Summary of Marine Mammal Observations during 2015 Surveys

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SUMMARY OF MARINE MAMMAL OBSERVATIONS DURING 2015 SURVEYS

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1.0 Introduction

At least five endangered species of whales are known to visit or inhabit the Massachusetts and Cape Cod Bay area (Environmental Protection Agency [EPA] 1993): the right whale, humpback whale, finback whale, and the rarely observed sei and blue whales. Several non-endangered marine mammal species are also found: minke whales, pilot whales, harbor porpoises, Atlantic white-sided dolphins, white beaked dolphins, hooded seals, harp seals, gray seals, and harbor seals.

Since 1995, Massachusetts Water Resources Authority (MWRA) has included marine mammal observers on monitoring surveys. The MWRA surveys are conducted as part of the long-term Harbor and Outfall Monitoring Project, designed to verify compliance with the Deer Island Treatment Plant discharge permit and to assess the potential environmental impact of treated sewage effluent discharge into Massachusetts Bay. The observers were included in response to a National Marine Fisheries Service (NMFS) request that MWRA provide observational data and set a positive example by using observers to minimize the chances of collision with a right whale. In addition to looking for right whales, observers note other marine mammals. On surveys where observers are not present, the chief scientist and field crew document any incidental sightings of marine mammals.

Marine mammal observers were present on all effluent outfall water quality surveys in Massachusetts Bay during 2015. Observers were not present on Alexandrium Rapid Response Study (ARRS), benthic and flounder surveys, Boston Harbor surveys or bacteria surveys for shellfish water quality monitoring.

2.0 Background

A brief description of when marine mammals are expected to be sighted in Massachusetts and Cape Cod Bays follows.

The North Atlantic right whale (*Eubalaena glacialis*) is critically endangered. Based on historical sightings, right whales can be expected to visit Massachusetts and Cape Cod Bays throughout the year (Brown *et al.* 2002), with peak abundance in February, March and early April (Hamilton and Mayo 1990). Approximately 70% of the catalogued population of right whales have been reported to visit Cape Cod Bay and Massachusetts Bay (Brown *et al.* 2002), and NMFS has designated the Bays as one of seven "areas of high use" for right whales (NMFS 2015a). The use of the eastern portion of Stellwagen Bank/Wildcat Knoll by right whales has been noted during extended surveys by the Provincetown Center for Coastal Studies (PCCS) (Brown *et al.* 2002). The total population of the Western Atlantic Stock in the Atlantic Ocean in 2015 was estimated to be about 476 individuals (NMFS 2015b).

The humpback whale (*Megaptera novaeangliae*) is an endangered species of whale known to feed within the Gulf of Maine in the spring, summer and fall (Waring *et al.* 1999). In the winter, some, but not all, humpbacks from Gulf of Maine will migrate to mating and calving grounds in the West Indies (NMFS 2015a). Historic records indicate that humpbacks have been documented on Stellwagen Bank from April through December (CeTap 1982; Geraci *et al*. 1989; NMFS 1991). However, distribution appears to correlate with prey densities (Waring *et al.* 1999). The number of humpback whales that visit Stellwagen area varies periodically and are most likely based on the availability of sand lance as prey (Payne *et al.* 1986; Payne *et al.* 1990; Weinrich *et al.* 1997). The total population of the Gulf of Maine stock in the western Atlantic in 2015 was estimated to be about 823 individuals (NMFS 2015b).

The finback (or fin) whale (*Balaenoptera physalus*) is considered to be an endangered species and is the most abundant and frequently sighted of the endangered whales that visit Massachusetts and Cape Cod Bays (EPA 1993). Finbacks are sighted year round in the Stellwagen Bank area with a peak abundance occurring between the spring and fall (Pett and McKay 1990). Finbacks do also migrate, potentially from

the North Atlantic to the West Indies, but migratory routes are unknown. As of 2015, the number of individuals for the western North Atlantic population is estimated at 1618 whales with a minimum population estimate of 1,234 individuals (NMFS 2015b).

The sei whale (*Balaenoptera borealis*) and blue whale (*Balaenoptera musculus*) are both endangered species (EPA 1993). The sei whale is uncommon but is regularly sighted (Schilling *et al.*1992), while the blue whale is rarely sighted in Massachusetts and Cape Cod Bays (EPA 1993). For blue whales, Massachusetts and Cape Cod Bays may represent the southern limit of their feeding area (NMFS 2015a). Both blue and sei whales typically remain in deeper water (more than 100 meters) and further offshore (CeTap 1982). However, sightings of these species in coastal areas may correspond to changes in prey distribution (Payne *et al.* 1990, Wenzel *et al.* 1988). In general, though, the large-scale distribution and movement patterns of sei whales are not well known. A 2015 survey of the Nova Scotia stock (formerly named the Western North Atlantic stock) of sei whale estimates the population consists of about 357 individuals (NMFS 2015b). As of 2015, the minimum population estimate for the western North Atlantic blue whale is 440 (NMFS 2015b).

