10 SURFACE WATER

CHAPTER CONTENTS

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PECONIC RIVER WATER QUALITY SURVEILLANCE

DQO START DATE January 1, 2003

REVISION NUMBER/DATE Rev.4, November 29, 2012

IMPLEMENTATION DATE January 1, 2014

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SUMMARY OF PROPOSED CHANGES

There are no proposed changes in calendar year (CY) 2014.

DESCRIPTION AND TECHNICAL BASIS

The headwaters of the Peconic River, a designated Wild and Scenic River that discharges to the Peconic Estuary, originate on the Laboratory site. The BNL Sewage Treatment Plant (STP) discharges treated sanitary effluent to the Peconic River. In addition, the Peconic River is subject to potential non-point sources of pollution as it flows through the site, including stormwater runoff from developed areas and contaminated groundwater during periods of high groundwater elevation.

The Peconic River enters the site at the northwest corner, west of the Relativistic Heavy Ion Collider (RHIC) ten o'clock experimental hall. The Peconic River traverses the RHIC area, exiting the ring on the east side of the two o'clock experimental hall. To facilitate construction of the RHIC, a corrugated metal conduit was installed under the ring at the ten o'clock and two o'clock positions to permit continuous river flow. The Peconic River is an intermittent stream in the RHIC area, with flow occurring predominantly in the spring and fall (a "gaining" stream) and completely drying up during dry periods (a "losing" stream). Several areas of low topography and areas with near surface silts and clays, located within the northern sections of RHIC, accumulate water during the wet seasons.

After exiting RHIC, the Peconic River flows easterly, then in a southeasterly direction and exits the site along the southeast boundary. With the exception of the RHIC construction, there has been nominal development along the Peconic River corridor. The Peconic River flows through a wooded area of BNL formerly used in the 1960s to study the effects of nuclear fallout. During these studies, the native vegetation was subjected to a radiation field emitted from a sealed cesium-137 (Cs-137) source and the effects on the vegetation were noted.

The STP discharge to the Peconic River (Outfall 001) is shown in Chapter 3, Figure 3-3, and is located approximately at the midpoint of the Peconic River on site. Due to the STP contribution, the Peconic River flow is continuous downstream for several hundred yards throughout the year. During dry periods, the river again becomes a losing stream and all water evaporates or percolates to recharge groundwater. During periods of extensive precipitation, such as the spring or fall, flow is continuous throughout the site.

In addition to contributions from the STP, surface runoff and groundwater comprise the only other contributed sources of water to the Peconic River. Potential contaminants include all constituents related to the STP discharge: sediment, oil and grease from surface runoff, and contaminants contributed from groundwater. Investigation of the Peconic River conducted under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) program indicate that historical releases of radiological materials, PCBs, pesticides, and inorganics have resulted in their accumulation within the Peconic River sediments (ITC 1998). Resuspension of sediments due to scouring can result in the migration of these contaminants off site. A majority of the contaminants were removed under the CERCLA program in 2004-2005 and again in 2011. Sediments were removed from the STP Outfall to the County Parklands east of BNL. Monitoring to measure the effect of these removal actions on fish and sediments are conducted under the Flora/Fauna sampling program. Further details of this program are provided in Chapter 8.

DRIVERS FOR MONITORING BEING CONDUCTED UNDER THIS PROGRAM

____ Compliance
____ Support compliance
_X_ Surveillance
____ Restoration

Surface water quality monitoring is not required by BNL's State Pollutant Discharge Elimination System (SPDES) permit. The monitoring of surface water at the Laboratory is performed in accordance with DOE Order 436.1 (2011), *Departmental Sustainability*, which requires DOE sites to maintain an Environmental Management System (EMS) and DOE Order 458.1 (2011), *Radiation Protection of the Public and Environment*, which requires DOE sites to maintain surveillance monitoring for determining radiological impacts to the public and environment. An extensive environmental monitoring program is one component of the Laboratory's EMS, and it specifies requirements for conducting general surveillance monitoring in order to:

- Verify compliance with federal, state, and local regulations
- Determine compliance with commitments made in Environmental Impact Statements, Environmental Assessments, or other official documents
- Identify potential environmental problems
- Detect, characterize, and report unplanned releases

Additionally, BNL's EMS requires that monitoring be conducted to measure the effects, if any, of DOE activities on and off site, to establish baselines of environmental quality, and to characterize and define trends in the physical, chemical, and biological condition of environmental media. The New York State Department of Environmental Conservation (NYSDEC) has established ambient water quality standards for the Peconic River and other local water bodies. These standards have been codified under Parts 700-706 of Title 6 of the NYCRR (6 NYCRR Parts 700-706).

