Water Quality

CHAPTER 6

Because facilities at Brookhaven National Laboratory (BNL) discharge or have the potential to discharge radioactive and organic or inorganic contaminants in liquid effluents, effluent monitoring is conducted to ensure that the public and environment are protected during operations and verify that all discharges comply with applicable federal, state and local standards.

At the Sewage Treatment Plant (STP) outfall, average gross alpha and beta activity was observed to be in the range typical of environmental surface waters; no elevation was detected. Improved wastewater management has led to the smallest release of tritium since such measurements began; the majority of daily samples indicated concentrations which were below the Minimum Detection Limit (MDL). The results of both independent and BNL analytical sampling for plutonium showed no detectable isotopes of plutonium in STP effluent. Average cesium-137 concentrations in STP effluent were less than one percent of drinking water standards. Though drinking water standards are not applicable to the Peconic River since it is not a direct source of potable water, these limits provide a stringent standard of comparison.

An increase in analytical capability allowed 19 inorganic parameters to be monitored daily. The results show that they were all within State Pollutant Discharge Elimination System effluent limitations. Inorganic data from upstream, downstream and at locations not affected by STP discharges show that elevated amounts of aluminum, copper, lead, iron and zinc are a result of natural geology, not influenced by STP effluent. Low pH is also due to natural causes. Organic analyses show no compounds detected above method MDL's.

In 1998, all wastewater effluents met applicable discharge standards. Monitoring of organic and inorganic contaminants showed all parameters to be within ambient water quality standards or background concentrations. Compliance is discussed extensively in Chapter 3.

6.1 SANITARY SYSTEM EFFLUENTS

In 1997, significant improvements were made in the way that sanitary wastes are treated at Brookhaven National Laboratory (BNL). Formerly, sanitary wastewater was treated by primary clarification followed by intermittent sand filtration. This process was enhanced by the addition of modular aeration and ultraviolet disinfection steps. Construction of the enhanced treatment system started in 1996 and was completed in September 1997. Present treatment includes: primary clarification to remove settleable solids and floatable materials, aerobic oxidation for secondary removal of biological matter and nitrification of ammonia, secondary clarification, intermittent sand filtration for final effluent polishing, and ultraviolet disinfection for bacterial control prior to discharge to the Peconic River. The enhanced treatment process became fully operational in 1998 by (1) accumulation of biomass necessary to effect biological treatment, and (2) operation of the oxygen minimizer. During the aeration process, the oxygen minimizer causes the microorganisms to use nitrate bound oxygen for respiration, consequently liberating nitrogen gas and reducing the concentration of nitrogen in the sewage treatment plant (STP) discharge. Nitrogen provides nutrients for plant growth, consequently plant growth within the Peconic has been extensive. Since plants require oxygen for survival during night hours, too much plant life can leave a water system void of oxygen. By reducing the concentration of nitrogen in the STP discharge, plant growth within the river remains in balance with the nutrients provided via natural sources.

Within the BNL site, the Peconic River is an intermittent stream. Offsite flow occurs during periods of sustained precipitation, typically in the spring. Since the incidence of rain was higher than average in 1998, flow was recorded from February through September. High flows were recorded in May and early June. The STP's Peconic River outfall is a discharge point operating under a State Pollutant Discharge Elimination System (SPDES) permit. Figure 6-1 shows a schematic of the STP and its related sampling arrangements.

Real-time monitoring of the clarifier influent for radioactivity, pH, and conductivity takes place at two locations: about 1.8 km (1.1 mi.) upstream of the STP and as the

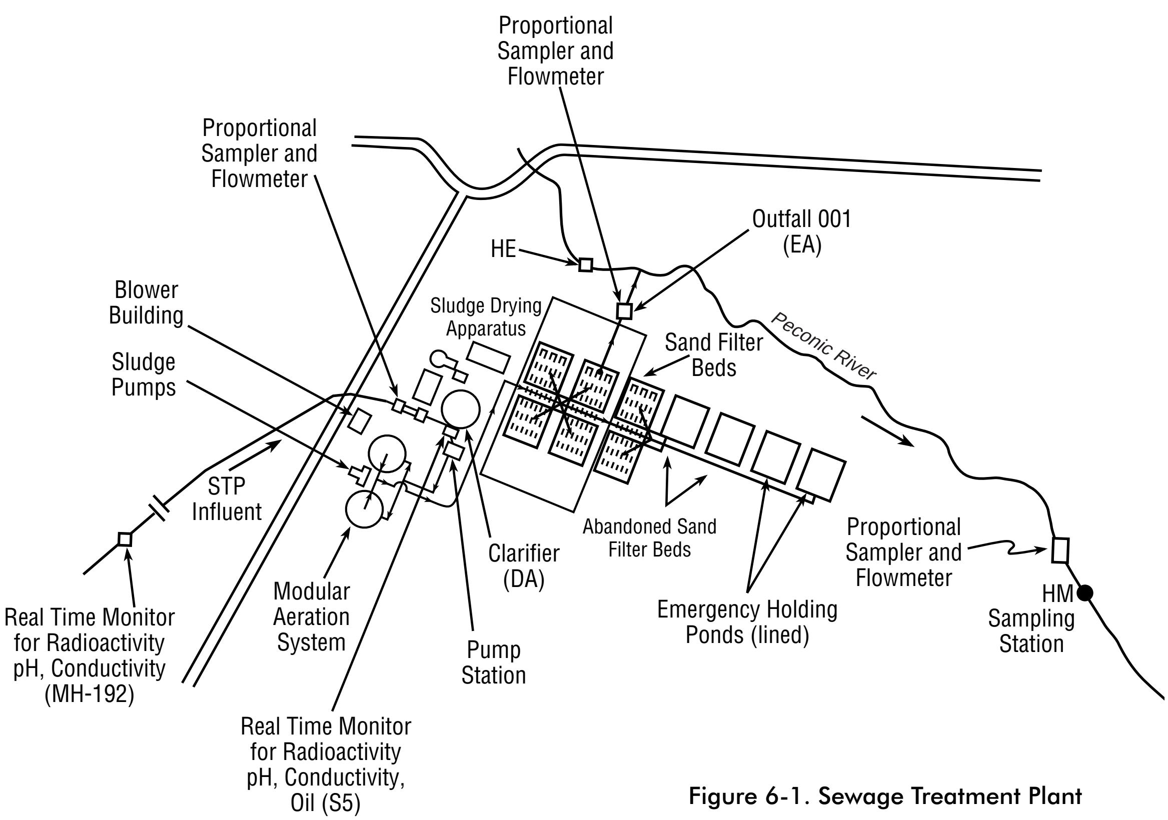


Figure 6-1. Sewage Treatment Plant

influent is about to enter the primary clarifier. The upstream station gives about 30 minutes of advanced warning to the STP operator if wastewater which may exceed BNL effluent release criteria or SPDES limits has entered the sewer system. Effluent leaving the clarifier is monitored a third time for radioactivity. Influent/effluent that does not meet BNL and/or SPDES effluent release criteria is diverted to one of two lined hold-up ponds. The total combined capacity of the two holding ponds exceeds 26.5 million liters (7 million gallons). Diversion continues until the effluent quality meets the permit limits or release criteria. The requirements for treating the effluent diverted to the holding pond are evaluated. Effluent is then reintroduced into the sanitary waste stream at a rate that ensures compliance with SPDES limits or BNL administrative release criteria.

Solids separated in the clarifiers are pumped to a digester, where they are reduced in volume by anaerobic bacteria. Periodically a fraction of the sludge is emptied into a drying bed for moisture reduction. The drying bed uses solar energy to dry the watery sludge to a semi-solid cake. The dried sludge is then containerized for offsite disposal at a Department of Energy (DOE) authorized facility.

6.1.1 SANITARY SYSTEM EFFLUENT - RADIOLOGICAL

As noted in the previous section, the STP effluent is sampled at the output of the primary clarifier (Station DA) and at the Peconic River Outfall (Station EA). At each location, samples are collected daily. The sample volume is proportional to the total water flow through the plant. These samples are analyzed for gross alpha, gross beta and tritium activity. Daily samples from these locations are also composited each month and analyzed for gamma-emitting radionuclides and strontium-90.

The Safe Drinking Water Act (SDWA) specifies that no individual may receive an annual dose greater than 4 mrem (0.04 mSv) from radionuclides present in drinking water. Although the Peconic River is not used as a direct source of potable water, the stringent drinking water standards are applied for comparison purposes. Under the SDWA, the annual average gross alpha activity limit is 15 pCi/L (0.5 Bq/L)(including radium-226, but excluding radon and uranium). SDWA also stipulates a 50 pCi/L (2 Bq/L) gross beta activity screening level, above which, nuclide-specific analysis is required. BNL goes beyond this basic screening requirement by performing nuclide-specific analysis regardless of the gross beta activity. Other specified limits are 20,000 pCi/L (740 Bq/l) for tritium and 8 pCi/L (0.3 Bq/L) for strontium-90. For all other radionuclides, DOE Order 5400.5 Derived Concentration Guides (DCGs) are used to determine the concentration of the nuclide which, if continuously ingested over a calendar year, would produce an effective dose equivalent of 4 mrem. These values are shown at the bottom of Tables 6-1 and 6-2 under "SDWA Limit".

