

Federation, New England Estuarine Research Society, National Shellfisheries Society, East Coast Shellfish Growers Association, and serve of the Board of Directors for the Jones River Landing Environmental Heritage Center.

5. I have over fifteen years of experience assessing environmental impacts associated with the construction and/or operation of projects that have impacts on water quality and marine and freshwater aquatic resources, including fisheries. For example, I worked as a Chief Scientist and Principal Research Scientist in connection with assessments on marine aquatic resources related to the wastewater discharges from the MWRA wastewater treatment plant outfall pipe located in Cape Cod Bay.

6. I have reviewed the PNPS Biological Assessment (BA) dated December 2006 found in the “Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 29, Regarding Pilgrim Nuclear Power Station, Final Report, NUREG-1437, Appendix E, pages E51-E77,” published July 2007 (GEIS). This includes a list of endangered and threatened marine aquatic species.

7. The references given in my affidavit are listed at the end of this affidavit.

8. The GEIS states, “Eleven Federally and/or State-listed marine species could occur in Cape Cod Bay in the vicinity of PNPS, including five whales.” GEIS, Table 2-4, p. 2-84, which is reproduced below. Cape Cod Bay is the southwestern most portion of the Gulf of Maine (EOEA, 2009). The 2010 U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments, conducted by National Marine Fisheries (NMFS) an agency within the federal National Oceanic and Atmospheric Administration (NOAA), confirms the presence of these species in Cape Cod Bay. (Waring et al 2011 pgs 8-39).

Table 2-4. Anadromous and Marine Threatened or Endangered Species

Scientific Name	Common Name	Federal Status	Massachusetts Status
TURTLES			
<i>Caretta caretta</i>	loggerhead turtle	Threatened	Threatened
<i>Chelonia mydas</i>	green turtle	Threatened (endangered in FL)	Threatened
<i>Dermochelys coriacea</i>	leatherback turtle	Endangered	Endangered
<i>Lepidochelys kempii</i>	Kemp's ridley turtle	Endangered	Endangered
WHALES			
<i>Balaenoptera borealis</i>	sei whale	Endangered	Endangered
<i>Balaenoptera physalus</i>	fin whale	Endangered	Endangered
<i>Eubalaena glacialis</i>	North Atlantic right whale	Endangered	Endangered
<i>Megaptera novaengliae</i>	humpback whale	Endangered	Endangered
<i>Physeter catadon</i> ^(a)	sperm whale	Endangered	Endangered
FISH			
<i>Acipenser brevirostrum</i>	shortnose sturgeon	Endangered	Endangered
<i>Acipenser oxyrinchus</i>	Atlantic sturgeon	not listed	Endangered

^(a) The sperm whale has two accepted scientific names: *Physeter catadon* and *P. macrocephalus*.
Source: FWS 2006b

9. The GEIS states, Section 2.2.5.3.7, states,

Although these species have been documented in Cape Cod Bay and/or coastal Massachusetts waters, no whales have been observed in the shallow waters off PNPS or in the intake and discharge areas by Boston Edison or Entergy biologists since biological monitoring began in the late 1960s.

10. I have reviewed the document entitled, "Summary Report: Fish Spotting Overflight in Western Cape Cod Bay in 1993" (Fish Spotting Report). It is a segment of the "Marine Ecology Studies Related to Operation of Pilgrim Station, Semi Annual Report No. 43, January 1993 to December 1993" (1993 Marine Ecology Study). The 1993 Marine Ecology Study states that it was prepared by Boston Edison Company. The Fish Spotting Report pertains to observations of marine aquatic species within that area by Boston Edison. A true and accurate copy of Figure 1 from the Fish Spotting Overflight segment of the 1993 Marine Ecology Study is reproduced below as Figure 1 of this affidavit.