The minke whale (*Balaenoptera acutorostrata*) is a non-endangered species typically seen in the Stellwagen Bank area during the spring, summer and fall (CeTap 1982; Pett and McKay 1990). During the winter, minke whale sightings in New England appear to decline dramatically (Waring *et al.* 1999). For management purposes, New England minke whales are known as the Canadian East Coast Stock, with an estimated 20,741 individuals and a minimum population estimate of about 16,199 in 2015 (NMFS 2015b).

The Atlantic white-sided dolphin (*Lagenorhynchus acutus*) is a species of dolphin found from central west Greenland to North Carolina (Waring *et al.* 1999). The Western North Atlantic stock of Atlantic white-sided dolphins is classified as strategic by the National Marine Fisheries Service (Waring *et al.* 1999). Sightings of these dolphins in the Stellwagen Bank and Cape Cod Bay areas are common in the spring, summer (Weinrich *et al.* 2001), and, to a lesser extent, in the fall (Pett and McKay 1990). In 2015 the western Atlantic stock was estimated at about 48,819 individuals and a minimum population estimate of about 30,403 (NMFS 2015b).

The Atlantic pilot whale or long-finned pilot whale (*Globicephala melas)* is the largest species of dolphin Delphinidae family found in cool temperate waters off Labrador, Newfoundland, and in the St. Lawrence River with sporadic sightings as far south as Maryland and Virginia (Bulloch 1993). Pilot whales form schools of a few to many hundreds of individuals and are mainly found relatively close to shore. The distribution and abundance of pilot whale appear to be linked to sea floor topography and the abundance of squid, their primary food source (Harrison and Bryden 1989). The 2015 population estimate of the long-finned pilot whale in the Western North Atlantic stock stands at around 5,636 individuals (NMFS 2015b).

The gray seal (*Halichoerus grypus*) is a non-endangered species of pinniped found from Maine to Long Island Sound (Rough 1995). A small, year round breeding population is known to occur on outer Cape Cod and Nantucket Island (Waring *et al.* 1999). The majority of gray seal sightings in Cape Cod Bay and the Stellwagen Bank area occur during the winter and spring, although periodic sightings have been recorded in the summer (PCCS unpublished data). The estimates of the Western North Atlantic stock population is not available as indicated in 2015 Marine Mammal Stock Assessment Reports (SARs). Most recent surveys indicate that population of the species is likely increasing after a long period of decline, due to hunting for both subsistence and fur (NMFS 2015b).

Harbor porpoises (*Phocoena phocoena*) of the Gulf of Maine/Bay of Fundy stock are classified as strategic by the National Marine Fisheries Service (Waring *et al.* 1999). Historic data indicate that harbor

porpoises can be found in the Stellwagen Bank area and Cape Cod Bay from December through June (Pett and McKay 1990). The most recent survey of the Gulf of Maine/Bay of Fundy stock estimated a population of about 79,833 individuals with a minimum population estimate of about 61,415 individuals. No population trend analysis has been performed (NMFS 2015b).

The harbor seal (*Phoca vitulina*) is a non-endangered species of pinniped commonly found in the near shore waters around New England (Katona *et al.* 1993). Harbor seals are most frequently seen in the Stellwagen Bank and Cape Cod Bay areas in the winter and early spring with sightings beginning in late September (Pett and McKay 1990). The Western North Atlantic stock was estimated to have a population of about 75,834 with a minimum estimate of about 66,884 individuals according to the most recent survey conducted in 2012. No population trend analysis has been performed, but compared to the last survey conducted in 2001, the corrected population estimate was 29.3% lower with a possible reason being the population is no longer growing and is declining (NMFS2015b).

3.0 Methods

Figure 1 shows MWRA effluent outfall ambient monitoring water column sampling stations. The year 2015 was the fifth year since the second revision of the ambient monitoring plan design was implemented (MWRA 2010). The revised design focuses more on stations likely to be impacted by the outfall; there are fewer distant reference stations. There are 14 total outfall monitoring stations (reduced from 33 in the older monitoring plan [MWRA 2004]).