Gross activity measurements are used as a screening tool for detecting the presence of radioactivity without identifying the specific radionuclide(s) causing the activity. Annual average gross alpha and beta activity in the STP effluent has remained consistent with background levels for many years. This continued to be the case in 1998. Average gross alpha and beta activity at the STP Outfall was 1.6 pCi/L (0.06 Bq) and 6.5 pCi/L (0.24 Bq/L), respectively. See Table 6-1 for complete gross activity data.

Sporadically throughout the year, gamma spectroscopy analysis detected beta/gamma-emitting radionuclides in the STP influent and effluent although at levels that were close to or below the Minimum Detection Limits (MDL) of the analysis system (see Table 6-2). The presence of cesium-137 in the STP effluent is due to the continued leaching of very small amounts of cesium from the sand filter beds, deposited during historic releases to the site sanitary system. This is clear when comparing cesium detected in STP influent and effluent; detections in influent are low and infrequent, whereas detections in effluent are measurably higher on a consistent basis. Total cesium-137 released at the STP Outfall during the year was less than 1 mCi (37 MBq), and average concentrations in STP effluent were less than one percent of the drinking water standard. In fact, cesium-137 concentrations in influent and effluent have been decreasing since 1990, as shown in Figure 6-2.

Stronitum-90 was not detected in any monthly composite samples of STP effluent, though it was detected at extremely low levels

Table 6 -1. Gross Activity and Tritium Results at the Sewage Treatment Plant

STP Primary Clarifier	Flow (liters)	Tritium Maximum (pCi/L)	Tritium Average (pCi/L)	Gross Alpha Maximum (pCi/L)	Gross Alpha Average (pCi/L)	Gross Beta Maximum (pCi/L)	Gross Beta Average (pCi/L)
January	6.90E+07	1,280±224	517±140	4.9±2.5	1.6±0.7	22.6±6.1	7.4±2.0
February	5.32E+07	588±228	312±69	9.0±3.1	2.2±1.3	18.4±5.8	6.6±1.9
March	6.14E+07	624±226	206±91	5.4±2.9	1.1±0.7	14.0±5.4	7.3±1.2
April	5.46E+07	726±255	320±94	3.2±2.0	1.0±0.5	9.7±5.2	5.8±0.8
May	5.87E+07	812±242	374±116	6.1±2.6	1.7±0.8	9.5±5.7	6.4±0.8
June	6.75E+07	5,250±381	676±464	5.0±2.4	1.0±0.6	19.7±5.6	5.0±1.7
July	7.33E+07	768±223	240±98	4.1±1.9	1.2±0.6	9.4±5.2	5.2±1.4
August	8.15E+07	664±218	215±84	3.3±2.3	1.2±0.4	11.5±5.0	5.4±1.3
September	7.50E+07	301±200	127±52	3.8±1.8	1.±0.5	10.8±5.5	5.7±1.2
October	6.28E+07	< 292	16±81	3.0±1.5	1.3±0.4	10.6±5.4	6.3±1.3
November	7.33E+07	< 301	58±60	4.8±2.2	2.6±0.7	17.4±6.2	11.4±1.7
December	5.80E+07	< 307	41±54	6.7±2.4	2.2±1.0	15.7±6.3	6.4±1.8
Annual Avg.			264±54		1.5±0.2		6.5±0.5
STP Outfall							
January	4.65E+07	1,140±221	460±113	7.4±2.9	2.1±0.9	20.4±6.1	7.0±2.4
February	4.95E+07	787±239	394±91	4.2±2.4	1.4±0.7	21.0±6.2	7.5±2.1
March	5.36E+07	595±231	259±72	4.6±2.7	1.7±0.6	14.2±5.3	6.6±1.3
April	5.26E+07	474±222	240±75	3.1±1.9	0.7±0.6	9.7±5.3	5.8±1.0
May	5.60E+07	593±217	303±75	8.6±3.0	1.9±0.9	24.3±6.0	7.1±2.2
June	5.90E+07	6,350±410	747±637	5.8±2.4	1.3±0.8	15.4±5.5	6.1±1.8
July	5.33E+07	1,360±247	421±166	2.9±1.8	1.1±0.4	9.8±4.7	5.1±1.1
August	6.21E+07	364±196	174±49	4.0±2.4	1.9±0.5	13.2±5.2	6.1±1.1
September	5.45E+07	489±214	169±59	6.7±2.9	1.6±0.7	9.9±4.9	5.5±1.2
October	4.68E+07	368±195	60±59	5.1±2.7	1.4±0.7	11.4±5.0	4.2±1.4
November	3.72E+07	376±198	107±68	5.4±2.6	2.0±0.8	16.7±5.3	10.6±1.9
December	5.13E+07	360±193	76±49	12.6±3.7	2.5±1.4	13.9±5.6	7.0±1.2
Annual Avg.			289±64 pCi/L		1.6±0.2 pCi/L		6.5±0.5 pCi/L
SDWA Limit (Annual Avg.)			20,000 pCi/L		15 pCi/L		50 pCi/L
Typical MDL			350 pCi/L		3 pCi/L		8 pCi/L
Total Release (Outfall)			195 mCi		1.1 mCi		4.0 mCi

Notes:
1. All values shown with 95% confidence interval.

on two occasions in the plant influent. The largest single value recorded for a monthly composite influent sample was 0.61 ± 0.18 pCi/L (0.02 ± 0.01 Bq/L), or seven percent of the drinking water standard of 8 pCi/L (0.3 Bq/L). Because the two results are so close to the MDL, they are not considered robust. However, since strontium-90 was discharged from the STP in the 1950s and 1960s, it is possible that some residual material remains in the sanitary piping system.

Tritium detected at the STP originates with either High Flux Beam Reactor (HFBR) sanitary system releases, or small, infrequent batch releases which meet BNL discharge criteria. Previously, the onsite waste concentration process at the Waste Concentration Facility (WCF) generated tritriated distillate which constituted a third liquid source. However, this source was eliminated with the introduction of the Evaporator Facility in 1995. A plot of 1998 tritium concentrations recorded in the STP effluent is presented in Figure 6-3. A 10-year trend plot of annual average tritium concentrations measured in the Peconic is shown in Figure 6-4. Annual average concentrations have been declining since 1995.

Table 6-2. Gamma-emitting Radionuclides and Strontium-90 Detected at the Sewage Treatment Plant

STP Primary Clarifier	Flow (L)	Co-60 (pCi/L)	Cs-137 (pCi/L)	Mn-54 (pCi/L)	Na-22 (pCi/L)	Sr-90 (pCi/L)
January	6.90E+07	ND	0.05±0.03	0.13±0.04	0.07±0.03	< 3.10
February	5.32E+07	ND	0.05±0.02	0.09±0.04	ND	< 1.48
March	6.14E+07	ND	0.04±0.03	0.07±0.04	ND	< 1.01
April	5.46E+07	ND	0.09±0.03	ND	ND	< 0.69
May	5.87E+07	ND	ND	ND	0.23±0.05	< 0.33
June	6.75E+07	ND	ND	ND	0.06±0.03	0.39±0.16
July	7.33E+07	ND	0.10±0.03	ND	ND	< 0.33
August	8.15E+07	ND	ND	ND	ND	< 0.22
September	7.50E+07	0.04±0.01	0.04±0.02	ND	ND	< 0.37
October	6.28E+07	ND	ND	ND	ND	< 0.33
November	7.33E+07	ND	ND	ND	ND	0.61±0.18
December	5.80E+07	ND	ND	ND	0.06±0.03	< 0.37
STP Outfall						
January	4.65E+07	ND	ND	ND	ND	<1.65
February	4.95E+07	ND	0.39±0.17	ND	ND	< 1.54
March	5.36E+07	ND	0.52±0.11	ND	ND	< 3.31
April	5.26E+07	ND	0.57±0.13	ND	ND	< 0.37
May	5.60E+07	ND	0.60±0.11	ND	0.09±0.04	< 0.34
June	5.90E+07	ND	0.88±0.16	ND	0.05±0.03	< 0.73
July	5.33E+07	ND	0.54±0.47	ND	ND	< 0.34
August	6.21E+07	ND	0.85±0.24	ND	ND	< 0.73
September	5.45E+07	ND	0.68±0.13	ND	ND	< 0.70
October	4.68E+07	ND	0.56±0.11	ND	ND	< 0.34
November	3.72E+07	ND	0.47±0.09	ND	ND	< 0.73
December	5.13E+07	ND	0.33±0.14	ND	ND	< 0.70
Total Release		0 mCi	0.3 mCi	0 mCi	0.008 mCi	0 mCi
DOE Order 5400.5 DCG		5,000 pCi/L	3,000 pCi/L	50,000 pCi/L	10,000 pCi/L	1,000 pC/L
SDWA Limit		200 pCi/L	120 pCi/L	2,000 pCi/L	400 pCi/L	8 pCi/L

Note: All concentration values shown with 95% confidence interval.

