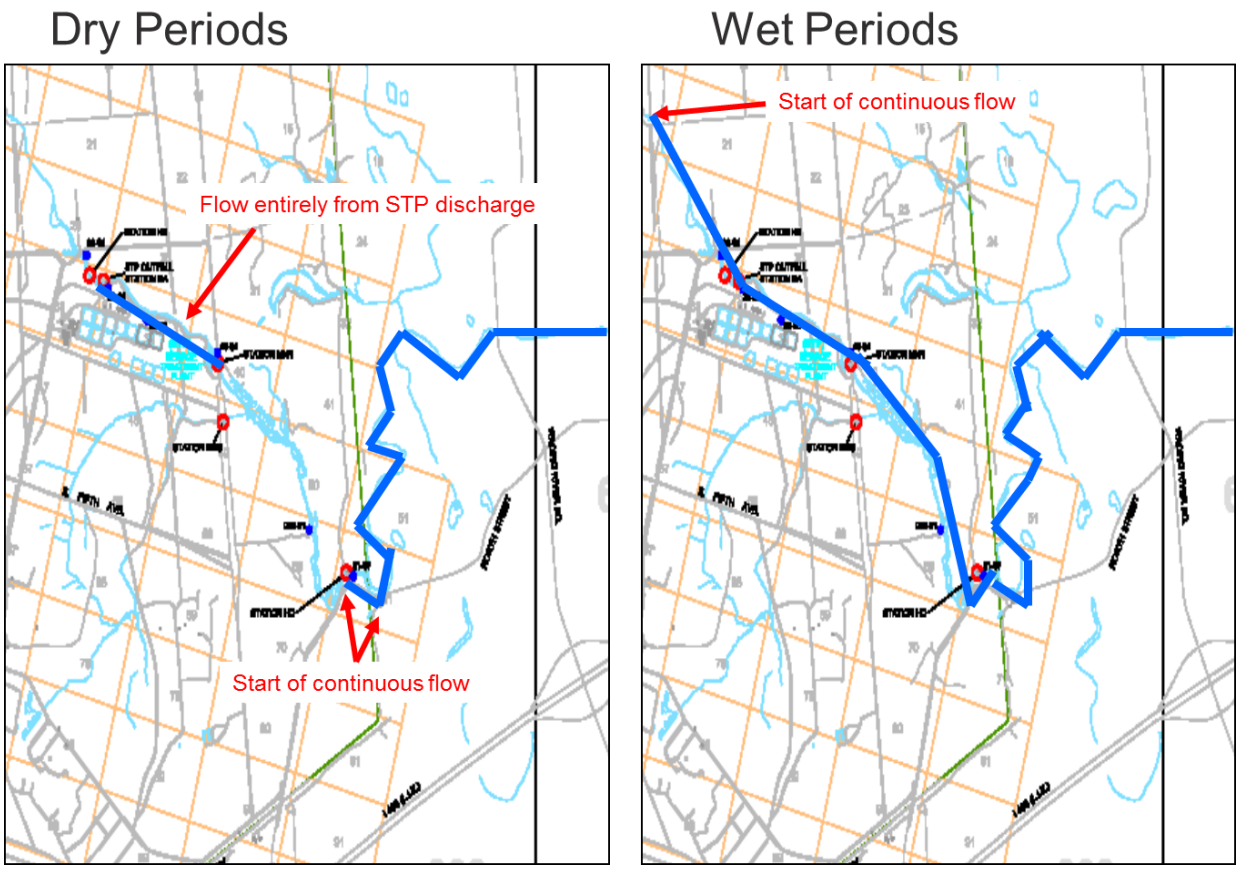

Figure 6: Comparison of flow between wet and dry periods.

Invasive Species

The area of the proposed project contains several invasive species including Japanese Barberry (*Berberis thunbergii*), black locust (*Robinia pseudoacacia*), and phragmites (*Phragmites australis*). These species were intentionally introduced to the area as ornamentals (i.e. Japanese Barberry), inadvertently transported to Long Island and BNL by visitors, or transferred through movement by animals. The area within the immediate vicinity of the STP has only minimal amounts of invasive species, with the exception of the area around the UV sterilization chamber and Building 580, which has both barberry and phragmites.

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 multiple wetlands on BNL but none of the known habitats for this species are within the area of the STP. Species listed by NY State as species of special concern that are present in the area around the STP include the eastern spadefoot toad (*Scaphiophus holbrokii*), the eastern hognosed snake (*Heterodon platyrhinos*), and the eastern box turtle (*Terrapene carolina*). The banded sunfish (*Enneacanthus obesus*), a NY State designated threatened species, has

been documented within the Peconic River; the swamp darter (*Etheostoma fusiforme*), a NY State threatened species, and the spotted turtle (*Clemmys guttata*), a species of special concern, are both known from associated waters of the Peconic. Other species of special concern in the proposed project are the Cooper's hawk (*Accipiter cooperi*) and the sharp-shinned hawk (*Accipiter striatus*). A full listing of threatened, endangered, or special concern species may be found in the annual Site Environmental Report (BNL 2010b).

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, and a total of 111 species of birds 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 BNL for nesting.

Of the six bird survey transects established at BNL, one transect covers habitats immediately along the Peconic River in the vicinity of the STP. The Peconic River transect has some of the most diverse avifauna on BNL with an average of 44 species identified during annual bird surveys each year, with a total of 82 species having been counted over the past eleven years. Twenty-eight species are the most commonly encountered, and include: American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), Baltimore oriole (*Icterus galbula*), black-capped chickadee (*Poecile atricapillus*), blue jay (*Cyanocitta cristata*), brown-headed cowbird (*Molothrus ater*), Canada goose (*Branta canadensis*), chipping sparrow (*Spizella passerine*), common grackle (*Quiscalus quiscula*), common yellowthroat (*Geothlypis trichas*), downy woodpecker (*Picoides pubescens*), eastern phoebe (*Sayornis phoebe*), eastern towhee (*Pipilo erythrophthalmus*), eastern wood peewee (*Contopus virens*), goldfinch (*Carduelis tristis*), grey catbird (*Dumatella carolinensis*), house wren (*Troglodytes aedon*), mourning dove (*Zenaida macroura*), northern cardinal (*Cardinalis cardinalis*), northern flicker (*Colaptes auratus*), northern mockingbird (*Mimus polyglottos*), ovenbird (*Seiurus aurocapillus*), pine warbler (*Dendroica pinus*), red-breasted nuthatch (*Sitta canadensis*), red-eyed vireo (*Vireo olivaceus*), tufted titmouse (*Baeolophus bicolor*), wild turkey (*Meleagris gallopavo*), and the yellow-billed cuckoo (*Coccyzus americanus*). Another twenty- four species are fairly common including: barn swallow (*Hirundo rustica*), belted kingfisher (*Ceryle torquata*), black-and-white warbler (*Mniotilta varia*), black-billed cuckoo (*Coccyzus erythropthalmus*), brown creeper (*Certhia Americana*), brown thrasher (*Toxostoma rufum*), Carolina wren (*Thryothorus ludovicianus*), cedar waxwing (*Bombycilla cedrorum*), fish crow (*Corvus ossifragus*), great blue heron (*Ardea herodias*), herring gull (*Larus argentatus*), killdeer (*Charadrius vociferous*), mallard (*Anas platyrhyncos*), red-bellied woodpecker (*Melanerpes carolinus*), red-tailed hawk (*Buteo jamaicensis*), red-winged blackbird (*Agelaius phoeniceus*), ruby-crowned kinglet (*Regulus calendula*), scarlet tanager (*Piranga olivacea*), tree swallow (*Tachycineta bicolor*),

veery (*Catharus fuscescens*), white-throated sparrow (*Zonotrichia albicollis*), wood duck (*Aix sponsa*), wood thrush (*Hylocichla mustelina*), and yellow-rumped warbler (*Dendroica coronate*).

Mammals

A number of mammals utilize the various habitats at BNL, including the area of the STP and Peconic River. 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 area of the STP and Peconic River compared to the areas around the constructed areas of BNL which have some of the densest deer populations on-site. BNL also provides habitats for small mammals such as bats, mice, squirrels, rabbits (discussed in detail below) and medium-sized mammals such as raccoons (*Procyon lotor*) and red (*Vulpes velox*) and grey (*Urocyon cinereoargenteus*) fox.

Only two bat species have been confirmed, the little brown bat (*Myotis lucifugus*) and the eastern red bat (*Lasiurus borealis*). The little brown bat typically utilizes buildings for maternity colonies while the eastern red bat utilizes trees. Both bats have been observed using streams and open water bodies for summer foraging.

