

Contingency Plan Quarterly Report on Ambient Monitoring Results Second Quarter 2017

MWRA gathers data near the outfall discharge location in Massachusetts Bay on various thresholds in the Contingency Plan related to its Deer Island Treatment Plant(DITP) NPDES discharge permit. This report shows ambient monitoring results for Contingency Plan thresholds that became available in April through June 2017. Previous Contingency Plan reports are available at:

<http://www.mwra.state.ma.us/harbor/html/contingency.htm>.

Results in this report include winter/spring (February through April) nuisance algae abundances, additional June tests for *Alexandrium*, winter/spring areal chlorophyll, and liver disease in flounder tested in April. There was one Contingency Plan threshold exceedance in this report — preliminary results from June *Alexandrium* samples triggered a Caution Level exceedance for this nuisance algae species.

NUISANCE ALGAE

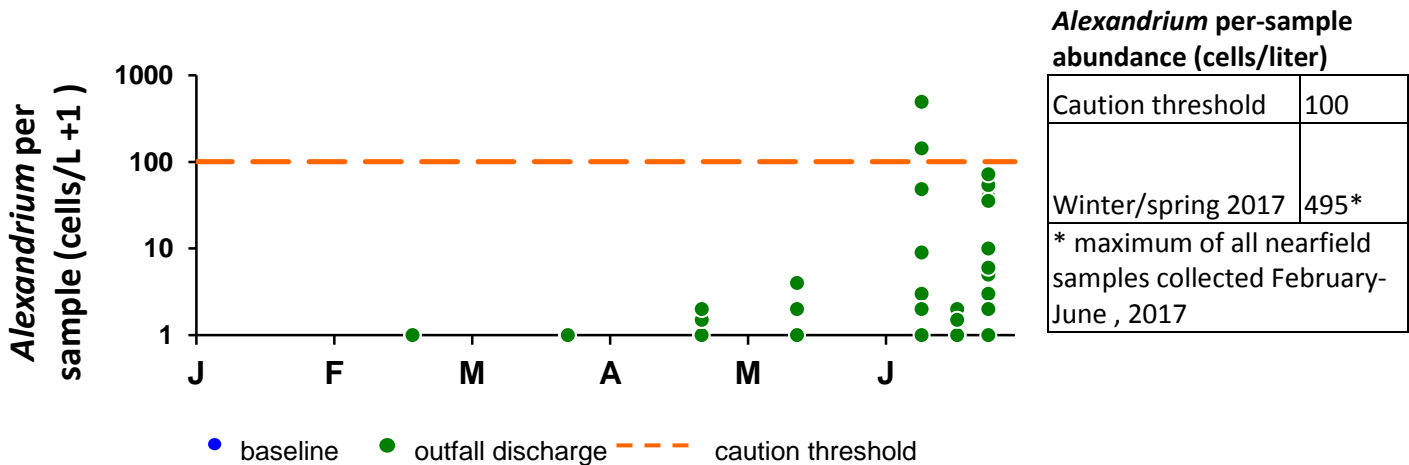
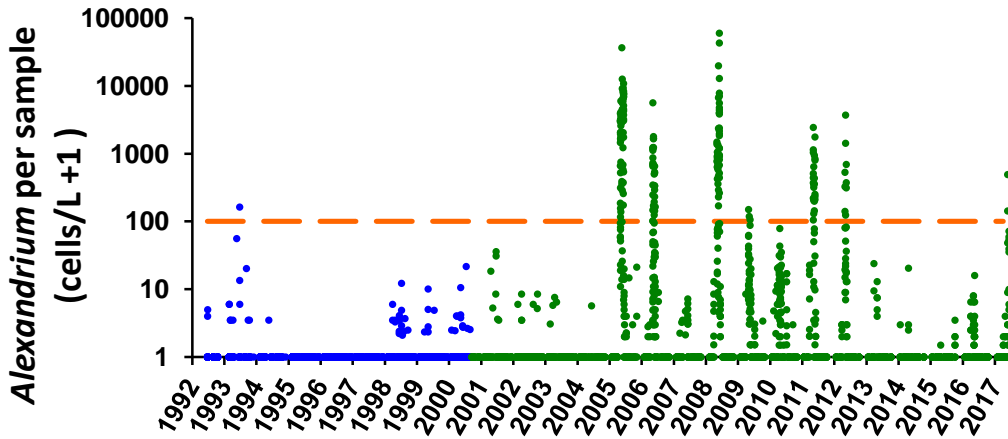
ALEXANDRIUM - Winter/Spring (February – April) 2017 and additional June special study