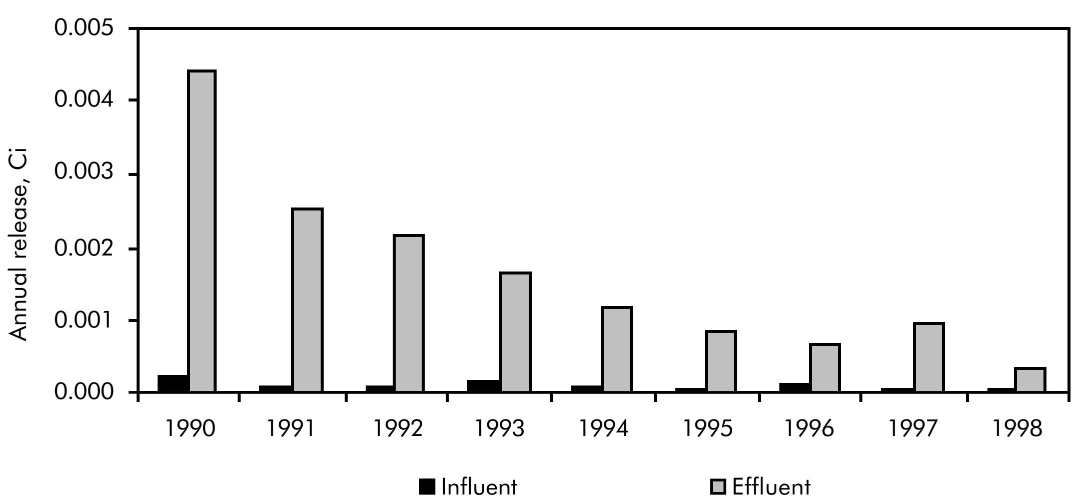


Figure 6-2. Cs-137 Trend in STP Influent and Effluent

Figure 6-3.
1998 STP
Effluent Tritium
Concentrations

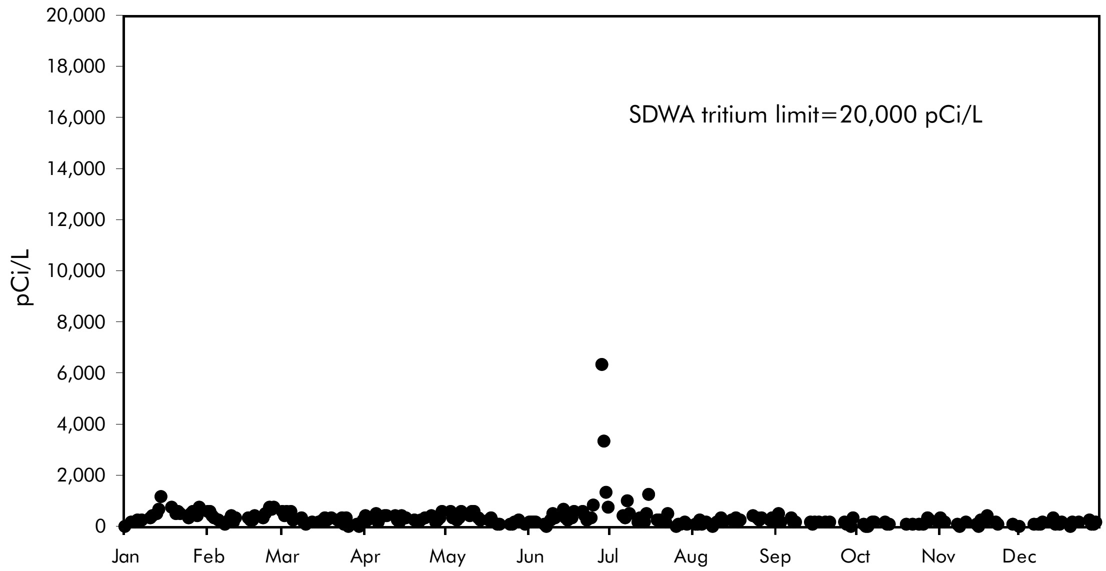


Figure 6-4.
STP/Peconic Annual
Average Tritum
Concentrations

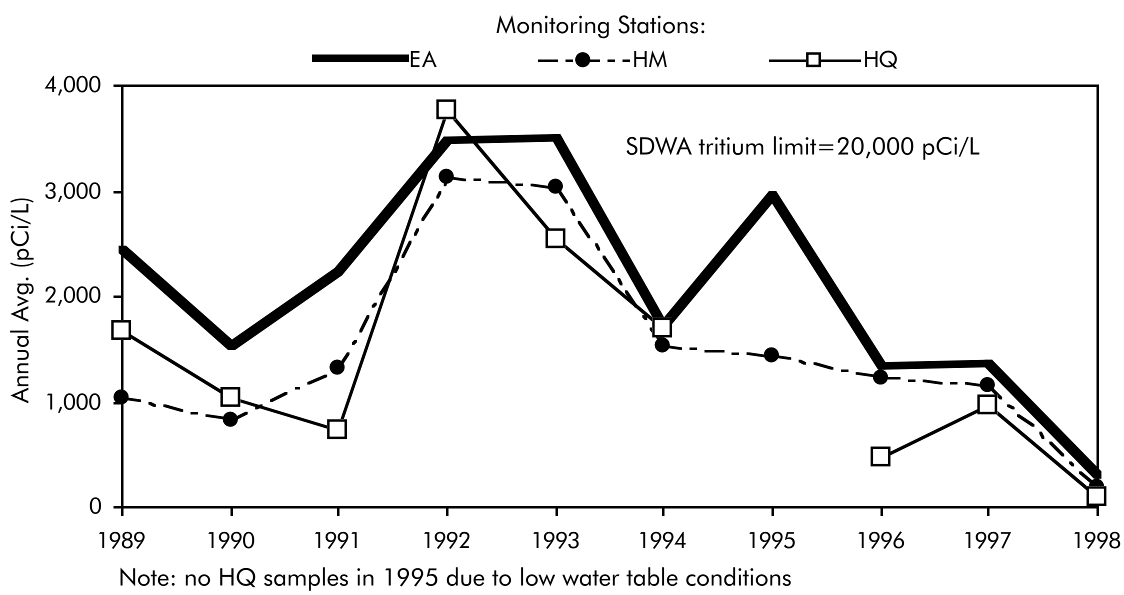
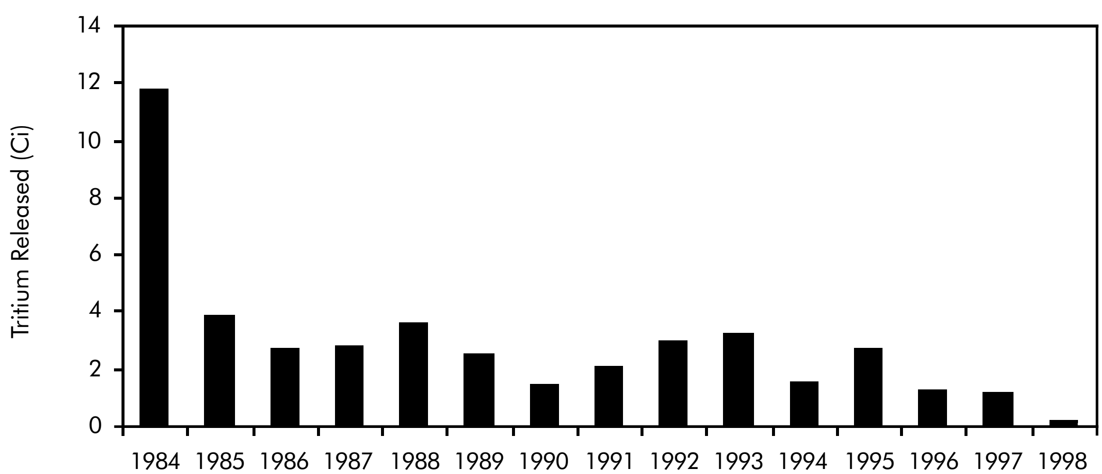


Figure 6-5.
Tritium Released to
the Peconic River,
15 Year Trend



In 1998, the annual average tritium concentration as measured at the Peconic River Outfall was 289 pCi/L (11 Bq/L), a value which is below the typical MDL limit of 350 pCi/L (13 Bq/L). A total source term of 0.195 Ci (7.2 GBq) of tritium was released during the year. This is the lowest annual release of tritium to the Peconic River observed since routine measurements began in 1966 (see Figure 6-5). This is attributable to HFBR facility shutdown, improved wastewater handling procedures at the HFBR and the use of the Building 802 Evaporator Facility for tritium disposal.

6.1.1.1 PLUTONIUM ANALYSIS

In an effort to address concerns over possible plutonium contamination in the STP effluent, two effluent samples were collected in June, 1998. It is important to note that there are no active facilities at BNL which could discharge this radionuclide to the sanitary system, though it was generated as a by-product in spent fuel from the Brookhaven Graphite Research Reactor (BGRR) in the 1950s and 1960s. This reactor was permanently shutdown in 1968.

One sample was processed by BNL's Analytical Services Laboratory (ASL), while another was sent to an independent commercial laboratory in South Carolina. The ASL has the analytical capability to determine total plutonium content, including the Pu-238, 239/240, and 242 isotopes. The offsite commercial laboratory analyzed the effluent sample for individual alpha-emitting Pu isotopes (including all of those listed above) as well as beta-emitting Pu-241. No plutonium isotopes were seen above either laboratory's minimum detection limits.