With the advent of the current monitoring plan, the number of annual surveys changed from 12 nearfield surveys, 6 of which included farfield sampling, to 9 surveys of all 14 stations. These changes mean that the surveys are completed in a single day while previously multiple days were needed to accomplish the farfield surveys. Thus, there is less time, and fewer distinct opportunities, to observe marine mammals than under the previous monitoring plan. In addition, except for the *Alexandrium* Rapid Response Study surveys (a red-tide algae that causes paralytic shellfish poisoning [PSP]) and flounder and lobster monitoring projects, MWRA's marine mammal observations no longer include the areas where whales are most frequently found (Stellwagen Bank National Marine Sanctuary and Cape Cod Bay).

Marine mammal observations were performed during all daylight hours while transiting between stations during water column surveys, and while the vessel was on-station for sampling operations. During vessel transits, the observer continuously scanned the sea surface from directly ahead to 90 degrees abeam on either side of the vessel. Initial sightings were made by eye with confirmation and identification aided by binoculars. While on-station, the observer scanned 360 degrees around the vessel. The observer was typically positioned at the highest secure vantage point of the survey vessel. Weather conditions, safety of the observer, and limiting interference with the operation of the vessel and sampling team were all factors that influenced the position of the observer on board the vessel.

Multiple survey vessels can be used as observation platforms during the course of the year. The observer's eye-height above the sea surface has ranged from approximately 2.5m to 4 m in recent years. Observations were conducted 40 minutes out of every hour and were suspended when visibility was reduced to zero or when darkness occurred.

For some surveys, dedicated marine mammal observers were not present. The scientific crew on board the R/V *Merganser,* R/V *Nasty Habits, and* R/V *Tioga* observed marine mammals while on these surveys. These vessels were used to conduct MWRA Boston Harbor water quality surveys, Boston Harbor and nearfield benthic surveys, and *Alexandrium* Rapid Response Study surveys (Figures 2 and 3). Similar to previous years, data from those surveys are included in this report.

Vessel track, station sequence, and number of stations varied among cruises, due to the constraints of weather, specific survey requirements, or both.