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*) all of which are found in the area of the STP and along the Peconic River.

Reptiles and Amphibians

BNL is home to 28 species of reptiles and amphibians. The various species are distributed throughout BNL, but may be localized depending on their habitat requirements. Reptiles like the eastern box turtle (*Terrapene carolinensis*) may be found in virtually all habitats on-site, whereas many species of snakes and other turtles are localized near wetland resources. Frogs and toads are isolated around wetlands 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*). Additionally, four-toed salamanders (*Hemidactylium* scutatum) are known to inhabit specific habitats along the Peconic River containing tussock sedge (*Carex stricta*) and/or sphagnum mosses (*Sphagnum sp*.).

Fish

There are six species of fish known from the Peconic River on BNL including the NY State designated threatened banded sunfish (*Enneacanthus obesus*), pumpkinseed (*Lepomis gibbosus*), bluegill (*Lepomis macrochirus*), chain pickerel (*Esox niger*), largemouth bass (*Micropterus salmoides*), creek chubsucker (*Erimyzon oblongus*), and brown bullhead catfish (*Ameiurus nebulosus*). The swamp darter (*Etheostoma fusiforme*) at NY State designated threatened species is also known to use the Peconic River, but has not been confirmed within the onsite stretch of the river. These species of fish utilize a variety of habitats within the river from slow moving backwater areas to deep open water pools. During high flow period's fish have been documented as far upstream as the ponds within the Relativistic Heavy Ion Collider (RHIC). In these cases fish had to overcome multiple barriers to fish passage. In general fish can only move up and downstream during high water periods which usually exist in the spring.

Pine Barrens

BNL is within the Central Pine Barrens of Long Island. This area has been designated a protected area under NY State ECL Article 57. Although BNL, as a federal enclave, is not bound by this law, DOE works within the spirit of the law whenever possible by conducting review of standards and/or applying for appropriate permits when planning and implementing projects. The Central Pine Barrens is an area of approximately 105,000 acres (42,492 hectares) and is divided into a Core Preservation Area (CPA) of approximately 55,000 acres (22,258 hectares) where development is proscribed and limited, and the Compatible Growth Area (CGA) of approximately 50,000 acres (20,234 hectares), where development is allowed but must meet a series of standards and guidelines established in the Land Use Plan for the Central Pine Barrens. The STP is within the CPA.

5.2.2 Effects of Preferred Alternative on Ecological Resources

Effects on Vegetation during Construction

Under the preferred alternative four to five acres (1.6 – 2.0 hectares) of the site of the former World War I sand filter beds would be cleared and reconstructed as recharge basins. This area is composed of mature pitch pine trees (*Pinus rigida*) with ages estimated to be between 70 to 80 years old, with a sparse under story of low and high bush blueberry (*Vaccinium spp.*) and huckleberry (*Gaylucssacia bacata*) (Figure 7). Additional disturbance around the perimeter of the former sand filter beds may also occur, but would be limited as much as possible to surface disturbance that would not compromise root stock of plants.

The demolition and removal of Building 580 (dependent on removal of gauging stations), UV light chamber, grit chamber, outfall head wall, and isolation of the existing sand filter beds from the Peconic River would result

in minor disturbance to existing grassy vegetation. Areas disturbed during the removal of these structures would be restored with native vegetation (typically native grasses).

Once the existing sand filter beds are isolated from the Peconic River, then the STP may be restored with native grasses. At the present time, the sand filter beds are consistently utilized by eastern blue birds, and the restoration to grasslands would benefit this species as well as others.

Removal of approximately 0.3 MGD (1.1 MLD) of STP discharge to the Peconic River will not have an immediate impact on vegetation along the river but will have a more gradual impact over time. Without the input of discharge water from the STP, vegetation along the onsite portion of the Peconic River downstream of the STP outfall will gradually shift to conditions that will be similar to those that existed prior to the channelization of the river during World War I, and that presently occur upstream of the outfall.

Effects on Vegetation during Operation

Once the new recharge basins are established and the STP effluent is routed to them for recharge, they will be maintained in a similar fashion to the existing sand filter beds. The bottoms of the basins will be kept free of vegetation to ensure that water will readily recharge through the bottom of the basins. The banks of the basins will be managed to allow grassy vegetation to grow, but will be maintained treeless to ensure that denser vegetation does not move into the basin bottoms. No other vegetation is expected to have impacts from operations.

Figure 7: Typical vegetation within the former World War I sand filter beds.

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

The construction of new recharge basins would have only a minor impact on threatened, endangered, and species of special concern. The impacts would be temporary, and the main affect will be the displacement of the eastern box turtle and the eastern hognose snake from the four - five acres (1.6 – 2.0 hectares). All other known threatened and endangered species would not be affected by the clearing and development of the basins. Furthermore, the removal and demolition of Building 580, UV light chamber, settling chamber, outfall headwall, and isolation of the existing filter beds would not impact any threatened, endangered, or species of special concern.

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

Once the STP discharges are removed from the Peconic River and routed to the new recharge basins, and the former sand filter beds are restored to grassy vegetation, the following species may be affected:

Banded sunfish and swamp darter: these fish are somewhat dependent on waters with emergent/submergent vegetation like pond lily, bladderwort, and rushes, combined with the absence of significant numbers of predatory

fish. The Peconic River will begin to function solely as a groundwater fed river with stream flows dependent upon seasonal precipitation patterns and groundwater levels. As discussed previously, deep water areas east of the east firebreak may remain wet throughout the year, with dry stretches of river in between. The seasonal fluctuation in stream flow will allow vegetation to develop on the shores and the shallow water areas of the deeper pools would provide habitat for fish. These natural fluctuations in water level and stream flow will prevent the development of large populations of predatory fish like largemouth bass, chain pickerel, bluegill, pumpkinseed, and possibly brown bullhead catfish on BNL. The isolated pools may become low in oxygen which can be tolerated by the banded sunfish and swamp darter but not the other fish species.

While the swamp darter has not been observed in the on-site portion of the Peconic River, conditions created by the removal of the STP discharge and removal of the on-site gauging stations may allow this fish to migrate into the BNL section of the river.

Spotted turtle: This turtle typically utilizes shallow water tussock sedge marshes for habitat. This habitat exists upstream of the current STP outfall and in multiple locations downstream. Removal of STP discharges is likely to impact the habitat near the east firebreak, where it may dry down on an annual basis much like similar habitat upstream of the STP does now.

Eastern hognose snake: This snake may benefit from the restoration of the existing sand filter beds to grasslands. The sandy soil of the grasslands, new recharge basins, and proximity to water at the new recharge basins, where toads may feed, will provide very limited habitat for this species.

Eastern box turtle: This turtle will be unaffected by the proposed changes. This species typically utilizes forested areas, and has sufficient habitat throughout BNL.

Eastern spadefoot: This species will be unaffected by the proposed changes. The eastern spadefoot toad is known to utilize the central wetlands south of the STP. These wetlands will not be affected by the proposed discharges to groundwater.

Sharp-shinned and Cooper's hawks: These species may benefit from the restoration of the current sand filter beds to grasslands. The new habitat should provide suitable nesting and foraging area for several bird species. Since both of these hawks prey on smaller birds, the increase in habitat for their prey will benefit them.

Effects of Construction on Migratory Birds

Clearing of trees and removal of understory vegetation would result in a minor negative effect on migratory song-birds. Noise from construction and movement of vehicles and workers may cause disturbance of some nesting birds. Existing blue bird boxes would have to be removed from the area during construction, and therefore would not be available for nesting.

Removal of trees would result in some destruction of nests if clearing occurs during late spring and summer months. Timing the clearing of the World War I-era sand filter beds to create the new recharge basins can minimize direct impacts. While clearing would remove approximately four acres (1.6 hectares) of available woodland habitat, approximately ten acres (4.0 hectares) of new grassland habitat would be established by restoring the existing sand filter beds to grasslands. Furthermore, the new recharge basins would provide habitat replacement for killdeer and other shore birds that currently utilize the current sand filter beds. The addition of the new recharge basins would create new open areas that would support placement of additional nest boxes for eastern bluebirds that would also be utilized by chickadee, tree swallows, and house wrens.

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 and increased grassland habitat. Increased edge habitat may result in slight increases in the number of brown-headed cowbirds parasitizing songbird nests. Recharge basins would provide long-term habitat for killdeer, and foraging habitat for migratory shore birds similar to the current sand filter beds. Changes to the Peconic River due to removal of discharges would result in additional low marsh and shoreline habitat that will be utilized by wading shorebirds without significant additional effects on other species.