6.1.2 SANITARY SYSTEM EFFLUENT - NONRADIOLOGICAL

The effluent from the STP is also monitored under the environmental surveillance program. Monitoring includes water quality and inorganic (i.e., metals) parameters. Daily composite samples are collected using a flow proportional refrigerated sampling device (ISCO Model 1600). In 1998, the ASL expanded its inorganic analytical capabilities by using an Inductively Coupled Plasma/Mass Spectrometer. This instrument effectively increased the routine inorganic analyte list to nineteen parameters. The ASL then analyzes these composite samples for metals and anions. Metals analysis is conducted on a monthly composite of the daily samples, whereas anions are analyzed using a single daily sample. Grab samples are collected daily at Location EA (see Figure 6-1) and monitored for field-measured parameters including pH, conductivity, temperature, and dissolved oxygen. To monitor STP operations, daily influent and effluent logs are also maintained by the STP operators for flow, pH, temperature, and settleable solids.

Table 6-3 summarizes the water quality and metals analytical results for these samples. Comparison of the effluent data to the SPDES effluent limitations (or other applicable standard) shows that all analytical parameters were within SPDES effluent limitations. (See also compliance data in Chapter 3).

6.2 ASSESSMENTS OF PROCESS-SPECIFIC WASTEWATER

Wastewater that may potentially contain constituents above SPDES permit limits or groundwater discharge standards is held and characterized to determine the appropriate means of disposal. The analytical results are compared with the appropriate limit, and the wastewater released only if the discharge would not jeopardize the quality of the effluent.

The SPDES permit includes requirements for the quarterly sampling and analysis of process-specific wastewater discharged from the photographic developing operations in Buildings 197B, the printed-circuit-board fabrication operations conducted in Building 535B, the metal cleaning operations in Building 498, cooling tower discharges from Building 902, and miscellaneous satellite boiler blowdown. These operations were monitored for contaminants, such as inorganic elements (i.e., metals), cyanide, and volatile and semi-volatile organic compounds. All analytical results were reported in the quarterly Discharge Monitoring Reports submitted to the NYSDEC. Analyses of these waste streams show that, while several contribute contaminants to the STP in concentrations exceeding SPDES permitted levels, the ranges of concentrations of these wastes are comparable to typical STP influent levels. Consequently, these discharges have little to no impact on the STP effluent water quality.

Table 6-3. Sewage Treatment Plant (STP), Average Water Quality and Metals Data[(c)]

	No. of Samples	STP Influent			No. of Samples	STP Effluent			SPDES Limit or Ambient Water Quality Standard[b]
		Min.	Max.	Avg.		Min.	Max.	Avg.	
pH(SU)	235	5	8.2	NA	235	6.1	7.3	NA	5.8 - 9.0
Conductivity (μmhos/cm)				(b)	235	6.8	309	238	NA
Temperature (C)					235	4.4	26.8	16.4	NA
Dissolved Oxygen (mg/L)	NA	NA	NA	NA	235	5.2	14.6	9.4	NA
Chlorides (mg/L)	NA	NA	NA	NA	12	19.8	34	26	NA
Nitrate (as N)(mg/L)	NA	NA	NA	NA	12	2.1	8.2	5.6	10 (Total N)
Sulfates (mg/L)	NA	NA	NA	NA	12	9.9	19.6	15.4	250 (GA)
Aluminum (μg/L)	11	53.7	247.3	123.28	12	21.4	55.1	43.8	100 (Ionic)
Arsenic (μg/L)	11	< 3	6	< 3	12	< 3	< 3	< 3	150 (Dissolved)
Barium (μg/L)	11	25.4	102.2	44.2	12	11.6	52	19.8	1000 (GA)
Beryllium (μg/L)	11	< 0.66	5.4	< 0.66	12	< 0.66	< 0.66	< 0.66	11 (Acid Soluble)
Cadmium (μg/L)	11	< 1.1	5.4	< 1.1	12	< 1.1	< 1.1	< 1.1	1.1 (Dissolved)
Chromium (μg/L)	11	1.4	7.7	2.6	12	1.6	2.5	2	34.4 (Dissolved)
Cobalt (μg/L)	11	0.5	6.3	1.3	12	0.3	1	0.5	5 (Acid Soluble)
Copper (μg/L)	11	60	207.8	113.5	12	37.7	60.4	50.3	150 (SPDES)
Iron (μg/L)	11	521	1307	881	12	107.1	223.6	163.3	370 (SPDES)
Mercury (μg/L)	11	< 0.2	< 0.2	< 0.2	12	< 0.2	0.64	< 0.2	0.8 (SPDES)
Manganese (μg/L)	11	14.7	22.6	18.1	12	3	15.4	8.4	300 (GA)
Sodium (mg/L)	11	29.8	39.6	33.7	12	26.2	34.9	31.1	NA
Nickel (μg/L)	11	2.7	10.9	5.4	12	3.4	4.8	4	110 (SPDES)
Lead (μg/L)	11	5	25.6	11.6	12	1.3	3.5	2	19 (SPDES)
Selenium(μg/L)	11	< 5	5.6	< 5	12	< 5	< 5	< 5	4.6 (Dissolved)
Silver (μg/L)	11	< 1	5	< 1	12	< 1	2.8	2	15 SPDES
Thallium(μg/L)	11	< 0.66	5.1	< 0.66	12	< 0.66	< 0.66	< 0.66	8 (Acid Soluble)
Vanadium (μg/L)	11	< 5.5	15.2	< 5.5	12	5.5	13.2	8.7	14 (Acid Soluble
Zinc(μg/L)	11	43.7	133.2	80.7	12	18	52.4	37.8	100 (SPDES)

Notes:
NA: Not Applicable or Not Analyzed
GA: Class GA (groundwater) Ambient Water Quality Standard
a. The locations of the monitoring stations are shown on Figure 6-1.
b. Unless otherwise provided, the reference standard is Class C surface water. For Class C standards the solubility state for the metal is provided.
c. All metal analytical results were generated using total recoverable analytical techniques.

Process wastewaters that are not routinely monitored under the SPDES permit because they were not expected to be of consistent quality or because they are not generated routinely, were held for characterization before release to the sewer. Waste waters routinely evaluated, are ion-exchange column regeneration wastes, primary closed-loop cooling water systems, and other industrial wastewaters. To determine the appropriate disposal method, samples are analyzed for contaminants specific to the process. The analyses are then reviewed, and the concentrations compared to the SPDES and radiological effluent limits. If the concentrations are within limits, authorization for sewer disposal is granted; if not, alternate means of disposal are pursued. In all instances, any waste which contains hazardous levels of contaminants or elevated radiological contamination is sent to the waste management program for disposal.

6.2.1 RECHARGE BASINS

Figure 6-6 depicts the locations of BNL's recharge basins. An overall schematic of water use at the Laboratory is shown in Figure 6-7. Recharge Basins HN and HT receive once-through cooling water discharges generated at the Alternating Gradient Syncrotron (AGS) as well as cooling tower blowdown and storm water runoff.

- Recharge Basin HS receives predominantly storm water runoff and minimal cooling tower blowdown from the National Synchrotron Light Source (NSLS).

- ♦ Basin HX receives Water Treatment Plant (WTP) filter backwash water.
- ♦ Basin HP receives once-through cooling water from the BMRR.
- ♦ Recharge Basin HO receives cooling water and cooling tower discharges from the AGS and HFBR, and storm water runoff. A polyelectrolyte and dispersant are added to the supply of AGS cooling- and process-water to keep the naturally occurring iron in solution. The HFBR secondary-cooling system water recirculates through mechanical cooling towers, and is treated with inorganic polyphosphate and tolytriazole to control corrosion and deposition of solids. The blowdown from this system, combined with once-through cooling water used at the Cold Neutron Facility and the Cyclotrons, is also discharged to the HO Basin. In 1998, approximately 4.1 MLD (1.1 MGD) was discharged to the HO Basin. Rates of discharge to Basin HO continued to be lower in 1998, due to the shutdown of the HFBR.
- ♦ In addition, several other recharge areas are used exclusively for discharging stormwater runoff; these include Basin HW (Outfall 008) and the Central Steam Facility (CSF) stormwater outlet.