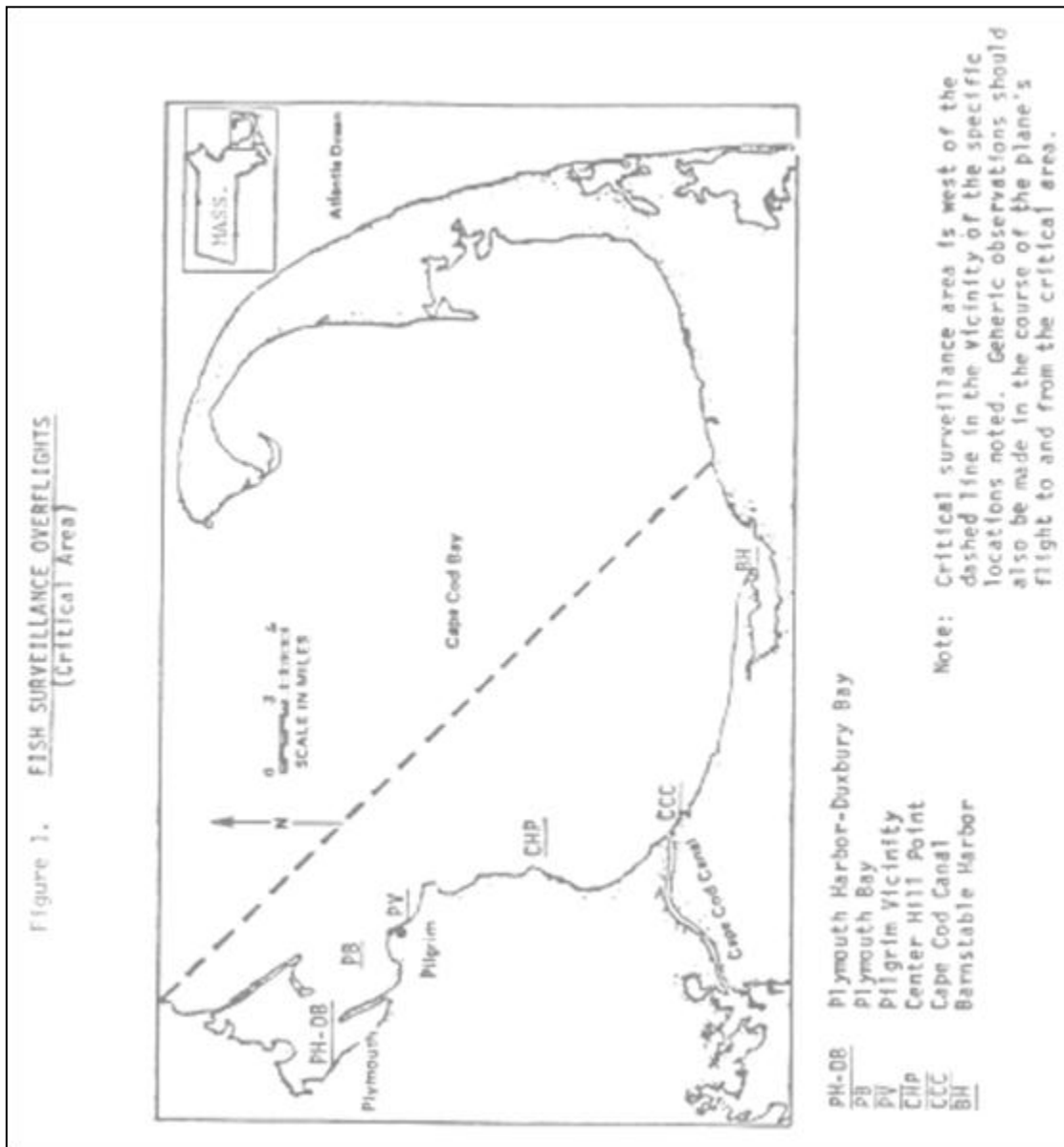


Figure 1. Reproduction of Figure 1 from the 1993 Fish Spotting Overflight report

11. Figure 1 to the Fish Spotting Report is entitled “Fish Surveillance Overflights (Critical Area). It contains a dashed line in Cape Cod Bay. The Note on Figure 1 of the Fish Spotting Report states that the “critical surveillance area is west of the dashed line in the vicinity of the specific locations noted.” I understand this “critical area” to be the area surveyed by Boston Edison Company to determine whether marine species were present in the vicinity of PNPS.