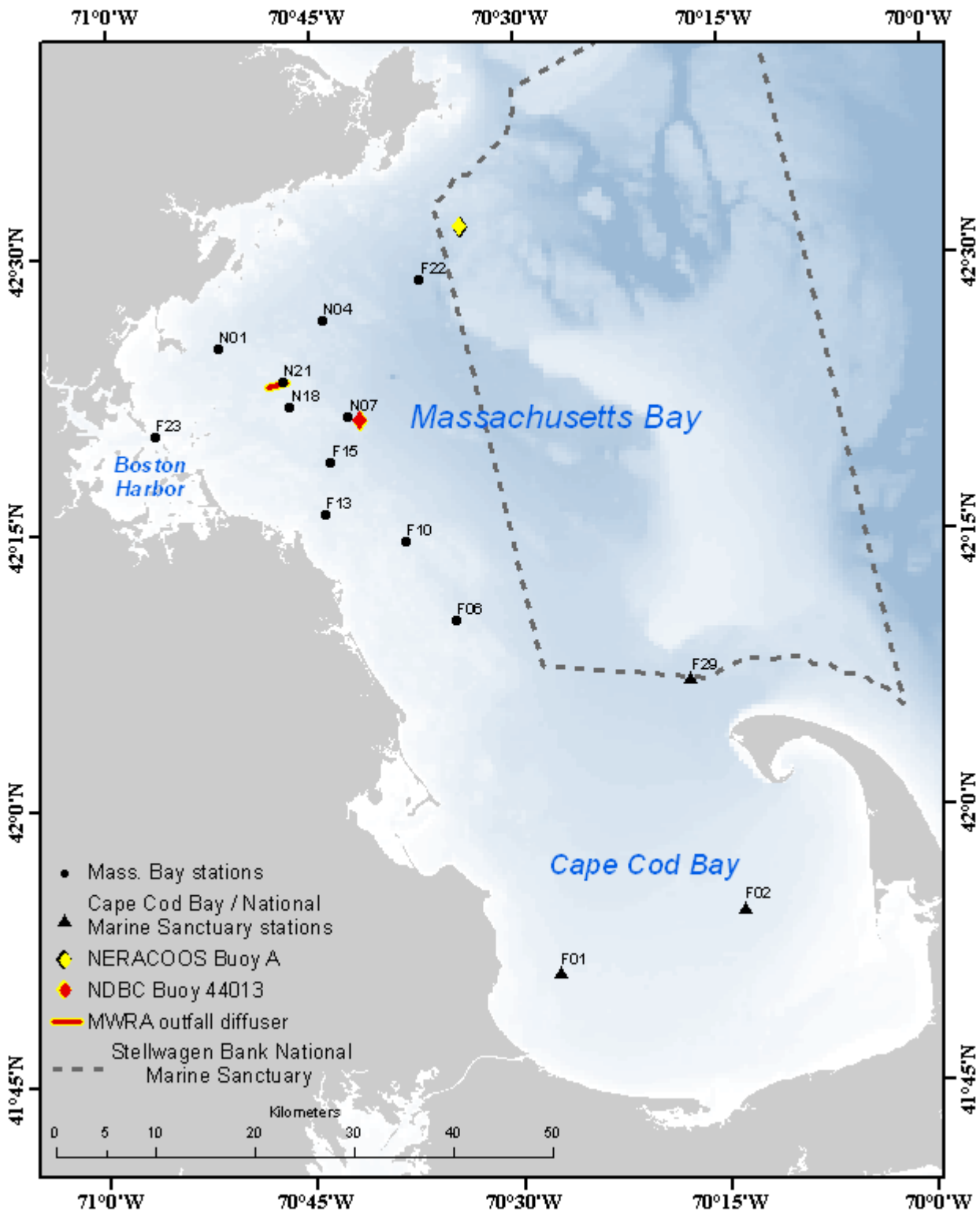

Figure 1. MWRA effluent outfall water column monitoring stations.