Each of the recharge basins is a permitted point source discharge under BNL's SPDES permit. To facilitate monitoring of these discharges, each is equipped with a flow monitoring station. Weekly recordings of flow are maintained, along with records of pH, conductivity and temperature. The specifics of the SPDES compliance-monitoring program are provided in Chapter 3. To supplement the SPDES compliance sampling program, samples are also collected routinely and

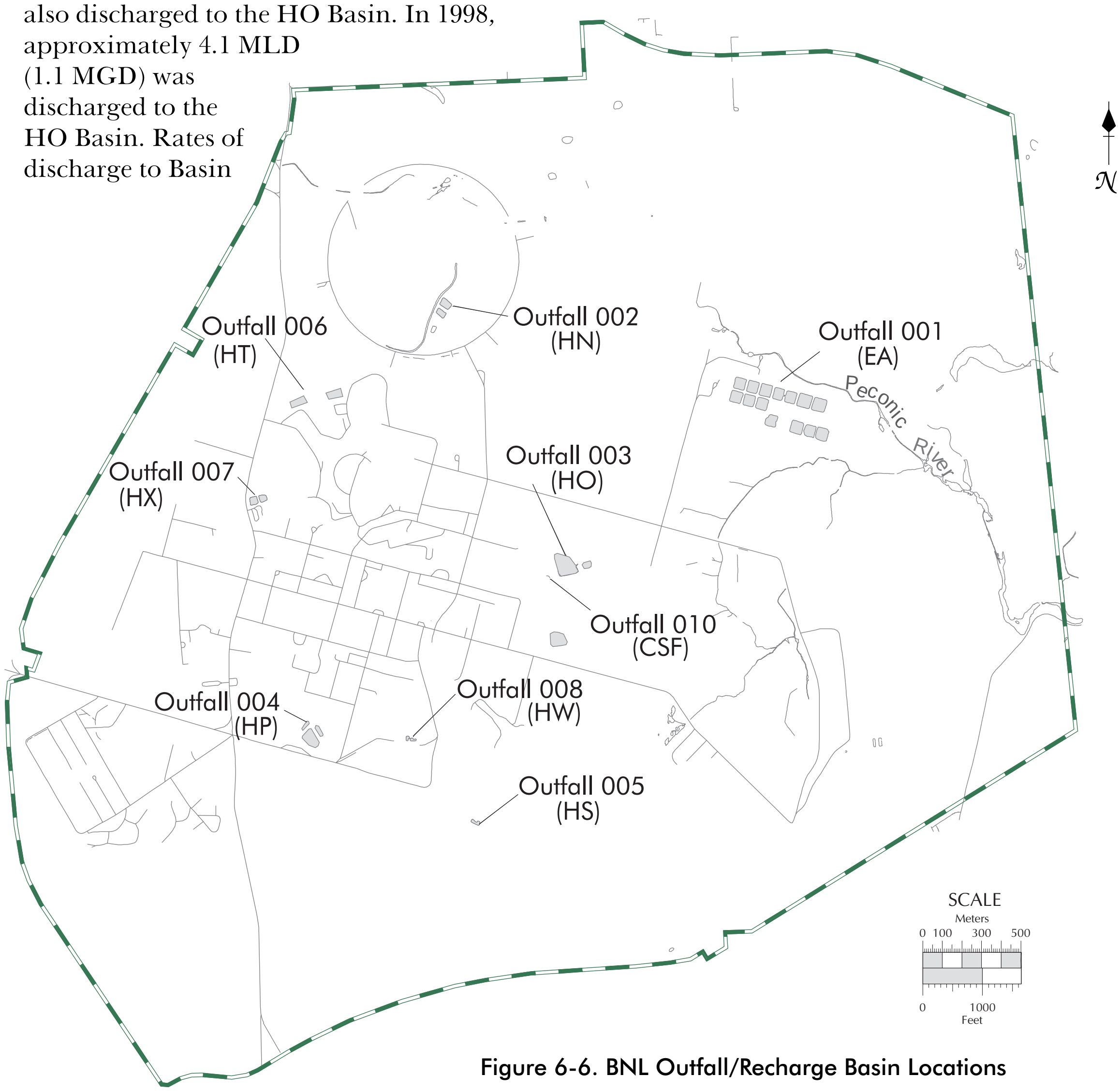
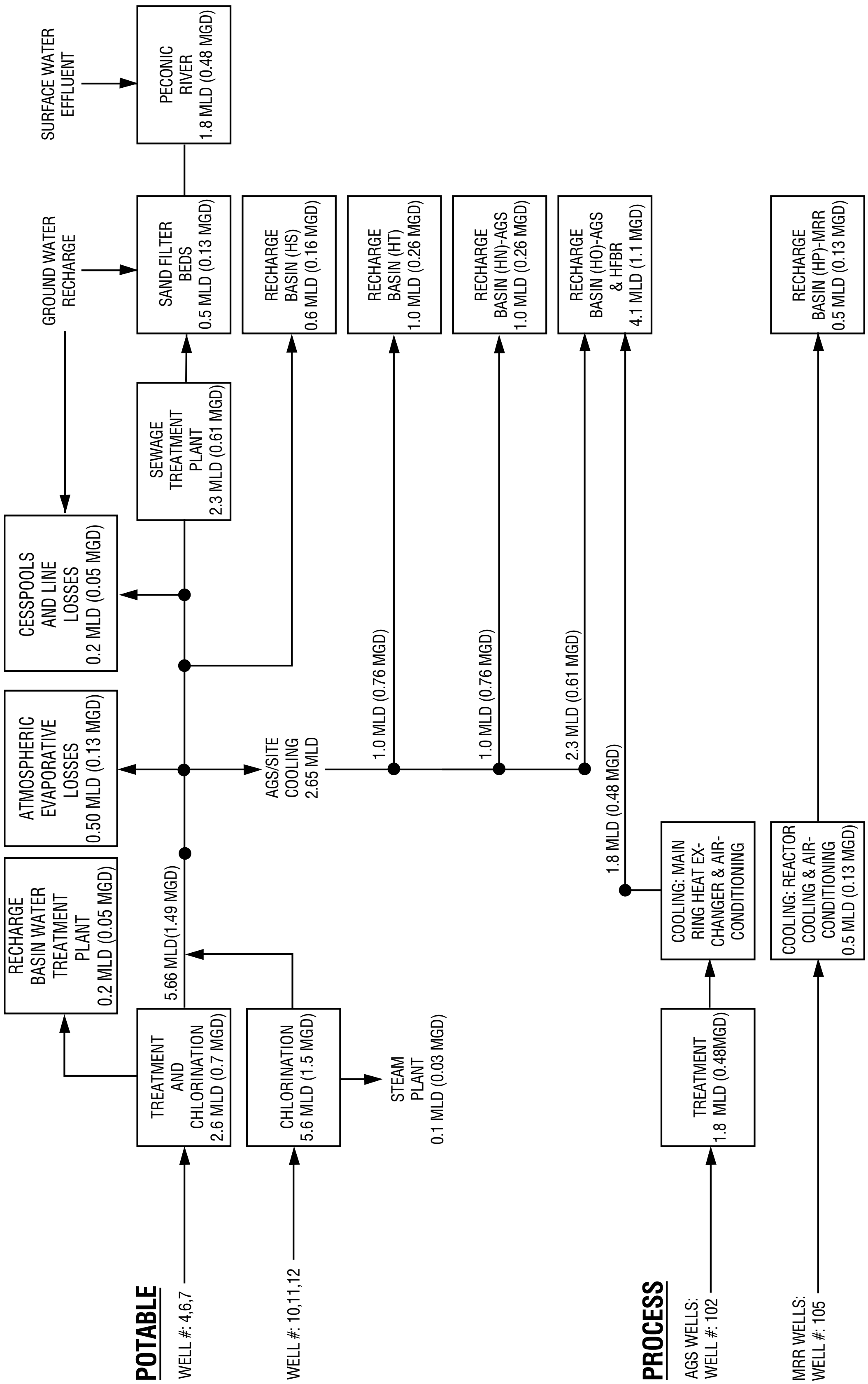


Figure 6-6. BNL Outfall/Recharge Basin Locations



NOTE: Well #101 and #103 were not operating in 1998.
MLD=Million Liters Per Day
MGD= Million Gallons Per Day

Figure 6-7. Brookhaven Nationl Laboratory Schematic of Water Use and Flow for 1998 analyzed under the environmental monitoring program for Volatile Organic Compounds (VOCs), metals and anions. During 1998, water samples were collected from Basins HN, HO, HP, HS, HT, HW, and the CSF storm water outfall.

6.2.1.1 RECHARGE BASINS - RADIOLOGICAL ANALYSES

Discharges to the recharge basins were sampled throughout the year to determine concentrations of gross activity, gamma-emitting radionuclides and tritium (if any). Radiological results for water samples collected at the recharge basins are presented in Table 6-4. As in previous years, Basin HN was found to contain trace amounts of radionuclides attributable to BNL operations. This basin receives secondary, non-contact magnet cooling water from the AGS. Secondary radiation in the vicinity of the beam line, where coolant lines run, may interact with elements in the water to produce radioactive species such as tritium. Metal corrosion products present in the system may also become activated. No elevations of gross activity levels were observed in any basin, and all average gamma-emitting radionuclide concentrations were far below applicable DCGs.

6.2.1.2 RECHARGE BASINS - NONRADIOLOGICAL ANALYSES

To determine the overall impact of these discharges on the environment, the data from samples collected from the discharges to the recharge basins were compared to groundwater discharge standards promulgated under Chapter 6 of the New York Code of Rules and Regulations (NYCRR), Part 703.6. Samples

Table 6-4. Radiological Analysis Results for Recharge Basin Samples

Basin		Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)	Be-7 (pCi/L)	Na-24 (pCi/L)
HN	N	15	15	15	16	16
	Max.	3.3±1.9	5.4±1.4	2,540±326	25.5±13	182.0±24
	Avg.	0.8±0.7	-4.4±10.8	411±415	3.2±3.7	16.0±3
HO	N	11	11	11	11	11
	Max.	2.0±0.7	4.0±2.3	< 335	22.9±14	ND
	Avg.	0.4±0.6	-8.0±14.6	20±53	2.1±3.9	
HP	N	4	4	4	4	4
	Max.	< 1.4	< 3.7	< 304	ND	ND
	Avg.	-0.3±0.9	-19.7±34.8	64±112		
HS	N	4	4	4	4	4
	Max.	4.0±0.8	8.2±2.5	< 309	22.7±13.0	ND
	Avg.	1.4±2.2	3.8±3.7	0±28	13.7±8.3	
HTe	N	12	12	12	12	12
	Max.	5.0±0.9	6.8±1.4	< 335	ND	ND
	Avg.	0.3±1.0	-6.7±13.2	53±74		
HTw	N	11	11	11	12	12
	Max.	7.0 1.0	10.0±2.8	< 335	ND	ND
	Avg.	0.9±1.5	-7.7±14.8	62±59		
HW	N	3	3	3	3	3
	Max.	6.4±1.4	14.7±2.7	< 335	40.2±14	ND
	Avg.	3.8±2.3	6.0±9.1	57±135	19.4±19	
SDWA Limit		15	50	20,000	1,600	400

Notes:
1. All values reported with 95% confidence interval.
2. N = Number of samples collected for analysis.
3. ND = Not Detected.
4. See Section 4.7.2 for a discussion of negative radiological results.