The [nuisance algae](#) *Alexandrium fundyense* (“*Alexandrium*”) can cause paralytic shellfish poisoning (PSP, “red tide”) in Massachusetts Bay. MWRA measures *Alexandrium* abundance in its monitoring program, and also checks state fisheries agency observations of shellfish PSP toxicity and other regional monitoring programs to keep track of the course of Gulf of Maine *Alexandrium* blooms.

There are no indications the 2017 exceedance is related to the DITP outfall discharge. The results available so far indicate that a portion of the coastal population of *Alexandrium* north of Cape Ann was transported into Massachusetts Bay by winds and currents, leading to the result observed. In 2017 there was an *Alexandrium* bloom along the coast of Maine, New Hampshire, and Massachusetts. Preliminary data from a routine MWRA survey on June 13 showed that the abundance of *Alexandrium* in the nearfield (within approximately three miles of the outfall) exceeded the Caution Level threshold of 100 cells/L, triggering notification under the Contingency Plan (see notice http://www.mwra.com/harbor/pdf/20170620_amx.pdf).

This finding also triggered special weekly surveys of *Alexandrium* on June 21 and 28. The special surveys will end when the measured *Alexandrium* abundance decreases below 100 cells/L (see *Alexandrium* Rapid Response Study Survey Plan <http://www.mwra.state.ma.us/harbor/enquad/pdf/2013-06.pdf>).

In the figures below, we compare nearfield *Alexandrium* data to the threshold for each sample through June 2017. All data from May onward have passed initial quality control (QC) checks but are considered preliminary until all QC procedures are complete. The first figure includes data since the start of the monitoring program in 1992. To better display recent values, the second figure shows data for 2017 only, including five routine surveys and two special surveys through the end of June. Note logarithmic scale for each graph.



Draft data from the June 13 survey show *Alexandrium* abundances in surface samples of 143 and 494 cells per liter (green dots above the dashed line in the bottom figure) at the eastern edge of the nearfield. A surface sample from a location near Scituate (not shown) had 107 *Alexandrium* cells per liter. All other *Alexandrium* surface samples, and all subsurface samples, had cell counts less than the *Alexandrium* Caution Level threshold of 100 cells per liter. Draft data from the special survey conducted the following week on June 21 show *Alexandrium* levels in the nearfield at or below 1 cell per liter, but results from locations south of Gloucester contained abundances of hundreds to thousands of cells per liter.

Draft data from the June 28 survey showed all nearfield results remained below the threshold. Counts at stations south of Cape Ann were lower than the previous week, but were as high as 800 at one site, so the special survey will continue into early July. On June 14, 19 and 26, Massachusetts Division of Marine Fisheries' monitoring reported non-detects for PSP toxicity at all Massachusetts Bay stations. Experimental Gulf of Maine

Alexandrium forecast simulations provided by the National Oceanographic and Atmospheric Administration (<https://products.coastalscience.noaa.gov/hab/gomforecast.aspx>) project *Alexandrium* cells moving offshore with few if any remaining in Massachusetts from June 20th onward. We anticipate that results from early July surveys will show that the *Alexandrium* bloom in Massachusetts Bay has subsided and the Contingency Plan threshold for *Alexandrium* is unlikely to be exceeded for the remainder of the year.