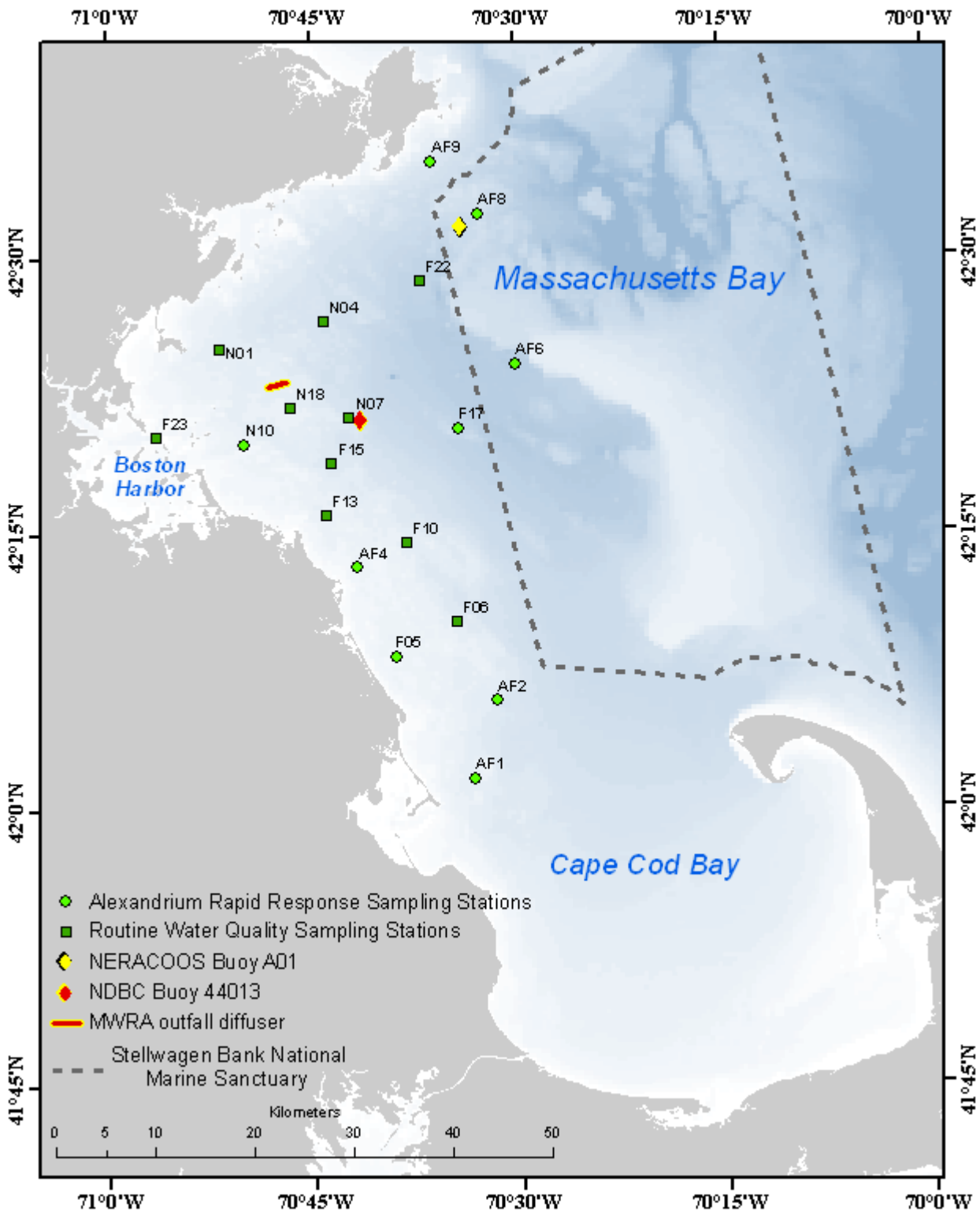

Figure 2. MWRA Alexandrium study monitoring stations

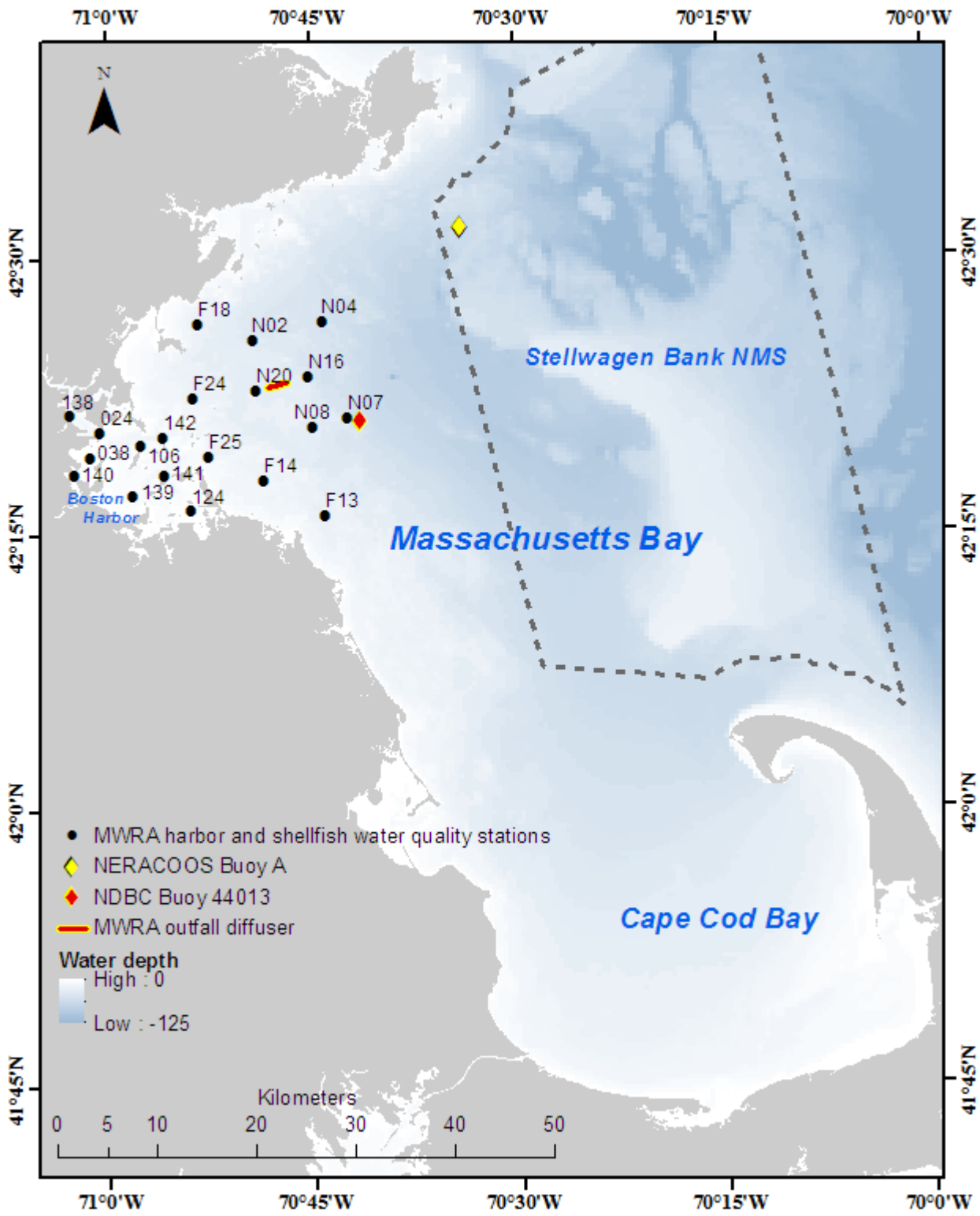

Figure 3. . MWRA Boston Harbor and shellfish-growing water quality monitoring stations

4.0 Results

Observation of marine mammals during surveys designed and operated for the collection of water quality data places limitations and constraints on the method of observation and on the conclusions that may be drawn from the data. Standard line transect methodology is not possible on such surveys, and different vessels (which vary the characteristics of the survey platform) were used during the year. Therefore, it is not appropriate to use these opportunistic sightings to estimate animal abundance. The data provide useful qualitative information concerning seasonal patterns and relative abundance within the same study area.