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were collected quarterly for water quality parameters, metals and VOCs and analyzed by the ASL. Field measured parameters (i.e., pH, conductivity and temperature) are routinely monitored and recorded. The water quality and metals analytical results are summarized in Tables 6-5 and 6-6, respectively. For VOCs, low concentrations of disinfection by-products were routinely detected in several discharges, as expected, including bromoform, chloroform, dibromochloromethane and dichlorobromomethane. Concentrations ranged from non-detectable to a maximum of 45 ppb. Sodium hypochlorite and bromine used as algae control agents in cooling towers were responsible for the formation of these compounds. With the exception of a single detection of 2-butanone (5 ppb) in recharge

Table 6-5. Water Quality Data for Onsite Recharge Basins

Location (a)		pH SU	Temp. C	Conductivity µmhos/cm	Chlorides mg/L	Sulfates mg/L	Nitrate as N (b) mg/L
HN	N	26	26	16	9	9	9
(RHIC Recharge)	Min.	6.9	2	47	3	2.2	<1.0
	Max.	8.2	23.4	386	181	150	4.9
	Avg.	NA	13.8	170	33.2	25.2	<1.0
HO	N	22	22	12	8	8	8
(HFBR-AGS)	Min.	6.3	4.4	35	3.1	2.2	<1.0
	Max.	7.9	22.7	190	20.5	12.8	<1.0
	Avg.	NA	14.9	123	16.5	8.9	<1.0
HP	N	8	8	5	4	4	4
(BMRR)	Min.	5.8	14.2	186	31.7	12.8	<1.0
	Max.	6.5	23	202	43.4	13.8	1.7
	Avg.	NA	17.9	192	35.1	13.3	1
HS	N	18	18	7	3	3	3
(Storm Water)	Min.	6.8	3.2	42	< 4	1.9	<1.0
	Max.	8.4	24	209	17	14.9	3.1
	Avg.	NA	12.9	118	11.7	10.8	<1.0
HT (c)	N	60	60	37	18	18	18
(LINAC)	Min.	6.8	3.4	23	1.2	0.7	<1.0
	Max.	8.3	26.3	231	20.9	21.6	5.3
	Avg.	NA	16	164	16.5	11.3	<1.0
HW	N	12	12	2	3	3	3
(Weaver Rd.)	Min.	5.8	2.7	70	< 4	4	<1.0
	Max.	8.1	25.5	93	8.1	12.5	3
	Avg.	NA	13.1	82	6.5	9.4	1.3
CSF	N	12	12	2	5	5	5
(Storm Water)	Min.	5.8	3.1	62	< 4	< 4	<1.0
	Max.	8	25.4	92	4.8	17.3	3.1
	Avg.	NA	14.5	77	< 4	7.5	<1.0
NYSDEC		6.5 - 8.5	(d)	(d)	500	500	20
Effluent Standard							
Typical MDL		NA	NA	10	4	4	1

Notes:
N: No. of samples
MDL: Minimum Detection Limit
NA: Not Applicable
a. The location of the recharge basins is provided on Figure 6-5.
b. The holding times specified by the USEPA were exceeded for several of these samples.
c. Recharge Basin HT has two discharge structures; consequently twice as many readings have been recorded.
d. No Class GA effluent standard specified.

Table 6-6. Metals Data for On-Site Recharge Basins

Location (a)	N		Al µg/L	As µg/L	Ba µg/L	Cd µg/L	Co µg/L	Cr µg/L	Cu µg/L	Fe µg/L	Hg µg/L	Mn µg/L	Ni µg/L	Na mg/L	Pb µg/L	V µg/L	Se µg/L	Zn µg/L
HN	10	Min.	9.9	< 3	19.3	< 1.1	< 0.12	1.2	20.4	69.1	< 0.2	2.7	< 1.1	3	< 1.3	< 5.5	< 5	19.2
(RHIC)		Max.	2809	< 3	56.0	< 1.1	1.8	5.3	99.2	3191	0.2	62.6	5.5	34.9	13.6	6.1	< 5	115.5
		Avg.	626	< 3	36.8	< 1.1	0.4	2.7	48.1	903	< 0.2	24	1.5	16.6	4.2	< 5.5	< 5	50.2
HO	9	Min.	4.4	< 3	< 1.8	< 1.1	< 0.12	< 1	2.8	30.1	< 0.2	2.5	< 1.1	2.7	< 1.3	< 5.5	< 5	< 4
(AGS/HFBR)		Max.	859.3	6.6	55.9	< 1.1	1.5	< 1	13.4	3059	0.21	351.2	4	18	3.6	< 5.5	33.4	61.9
		Avg.	121.5	< 3	29.6	< 1.1	0.6	< 1	6.7	828.9	< 0.2	93.9	1.1	12	< 1.3	< 5.5	< 5	17.2
																		HP
	4	Min.	15.3	< 3	57.4	< 1.1	0.15	< 1	4.2	68.5	< 0.2	51.9	< 1.1	17.6	< 1.3	< 5.5	< 5	10.3
(BMRR)		Max.	54.2	< 3	676.3	< 1.1	0.21	< 1	6.8	847.4	< 0.2	62.9	< 1.1	20.2	< 1.3	< 5.5	< 5	48.6
		Avg.	35.2	< 3	213.5	< 1.1	0.18	< 1	5.2	314	< 0.2	58.9	< 1.1	18.8	< 1.3	< 5.5	< 5	22.5
HS	4	Min.	84.7	< 3	21.2	< 1.1	< 0.12	2	9.4	64.7	< 0.2	2.8	< 1.1	2.9	< 1.3	< 5.5	< 5	16.5
(Storm		Max.	1719	< 3	43.2	< 1.1	0.86	6.2	49.8	1329	< 0.2	30.6	2.5	24.5	15.1	< 5.5	< 5	160.5
Water)		Avg.	547	< 3	33.3	< 1.1	0.33	3.5	22.4	478.3	< 0.2	15.9	1.7	13.9	7.2	< 5.5	< 5	71.7
HT (b)	19	Min.	8	< 3	23.3	< 1.1	< 0.12	< 1	9.7	30.2	< 0.2	< 2	< 1.1	12.8	< 1.3	< 5.5	< 5	7.6
(Linac)		Max.	250.7	< 3	66.8	< 1.1	0.23	9	92.4	381.8	0.2	9.9	1.5	34.6	5.1	102.6	< 5	55.2
		Avg.	65.6	< 3	36.7	< 1.1	< 0.12	< 1	31.2	117.7	< 0.2	3.8	< 1.1	20.8	< 1.3	< 5.5	< 5	26.1
HW	3	Min.	131.8	< 3	20.4	< 1.1	0.3	1.1	7.2	228	< 0.2	10.4	2.3	1.2	7.1	< 5.5	< 5	58.7
(Weaver Rd.)		Max.	3209	< 3	42.2	3.8	7.6	13.7	82.7	4379	0.37	61.6	10.6	5	72	18.1	< 5	274
		Avg.	1235.7	< 3	32.1	2	2.8	5.6	36.7	1676	< 0.2	30.1	5.3	2.9	29.4	6	< 5	172
CSF	5	Min.	321.1	< 3	34.4	< 1.1	0.7	< 1	4.9	691	< 0.2	15.7	6.4	1.6	21.2	7.1	< 5	37.9
(Storm		Max.	1875	< 3	72.7	2.6	5.6	13.7	51.4	7305	< 0.2	70.8	52.9	5.1	77.5	49.5	< 5	249.2
Water)		Avg.	1200.8	< 3	50.6	< 1.1	3.1	5.7	26.3	2583	< 0.2	27.1	24.8	3.1	43.6	35.2	< 5	127.1
NYSDEC Effluent Limitation or AWQS			2000	50	2000	10	5	100	1000	600	1.4	600	200	NS (c)	50	NS (c)	20	5000
Typical MDL			2.2	3	1.8	1.1	0.12	1	2	15	0.2	2	1.1	1	1.3	5.5	5	4

Notes:
N: No. of samples.
MDL: Minimum Detection Limit.
a. Locations of recharge basins are shown on Figure 6-6.
b. Recharge Basin HT is comprised of two discharge structures, hence twice as many samples are collected and analyzed.
c. No effluent standard specified.