Effects of Construction on Mammals

Since over-abundant deer populations have already impacted small mammal populations, and there is lack of understory plants in the former World War I sand filter beds, removal of trees would have minor effects on mammals. Species most likely affected include flying squirrels and grey squirrels, which would be dispersed to surrounding forests. Because the four to five acre area to be cleared can only support one deer, displaced deer would not cause significant added stress on surrounding forests. 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 have minor positive effects on small mammals because of the restoration of the current sand filter beds to grasslands. The grasslands will typically have some early successional species (e.g., wild flowers) that will provide food source (seeds) for small mammals. Some of the plant species found in grasslands may also provide a food source for deer.

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 likely to

be affected may be the eastern box turtle and eastern hognose snake. Neither of these species has been found in significant numbers within the new recharge basin areas, and clearing for construction activities would likely only affect one or two individuals. Most other species would likely not be affected since the area does not provide suitable habitat.

Effects of Operations on Reptiles and Amphibians

The operation of the proposed project is expected to result in only slight habitat improvements for reptile and amphibian species, and may benefit the eastern hognose snake (see assessment above). Moving discharges from the current sand filter beds to the new recharge basins will be an approximately equal exchange of wet area for use by snakes and amphibians.

Effects of the Construction on the Pine Barrens

The clearing of 4 to 5 acres (1.6 – 2.0 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 CPA on BNL, and would normally require a hardship permit from the Central Pine Barrens Commission and a request for creating an equal amount of habitat elsewhere on BNL. The restoration of up to 10 acres (4.0 hectares) of the current sand filter beds would provide needed grassland habitat in exchange for the marginal habitat lost from clearing. The clearing and construction of new recharge basins, removal of the outfall headwall, Building 580, UV light chamber, settling chamber, gauging stations and the restoration of the current sand filter beds would require permits from the NYSDEC under Wetlands and Scenic River regulations. In obtaining the permits BNL would meet the substantive requirements found within the *Land Use Plan for the Central Pine Barrens* (CPB, 1995).

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. The new recharge basins would be replacing the current sand filter beds which would then be restored to grasslands. The project is isolated to a small area in the immediate vicinity of the STP, and therefore will not have further impact beyond the local area. Discontinuing discharges to the Peconic River will not have any impact on stream flow within the Peconic downstream of BNL and recharging the treated STP effluent to groundwater will not have any significant impacts on groundwater quality.

5.2.3 Effects of No Action on Ecological Resources

Continuing the existing system of sewage treatment would result in the continued discharge of effluents containing various metals including copper, iron, lead, mercury, and zinc above new permit limits. While most metals do not appear to harm aquatic biota, not meeting the limits would put BNL in violation of the permit. Continued discharge under the current treatment

system would also result in consistent input of mercury at the approximate rate of 70 ng/L. Mercury is known to accumulate in fish tissues and may migrate up the food chain. Other than the continued release of mercury to the river, and inability to meet permit limits, the No Action alternative would have minimal impact on ecological resources compared to the existing conditions provided BNL continues to improve treatment of wastewater.

5.2.4 Effects of the Enhanced Treatment Alternative on Ecological Resources

The use of enhanced treatment for removing metals would allow the continued discharge to the Peconic River and maintenance of the current wetland regimes. Under this alternative there would be a significant reduction in mercury and potentially other metals because discharges would bypass the sand filter beds which are a known source of mercury and other metals. However, as mentioned in section 4.3, the enhanced treatment alternative would have to go through pilot studies to determine the effectiveness of metals removal through use of polythiocarbonate. Toxicity testing would also be necessary as the polythiocarbonates may cause in increased release of sulfur compounds. If the sulfur compounds were determined to not meet toxicity standards, they would either have to be removed or neutralized prior to discharge to the Peconic River. Even then perturbations in the metering systems could result in excess chemical being introduced to the Peconic River and ecological damage to aquatic biota may occur.

If pilot studies indicated that WQBELs could not be met, and/or effluents contained toxic substance that could not be removed or neutralize, BNL would have to move discharges to a groundwater recharge system in order to meet permit requirements.

5.3 Water

5.3.1 Existing Environment

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

Surface Water

BNL lies within the headwaters region of the Peconic River watershed. Current STP liquid effluent receives tertiary treatment before it is discharged to the Peconic River, and effluent water quality conforms to the criteria in the approved SPDES permit issued by the NYSDEC.

Pocket seasonal wetlands are also found throughout the site and provide habitat for a number of wildlife species including tiger salamanders. The Peconic River and its associated wetlands are the key wetland features on BNL.

Scenic River Corridor

The onsite portions of the Peconic River have been designated as "Scenic" by the NYSDEC under the *New York State Wild, Scenic, and Recreational Rivers Act*. Under the act, the NYSDEC has established a 0.5 mile (0.8 km) buffer on either side of the river which limits certain activities and development that are not compatible with the designation. The STP is wholly within the Peconic River corridor and the scenic buffer, and the outfall, Building 580, and UV light chamber are within 100 ft. (30 m) of the Peconic River wetlands. The stream gauging stations HE, EA, HM-N, HM-S, and HQ fall within the channel of the River or its tributary (Fig. 4). Any actions causing disturbance within the river channel or within 100 ft. (30 m) of a wetland would require a wetlands permit and a Wild, Scenic, and Recreational Rivers Act permit from the NYSDEC.

Groundwater

BNL 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 used for industrial purposes such as cooling and steam generation. The underlying groundwater is further classified by New York State as Class GA groundwater, which is defined as a source of potable water. Federal drinking water standards, NYS drinking water standards as well as NYS ambient water quality standards (AWQS) for class GA groundwater are used as goals for groundwater protection and remediation. In the vicinity of the STP the ground surface ranges from 50 to 60 feet above mean sea level (AMSL), and depth to groundwater in the STP area varies between 5 to 15 feet (1.5 to 4.6 meters) below land surface (Figure 8). The general direction of groundwater flow is to the east. Shallow, laterally discontinuous clay and silt deposits are present in the STP area. These deposits have a relatively low hydraulic conductivity, which reduces rainfall infiltration and subsequent groundwater recharge, and promotes ponding and more lateral interflow and overland flow to the Peconic River channel.

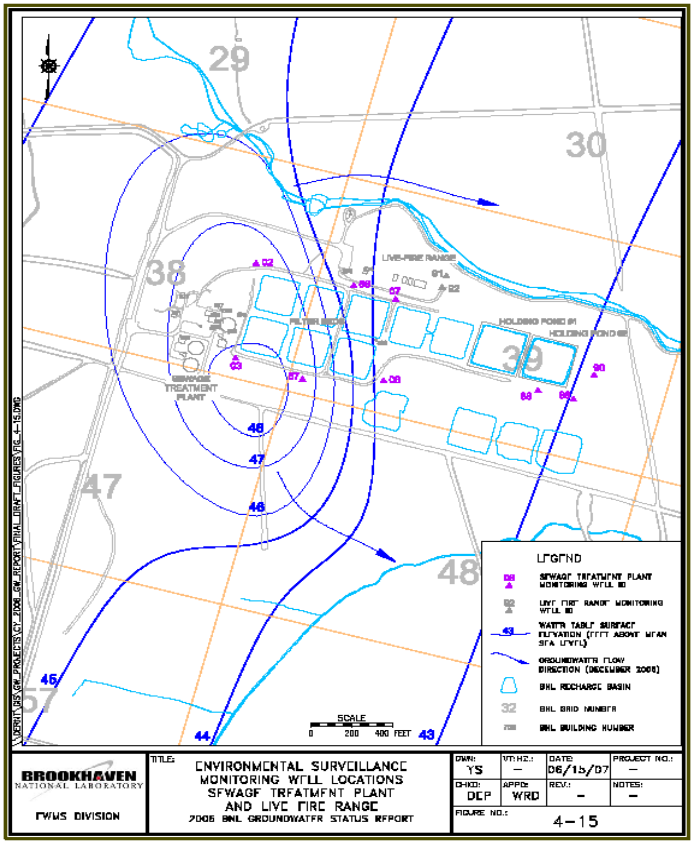

Figure 8: Groundwater contours in the vicinity of the STP (2007)

On average, the STP receives approximately 0.3 MGD of treated effluent. Of that flow, approximately 80 percent of the treated effluent is discharged to the Peconic River. It is estimated that much of the remaining 20% infiltrates past the sand filter bed under drain collection systems and is directly recharged to groundwater. In addition to the comprehensive influent and effluent monitoring program at the STP, BNL also monitors groundwater in the filter bed areas using six shallow wells. Since the beginning of the monitoring program in 1999, monitoring results have indicated the direct recharge of some of the post-aeration effluent has had only a minor impact to groundwater quality. Although trace levels of tritium are periodically detected, radioactivity results are typical of ambient (background) levels. All volatile organic compounds (VOCs), nitrate, pH and most metals concentrations (including mercury) are below the applicable NYS AWQS. Sodium, iron, and aluminum are occasionally detected in unfiltered groundwater samples at concentrations that exceed NYS AWQS. The elevated levels of these metals may be related to the treated water recharged at the filter beds, and in the case of iron and aluminum, they may also be related to naturally occurring minerals in the aquifer.