During the 2015 monitoring year, there were nine effluent outfall ambient monitoring surveys (WN), one flounder survey, five benthic surveys, twenty-four Boston Harbor water quality surveys, and eleven Massachusetts Bay shellfish water quality monitoring surveys. Observers were present on the nine effluent outfall ambient monitoring surveys. Survey team members counted twenty-one harbor seals and one harbor porpoise. No whales were sighted during 2015 surveys. Tables 1 and 2 summarize the locations and dates of all MWRA's sightings of marine mammals and non-mammals in 2015. The locations and numbers of marine mammals sighted during 2015 surveys are shown in Figure 4.

Table 1. Marine mammals and non-mammals sighted during year 2015 effluent outfall ambient monitoring surveys (No *Alexandrium* surveys were conducted in 2015)

Survey ID	Date/Time	Number	Species Common Name	Location	Sighting Comments	Observer Present
WN152 R/V Tioga	3/20/2015 7:50	1	Harbor seal	42.3013333, -70.923	While in transit from Hull to F13	Yes
	3/20/2015 6:50	1	Harbor seal	42.3026667, -70.92	While the boat was at the dock	Yes
	3/20/2015 14:30	2	Harbor seal	42.3391667, -70.9413333	While at station F23	Yes
	3/20/2015 14:50	2	Harbor seal	42.3148333, -70.9283333	While in transit from F23 to Hull	Yes
WN153 R/V Tioga	4/13/2015 12:35	2	Harbor seal	42.335167, -70.922667	On rocks 0.5 miles, east side of Little Calf Island	Yes
WN154 R/V Tioga	5/11/2015 6:55	1	Basking shark	42.2678333, -70.7336667	0.25 miles from F13	Yes
	5/11/2015 7:15	3	Basking shark	42.253, -70.7308333	0.10 miles, under way	Yes
WN157 R/V Tioga	8/18/2015 6:20	2	Harbor seal	42.3098333, -70.9003333	0.25 miles, under way on Toddy Rocks	Yes
WN159 R/V Tioga	10/21/2015 14:35	1	Harbor seal	42.292, -70.926167	0.10 miles, under way	Yes

Table 2. Marine mammals sighted during year 2015 Boston Harbor and Massachusetts Bay shellfish water quality monitoring surveys

Survey ID	Date/Time	Number	Marine Mammal	Location	Sighting Comments	Observer Present
WQM2015 R/V Merganser	1/21/2015 11:04	1	Harbor seal	42.339167, -70.9315	Near 142	No
PC152 R/V Merganser	2/4/2015 8:07	1	Harbor seal	42.34368, -70.96257	Off Deer Island	No
PC153 R/V Merganser	3/10/2015 9:24	1	Harbor seal	42.27056, -70.7323	Near F13	No
PC153 R/V Merganser	3/10/2015 9:40	1	Harbor porpoise	42.33065, -70.70675	Between F13 and N07	No
WQM2015 R/V Merganser	3/11/2015 9:02	1	Harbor seal	42.29033, -70.92196	SE of Peddock"s Island	No
CSO2015 R/V Merganser	3/27/2015 9:20	1	Harbor seal	42.384804, -71.047393	Below Tobin Bridge	No
WQM2015 R/V Merganser	4/2/2015 11:27	1	Harbor seal	42.383, -71.045167	Near 015	No
PC154 R/V Merganser	4/6/2015 8:59	1	Harbor seal	42.28601, -70.7258	Near F13	No
CSO2015 R/V Merganser	4/7/2015 8:36	1	Harbor seal	42.2959, -70.98525	SE of Moon Island	No
CSO2015 R/V Merganser	4/23/2015 11:00	1	Harbor seal	42.3587721, -71.04618	Near 019	No
WQM2015 R/V Merganser	5/7/2015 11:30	1	Harbor seal	42.34187, -70.99641	Near Logan Airport	No