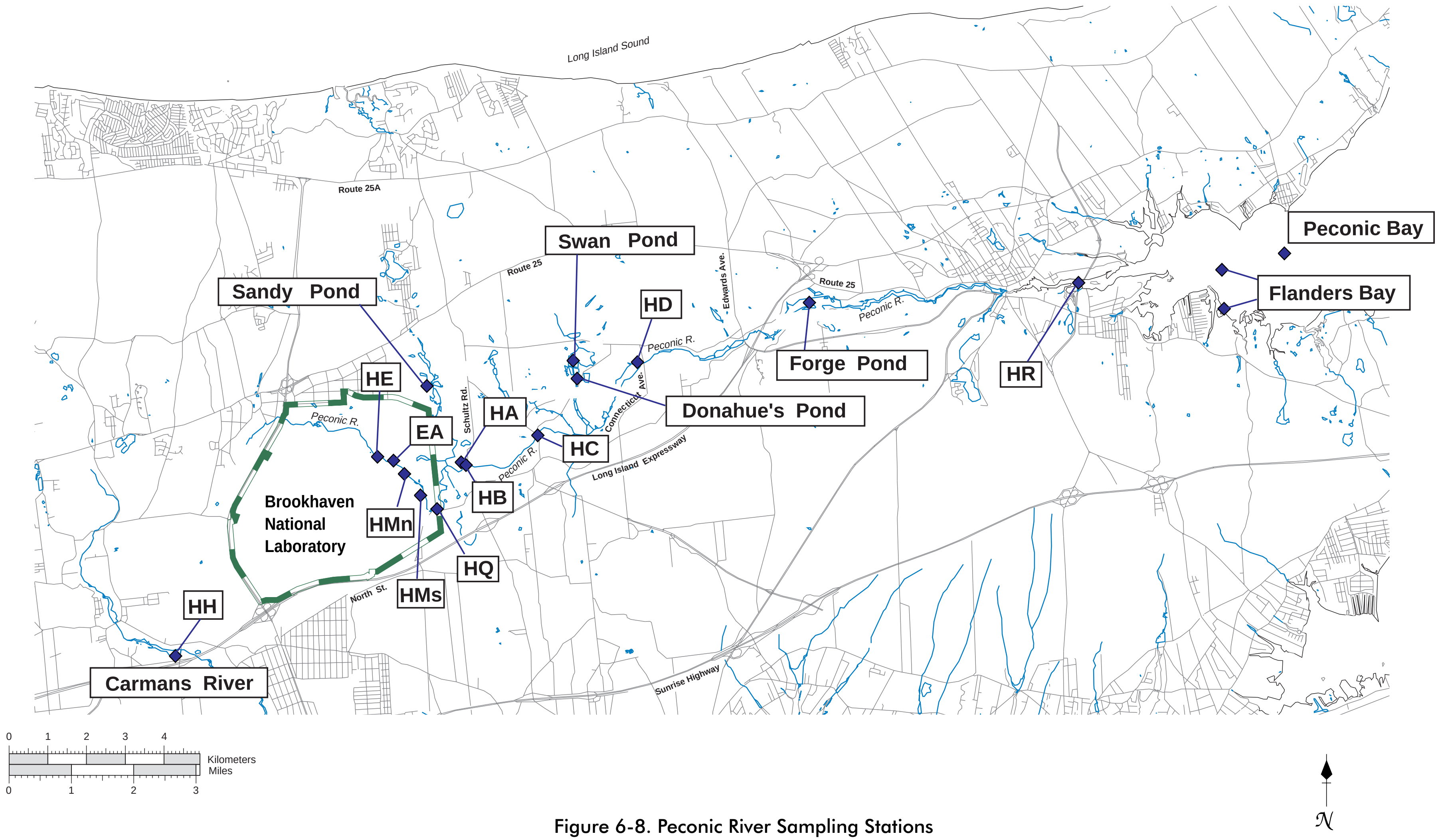

Figure 6-8. Peconic River Sampling Stations

Table 6-7: Radiological Analysis of Peconic River Water Samples

Sample Station	Geographic Location		Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)	Sr-90 (pCi/L)
HMn	Peconic River,	N	148	148	150	4
	0.7 km from STP,	Max.	8.3±3.1	15.1±5.6	8,440±543	< 0.95
	On-Site	Avg.	1.4±0.2	5.0±0.5	185±115	-0.39±0.85
HMs	Peconic River	N	7	7	7	5
	tributary, On-Site	Max.	1.4±0.8	< 4.0	< 304	0.27±0.07
		Avg.	0.2±0.5	1.2±0.9	-116±65	-0.91±0.75
HQ	Peconic River,	N	101	101	103	2
	BNL site boundary	Max.	4.1±2.0	13.2±5.6	822±234	< 0.68
		Avg.	1.1±0.2	4.4±0.6	94±33	-1.66±1.06
HA	Peconic River,	N	4	4	4	4
	Off-Site	Max.	2.0±1.0	< 3.7	< 335	0.84 ±0.20
		Avg.	0.1±1.1	-22.4±35.6	174±55	-0.34±0.75
HB	Peconic River,	N	4	4	4	3
	Off-Site	Max.	< 1.4	< 3.7	< 335	< 0.21
		Avg.	-0.2±0.8	-21.8±36.4	94±94	-0.15±0.19
HC	Peconic River,	N	6	6	6	4
	Off-Site	Max.	1.4±0.9	< 3.7	< 302	< 0.11
		Avg.	0.1±0.5	-16.4±24.2	83±54	-1.64±0.99
HD	Peconic River,	N	1	1	1	NS
	Off-Site	Max.	0.9±0.5	< 2.1	< 322	
HR	Peconic River,	N	5	5	5	4
	Riverhead	Max.	2.5±0.8	< 3.7	< 304	0.54±0.09
		Avg.	0.6±0.9	-17.4±28.4	38±68	-1.12±0.95
HH	Carmans River	N	4	4	4	4
	(Control Location)	Max.	3.7±0.8	6.5±1.5	< 335	0.46 ±0.16
		Avg.	0.9±1.7	-21.2±37.2	115±144	-0.04±0.29
SDWA Limit			15	50	20,000	8

Notes:
1. All values shown with 95% confidence interval.
2. N = Number of samples analyzed.
3. NS = Not Sampled for this analyte.
4. No gamma-emitting anthropogenic radionuclides were detected in Peconic River water samples in 1998.
5. Station HMn Sr-90 analysis results based on composite samples, all others collected as grab samples.

Samples at Station HQ (located at the eastern site boundary) were collected on a much more frequent basis than in recent years, due to increased flow of the Peconic there. Since the Peconic is a groundwater-fed river, continued elevated water table levels in 1998 served to provide frequent flow at this location. Over 100 samples were collected at HQ for gross activity and tritium analysis. Annual average gross activity values were below typical minimum detection limits. Tritium was rarely detected at HQ, reflecting the trend recorded at the STP outfall. Tritium was not detected in any quarterly Peconic River sample collected beyond the BNL site boundary.

In Peconic River samples collected at Riverhead (Location HR), gross alpha and gross beta activity values were consistent with typical background values. Neither tritium nor any man-made gamma-emitting radionuclides were detected. One out of four samples analyzed for strontium-90 showed a value above the MDL. The result for that sample was equal to 0.54 ± 0.09 pCi/L (20 ± 3 mBq/L) with a MDL of 0.13 pCi/L (5 mBq/L). Given that the other three samples showed values for strontium-90 which were negative, this value is considered suspect. Samples collected from the Carmans River control location showed a similar pattern in that one of four samples

Table 6-8. Water Quality Data for Surface Water Samples Collected Along the Peconic and Carmans Rivers

River	Sample Location[(a)]		pH SU	Conductivity umhos/cm	Temp. deg. C	Dissolved Oxygen mg/L	Chlorides mg/L	Sulfates mg/L	Nitrates as N mg/L
Peconic	**HE**	N	15	15	15	0	12	12	12
		Min.	4.8	69	2.6	0	19.8	9.9	2.1
		Max.	8	223	22.1	0	34	19.6	8.2
		Avg.	NA	98	11.7	0	23.9	15.4	5.6
	HMn	N	152	152	152	149	8	8	8
		Min.	5	51	2	3.6	18.8	7.9	< 1
		Max.	7.3	291	23.4	15.3	60.5	17.5	6.6
		Avg.	NA	175	12.6	8	30.3	13.3	3
	HMs	N	5	5	5	0	6	6	6
		Min.	3.8	41	5.5	0	< 4	< 4.0	< 1.0
		Max.	4.5	95	18.9	0	7.7	7.8	< 1.0
		Avg.	NA	57	12.5	0	< 4	< 4	< 1.0
	HQ	N	110	110	110	109	8	8	8
		Min.	5.1	48	1	0.3	8.9	< 4	< 1.0
		Max.	7.5	233	24.3	13.7	27.7	15.5	1.4
		Avg.	NA	134	14.2	5	18.2	8.8	< 1.0
	HA	N	5	5	5	0	4	4	4
		Min.	5.3	49	9.3	0	7.5	< 4.0	< 1.0
		Max.	6.1	77	19.2	0	11.7	6.4	< 1.0
		Avg.	NA	61	15.1	0	9	< 4	< 1.0
	HB	N	4	4	4	0	4	4	4
		Min.	5.4	44	9.5	0	6.2	< 4.0	< 1.0
		Max.	6.1	86	19	0	10.4	5.2	< 1.0
		Avg.	NA	69	14	0	8.6	< 4.0	< 1.0
	HC	N	4	4	4	0	4	4	4
		Min.	6.2	57	9.3	0	8	< 4.0	< 1.0
		Max.	6.8	68	19.2	0	11	8	< 1.0
		Avg.	NA	63.5	14.7	0	9.8	6.1	< 1.0
	HR	N	4	4	4	0	3	3	3
		Min.	6.2	90	9.1	0	12.1	8.1	<1.0
		Max.	7.5	120	20.9	0	14.6	10.2	<1.0
		Avg.	NA	104	15.5	0	13.2	9.5	<1.0
Carmans	**HH**	N	4	4	4	0	4	4	4
(Control Location)		Min.	5.5	110	10.1	0	16.5	8.6	<1.0
		Max.	7.7	191	19	0	25	11.4	1.7
		Avg.	NA	152	14.4	0	21.9	10.4	1.1
NYS AWQS (b)			6.5 - 8.5	(c)	(c)	(c)	250	250	10
Typical MDL			NA	10	NA	NA	4	4	1

Notes:
N: No. of samples
NA: Not Applicable
MDL: Minimum Detection Limit
a. The Peconic and Carmans Rivers sample locations are shown on Figure 6-7.
b. AWQS: Since there are no Class C Surface Water Ambient Water Quality Standards (AWQS) for these compounds, the AWQS for Ground Water is provided, if specified.
c. No AWQS specified.