5.3.2 Effects of Preferred Alternative on Water Resources

Effects on Surface Waters

The proposed action would have minimal impact on on-site surface waters, including the Peconic River. The water released to the proposed recharge area is predicted not to enter the Peconic River adjacent to the STP as groundwater base flow (BNL 2010a). Therefore, by taking the STP effluent out of the river, the onsite reach of the river will return to an intermittent stream (i.e. similar to what existed prior to establishment of Camp Upton in World War I), with the water table remaining close to the stream bed. Even during dry periods, some isolated areas of standing water may be present in this section of the river due to impounded base flow into natural or disturbed stream bed depressions. The close proximity of the water table to the base of the stream provides wet antecedent stream bed conditions which will allow for quick flow in wet weather. No significant changes to stream flow would occur east of BNL, where the river has nearly continuous year-round flow. Furthermore, groundwater recharge is predicted not to have an adverse impact to the operations of any of BNL's environmental remediation programs, including the Operable Unit V volatile organic compound plume that originated from historical STP operations. The Operable Unit V plume is currently located entirely off-site, and is undergoing monitored natural attenuation.

In addition, discontinuing STP discharges to the Peconic River will eliminate the continued release of trace to low levels of mercury and other metals present in the treated effluent. Following BNL's extensive remediation of contaminated river sediments (in 2004-2005 and 2010-2011); eliminating the discharge of STP effluent would prevent the potential accumulation of additional heavy metals in river sediment and reduce their potential uptake by fish and other aquatic organisms.

Effects on Peconic River Scenic Corridor

The Peconic River Scenic Corridor may see minor improvements through the removal of the Building 580 (dependent on monitoring weir removal) and outfall headwall. Scenic river resources will also be improved if the gauging stations are also removed. The removal of trees and the development of the new recharge basins, while within the scenic corridor will likely not be seen from the river itself as the existing sand filter beds block views from the river.

Effects on Groundwater

Because the current and proposed SPDES effluent limits are less than the NYS AWQS for Class GA groundwater, it is anticipated that the direct groundwater recharge of all STP effluent will have little to no effect on overall groundwater quality in the STP area. Although low levels of coliform bacteria and viruses could be present in the water released to the recharge basin if it is not treated by UV disinfection, there are no drinking water supply wells in the immediate area. Under Suffolk County Department of

Health Services guidance, water supply wells must be located greater than 100 feet (30 meters) from sanitary input to groundwater (SCDHS 2009). The closest BNL water supply wells are located over 3,000 feet southwest of the STP, and the capture zones for these wells do not extend into the STP area. The closest down gradient private water supply well is more than 8,000 feet to the east; with a groundwater travel time from the STP area to the supply well of approximately 20 years. Recent monitoring data for wells surrounding the current sand filter beds indicates presence of only low levels of contaminants related to STP effluent (e.g., trace levels of mercury and low levels of nitrates and sodium). Although impacts to groundwater quality are expected to be insignificant with the re-direction of STP effluent to recharge basins, additional monitoring wells will be installed for surveillance purposes.

Unlike the existing filter bed area, available geologic data indicates that the proposed recharge basin area is not underlain by near surface clays, and therefore it is expected that the infiltration and recharge of the STP effluent can occur at the required rates. Geotechnical investigations would be conducted during the design phase of the recharge basins to better characterize the local geology. Although there will not be a substantial change in groundwater flow directions, a small, localized groundwater mound will likely be formed below the proposed recharge area.

Permits

Because the STP and proposed recharge basins are within the Peconic River Corridor and some of the facilities are next to or within the stream channel of the river, this project, if implemented, would require the acquisition of both freshwater wetlands and Wild, Scenic, and Recreational Rivers Act permits from the NYSDEC. The construction may also require a Notice of Intent and a Stormwater Pollution Prevention Plan in order to utilize a NYSDEC General Permit for construction. Prior to removing the discharge from the Peconic River and directing it to groundwater BNL's current SPDES permit would be modified to permit the change in discharge.

Use of Brownfields

No brownfields would be utilized for this project. However, under the proposed project, the existing sand filter beds would be restored to native vegetation. The existing sand filter beds were remediated as part of the Operable Unit V Project conducted under the Federal Facilities Agreement.

5.3.3 Effects of No Action Alternative on Water Resources

Continuing the current operation as is would maintain the existing conditions for surface water and groundwater. The surface waters of the Peconic River would continue to receive residual mercury from the STP sand filter beds, which over time could result in increased accumulation of mercury in river sediments and biota. No change to groundwater quality would be expected.

5.3.4 Effects of the Enhanced Treatment Alternative on Water Resources

Because the Enhanced Treatment Alternative would result in by-passing the sand filter beds, approximately 20 percent more water would be released to the river. This increase accounts for the water that currently infiltrates directly to groundwater below the filter beds. Over time the mounded groundwater below the sand filter beds would dissipate. Pilot studies and toxicity testing would be necessary to ensure that discharged water would not impact surface water. Malfunction of the chemical metering system could result in release of toxic materials to surface waters. Should pilot testing result in continued release of metals above WQBELs, BNL would have to move to a groundwater discharge scenario to meet permit requirements.

5.4 Land Use, Demography, and Environmental Justice

5.4.1 Existing Environment

Land Use

The current BNL site was established in 1947 specifically to develop and construct large-scale scientific facilities. Figure 9 "Land Use Within 1-mile of BNL Border" presents a 2007 aerial photograph of the Laboratory site and surrounding areas. Land use to the east, within one mile (1.6 kilometers) of the Laboratory, consists of preserved open space, public and private land dedicated to public recreation, and low-density residential areas of one dwelling or less per acre. To the north is a mixture of residential properties, commercial retail and service properties, 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, and residential areas. The brownfield areas are designated for industrial use within established controls.

Demography

Based on the 2000 U.S. Census and subsequent population estimates for 2007, approximately 13,460 persons live within 1.0 mile (1.6 kilometers) of the Laboratory's boundary (Davis, 2009). Figure 10 shows BNL boundary and 1-mile extent superimposed over a map of the U.S. Census blocks, along with the 2007 population estimate.

The Laboratory's on-site population includes approximately 3,000 employees and more than 4,300 guest researchers who visit each year[1]. On a daily basis an average of 180 people live in temporary on-site housing

[1] NOTE: The Laboratory's on-site population is not shown on Figure 10.

and during the summer months an average of 130 additional 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. 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 491,818 persons, based on the 2009 LIPA Long Island Population Survey (LIPA 2009), (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 (Suffolk County 2009). Using the same 2000 U.S. Census data (Tele Atlas 2008), within one mile of the Laboratory's boundary the percentage of minority population is estimated to be approximately 15.9 percent (Davis, 2009). 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 one 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 one 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 the BNL boundary through the Suffolk County government website (Suffolk County 2009). 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.

Figure 9: Land Use within 1 mile of the BNL border.