PSEUDO-NITZSCHIA - Winter/Spring (February – April) 2017

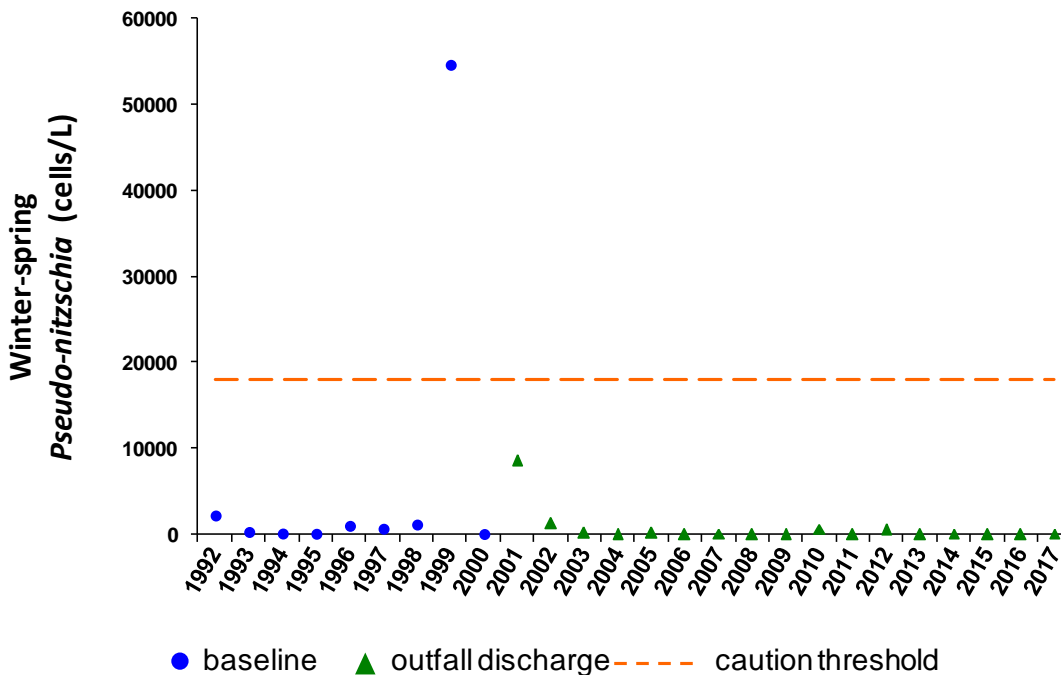
For *Pseudo-nitzschia* nuisance algae species, mean seasonal abundances are compared against threshold values derived from the 95th percentile of seasonal baseline means. This report compares spring 2017 seasonal means from surveys done in February, March, and April against threshold values.

Pseudo-nitzschia was observed at low abundances that were well below the Caution Level threshold of 17,900 cells per liter during winter/spring 2017.

In the figure below, we compare *Pseudo-nitzschia* data to the nuisance algae thresholds for the winter/spring seasonal Caution Level threshold. The graph includes data since the start of the monitoring program in 1992. The baseline seasonal mean values for 1992-2010 have been recalculated to reflect monitoring design changes made in 2011, to better allow comparisons between historical and recent results.

winter/spring <i>Pseudo-nitzschia</i> mean abundance (cells/liter)	
Caution threshold	17,900
2017 seasonal mean	68