Table 6-9. Metals Concentration Data for Surface Water Samples Collected Along the Peconic and Carmans Rivers

River	Sample Location [(a)]		Ag µg/L	Al µg/L	Ba µg/L	Cd µg/L	Co µg/L	Cr µg/L	Cu ug/L	Fe µg/L	Hg µg/L	Mn µg/L	Ni µg/L	Na mg/L	Pb µg/L	V µg/L	Se µg/L	Zn µg/L
Peconic	HE	N	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
		Min.	< 1	123.4	21.1	< 1.1	0.5	< 1	< 2	54.7	< 0.2	59.1	< 1.1	8.2	< 1.3	< 5.5	< 5	8.2
		Max.	14	905.3	86.8	< 1.1	15.3	9.5	41.5	10460	< 0.2	514	14.1	20.3	6.6	< 5.5	< 5	258.5
		Avg.	2	434.8	34	< 1.1	3.8	1.8	11.4	3592	< 0.2	169	2.7	11.4	2.2	< 5.5	< 5	56.9
	HMn	N	12	12	12	12	12	12	12	12	12	12	12	12	12	8	8	8
		Min.	< 1	46	11.5	< 1.1	0.3	1	17.8	166.2	< 0.2	4.7	2.5	12.1	1.4	< 5.5	< 5	12.8
		Max.	2.4	450	17.3	< 1.1	1.3	2.4	49.4	1453	< 0.2	142.9	4.3	30.6	7.8	8.1	< 5	76.4
		Avg.	1.8	202.4	13.3	< 1.1	0.6	1.7	33.8	628.3	< 0.2	36.9	3.3	23.1	2.8	< 5.5	< 5	35.4
	HMs	N	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
		Min.	< 1	57.8	22.2	< 1.1	0.2	< 1	< 2	179.4	< 0.2	21.7	< 1.1	1.7	< 1.3	< 5.5	< 5	< 2
		Max.	< 1	860	59.4	< 1.1	0.6	9.3	38.9	3096	< 0.2	46.1	2.8	3.6	5.6	< 5.5	< 5	61
		Avg.	< 1	613	39.4	< 1.1	0.4	1.7	7.2	723.7	< 0.2	30.3	< 1.1	3.1	1.3	< 5.5	< 5	26.4
	HQ	N	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
		Min.	< 1	16.5	9.5	< 1	0.3	< 1	12.5	113.6	< 0.2	9	2.9	8.7	< 1.3	< 5.5	< 5	4.7
		Max.	< 1	324.5	31.3	1.1	0.5	1.4	26.2	1085	0.24	84.4	4.3	34.6	1.8	6.6	< 5	117.6
		Avg.	< 1	211.5	12.7	< 1	0.4	< 1	16	424.3	< 0.2	27.8	3	18.3	< 1.3	< 5.5	< 5	28.5
	HA	N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Min.	< 1	89.9	< 1.8	< 1.1	0.2	< 1	< 2	341.1	< 0.2	34.5	< 1.1	4.6	< 1.3	< 5.5	< 5	14.7
		Max.	< 1	194.2	31.3	< 1.1	0.4	1.4	195.1	1580	< 0.2	58.5	2.4	9.1	9.4	< 5.5	< 5	111.4
		Avg.	< 1	155.2	20.9	< 1.1	0.3	< 1	50.6	1058	< 0.2	45.5	< 1.1	6.7	2.4	< 5.5	< 5	48.8
	HB	N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Min.	< 1	67.3	15.6	< 1.1	0.18	< 1	< 2	900.3	< 0.2	36.6	< 1.1	4.8	< 1.3	< 5.5	< 5	7.8
		Max.	< 1	173.4	48.1	< 1.1	0.5	< 1	37	4543	< 0.2	79.5	< 1.1	7.7	2	< 5.5	< 5	19.9
		Avg.	< 1	133.6	32.2	< 1.1	0.3	< 1	10.7	2627	< 0.2	56.7	< 1.1	6.3	< 1.3	< 5.5	< 5	13.2
	HC	N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Min.	< 1	46.5	24.5	< 1.1	< 0.1	< 1	< 2	533.9	< 0.2	32.2	< 1.1	4.9	< 1.3	< 5.5	< 5	5.5
		Max.	< 1	138.2	38.5	< 1.1	0.6	< 1	< 2	3424	< 0.2	195.8	< 1.1	8.9	< 1.3	< 5.5	< 5	15.9
		Avg.	< 1	92.8	29.7	< 1.1	0.2	< 1	< 2	1765.3	< 0.2	78	< 1.1	6.8	< 1.3	< 5.5	< 5	11.7
	HR	N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Min.	< 1	85.2	29.7	< 1.1	0.3	< 1	< 2	582.7	< 0.2	96.9	< 1.1	8.1	< 1.3	< 5.5	< 5	11.7
		Max.	< 1	515	42.1	< 1.1	0.5	< 1	3.7	2278	< 0.2	149.7	< 1.1	12.6	3.4	< 5.5	< 5	37.4
		Avg.	< 1	277.2	35.7	< 1.1	0.4	< 1	2.5	1416.7	< 0.2	123.8	< 1.1	10	2	< 5.5	< 5	11.7
Carmans (Control Location)	HH	N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Min.	< 1	33.2	14.9	< 1.1	< 0.1	< 1	< 2	297.5	< 0.2	37	< 1.1	11.2	< 1.3	< 5.5	< 5	5.4
		Max.	< 1	1746	71.6	< 1.1	0.6	< 1	5.6	1601	< 0.2	160.6	< 1.1	17.2	119.4	< 5.5	< 5	22.3
		Avg.	< 1	527.9	44.7	< 1.1	0.2	< 1	2	961.4	< 0.2	90.2	< 1.1	14.7	31	< 5.5	< 5	11.8
NYSDEC	AWQS		0.1	100	NS	1.1	5	34	4	300	0.8	NS	23	NS	0.1	14	4.6	37
Metallic State[(b)]			I	I		D	AS	D	D	AS	D		D		D	AS	D	D
Typical MDL			1	2.2	1.8	1.1	0.12	1	2	15	0.2	2	1.1	1	1.3	5.5	5	4

Notes:
N: No. of samples
AWQS: Ambient Water Quality Standard for Class C Surface Water
MDL: Minimum Detection Limit

a.The Peconic and Carmans River sample locations are shown on Figure 6-7.
b. The regulated state of these constituents are as follows:
I= Ionic Form
D= Dissolved Form
AS= Acid Soluble
NS=There are no AWQS specified for these elements for Class C waters.

showed a low positive value. This result is considered suspect for similar reasons.

6.3.2 PECONIC RIVER - NONRADIOLOGICAL ANALYSES

Organic and inorganic analytical data for Peconic and Carmans River samples are summarized in Tables 6-8 and 6-9. During 1998, these samples were analyzed for water quality parameters (i.e., pH, temperature, conductivity, and dissolved oxygen), anions (i.e., chlorides, sulfates, and nitrates), metals, and VOCs. There were no VOCs routinely detected in river water samples above the MDL, although trace concentrations (i.e., 2 ppb or less) were reported for acetone and methylene chloride at one or more locations. Due to the level of detection, the presence of these compounds is questionable.

Comparison of Peconic River water quality data collected upstream and downstream shows water quality parameters to be consistent throughout the river system. These data were also consistent with the Carmans River control location. Examination of the metals data shows that aluminum, copper, lead, iron and zinc were present in concentrations which exceeded ambient water quality standards at upstream, downstream and Carmans River stations. Though these elements were routinely detected in the STP discharge, the presence of these elements at upstream locations and locations not directly influenced by STP discharges is evidence of natural contributions. In several instances, the highest concentrations of these elements were detected at areas not influenced by the STP discharge. At station HE, upstream of the STP discharge, silver and cobalt were also detected above ambient water quality standards. The pH of the Peconic River, as measured upstream and downstream of the STP discharge, is frequently lower than the ambient water quality standard. Contributions of groundwater, natural decay products such as humic acids, and stormwater runoff, all of which have pH values typically less than 5.8, contribute to these observations.