DATA QUALITY OBJECTIVE ANALYSIS

Step 1: State the Problem

Laboratory operations have the potential to impact the Peconic River and its environment through routine discharges from the STP, failure of the STP, unplanned and untreated releases to the STP, nonpoint-source spills, and disturbance of legacy contamination in the riverbed. Impacts include contamination of surface water and associated fresh water ecosystems, including associated

aquatic and terrestrial flora and fauna that rely on these water systems for survival, and river sediments.

Step 2: Identify the Decision

The desired decisions for the surface water monitoring program are:

- Are BNL operations causing the Peconic River segments on site and immediately downstream of the Laboratory to exceed ambient water quality standards and historical levels?
- Are BNL's efforts to continually improve its environmental management program improving the quality of the Peconic River?
- Are BNL operations contributing to any river use restrictions?
- Are engineered and operational controls effective in preventing the activation of the Peconic River water that flows via a culvert beneath the RHIC ring?

Step 3: Identify Inputs to the Decision

Inputs necessary to support the decisions in Step 2 include:

- Analytical data (and trends) for the Peconic River both upstream and downstream of the STP discharge
- Analytical data (and trends) for control locations (i.e., Carmans River)
- Historical analyses of process discharges and the STP effluent
- Field Sampling Team field logs and records
- Field Sampling Team instrumentation calibration and maintenance records
- Environmental Monitoring Standard Operating Procedures (SOPs)
- Documentation of the sampling and analysis program
- Collection and analysis of samples performed according to Environmental Protection Agency (EPA), state, or other regulatory agency standards or guidelines
- Review of analytical results by project managers in accordance with Environmental Protection Division (EPD) data review procedures to ensure data is of acceptable quality
- New York State ambient water quality standards
- River flow data

Step 4: Define the Study Boundaries

The study area incorporates all BNL operations that contribute wastewater or runoff to the Peconic River, either through direct or indirect discharge via the STP. The Peconic River is sampled at four off-site locations between the southeast site boundary and Riverhead, New York (stations HA, Swan Pond, Donahue's Pond, and Forge Pond), and at six locations on site (stations HY, HV, HE, HM-N, HM-S, and HQ) (see Figure 10-1 on Page 10.1-7). Three of the on-site stations are located upstream of the STP discharge, with the remaining three downstream. The Carmans River, located southwest of the site, is sampled at station HH to determine background or ambient conditions. Swan Pond is an off-site location on the Peconic that is not influenced by Laboratory discharges. Samples are collected and analyzed for radiological parameters (gross alpha, gross beta, and tritium activity, as well as strontium-90 (Sr-90) and other gamma-emitting radionuclides), nonradiological parameters (e.g., metals, volatile organic compounds [VOCs], and water quality parameters).

Water samples have historically been collected on a quarterly basis for most locations with samples collected several times weekly at points directly downstream from the STP discharge. Re-

view of past analytical data shows the quality of the Peconic River to be very consistent with most VOCs and semivolatile organic compounds (SVOCs), and radionuclides being nondetectable. Inorganics are detected throughout the Peconic and Carmans River. The concentration of some inorganics is highest immediately downstream of the STP discharge. To assess the physical state of inorganic contaminants, filtered and unfiltered samples are collected and the analytical data compared. Evaluation of the data shows that many of the inorganic detections are due to suspension of sediments. Radiological analyses have shown significant decreases in concentration and nuclide detection. For example, tritium is detected typically just above detection limits once or twice yearly, while gamma activity has not been detected for several years.

Historical data show no significant variations in water quality throughout the Peconic River system. Drastic changes in concentrations are unexpected, because unplanned releases would be detected via effluent monitoring at the STP outfall. The focus of the surface water-monitoring program is to assess the long-term, cumulative impact of BNL discharges on surface waters. Because cumulative effects are the focus of this monitoring/decision process, quarterly to annual decisions are appropriate.

Step 5: Develop the Decision Rule

Decision 1

Are BNL operations causing the Peconic River segments on the BNL Site and immediately downstream of the Laboratory to exceed ambient water quality standards and historical levels?

Analytical data collected from the Peconic River are compared to New York State ambient water quality standards and historical and control points analyses.

If this comparison yields an excursion of an ambient water quality standard or a significant deviation from historical data that may be attributable to BNL, **then** implement the Event/Issues Management Subject Area, as appropriate, to determine the source of the contaminant and collect additional samples to better define the extent (i.e., duration and magnitude) of the discharge.

If the comparison shows the data to be consistently below regulatory limits or standards or within historical levels, **then** routine monitoring and reporting is continued.

Decision 2

Are BNL's efforts to continually improve its environmental management program improving the quality of the Peconic River?

Analytical data collected from the Peconic River are evaluated and compared with historical trends and with data collected from the off-site control location and background Peconic River stations to determine the impact of BNL discharges on the environment.
If contaminant trends for stations HM-N, HQ, and HA show improving or stable trends in Peconic River quality and can be correlated with Laboratory actions, **then** BNL will claim credit under the Laboratory's EMS**.**

If the evaluation shows declining water quality that may be attributable to BNL, **then** implement the Event/Issues Management Subject Area, as appropriate, to determine the cause of the decline.

