

## **Contingency Plan Report**

Third Quarter 2015

### **Ambient Monitoring**

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MWRA gathers data near the discharge outfall location in Massachusetts Bay on various thresholds in the Contingency Plan related to its Deer Island outfall NPDES discharge permit. **This report shows** ambient monitoring **results** relevant to Contingency Plan thresholds **that became available in the July - September 2015 time period**. There were no Contingency Plan threshold exceedances in the results available in this time period. Previous Contingency Plan reports are at: <http://www.mwra.state.ma.us/harbor/html/contingency.htm>.

#### **NUISANCE ALGAE – May - June 2015**

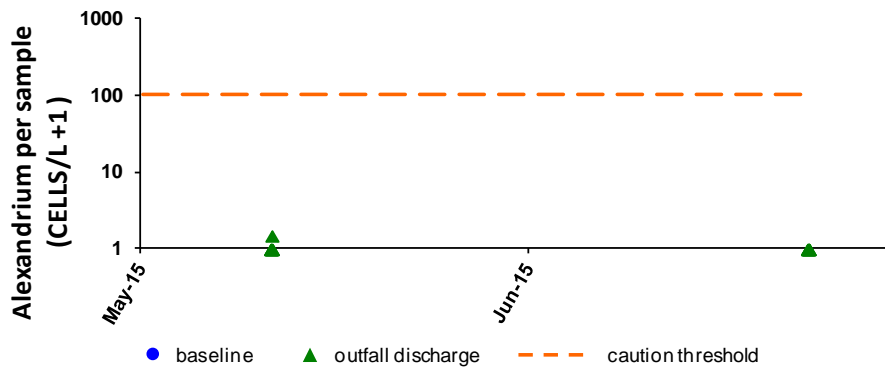
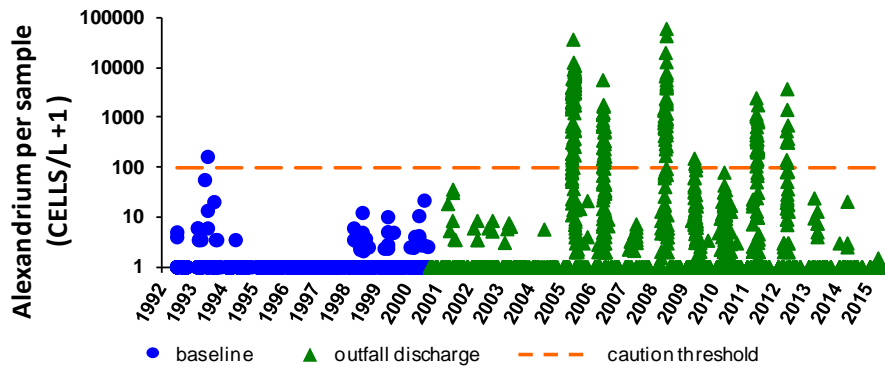
There were no exceedances of [nuisance algae thresholds](#) in the period covered by this report.

#### **ALEXANDRIUM**

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

So far in 2015, *Alexandrium* has been almost entirely absent from Massachusetts Bay. Final data have been received for MWRA water column monitoring surveys in May and June, and preliminary results have been reported for surveys in July, August, and September. In the May-June time period when *Alexandrium* has historically bloomed in Massachusetts Bay, final and preliminary data show that levels remained very low and well below the caution threshold of 100 cells per liter.

For May, *Alexandrium* was observed in 3 of the 20 samples at a very low abundance of 1 cell/L or lower. These cells were present in samples from three stations spread between the mouth of Boston Harbor, the DITP outfall, and northern Massachusetts Bay. In June *Alexandrium* was observed in only 1 of 20 samples in a near-surface sample collected in July from Boston Harbor an abundance of 1.5 cells/L. Preliminary data from July, August, and September show only a single near-surface sample collected at mid-depth near Cohasset in July with *Alexandrium* at an abundance of 1 cell/L. The remaining samples from July through September had no *Alexandrium* present. The figure below shows *Alexandrium* in the nearfield since 1992. The bottom figure shows the same data but includes only final results for the dates covered by this report and does not include preliminary data from July through September. Note logarithmic scale for graphs.



