April 16, 2004

Ms. Linda Murphy, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency
Water Technical Unit "SEW"
P.O. BOX 8127
Boston, MA 02114

Mr. Glenn Haas, Director
Division of Watershed Management
Department of Environmental Protection
1 Winter Street
Boston, MA 02108

RE: Massachusetts Water Resources Authority
NPDES Permit Number MA 0103284
April 11, 2004 Deer Island Treatment Plant power failure

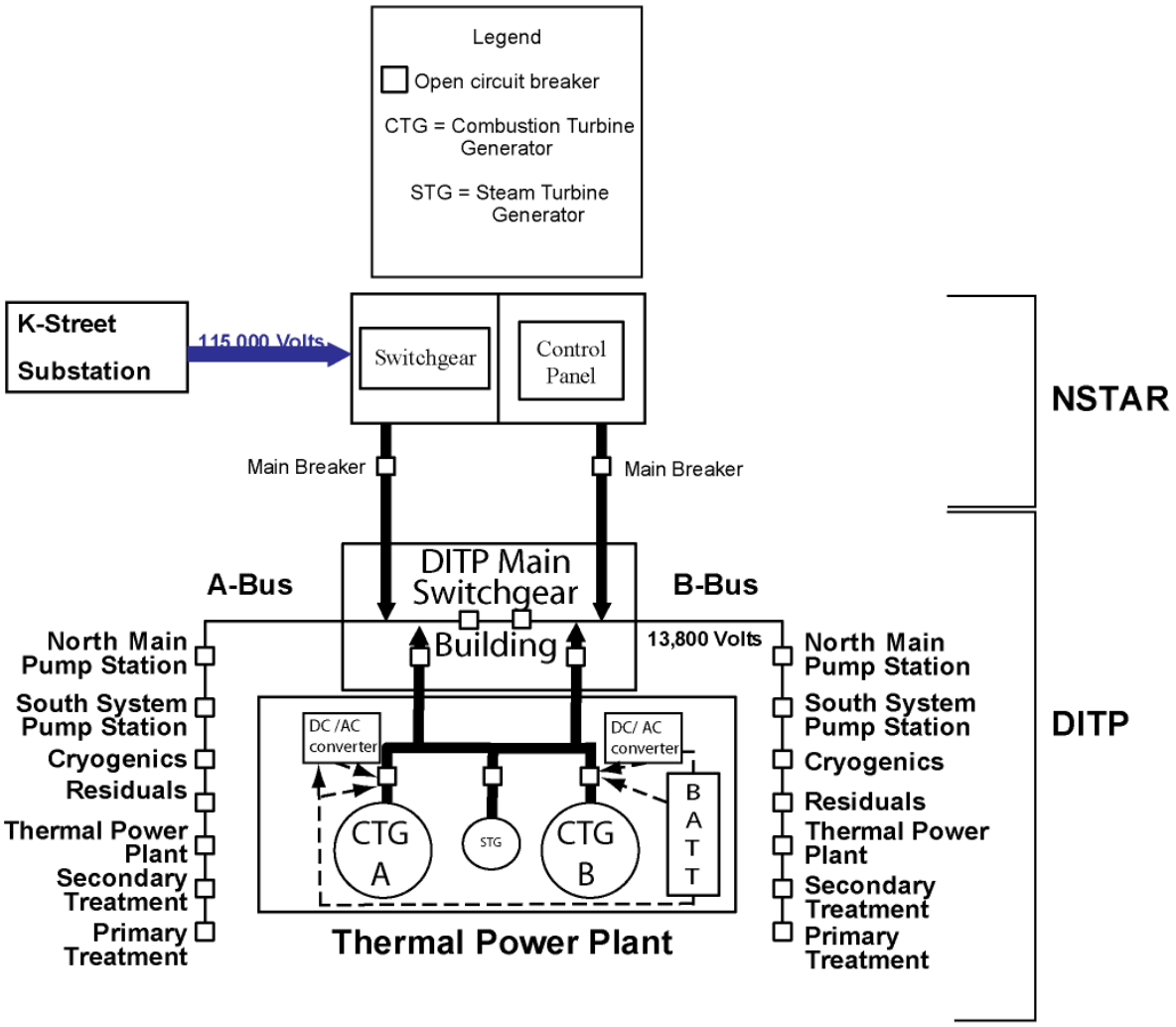
Dear Ms. Murphy and Mr. Haas:

In accordance with Part II.D.1.e. of MWRA's NPDES Permit Number MA 0103284, the Massachusetts Water Resources Authority ("MWRA") is submitting this written notification, which is a follow-up to its verbal notification made on April 11, 2004, regarding what began with an under-current event from NStar, the power provider to Deer Island Treatment Plant ("DITP"), and a subsequent prolonged series of steps taken by DITP staff to bring the onsite power facilities on line. The lengthy process of activating the onsite power supply led to the subsequent emergency bypassing of the headworks facilities. Because DITP lost all power and pumping capability, in order to protect the facilities all four headworks were isolated, causing discharges from two relief points: the emergency outfalls at Nut Island Headworks and at the Cottage Farm CSO Treatment Facility.

Deer Island lost power when a circuit breaker tripped at NStar's K Street Substation in South Boston at 7:23 p.m. on April 11, 2004. The K Street Substation feeds Deer Island via the cross harbor cable. The break in the circuit produced an undervoltage which caused NStar's breakers on Deer Island which feed DITP's main switchgear building to trip, and, in turn, MWRA's breakers within its main switchgear building, power distribution system, and connected substations tripped.

Description of event

The undervoltage from NStar's K Street Substation tripped NStar's main breaker switches at its building on Deer Island, and all the circuit breakers within DITP's main switchgear building for the A bus and the B bus which control all DITP facilities (see schematic diagram below). In addition, the circuit breakers at all the facilities on Deer Island (the pumping stations, cryogenics, thermal plant, residuals, primary and secondary treatment) were tripped, leaving the plant completely



Schematic circuit diagram of DITP

powerless and dark. Immediately, additional staff were called in and on-site staff began efforts to bring power back on-line using DITP's backup power source—the two combustion turbine generators (CTGs).

It has been estimated that it should take approximately an hour to re-power the plant with the CTGs in the event of a total power loss. Problems connecting the CTGs to the electrical distribution system made the process more difficult. The breakers to the CTGs had been tripped and could not be closed because the battery serviced by the DC/AC converter, which delivers power to close the CTG breakers, did not operate. Therefore, staff had to manually close a high-voltage CTG breaker to enable the CTG to power up. Staff then manually closed all the critical high-voltage breakers in the main switch building, enabling the CTG to restore power to the A bus. At this time (shortly after 9 p.m.), staff from NStar arrived on Deer Island and began to work to restore power to the B bus.

Once staff had restored power to the A bus, they had to manually close the circuits at each of Deer Island's facilities. Staff then started the pumps at about 10:15 p.m. Simultaneously, NStar restored its power to the B bus. All the pumps and facilities operated from the A bus for almost two hours. At midnight, in order to smoothly transfer power from DITP's CTG to NStar, an attempt was made to synchronize the power from the CTG with NStar on the A bus, but when this was attempted, the

A bus generator dropped off line due to fuel transfer issues. It took about 12 minutes to re-power the A bus using NStar's power, and pumping resumed.

Discharges resulting from power and pumping loss

As a result of the power loss, all the headworks were isolated to protect them from flooding until the North and South Main Pump Stations were back up and running. Staff were deployed around MWRA's service area to monitor the levels of wastewater in the system and to determine whether it would be necessary to open relief points. To prevent backups of sewage into homes and streets, wastewater was diverted to the Cottage Farm CSO Treatment Facility. To prevent serious flooding at the Nut Island Headworks and in the south system communities, the Nut Island emergency outfalls were opened. Shortly after 9 p.m., wastewater began to be discharged from Nut Island into Quincy Bay; the discharge lasted in total about three hours. Based on flow rates during this period it is estimated that approximately 17 million gallons would have reached DITP from Nut Island Headworks. MWRA will provide a better estimate of the amount of flow discharged through the Nut Island outfalls, once a more detailed analysis accounting for in-system storage and other factors is carried out. Approximately 4.7 million gallons of treated wastewater were discharged to the Charles River. No other discharges or sewer backups into homes and businesses were observed.