Decision 3

Are BNL operations contributing to any river use restrictions?

There are no fish advisories issued that are specific to the Peconic River. A general advisory has been issued statewide to protect against eating fish that have not been tested or that may contain unidentified contaminants. The Laboratory will keep apprised of specific health advisories and will maintain data for water and fish to determine if BNL is contributing to any future issued advisory. All data is shared routinely with NYSDEC and the New York State Department of Environmental Health (NYSDOH), and the Laboratory continually strives to reduce the impact of its discharges by implementing waste minimization and pollution prevention practices and by imposing strict effluent limitations on pollutant sources.

If NYSDOH issues a health advisory for the Peconic River, **then** implement the Event/Issues Management Subject Area, as appropriate, and work with the issuing authority to determine if the Laboratory is contributing to the advisory and what steps could be taken to reduce the impact.

Decision 4

Are engineered and operational controls effective in preventing the activation of the Peconic River water that flows via a culvert beneath the RHIC ring?

Concentrations of radionuclides collected at stations HY and HV are compared to determine if activation is resulting from RHIC operations.

If radionuclide concentrations at station HV are significantly greater than HY, **then** implement the Event/Issues Management Subject Area, as appropriate, to investigate whether this is an impact from RHIC and determine the cause.

Step 6: Specify Acceptable Error Tolerances

The Laboratory has monitored the surface waters of the Peconic River and Carmans River routinely for many years and documents the results annually in BNL's annual Site Environmental Report (SER). Due to the low concentration of contaminants in the Laboratory's discharge to the Peconic River, cumulative impacts occur over many years and it is very unlikely there will be an immediate impact to the environment. The risks of not detecting an impact are erosion in stakeholder confidence and possible cleanup costs. Although BNL has a history of impacting the river, recent improvements in wastewater management, remediation of Peconic River sediments, and reductions in effluent releases have significantly reduced the impact.

The most obvious potential error associated with decisions regarding the quality of the Peconic River is in the sample design. Potential errors include failure to collect a representative sample, failure of a sample collection device, and impacts to sampling collection schedules due to flow conditions of the river. Monitoring of the Peconic River is limited to semi-annual analysis for most locations; consequently, loss of a single sample could have a detrimental impact on the ability to characterize the Peconic and Carmans River. However, diligence on the part of BNL's Field Sampling Team precludes loss of samples. Seasonal flow of the Peconic River also impacts the ability to collect samples and characterize water quality. Again, awareness on the part of the Field Sampling Team enables them to maximize the collection of samples when possible. Sample collection devices are monitored several times weekly to ensure they are operating properly and are collecting samples. Upon sample collection, the sample is inspected to determine if the volume is

appropriate for the period of sample collection and that the sample looks representative (e.g., color, settleable solids, etc.). Deviations are noted in a field log and notebooks. Should a sample device fail during a sample collection period or if the sample volume seems inappropriate for the collection period, samples are either collected on a subsequent day or a grab sample is taken. The field log is appropriately annotated to document the failure of the sample collection device and to describe the action taken.

Analytical errors could have a greater impact on monitoring. Because the sample is consumed in analysis, if an error is made during the analysis, complete loss of a sample is possible. If the error is not discovered soon enough, the loss could be unrecoverable. To prevent such an occurrence, additional sample volume is collected to allow for repeat analyses. Deviations in analytical methods are not expected to impact the results.

Step 7: Optimize the Design

The surface water monitoring program is required as part of the Laboratory's EMS and is geared toward determining impacts of BNL operations on the environment. Based on review of analytical data over the past 5 years, collection of samples for metals, anions, and VOCs analyses at monitoring stations HM-N and HQ will be reduced from monthly to quarterly (filtered/unfiltered). Samples collected at all other Peconic River monitoring stations will be reduced from quarterly to semi-annual (filtered/unfiltered). Except for an occasional low-level detection of tritium, radionuclides at the STP have not been detected for several years. Therefore, sample collection frequency for gross alpha/beta, tritium, gamma, and strontium-90 will be quarterly at monitoring stations HM-N and HQ and from quarterly to semi-annual for the remaining Peconic River stations. Continued review of radiological data shows no impacts from Laboratory operations; consequently, the reduction in sampling frequency is justified.