**May- June 2015 results for Alexandrium per-sample abundance (cells/liter)**

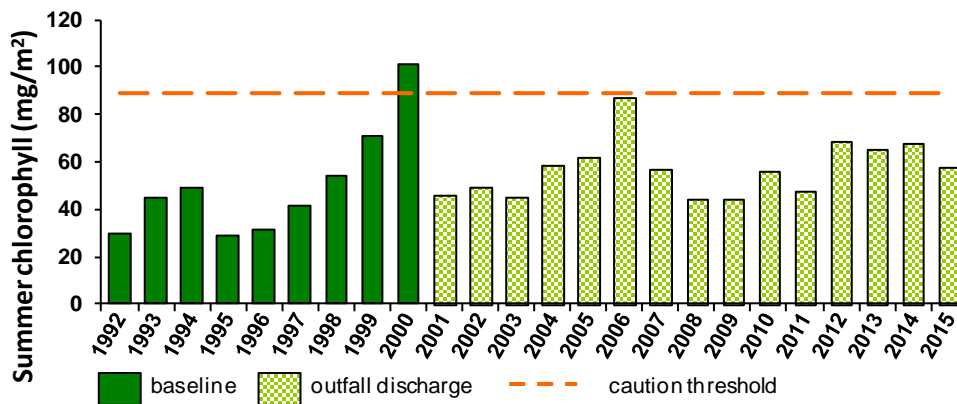
Caution threshold	100
Summer 2015	1.5*
* maximum of DNA-probe samples collected between May 2015 and June 2015.	

## CHLOROPHYLL May - August 2015

There were no chlorophyll threshold exceedances in this period. The nearfield mean areal average chlorophyll in summer 2015 (May through August) was 57.7 mg/m<sup>2</sup>, below the caution level threshold for summer of 89 mg/m<sup>2</sup>. The summer 2015 value is close to the median of post-diversion years, neither higher nor lower than usual.

The figure compares chlorophyll data for summer 2015 (May through August), which included four surveys, to the corresponding threshold. The graph includes data since the start of the monitoring program in 1992; however, the seasonal average values for 1992-2010 are calculated using a subset of all results reflecting the modified design that began in 2011, *i.e.* four summer surveys. This enables us to better compare the threshold results across years.