On the morning of April 12, MWRA collected water samples in Boston Harbor which showed *Enterococcus* bacteria counts around the Nut Island outfalls ranging from 90 to 210 colonies per 100 ml (slightly higher than the 104 colony per 100 ml swimming standard). On April 13, there were 5 to 45 colonies per 100 ml around the Nut Island outfalls, well within the swimming standard. Samples near and downstream of the Cottage Farm discharge in the Charles River on the morning of April 12 showed *Enterococcus* and *E. coli* levels within swimming standards (see attachment).

Follow up

MWRA has retained two electrical engineering experts to audit and review both this power loss incident and the incident of April 3, to determine if there are if there are enhancements to the power distribution system that can minimize future reaction times. The consultants are reviewing the design, capacity, redundancy, maintenance, and operation of Deer Island's electrical system and will provide MWRA with a report and recommendations. MWRA is using the experience gained during this "dead-start" incident to review and update new operating procedures for re-powering the energized systems in each facility. MWRA is also working with NStar to learn why power to DITP was lost, implement improved response time from NStar, and determine whether an automatic reset function can be installed in NStar's control center. MWRA has requested that NStar expedite the repair of the roof on its substation on Deer Island which caused the April 3 power outage. NStar personnel and additional MWRA staff are on-site at DITP, while the failure of the direct-current processes is being evaluated and remediated, in case of another power interruption.

The closure of the headworks and the loss of pumping required MWRA to divert flow to prevent severe property damage to the headworks facilities. There were no feasible alternatives to the bypass. MWRA used available in-system storage and relief points to prevent injury and property damage to homes and businesses in the communities it serves.

MWRA plans to meet with EPA and DEP in the near term to provide a more detailed description of the April 3 and April 11 events and to provide preliminary results of the electrical consultants' analysis.

If you have questions about this notification, please do not hesitate to call me at (617) 788-4359.

Sincerely,

Michael J. Hornbrook
Chief Operating Officer

cc: E. Hall, EPA
B. Pitt, EPA
K. Honkonen, EOEA
C. Coniaris, DEP
D. Ferris, DEP
J. Kennedy, DMF

Attachment
Bacteria sampling results around Nut Island outfalls and Charles River after April 11, 2004 discharges

Table 1 shows the bacteria monitoring results from MWRA sampling at the Nut Island outfalls and in Hingham Bay. Samples were collected on the mornings of April 12 and 13 at locations shown in Figure 1. On April 12, both *Enterococcus* and *E. coli* showed results slightly higher than the swimming standard and higher than usually measured at those locations (usually 5-10 colonies/100 ml).

Typical counts for these bacteria in MWRA's raw influent are between 400,000 and 1,000,000 colonies/100 ml for *Enterococcus* and between 1,000,000 and 5,000,000 colonies/100 ml for *E. coli*. Thus, by the morning after the discharge, the wastewater was already significantly diluted; residual water quality impacts are unlikely. By two days after the discharge, bacteria results were well within the swimming limit.

Table 1. Results of water quality monitoring in Quincy Bay and Hingham Bay after Nut Island emergency discharge of April 11, 2004. *Enterococcus* limits (for swimming, marine water): geometric mean 35, single sample maximum of 104; *E. coli* limits (for swimming, freshwater): geometric mean of 126, single sample maximum of 235

Station number	Location Description	*Enterococcus*/100ml		*E. coli*/100 ml	
		4/12/04	4/13/04	4/12/04	4/13/04
117	Mid Hingham Bay	90	10	40	<5
080	Quincy Yacht Club	210	20	110	<5
079	Outfall 103	150	5	105	<5
082	Outfall 101	95	5	35	<5
081	Outfall 102	125	45	55	45