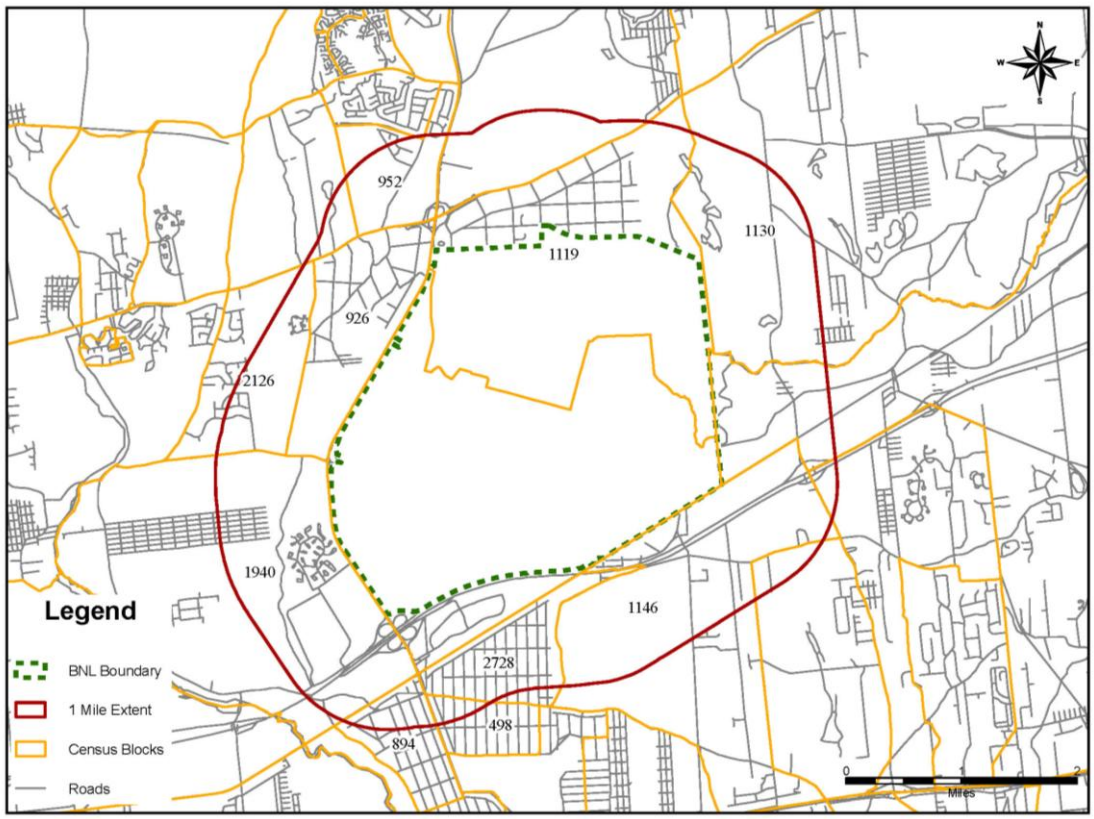

Figure 10: Population within 1 mile of the BNL border.

Table 2: 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 one 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 area would change, with approximately 4 – 5 acres (1.6 – 2.0 hectares) of trees being removed from the World War I-era sand filter beds, and up to 10 acres (4.0 hectares) of the current sand filter beds would be restored. Therefore, there would be a net loss of up to 5 acres (2.0 hectares) of trees and a net gain of up to 10 acres (4.0 hectares) of restored native vegetation in the form of grasslands. The development of the new recharge basins, removal of associated structures, installation of a new treatment building and piping systems, removal or modification of gauging stations, and the decommisioning and restoration of the sand filter beds would require approximately 20 temporary construction workers. After construction there would be no permanent jobs above those that currently exist.

Environmental Justice

The analysis described above 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 Proposed Action 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.

5.4.3 Effects of the No Action Alternative on Land Use and Demography

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

5.4.4 Effects of the Enhanced Treatment Alternative on Land Use and Demography

Under this alternative, BNL would isolate and decommission the STP sand filter beds which could then be restored with native vegetation - creating approximately 12 acres of wildlife habitat. The installation of chemical metering systems, post-aeration filtration, installation of new piping systems, and the decommisioning and restoration of the sand filter beds would require approximately 20 temporary construction workers. After construction there would be no permanent jobs above those that currently exist. All other conditions related to land use and demography would remain unchanged.

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

The Laboratory 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 $573 million by BNL in fiscal year 2009 caused a total output of goods and services to the region to expand by more than $704 million. It is estimated that more than 5,400 secondary jobs were created throughout the economy. Projected spending for fiscal years 2010-2014 could total almost $947 million annually while supporting 7,092 jobs throughout New York (Appleseed, 2011).

5.5.2 Effects of Preferred Alternative on Socioeconomic Factors

The proposed action would have very minor impacts on socioeconomic factors. The clearing and construction of new recharge basins, isolation and restoration of the existing sand filter beds, removal of the STP outfall headwall, Building 580, and UV light chamber, and the potential modification of gauging stations would result in short-term jobs for local contractors. The proposed new filtration system would also result in contract labor to install a packaged system that would be tied into the existing and new facilities at the STP. There would be no permanent jobs created or lost as a result of the proposed action.

5.5.3 Effects of the No Action Alternative on Socioeconomic Factors

The no action alternative could have major negative effect on the socioeconomic status of the region. Should BNL not upgrade the STP to meet permitted discharge limits, DOE could face significant fines, and under a worst case scenario, could be faced with site closure and the resulting significant loss of financial support to the region.

5.5.4 Effects of the Enhanced Treatment Alternative on Socioeconomic Factors

This alternative would have similar impacts as the preferred alternative in that it would result in spending and jobs creation to install metering systems, filtration systems, and isolation and restoration of the existing sand filter beds. There would be no permanent jobs created, but annual expenditures for chemicals and testing would increase slightly.

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 BNL unless participating in a scheduled event. Commercial delivery, construction and service contractor vehicles are permitted access to the site as necessary.

Routine access to BNL 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 BNL. The potentially affected area is accessible by both paved and unpaved roads.

The Laboratory maintains an on-site railroad spur branching off the Long Island Railroad (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

Construction activities associated with the preferred alternative would result in only minor temporary increase in the number of vehicles entering and exiting BNL each day, including workers, material deliveries, and waste transport from demolition activities.

Preparatory and construction activities may require delivery of several large machines to clear trees from the World War I-era sand filter beds and to

reconstruct the filter beds into recharge basins. Shipments of material for building structures associated with post-aeration filtration and piping for the effluent distribution system, as well as the potential trucking needed to remove debris from the demolition of Building 580, STP outfall headwall, and gauging stations would be expected.

Once modifications to the STP are completed, traffic and transportation would return to levels equivalent to those existing now.

Railroad spur – It is not anticipated that the on-site railroad spur would be used for any shipments to or from BNL associated with the modifications to the STP.

5.6.3 Effects of No Action Alternative on Transportation Conditions

Under the no action alternative, transportation conditions would not be altered from the existing conditions.

5.6.4 Effects of the Enhanced Treatment Alternative on Transportation Conditions

The enhanced treatment alternative would have similar effects on transportation as the preferred alternative (see Section 5.6.2 above). Because the enhanced treatment alternative would result in continued discharges to the Peconic River, the removal and off-site disposal of gauging stations and ancillary structures associated with the discharge would not occur. However, the enhanced treatment alternative would require routine shipments of polythiocarbonates used for removing metals from wastewater. These shipments would enter the Laboratory through routine shipping and receiving procedures.

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.

The area to the south and east of the STP proposed for construction of the recharge basins overlays the former World War I-era sand filter beds. In 2004, the NY State Historic Preservation Officer (SHPO) concurred with the DOE's determination that all remaining World War I-era Camp Upton features, including trenches and foundations, are eligible for listing in the National Register of Historic Places (NRHP).

5.7.2 Effects of Preferred Alternative on Cultural Resources

BNL performs 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 World War I-era Camp Upton (Bernstein, et. al 2001). Because of the low potential for the presence of 20th century archeological deposits in the World War I-era sand filter beds, construction and land preparatory activities in this area are not likely to have unavoidable adverse effects. Therefore, archeological and data recovery surveys of these sand filter beds is not necessary.

5.7.3 Effects of the No Action Alternative on Cultural Resources

The no action alternative would not affect the current status of any known cultural resources.

5.7.4 Effects of the Enhanced Treatment Alternative on Cultural Resources

Because there would be no significant change from the no action alternative, this alternative would not result in any change to known cultural resources.

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 BNL, 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 New York subset of the region, which includes Bronx, Kings, Queens, New York, Orange, Richmond, 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. 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 this regulation, calculations would be done to determine the potential impact of construction emissions on regional air quality. However, based on recent construction projects the need for a conformity analysis would not be expected. 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 of the post-aeration filtration system and recharge basins is complete, any emissions from the STP would be equivalent to the existing functioning plant. The recharge basins would handle an equivalent amount of effluent as the current sand filter beds, and therefore little difference would be seen.

5.8.3 Effects of the No Action Alternative on Air Quality

The no action alternative would not alter the existing air quality conditions.