### Summer

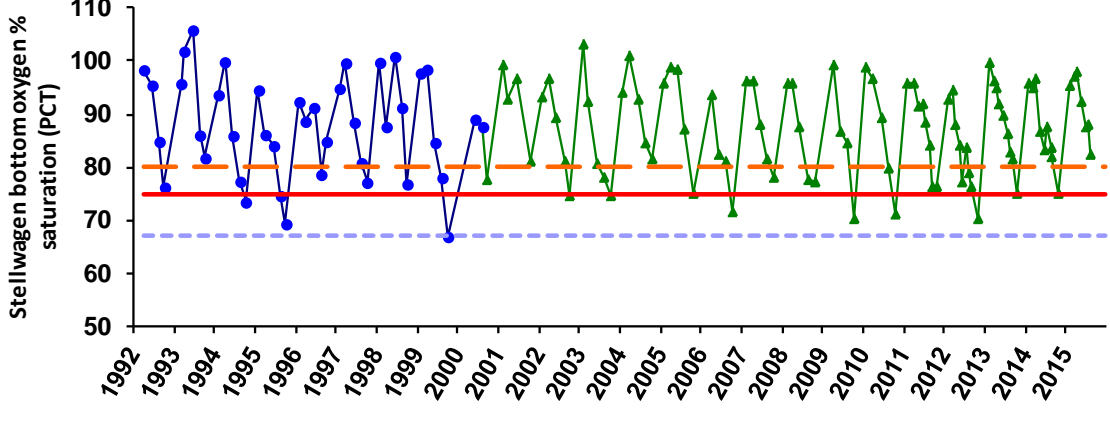
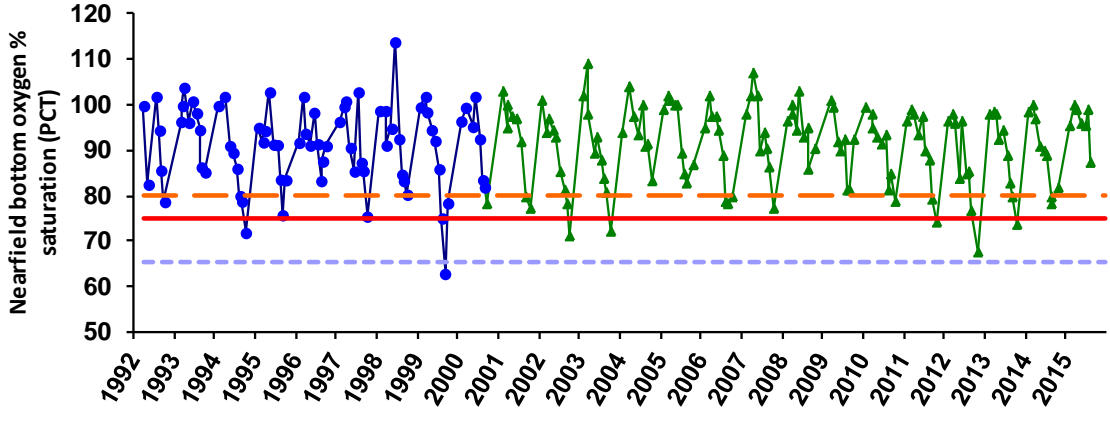
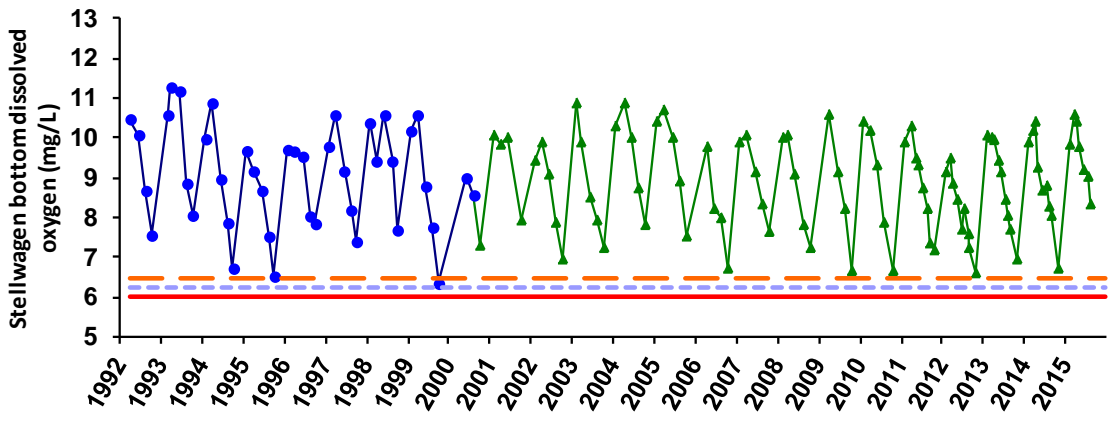
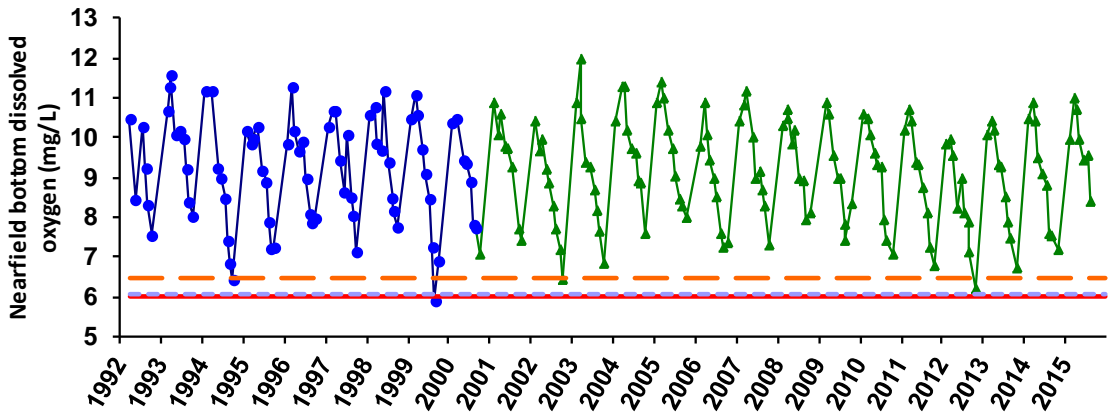