***Pseudo-nitzschia* – winter/spring 2017**

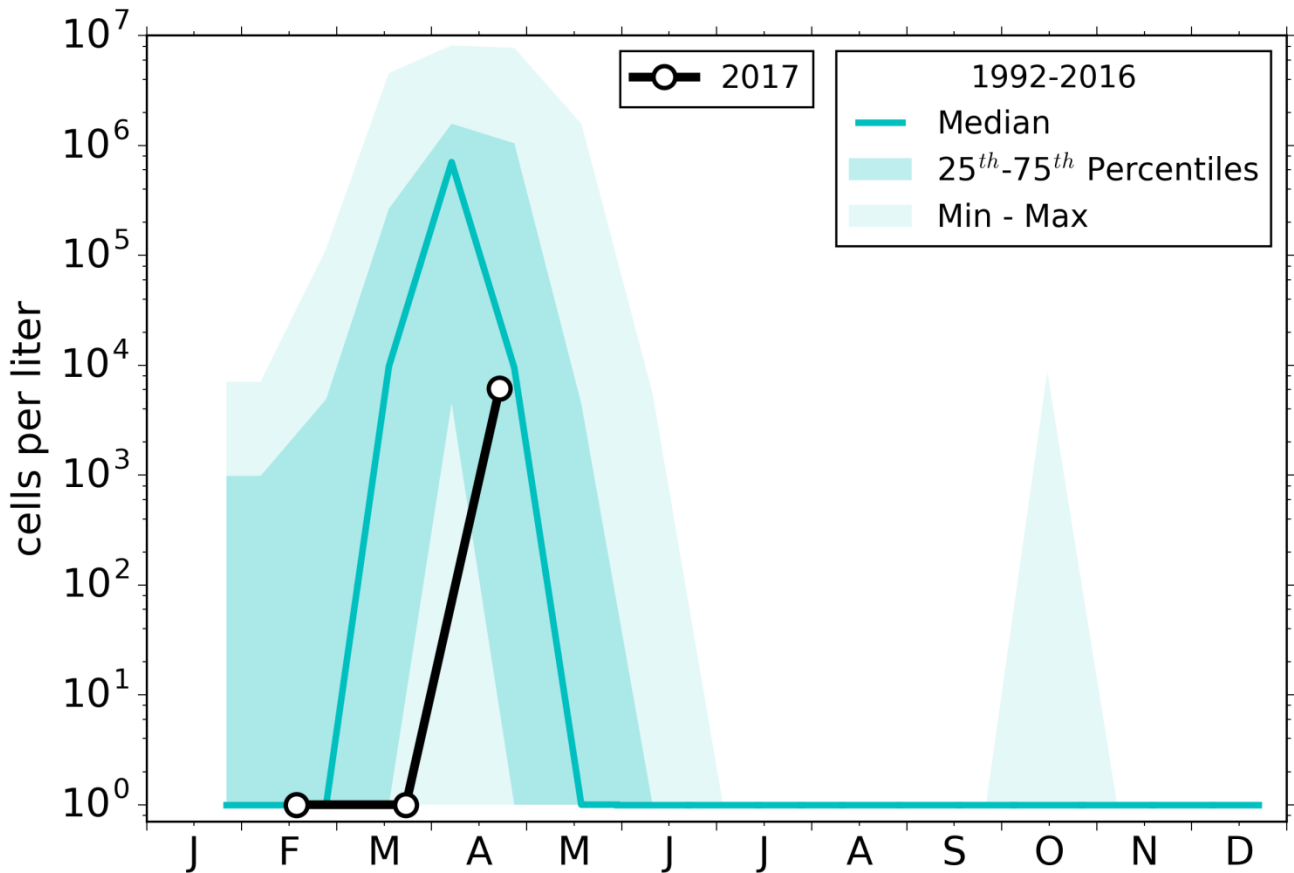


PHAEOCYSTIS- Winter/Spring (February – April) 2017

In February 2017, EPA approved changes in the Contingency Plan to remove the threshold for the seasonal abundance of the nuisance alga *Phaeocystis pouchetii* in the nearfield water column. During bloom conditions, *Phaeocystis* can form large, gelatinous colonies, which may accumulate as foam as they disintegrate on beaches. Evaluations of prior threshold exceedances for this species have indicated that they resulted from natural fluctuations in Massachusetts Bay, do not represent degradation, did not result from MWRA’s discharge, and have not occurred in concentrations that would pose problems for recreation. MWRA agreed to continue to report each quarter on nearfield survey mean abundances of *Phaeocystis pouchetii* compared to its historical seasonal pattern.