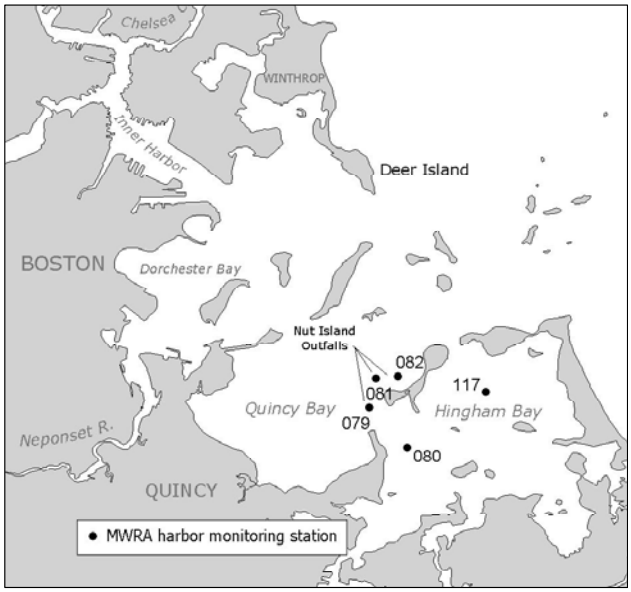


Figure 1. Station locations sampled after emergency discharge from Nut Island outfalls.

Table 2 shows the results for the Charles River, upstream and downstream of Cottage Farm; sampling locations are in Figure 2. Except at the Stony Brook outlet, which typically shows high bacteria counts, bacteria levels in the river were within swimming standards for both *Enterococcus* and *E. coli*. No effect of the Cottage Farm discharge was detectable by the morning after the discharge.

Table 2. Results of water quality monitoring in Charles River after Cottage Farm Facility emergency discharge of April 11, 2004. *Enterococcus* limits (for swimming, freshwater): geometric mean of 33, single sample maximum of 62; *E. coli* limits (for swimming, freshwater): geometric mean of 126, single sample maximum of 235.

Date	Time	Sampling station	Location	*Enterococcus*/ 100 ml	*E. coli*/100ml
04/12/04	11:53	005	Magazine Beach, upstream of Cottage Farm	70	110
04/12/04	11:46	006	BU Bridge, downstream of Cottage Farm	50	60
04/12/04	11:31	007	MIT boathouse	100	120
04/12/04	11:25	008	Harvard Bridge	20	40
04/12/04	11:16	009	Between Harvard and Longfellow	20	20
04/12/04	11:08	010	Downstream of Longfellow	10	50
04/12/04	10:56	011	Downstream of Science Museum	10	50
04/12/04	11:37	145	Stony Brook outlet	3700	2800

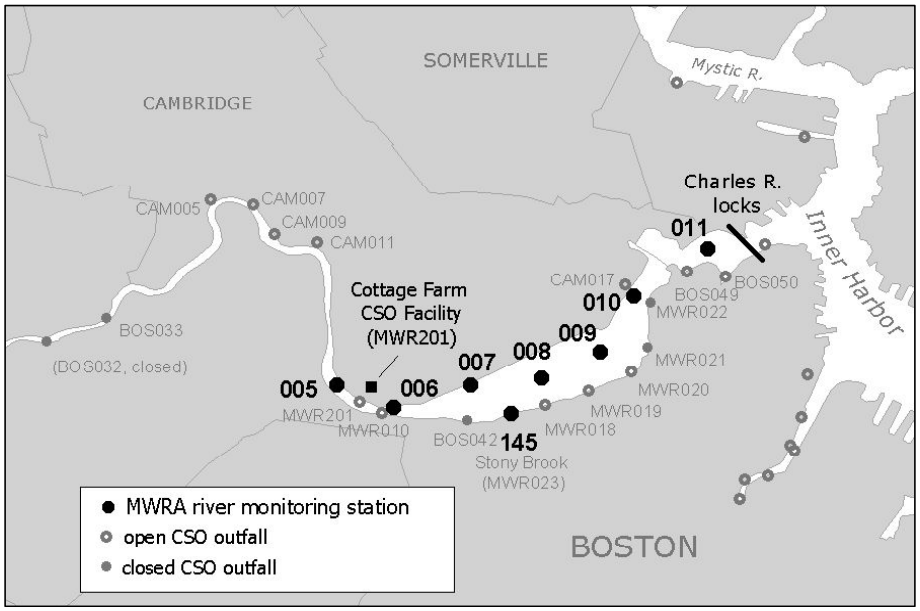


Figure 2. Sampling locations in the Charles River.