## DISSOLVED OXYGEN – July - September 2015

Measurements of dissolved oxygen (DO) concentration in July-September 2015 did not fall below background levels and thus did not exceed thresholds.

The current reporting period for [dissolved oxygen thresholds](#) is July-September 2015. During this period there were three surveys. Oxygen levels were similar to those seen in most baseline years. The graphs below show the natural annual fluctuation of DO and percent saturation, which is typically lowest in early autumn. The 1992-2010 data are from the reduced set of sampling stations included in the modified study design that began in 2011, *i.e.* nine surveys per year, and one station rather than four in Stellwagen Basin. This enables us to better compare the threshold results across years.

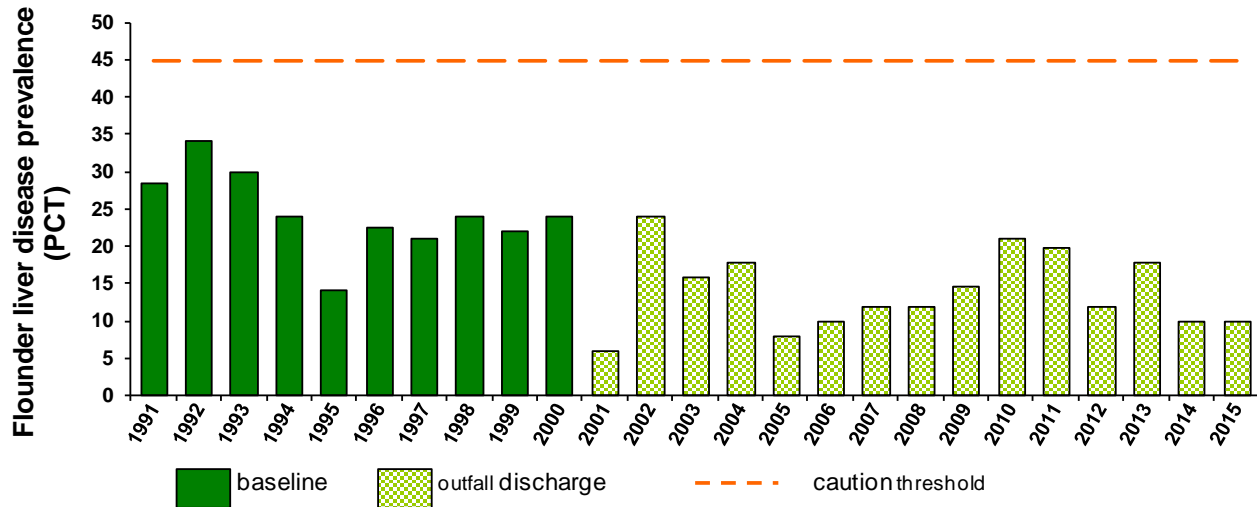
Nearfield oxygen levels in September 2015 were similar to those seen in several baseline years.