The figure below shows the 2017 survey mean *Phaeocystis* results against the seasonal background for all prior years since 1992. Due to reductions in the number of surveys conducted each year, the historical seasonal pattern encompasses more time-points than shown for the current year.

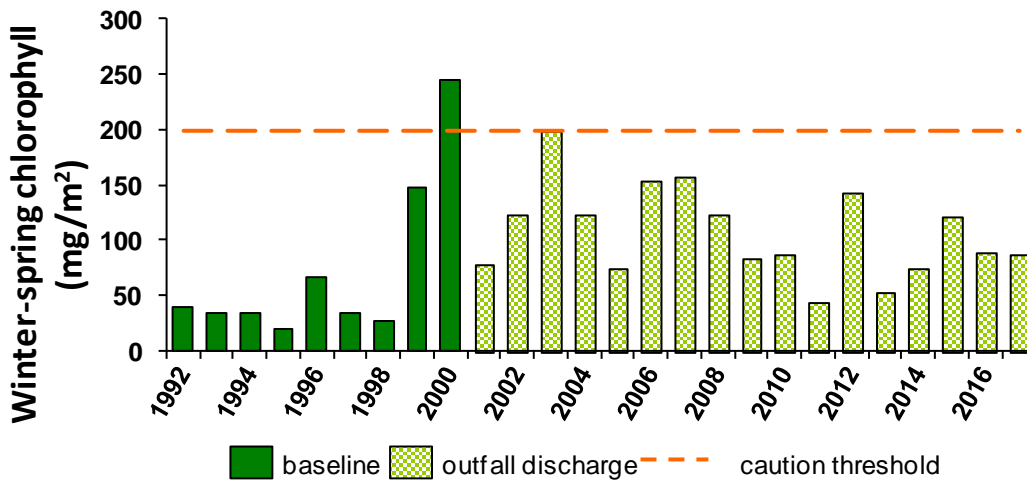
Both the timing and magnitude of survey mean *Phaeocystis* abundance for February through April 2017 was within range of the historical seasonal pattern. All *Phaeocystis* observed during these surveys were present in non-colonial form.



CHLOROPHYLL - Winter/Spring (February – April) 2017

There were no [chlorophyll threshold](#) exceedances for winter/spring 2017. The nearfield mean areal average chlorophyll in winter/spring 2017 was 88 mg/m², well below the Caution Level threshold for winter/spring of 199 mg/m² and in the range of other years in the baseline (pre-discharge) period.

The figure below compares chlorophyll data for winter/spring 2017 (February through April), which included three surveys. The graph includes data since the start of the monitoring program in 1992. The baseline seasonal mean values for 1992-2010 have been recalculated to reflect monitoring design changes made in 2011, to better allow comparisons between historical and recent results.



FLOUNDER LIVER DISEASE - April 2017

The prevalence of early liver disease at the outfall site in 2017 was 8%, near the low end of the range of post-diversion observations, and did not exceed the Caution Level threshold percent occurrence of 45%. Flounder are sampled annually in April.

The prevalence of centro-tubular hydropic vacuolation, a condition considered a precursor to liver tumors caused by exposure to contaminants in winter flounder, is a useful measure of the effects of pollution. The flounder liver disease Caution Level threshold value (dashed line) is based on data from Boston Harbor during the baseline (pre-discharge) monitoring period (1991-2000). The baseline was calculated in this way to reflect the expectation that flounder caught in Massachusetts Bay after outfall discharge began would not approach levels of CHV seen in Boston Harbor during baseline monitoring. The bars in green show disease prevalence for flounder collected at the site of the Massachusetts Bay outfall during baseline and discharge time periods. Since Massachusetts Bay monitoring began, prevalence of early-stage liver disease near the Massachusetts Bay outfall has been much lower than the threshold, and generally lower than was observed in Massachusetts Bay flounder during the baseline.