5.8.4 Effects of the Enhanced Treatment Alternative on Air Quality

Enhanced treatment would have similar impacts on air quality as compared to the preferred alternative. Construction would be necessary for installing metering devices for delivery of the polythiocarbonates, post-aeration filtering, and a by-pass line to avoid delivery of waste water to the sand filter beds. As in the preferred alternative a review of construction operations would be performed to determine the need for appropriate air permits.

Once constructed the emissions from the STP would be equivalent to those currently existing at the plant.

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 local weather data since August 1948. 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 2009b). 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 2009a). 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 (Hailey 2008).

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 new recharge basins (loss of 5 acres (2 hectares) of trees) and restoring the existing sand filter beds (increase of 10 acres (4.0 hectares) of grassland) at the STP 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. Changes to the location and type of discharge from the STP is not likely to have any demonstrable change in the current generation of GHGs from the STP, therefore any changes will be a result of difference in vegetation.

5.9.3 Effects of the No Action Alternative on Climate

Since, the no action alternative does not change any of the operations at the STP; there would be no difference from the current conditions with this alternative.

5.9.4 Effects of the Enhanced Treatment Alternative on Climate

This alternative would result in similar effects as the preferred alternative since the type of discharge from the STP would not change. The major difference between the Enhanced Treatment alternative and the Preferred Alternative is increased acreage of grasslands without the removal of trees.

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 Pine Barrens habitat that surrounds the STP, which is not visible from off site. The area is accessible by several roads or firebreaks and visual quality is a concern with regard to the Peconic River. Below are a series of photographs (Figures 11 to 12) taken from along the South Sewage Treatment Path, from the area proposed for the recharge basins to the Peconic River, and from the Peconic River road looking back toward the area of the proposed recharge basins.

Figure 11: View from Southeast most World War I sand filter bed looking toward the Peconic River to the Northeast.

Figure 12: Left photo is from the Peconic River looking southwest toward the World War I sand filter beds. Right photo is looking south from the Peconic River at the east end of the Pistol Range. Trees in the back ground of the right photo would be removed to establish recharge basins.

5.10.2 Effects of Preferred Alternative on Visual Quality

The recharge basins are proposed to be developed just to the south and east of the existing sand filter beds, and would result from the alteration of the World War I-era sand filter beds. As mentioned above, these beds are not visible from offsite.

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 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 World War 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 recharge basins would be approximately 2,500 feet (762 meters) from the nearest Camp Upton training trench, and 475 feet (145 meters) from the Peconic River. However, due to the density of trees separating the recharge basins and the training trenches the recharge basins would not be visible from the trenches. Similarly, the recharge basins would not be visible from Peconic River. However, the removal of trees from the area of the new recharge basins would be evident from one narrow area along the Peconic River just behind the east end of the pistol range (see Figure 12 right photo).

Under the preferred alternative Bldg. 580 would be removed making a clear view to native vegetation when traveling west along the Peconic River road (see Figure 13).

Figure 13: View from along the Peconic River looking west toward Bldg. 580. Bldg. 580 may be removed under Preferred and Enhanced Treatment alternatives.

5.10.3 Effects of the No Action Alternative on Visual Quality

Visual Quality under the no action alternative would remain in its current state.

5.10.4 Effects of the Enhanced Treatment Alternative on Visual Quality

Under this alternative there would be little change in visual quality in the vicinity of the STP. The addition of metering systems to add the polythiocarbonate would likely not change the physical appearance of the STP. The addition of a new filtration system would result in a new small structure at the STP but would not result in the clearing of trees as in the preferred alternative. Since the sand filter beds would be bypassed by a new discharge line to the Peconic River the existing sand filter beds would be restored to native vegetation that would provide habitat and result in a more natural appearance to the STP area.

5.11 Park Lands

5.11.1 Existing Environment

Brookhaven National Laboratory is in close proximity to town (Smith Estate), county (Hubbard County Park and Open Space), and New York

State parklands (Brookhaven State Park). Federal parklands are located to the south and include the William Floyd Estate and Fire Island National Seashore and wilderness area.

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

5.11.2 Effects of Preferred Alternative on Park Lands

Suffolk County park lands are located to the east of the BNL site. Modeling studies (BNL 2010a) indicate that even without the continuous discharge from the STP, the start of river flow during dry periods would typically occur at or near the east boundary of BNL, and therefore would likely have minor effects on the park lands and open space to the east of BNL.

5.11.3 Effects of No Action Alternative on Park Lands

The effects of continued discharge to the Peconic River and Suffolk County park lands to the east of BNL are discussed in sections 5.2 and 5.3 above.

5.11.4 Effects of Enhanced Treatment Alternative on Park Lands

The Enhanced Treatment Alternative would result in continued discharges to the Peconic River, but would by-pass the sand filter beds. The continued discharge would not result in any appreciable difference in impacts to park lands. The river would continue to dry prior to leaving the BNL site during dry years.

5.12 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.

5.12.1 Existing Environment

The STP is located more than one mile (1.6 km) from the core developed sector of the Laboratory, and is surrounded primarily by woodlands. There is a wide range of existing noise sources present in the area of the STP that contribute to ambient noise levels including: street traffic such as cars and trucks, pumps and aerators, gunfire from BNL's pistol range, 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 operators of the STP, well-drilling or environmental sampling. The nearest offsite receptors would be to the north in Ridge, approximately 6,800 ft. (2,073 meters) and to the southeast along North Street, approximately 6,000 ft. (1,829 meters).

5.12.2 Effects of Preferred Alternative on Noise

Construction activities associated with building a new filtration system, recharge basins, removal of Building 580 and other pertinent structures would result in temporary increases in ambient noise levels for approximately six months. A variety of construction equipment such as tree harvesters, dozers, trenchers, cement 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 1978). 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 1978). 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 along the Peconic River at the closest point to the construction areas would be about 60 dBA. These estimated noise levels are considered conservative values because the STP site is generally surrounded by woodlands which would attenuate sound and result in lower noise levels.

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

Table 3: 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

New York 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."

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 along North Street is 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 periods of maximum construction activities at the STP, there would be occasions when the NYSDEC guidance of 6 dBA could be exceeded. However, these situations would not have a major adverse impact because the construction phase would be limited to approximately six months, and only during a small fraction of that time would the highest noise generating activities be taking place.

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 STP and

associated maintenance activities would be negligible and would likely be inaudible against ambient levels.

5.12.3 Effects of the No Action Alternative on Noise

Since no construction would occur under the no action alternative the level of noise would remain similar to current levels.

5.12.4 Effects of the Enhanced Treatment Alternative on Noise

Noise would be similar under the enhanced treatment alternative as compared to the preferred alternative due to required construction activities. BNL would utilize the same safety requirements as the preferred alternative to protect workers and worker exposure to noise.

5.13 Industrial Safety and Occupational Health

5.13.1 Existing Environment

The area proposed for the recharge basins is currently undeveloped, consisting of re-vegetated World War I-era sand filter beds, paved (1st Street) and unpaved (Sewage Treatment Path) 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, and insect bites sustained by employees working at the STP, conducting routine environmental sampling activities, or exercising in the area (i.e., jogging or walking). 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.

5.13.2 Effects of Preferred Alternative on Industrial Safety and Occupational Health

Construction and trade workers would be exposed to the same 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 filter system and recharge basins.

BNL employees and the general public would not be adversely impacted by the construction and operation of the proposed facilities. The remote location of the site and construction of a temporary fenced enclosure would minimize exposure of the Laboratory staff, visitors, and public to potential safety hazards at the site during construction. The new filter system would be within the fenced compound of the STP.

5.13.3 Effects of the No Action Alternative on Industrial Safety and Occupational Health

The STP area would remain unchanged under this alternative and the current practice of continual improvement in safety and health would be the prevailing work practice. As IS&H issues are identified, they would be addressed and improvements made.

5.13.4 Effects of the Enhanced Treatment Alternative on Industrial Safety and Occupational Health

Under the construction phase of this alternative, IS&H issues would be very similar to that of the preferred alternative and appropriate construction safety techniques would be employed. Once operational, the enhanced treatment system would require additional controls for handling the polythiocarbonate while attaching containers to the metering system, and would require controls and preparedness for spills.

5.14 Radiological Characteristics

5.14.1 Existing Environment

The radiological characteristics of Laboratory operations are determined through routine DOE required surveillance and permit-based monitoring efforts. Water discharged from the STP is routinely monitored at the plant's Peconic River Outfall. In 2009, 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 background ranges, and that there were no Laboratory related gamma-emitting radionuclides detected. In 2009, 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 400 pCi/L, which is approximately 2 percent of the drinking water standard (BNL 2010b).