### FLOUNDER LIVER DISEASE - 2015

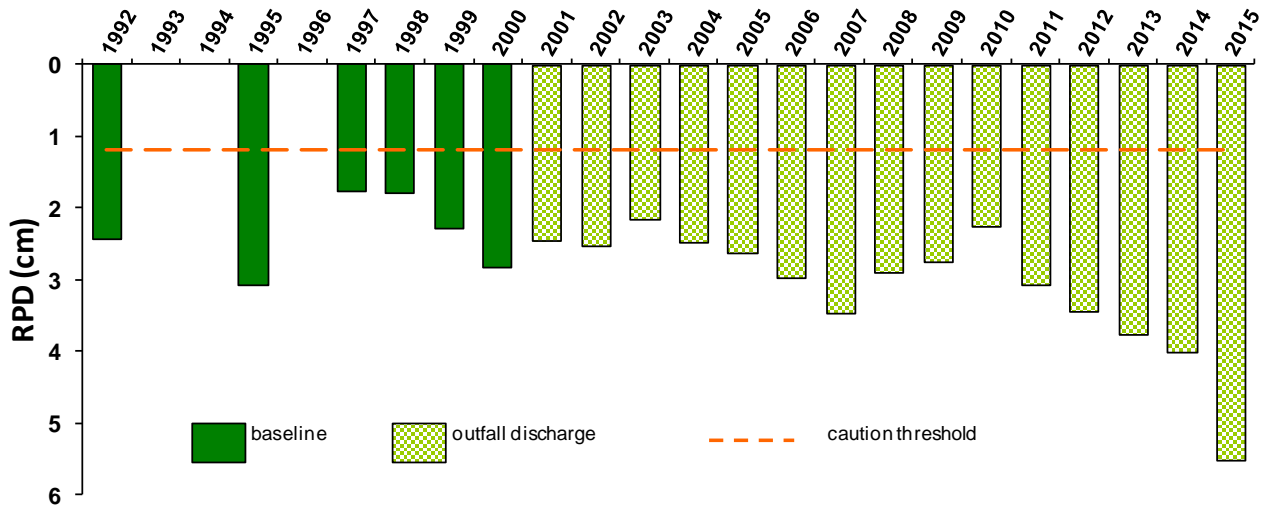
The prevalence of liver disease at the outfall site in 2015 was 10% (the same as the previous year), which is lower than any of the baseline years, and did not exceed the threshold. Flounder are sampled annually in April. This year, sampling extended into the first week of May to acquire enough fish at Deer Island Flats.

The prevalence of centrotubular 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 threshold value (dashed line) is based on data from Boston Harbor during the baseline monitoring period (1991-2000). In the harbor, flounder liver disease rates were historically quite high but dropped considerably during the late 1990s. Since Massachusetts Bay monitoring began, prevalence of early-stage liver disease near the new outfall has been much lower than the threshold.



## SEDIMENT ENRICHMENT - 2015

The 2015 annual sediment monitoring showed that the redox potential discontinuity (RPD) depth was the deepest yet observed at the outfall site and did not exceed the threshold (did not fall below the minimum RPD threshold; see explanation below).



The depth of the oxygenated layer in marine sediment is a measure of ecosystem health. A diverse bottom-dwelling community includes organisms that mix water and oxygen down into the sediment. In an over-enriched environment, organic material deposited on the sediment surface can use up the available oxygen and smother the bottom-dwelling community. Such areas, including some areas of Boston Harbor, have a thin or nonexistent oxygenated layer. The thickness of the oxygenated layer is called the redox potential discontinuity (RPD) depth. In MWRA's monitoring program, the RPD depth is estimated from sediment-profile images, cross-sections of the upper several centimeters of the sediment taken with a special mud-penetrating prism and camera. The threshold for RPD is half the mean measured in the baseline period (that is, if the thickness of the oxygenated layer fell to less than half the thickness measured pre-discharge, a caution threshold would be exceeded.). Sediment profile imaging for MWRA monitoring is done in August.