

May 18, 2001

Mr. Glenn Haas, Acting Assistant Commissioner
Bureau of Resource Protection
Department of Environmental Protection
1 Winter Street
Boston, MA 02108

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

Re: Massachusetts Water Resources Authority, Permit Number MA0103284
Notification Pursuant to Part I.8. Contingency Plan

Dear Mr. Haas and Ms. Murphy:

One of the four effluent toxicity tests that MWRA conducts every month is the *Menidia beryllina* (inland silverside minnow) chronic test which measures the growth of juvenile fish in six dilutions of effluent, and compares the final weight of those exposed fish to the final weight of control fish grown in seawater. If the final weight of the test fish at the dilution prescribed in the permit is less than the control at a statistical significance level of 5%, then the test is failed.

On May 14, 2001, MWRA received the results of its *Menidia beryllina* chronic growth test that was performed on a series of samples collected April 1-6, 2001. These results indicated that the average weight of the control *Menidia beryllina* was statistically significantly greater than the average weight of some of the test groups of *Menidia beryllina*.¹ This result triggers a notification requirement under the Contingency Plan. This letter constitutes that notification.

All other requirements of the permit were met on April 1-6, and there were no operational upsets during this period that would have caused the Deer Island Treatment Plant to violate other parameters within the permit. In fact, effluent toxic contaminant concentrations were low. Although the April *Menidia* test result is technically a failure of the chronic *Menidia* toxicity test, MWRA believes that the test data, reported below, clearly indicate that the failure is the result of a statistical anomaly and not due to toxicity of the effluent.

The testing procedure requires that the lab use 7 to 11 day old *Menidia beryllina* and grow them in 1.5%, 6.25%, 12.5%, 25%, 50% and 100% effluent for 7 days. Four replicates are used for each dilution, with 10 fish per replicate, totaling 40 fish for each dilution. The control water used by MWRA's contract laboratory is natural New Hampshire estuarine water. During the testing period, the diluted effluent in which the fish are growing is replaced twice with fresh sample on the third and fifth

¹ This test failure happened within the six-month period allowed by the Federal District Court's Compliance Order to achieve consistent secondary treatment. See Footnote 29 of Schedule Six.

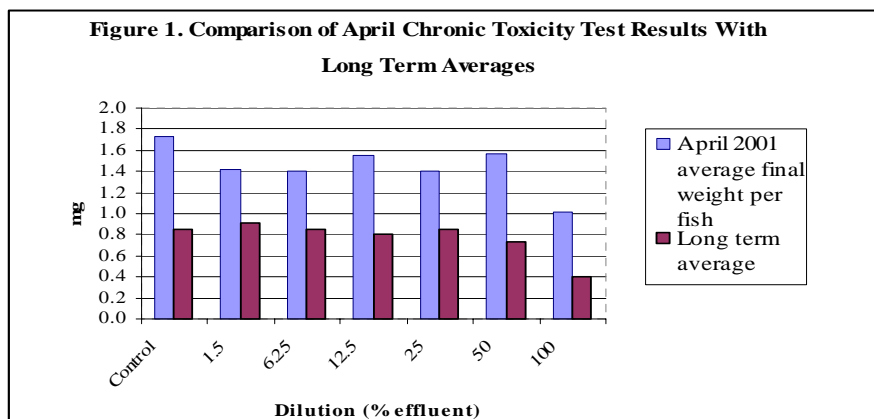
days. After seven days the survival (number alive) and the average weight per fish (growth) for each dilution is statistically compared to the controls. Only the final weight is used—initial weights are not measured.

Table 1. April Chronic Toxicity Test Results - *Menidia beryllina*

Dilution (% effluent)	No. of fish				April 2001 average final weight per fish*(mg)
	Rep. 1	Rep. 2	Rep. 3	Rep. 4	
Control (no effluent)	10	10	10	10	1.7380
1.5	10	10	10	10	1.4193
6.25	10	10	10	10	1.4090
12.5	10	10	10	10	1.5575
25	10	10	10	10	1.3993
50	10	10	10	10	1.5723
100	10	10	10	10	1.0173

* Average weight of fish after 7 days.

The results for MWRA's April *Menidia* growth test are in Table 1. The average weight of the control fish at the end of the testing period was 1.7380 mg. The final weights of the tested fish were less than the control in 1.5%, 6.25%, 25%, and 100% effluent. However, the tested fish were statistically **not different** from the control at 12.5% and 50% effluent. That is, fish grown in relatively concentrated effluent (50%) actually weighed **more** than the fish grown in dilute (1.5%) effluent. This is one reason that MWRA does not believe that the results indicate a toxic effect on growth, but are more likely to be simply due to natural variability in the fishes being tested.² Another reason is that even 100% percent effluent showed no impact on *Menidia* acute and chronic survival, *Arbacia* (sea urchin) fertilization or *Mysid* (shrimp) survival. Moreover, both the control group and test groups were significantly heavier than fish that previously passed the last eight tests (Figure 1).



² Other data indicating that the results are anomalous are the calculated IC10 and IC25 for the test. Many scientists believe that these are better estimates of test results because they are point estimates along the dose-response curve and closely approximate the NOEC. In this case the IC10 was 9.3% and the IC25 was 67.7%. The disparity between these numbers and the calculated NOEC is due to the unusual dose-response curve pattern. Also, the statistical tests for the dilutions that yielded lower weights (except for the 100% effluent) only exceeded the Dunnett critical value by a small margin and so were just barely significant.

MWRA acknowledges that this was technically a failure of the *Menidia* chronic toxicity test. However, because the relatively concentrated effluent sample “passed” and other data indicated that toxic contaminants were at low levels (Table 2), MWRA believes there was no environmental impact associated with this test failure. In addition, preliminary data from our contract laboratory indicate that the May, 2001 result for the *Menidia* chronic toxicity test was 50%, well above passing.

Table 2. Effluent Quality, January - April, 2001

	January	February	March	April*
<i>Menidia</i> Growth NOEC (% effluent)	50	25	100	<1.5
Flow (MGD)	339	417	727	698
% Secondary	94.7	77.2	51.4	69.3
Total Suspended Solids (mg/L)	16	25	34	17
Copper (ug/L)	11.2	17.5	17.6	10.3
Lead (ug/L)	2.97	4.35	4.63	<2.4
Mercury (ug/L)	0.017	0.07	0.058	0.034
Ammonia(mg/L)	16	16	10.9	9.6
Total PAHs (ug/L)	1.03	0.898**	1.544	0.431

* April data preliminary - data is average of 3 samples except 2 for PAHs.

** Detection limit 5X higher than January. Actual concentration probably 1.0 - 1.

Please let me know if any of MWRA's staff can give you additional assistance regarding this notification.

Sincerely,

Michael J. Hornbrook
Chief Operating Officer

Cc:

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