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 2009 was calculated to be 0.07millirem, far below the allowable limit (BNL 2010b).
The existing sand filter beds at the STP were remediated as part of the Federal Facilities Agreement. The filter beds were remediated to the extent

that residual Cs-137 concentrations of 6.7 pCi/g would be suitable for unrestricted land use today.

The STP generates sludge material that must periodically be dried and disposed of appropriately. Recent sludge disposal has been authorized for release to Bergen Point as non-radiological waste.

5.14.2 Effects of Preferred Alternative on Radiological Characteristics

As presented in Section 5.3, constructing a new filtration system and recharge basins in the vicinity of the STP would not affect the hydrologic or radiological characteristics of any nearby groundwater plumes. BNL would continue to maintain multiple monitoring points along the treatment path for waste water and the ability to direct it to the STP's emergency holdup ponds, if necessary. The likelihood of radiologically contaminated effluents making their way to the aquifer below the recharge basins would not change from the current conditions due to the existing controls in place.

5.14.3 Effects of the No Action Alternative on Radiological Characteristics

Under the no action alternatives the existing radiological characteristics would remain the same and BNL would continue to monitor waste streams for radiological material that, if detected, would be result in the waste water being diverted to the emergency holding ponds for characterization and proper disposal.

5.14.4 Effects of the Enhanced Treatment Alternative on Radiological Characteristics

Under the enhanced treatment alternative discharges to the Peconic River would bypass the existing sand filter beds, similar to the preferred alternative. This alternative would not affect the hydrologic or radiological characteristics of any nearby groundwater plumes. BNL would continue to maintain multiple monitoring points along the treatment path for waste water and the ability to direct it to the STP's emergency holdup ponds, if necessary. The likelihood of radiologically contaminated effluents making their way to the Peconic River would be low with the existing controls in place.

5.15 Natural Hazards

5.15.1 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 1994). Tornadoes and hailstorms are rare on Long Island. Thunderstorms, snowstorms, and ice storms do occasionally occur and have the potential to cause damage to facilities.

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 2009).

Earthquakes on Long Island are extremely rare, and no active earthquake-producing faults are known in the Long Island area (Hoey 1994). Long Island lies in a zone 2, or moderate damage seismic probability area, and it is assumed that an earthquake of Modified Mercalli VII could occur (DOE 1999). A recent history of earthquakes in the central Long Island area is presented below (USGS 1998):

Table 4: 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)
2001	Jan 17	IV
2001	Oct 27	IV
2010	Nov 30	I-III

The likelihood of a serious earthquake in the BNL area is slight and seismologists expect no significant earthquakes in the foreseeable future (Hoey 1994).

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 2009). Prescribed burns, totaling about 16 acres (6.5 hectares), have been performed in two out of the last six 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.

5.15.2 Effects of Natural Hazards on Preferred Alternative

At the closest point, the proposed filtration system and recharge basins would be approximately 600 feet (182 meters) from the Peconic River and 10 feet (3 meters) higher in elevation. The potential may exist for some seasonal flooding in the area to the south of the STP. However, flooding is not a concern for the STP as it is placed higher than the surrounding area.

The STP is designed to treat up to 3.0 MGD (11.3 MLD) of wastewater including some storm water inputs. Under most hurricane scenarios the STP could handle the additional flows.

The while the area is surrounded by forest, the buildings associated with the STP have more than 30 feet of clearance around them and most structures are constructed with non-combustible material.

Seismic activity, at the levels historically seen on Long Island, is likely not to have any major impact on the operation of the STP, new filtration system, and the new recharge basins.

5.15.3 Effects of Natural Hazards on the No Action Alternative

Natural hazards will not have any greater effect on the STP in its current configuration than they already have. The STP is well positioned to withstand effects from most natural hazards.

5.15.4 Effects of Natural Hazards on the Enhanced Treatment Alternative

The alterations to the STP under the Enhanced Treatment Alternative would whether natural hazards similar to the preferred alternative. The STP would continue to be able to treat up to 3 MGD and could handle increased flows from storms, including hurricanes. Since the metering system and filtration system would be built within the existing footprint of the plant, they would not be any more susceptible to wildland fire nor wind storms.

5.16 Intentional Destructive Acts

5.16.1 Existing Environment

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

The Laboratory does experience trespass situations along the north and east boundaries of the site from individuals riding all-terrain vehicles,

horses, bicycles, or just walking. These have resulted in little if any vandalism on the site.

5.16.2 Intentional Destructive Acts Effects on the Preferred Alternative

Construction and operation of a new filtration system and groundwater recharge basins would not significantly change the current operation of the STP. Consequently, it is highly unlikely that saboteurs or terrorists would view construction or operation of the new facilities 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, the new filtration system would be within the fenced area of the STP and random patrols by STP operations personnel would identify most issues related to destructive acts. Therefore the preferred alternative would not offer any targets of opportunity for terrorists or saboteurs to inflict adverse impacts to human life, heath, or safety.

5.16.3 Intentional Destructive Acts Effects on the No Action Alternative

The STP in its current configuration has not been susceptible to destructive acts. There is no current concern for destructive acts to occur.

5.16.4 Intentional Destructive Acts Effects on the Enhanced Treatment Alternative

While there is no reason to expect an increase in destructive acts, this alternative could potentially result in destructive acts to the environment due to the presence of polythiocarbonate through deliberate release of this chemical to either the STP or directly to the Peconic River. Otherwise there is no real difference between this alternative, the preferred alternative, and the no action alternative.

5.17 Utilities

5.17.1 Existing Environment

There are only a few utilities present in or near the STP that would need to be addressed. The new filtration system would tap into the plumbing of the STP. The new groundwater recharge basins border along Treatment Plant Path, and would be adjacent to a buried electric cable that feeds two sampling stations located along the East Firebreak Road. The remainder of the area within the STP has electric, water, and sanitary lines associated with the facility. The World War I-era sand filter beds may have residual distribution piping, clay tile collection systems and effluent piping present.

The STP is served by an overhead electric feed that runs along First Street and enters the STP area from the west.

5.17.2 Effects of Preferred Alternative on Utilities

The new filtration system and groundwater recharge basins will require a slight increase in the use of electricity to run the filtration system. This increase in electric use would likely be offset by the possible discontinued use of the UV light banks at the sanitation chamber near the Peconic River. The transfer and continued use of the UV treatment system will be evaluated during the design phase. Various water control structures would have to be removed and new ones installed to deliver water to the new recharge basins. New plumbing would also be installed to connect the new filtration system and backwash systems into the STP facility. The buried power line running along the north side of Treatment Plant Path will need to be avoided for safety and to prevent power disruptions at the monitoring stations. The preferred alternative will not have significant effects on utilities associated with the STP or BNL.

5.17.3 Effects of No Action Alternative on Utilities

Under the no action alternative there would be no changes to the existing systems. BNL would continue to reduce usage of water and electricity where possible, but the operations of the STP would remain somewhat constant.

5.17.4 Effects of the Enhanced Treatment Alternative on Utilities

The construction of a metering system for the polythiocarbonate and new filtration system would create an addition need for electricity only slightly greater than that used under the preferred alternative. Construction activities would result in new effluent piping to the Peconic River, and disconnecting the existing piping from the sand filter beds to the Peconic River. Additional plumbing would be needed for the new filtration system and backwash feed from the filtration system to the secondary clarifiers similar to that of the preferred alternative.

5.18 Electric and Magnetic Fields (EMF)

There are no Federal standards limiting residential or occupational exposure to the common utility magnetic or electric fields found in the 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 2005).

5.18.1 Existing Environment

Overhead electric power lines are currently present in the vicinity of the STP and run along First Street providing power to the STP. 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.

5.18.2 Effects of Preferred Alternative on EMF

Because the preferred project would not result in a significant modification of electric power usage the project would not be expected to have any adverse health effects from EMF.

5.18.3 Effects of the No Action Alternative on EMF

There would be no change to EMF under this alternative.

5.18.4 Effects of the Enhanced Treatment Alternative on EMF

This alternative would not significantly increase the use of electricity and therefore would not likely result in any changes to EMF.

5.19 Waste Management and Pollution Prevention

5.19.1 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 Environmental Protection Division (EPD) is staffed with subject matter experts responsible for evaluating and implementing regulatory requirements and P2 programs. The EPD operates the Waste Management Facility (Buildings 855 and 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 (BNL 2010b). The STP periodically produces sludge that must be characterized before disposal. Once characterized the waste sludge is shipped to appropriate disposal sites. Recent shipments have been characterized as non-radiological waste and sent for disposal at the Bergen Point Wastewater Treatment Facility.