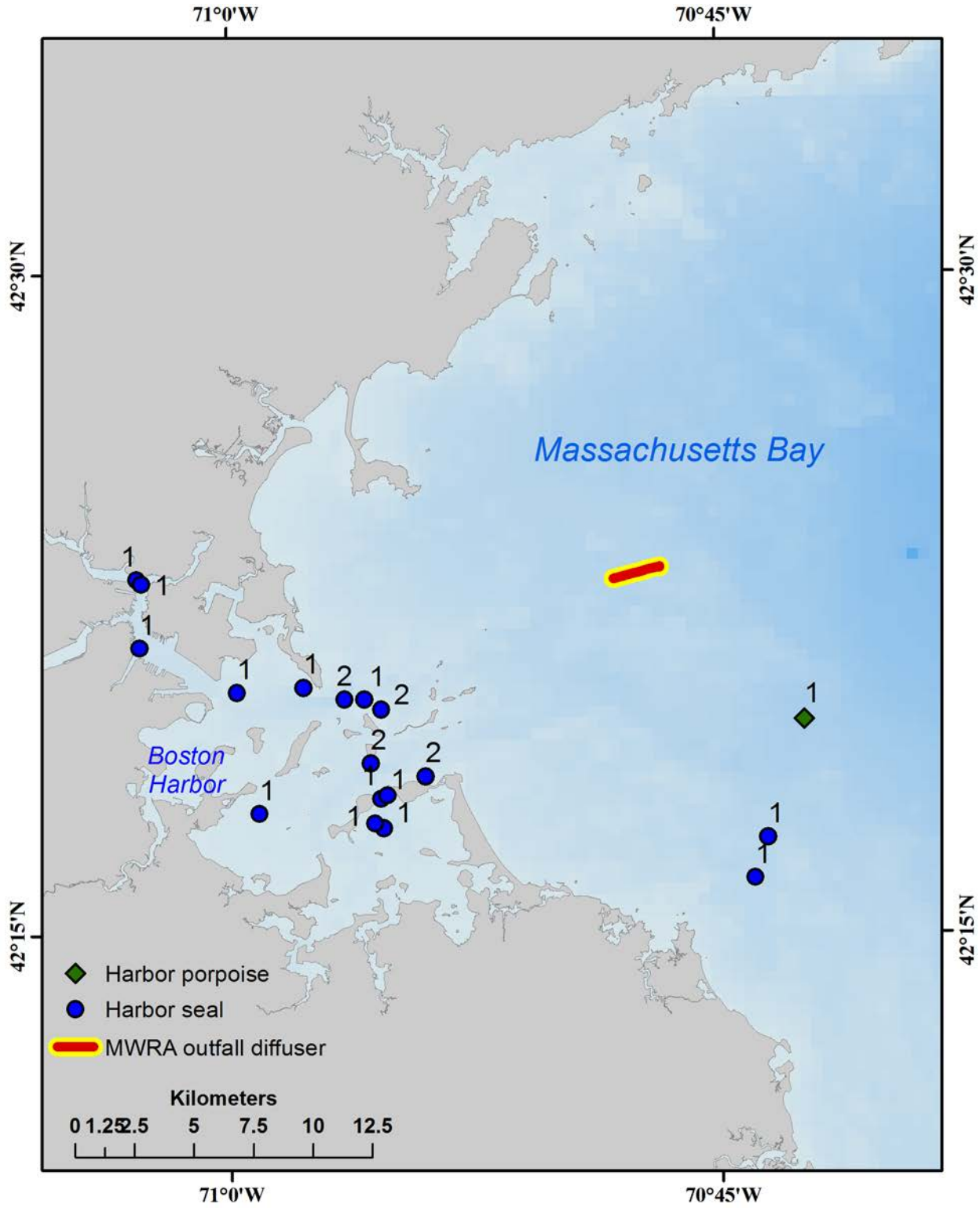

Figure 4. Locations and numbers of marine mammals sighted during 2015 surveys

Note: The data displayed in this figure come from Tables 1 and 2 of this report.

5.0 Discussion

Unlike statistically-based programs or programs that are specifically designed to search for whales, the MWRA sightings are opportunistic and do not follow dedicated and systematic line transect methodology. Therefore, observations are descriptive and not a statistically robust population census. As noted above, the hours spent on the water have been substantially reduced since 2011 compared to previous years, and the prime whale habitats of Stellwagen Bank and Cape Cod Bay are no longer included in MWRA's marine mammal observations.

MWRA's pre-2011 marine mammal reports compared the sightings of species of whales across years and areas surveyed (e.g., Wu 2011, Table 3). Although not identical, the best historical comparisons for whale observations in years since 2011 would be with those pre-2011 nearfield (NF) observations. From 1998-2010 the 13-year NF observations were: right whales total = 0; humpback whales total = 3, range 0-2/year; finback whales total = 7, range 0-3/year; minke whales total = 24, range 0-4/year; unidentified whales total = 4, range = 0-1/year. No whales were observed during 2015 surveys. North Atlantic right whales were most recently sighted during surveys in 2012 and 2013. Table 3 summarizes the yearly whale observations since 2011, and the total number and ranges of observations in the nearfield in the historical period 1998-2010. Figure 5 displays the same information in graphical form.