2013 Surface Water Monitoring Program		
Sampling Location	Sample Type	Analysis/Frequency
HM-N and HQ	24-hr composite	Anions, gross alpha, gross beta, tritium, and metals (filtered/unfiltered); sampled and analyzed quarterly.
HM-N and HQ	24-hr composite	Gamma and Sr-90 analysis; samples are from individual 48-hour composites and analyzed quarterly.
HM-N and HQ	Grab sample	VOCs (EPA 624); sampled and analyzed quarterly.
HM-S, HY, HE, HA, HH, Donahue's Pond, Swan Pond, Forge Pond	Grab sample	Anions, VOCs (EPA 624), metals (filtered/unfiltered), gross alpha, gross beta, tritium, gamma, and Sr-90 analysis; sampled and analyzed semi-annually.
HV	Grab sample	Gross alpha, gross beta, tritium, and gamma analysis; sampled and analyzed semi-annually.
HM-N, HM-S, HE, and HQ	Grab sample	Flow chart exchanged and pH measurement taken weekly.
HQ	Grab sample	Gross alpha, gross beta, and tritium; collectedly monthly for NYSDOH analysis (used for comparison in the SER).

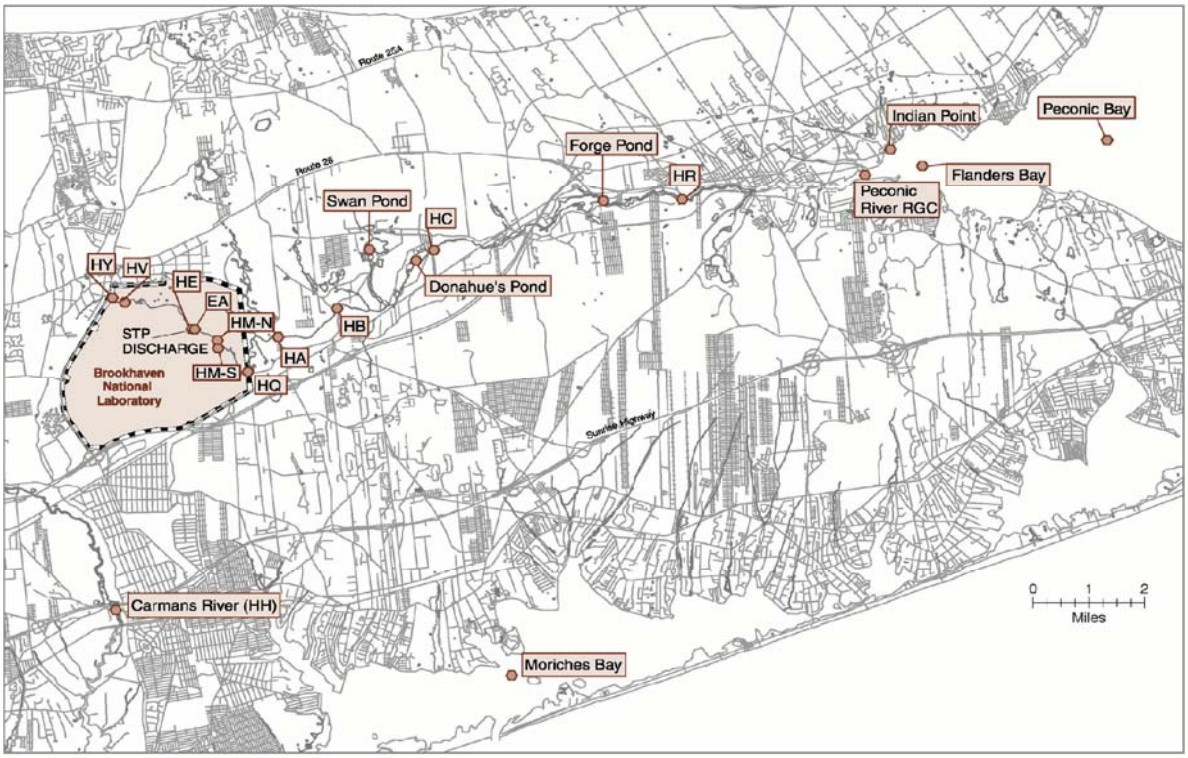
PECONIC WATER TOTAL ANALYTICAL PROGRAM COSTS

Surface water analytical costs have been updated to reflect the most current program costs for CY 2014.

2014 Peconic River Analytical Program Costs			
Environmental Surveillance			
	Frequency/Year	Unit Cost	Total Cost
TAL Metals	48 analyses	$100	$4,800
Anions	24 analyses	$40	$960
Volatile Organics	24 analyses	$75	$1,800
Radiological (gross alpha, gross beta, and tritium)	26 analyses	$70	$1,820
Gamma Analysis	26 analyses	$60	$1,560
Sr-90	24 analyses	$100	$2,400
Radiological (gross alpha, gross beta, and tritium)	12 analyses by NYSDOH	$0	$0
QA/QC Samples		20%	$2,668
		Total Analytical Program Costs	$16,008

See Appendix B for the monitoring program for this DQO.

Figure 10-1. Sampling Stations for Surface Water, Fish, and Shellfish



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