5.19.2 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. The STP operations would continue to periodically produce sludge that would require appropriate characterization and disposal. Because the majority of trees likely to be cleared are pitch pines, they would most likely be chipped and chips either spread within the surrounding

forested area, or transported to BNL's composting area. Concrete from headwalls, foundations, and possibly clay tiles and pipes may be trucked to BNL's concrete crushing site for processing and reuse as road base or beneficial fill material.

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 NYCRR Parts 613 and 614.

5.19.3 Effects of the No Action Alternative on Waste Management and Pollution Prevention

Under the no action alternative sludge would have to periodically be characterized and shipped to a disposal facility.

5.19.4 Effects of the Enhanced Treatment Alternative on Waste Management and Pollution Prevention

Under this alternative, unused or expired chemicals may have to be disposed of and the periodic characterization and disposal of sludge would occur as in the other alternatives. Additionally, BNL would continually look for other safer more effective chelating agents to replace the polythiocarbonates and/or investigate techniques to make them work more efficiently and at lower dosing rates.

5.20 Commitment of Resources

5.20.1 Commitment of Resources under the Preferred Alternative

Construction activities would result in a temporary increase in fuel use to power the construction vehicles and minimal increase in water use for dust control. Operation of the new filtration system and groundwater recharge basins would not result in any significant change in resource usage as the increase in electric use for the filtration system could be offset by the removal of the UV light sanitation system if it is not relocated. The potential continued use of the UV system will be evaluated during the design phase.

5.20.2 Commitment of Resources under the No Action Alternative

Resource use under the no action alternative would remain the same as is currently being used. BNL constantly looks for ways to reduce its use of natural resources and energy. This practice would continue to take place under this alternative.

5.20.3 Commitment of Resources under the Enhanced Treatment Alternative

There would be slight increased to electric use under this alternative as the installation of a metering system for the polythiocarbonate and a new filtration system would both require power. Under this alternative the UV light sanitation system would remain. As in other alternatives BNL would continue to look for ways to conserve resources.

5.21 Connected Actions

5.21.1 Modification or Removal of Gauging Stations

Under the preferred alternative all discharges to the Peconic River from the STP would be discontinued. This would result in lower flows within the river between the STP outfall and BNL's east boundary. BNL maintains four Parschal flume weirs at monitoring stations HQ (east boundary at Z-Path), HM-S (East Firebreak south of the Peconic River), HM-N (East Firebreak at the Peconic River), and HE (just above the STP outfall on the Peconic River). With the removal of discharges the requirement for continuous accurate calculation of flow would no longer be needed. The NYSDEC expressed interest in BNL removing or modifying the gauging stations to improve fish passage along the Peconic River on BNL. Effects of the removal or modification of the gauging stations was evaluated in section 5.2.2.

5.22 Future Upgrades

While no specific future upgrades to the STP are proposed, BNL continually looks for ways to improve treatment and lessen its overall impact to the environment. Under this commitment future upgrades to the STP could occur. Should upgrades be necessary in the future, an appropriate environmental evaluation under NEPA would take place.

5.23 Decommissioning and Restoration

Decommissioning of the STP is not expected to occur until such time as the Laboratory is closed. Since this event is not expected in the foreseeable future, decommissioning and restoration is difficult to evaluate in this document. Should parts of the STP require ecological restoration actions, the area would be planted using native Pine Barrens species, and a plan would be developed and implemented in accordance with the BNL Natural Resource Management Plan (BNL 2003).

5.24 Cumulative Impacts

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 5 below.

Table 5: Estimated Tree Removal for Present and Future BNL Projects
Project Estimated Tree Removal Acres (Hectares)

National Synchrotron Light Source-II Under construction	8 acres (3.2 hectares)
Interdisciplinary Science Buildings I and II	None
ISB-1 under construction	
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)
LISF (under construction), research array	170 acres (69 hectares)
STP Discharge to Groundwater	4-5 acres (2 hectares)
TOTAL	228 acres (92 hectares)

The total amount of tree removal required for the anticipated BNL projects identified above would amount to approximately 4.1% of the BNL property. This would increase the cleared area of the BNL site from about 26.8% to 30.8%. The five acres cleared for development of the new recharge basins would be 0.1 percent of the overall site and 2.2 percent of all of the potential clearing.

Because BNL works to minimize clearing, when possible, reduce use of water and other resources, the overall the cumulative impact of these projects would have negligible effects on the environment.

6.0 ACRONYMS, INITIALS, AND ABBREVIATIONS

AMSL	Above Mean Sea Level
AWQS	Ambient Water Quality Standards
BER	Brookhaven Executive Roundtable
BHSO	Brookhaven Site Office (DOE)
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates, LLC
CAC	Community Advisory Council
CCC	Civilian Conservation Corps
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CGA	Compatible Growth Area
CO	Carbon monoxide
CPA	Core Preservation Area
CPB	Central Pine Barrens Joint Planning & Policy Commission
CRMP	Cultural Resource Management Plan
D&B	Dvirka and Bartilucci Consulting Engineers
dBA	Decibel
DEC	Department of Environmental Conservation
DOE	Department of Energy
EA	Environmental Assessment
ECL	Environmental Conservation Law
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
EPD	Environmental Protection Division
EMT	Emergency Medical Technician
FEMA	Federal Emergency Management Agency
FERN	Foundation for Ecological Research in the Northeast
FONSI	Finding of No Significant Impact
GHG	Greenhouse Gas
GWP	Global Warming Potential
HFBR	High Flux Beam Reactor
ILIA	Institute of Long Island Archaeology
IPCC	United Nations Intergovernmental Panel on Climate Change
IS&H	Industrial Safety and Occupational Health
ISB	Integrated Science Building
LIE	Long Island Expressway – Interstate 495
LIPA	Long Island Power Authority
LIRR	Long Island Railroad
LISF	Long Island Solar Farm
MEI	Maximally Exposed Individual
meV	Milli-[thousandth] electron Volt
mG	milligauss
MGD	Million gallons per day
MLD	Million liters per day
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants

NOx	Nitrogen Oxides
NRHP	National Register of Historic Places
NRMP	National Resource Management Plan
NSLS-II	National Synchrotron Light Source-II
NY	New York
NYCRR	New York Codes, Rules, and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
P2	Pollution Prevention
PM	Particulate Matter
PSC	Public Service Commission
pCi/l	Pico-[trillionths] Curies per liter [Curie = basic unit used to describe the intensity of radioactivity in a sample of material]
Q&R	Quantification & Removal
RHIC	Relativistic Heavy Ion Collider
SC	Suffolk County
SER	Site Environmental Report
SEQRA	New York State Environmental Quality Review Act
SHPO	State Historic Preservation Officer
SPDES	State Pollutant Discharge Elimination System
SPL	Sound Pressure Level
STP	Sewage Treatment Plant
T&E	Threatened and Endangered
U.S.	United States
USGS	Untied States Geological Survey
UV	Ultraviolet
VOC	Volatile Organic Compound
WFMP	Wildland Fire Management Plan
WQBEL	Water Quality Based Effluent Limit
WWI	World War I
WWII	World War II
WSRRA	Wild, Scenic, and Recreational Rivers Act

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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

Town of Riverhead Supervisor's Office – Riverhead, 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

State Historic Preservation Office – Cohoes, 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 modifications to BNL's SPDES permit and proposed discharges to groundwater system 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 Modifications to BNL's SPDES permit and proposed discharge to groundwater were provided to the BER on April 22, 2009, September 15 2010, January 26, 2011, and May 11, 2011.

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 Modifications to BNL's SPDES permit and proposed discharge to groundwater were provided to the CAC on March 12 and April 15, 2009, and on May 13, 2010. The CAC provided input to the draft EA in the form of a consensus resolution on June 11, 2010. They received an update on the draft EA content and schedule on February 10, 2011 and were provided with a presentation on the completed draft EA on April 14, 2011.

Additional Outreach

A letter was drafted notifying potentially interested stakeholders that an EA was being prepared. Approximately 40 letters were sent out on March 8, 2011 to local elected officials, civic associations, and others. BNL staff also met with the Riverhead Town Supervisor in February to discuss this and other Peconic River-related issues. Outreach to BNL employees included an article published in the April 11, 2011 Monday Memo, BNL's web-based newsletter.

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