Table 3. Comparison of whale sightings from 1998 to 2015

Whale species	Total number of sightings (1998-2010)*	Range of sightings per year (1998-2010)*	2011†	2012†	2013†	2014†	2015†
Finback	7	0-3	1	0	0	0	0
Humpback	3	0-2	0	1	0	0	0
Minke	24	0-4	5	1	0	2	0
North Atlantic Right	0	0-0	0	1	4	0	0
Unidentified	14	0-5	0	3	1	1	0

* Nearfield stations only per the pre-2011 ambient monitoring plan

† All stations per the current ambient monitoring plan

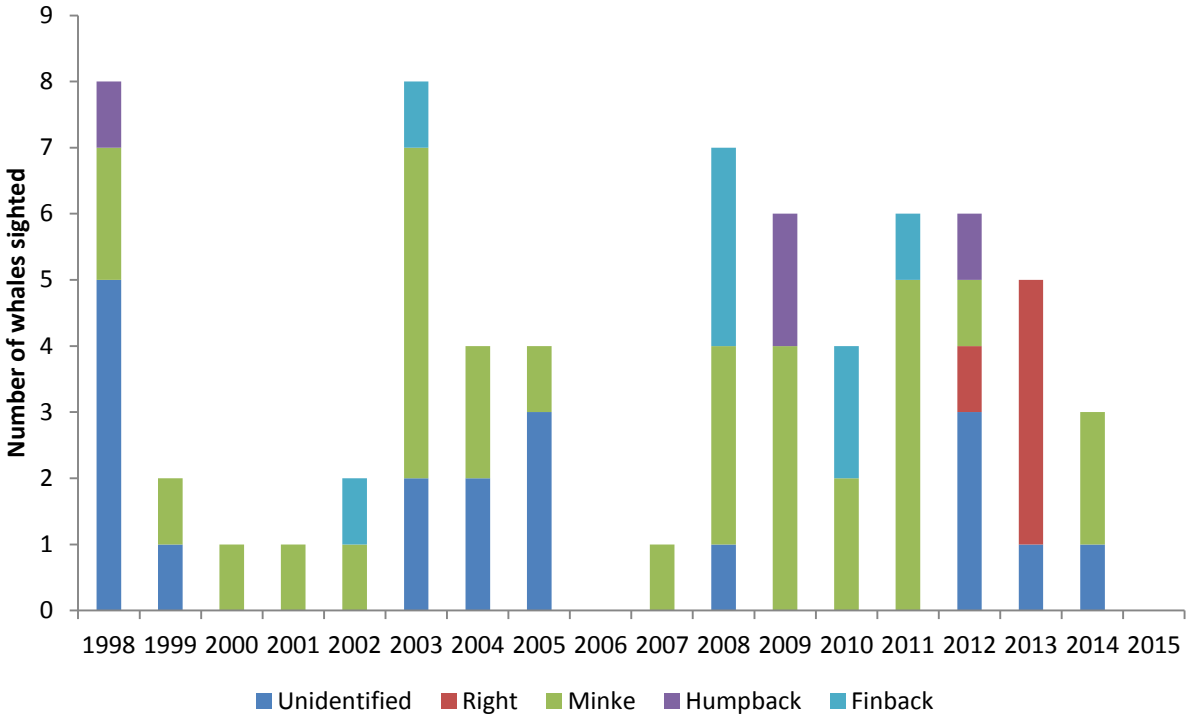

Figure 5. Whale sighted in the nearfield (1998-2010) and in all stations (2011-2015)

Most observations of seals are when the vessels are transiting to and from the outfall monitoring area or during Boston Harbor surveys. The seals were typically resting upon rocks. During 2015, 21 pinnipeds were sighted. All were harbor seals. These sightings were a decrease from previous years (more than 33 in 2014, 36 in 2013, 69 in 2012, and 31 in 2011). For comparison, the numbers for 2001 to 2010 ranged from 78 to 303/year. Before 2001, 20 to 65/year pinniped sightings were made throughout the survey area.

One harbor porpoise was sighted in 2015, which was also a decrease from 5 in 2014 and 6 in 2013.

MWRA no longer tabulates whale observations in Cape Cod Bay. Beginning in 2011, MWRA's Cape Cod Bay water quality monitoring is carried out by the PCCS, which has a long-standing scientific monitoring program for whales in Cape Cod Bay. Since 1998, PCCS has conducted systematic whale surveys of Cape Cod Bay and adjacent waters from January through mid-May each year. In 2010 PCCS (Stamieszkin *et al*. 2010) counted 163 individual right whales identified using photographs. This number is comparable to sightings in 2007, 2008, and 2009. Half the individuals sighted in 2007 were seen again in the 2008 surveys, and 61% of the individuals seen in 2008 were spotted in 2009. From 2007 to 2010 at least 45% of the known right whale population has been sighted annually in the Cape Cod Bay, making it an important habitat for right whales (Stamieszkin *et al*. 2010, Leeney *et al*., 2008, 2009).

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