12. North Atlantic Right Whales have been documented in Western Cape Cod Bay, including in shallow water. NOAA's Sighting Survey and Sighting Advisory System tracks Right Whales throughout the region. In 2005 and 2006, prior to the July 2007 GEIS, Right Whales were spotted by NOAA in Cape Cod Bay. Figure 2 below in this affidavit shows North Atlantic Right Whale sightings from January 1, 2005 to December 31, 2006 as reported by NOAA's Sighting Survey and Sighting Advisory System database (<http://www.nefsc.noaa.gov/psb/surveys/>).

13. The red line on Figure 1 in this affidavit, below is the area the same line used to show the "critical area" from Figure 1 of the Fish Spotting Report. The red circle on Figure 1 below in this affidavit indicates a 6-mile radius around PNPS. The numbers on Figure 1 below represent the number of whales sighted in each group.

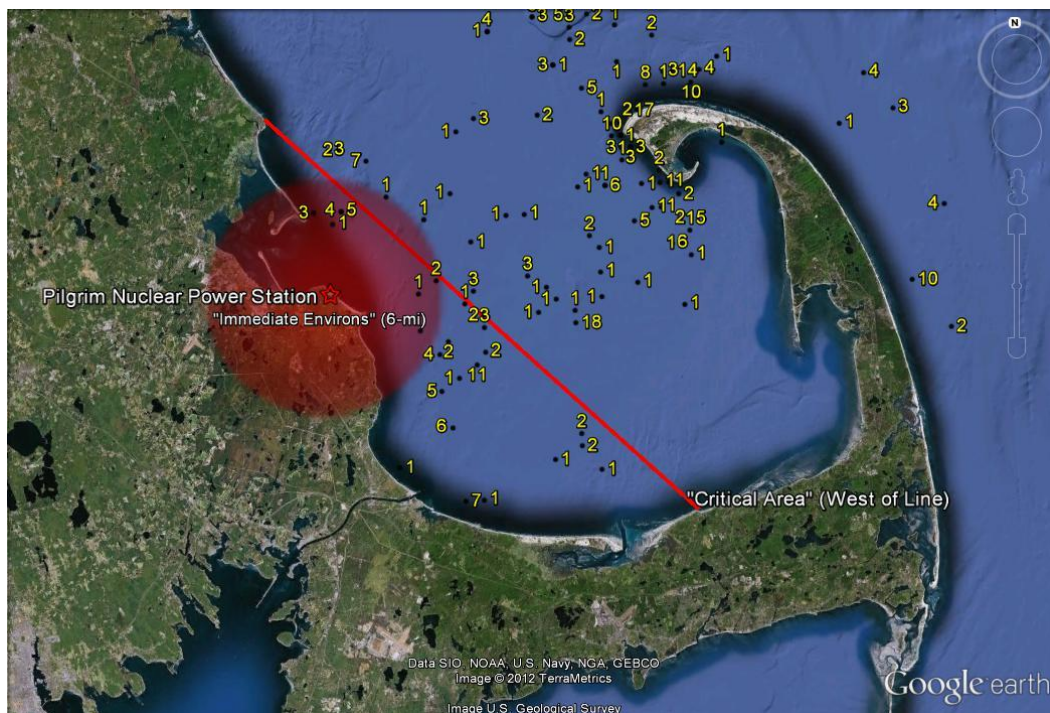


Figure 2. Right Whales Sightings 1/1/2005 – 12/31/2006. Labels Indicate Number of Whales Sighted in Group.

14. Figure 3 below shows North Atlantic Right Whale sightings from January 1, 2007 to February 28, 2012, as reported by NOAA's Sighting Survey and Sighting Advisory System database (<http://www.nefsc.noaa.gov/psb/surveys/>).

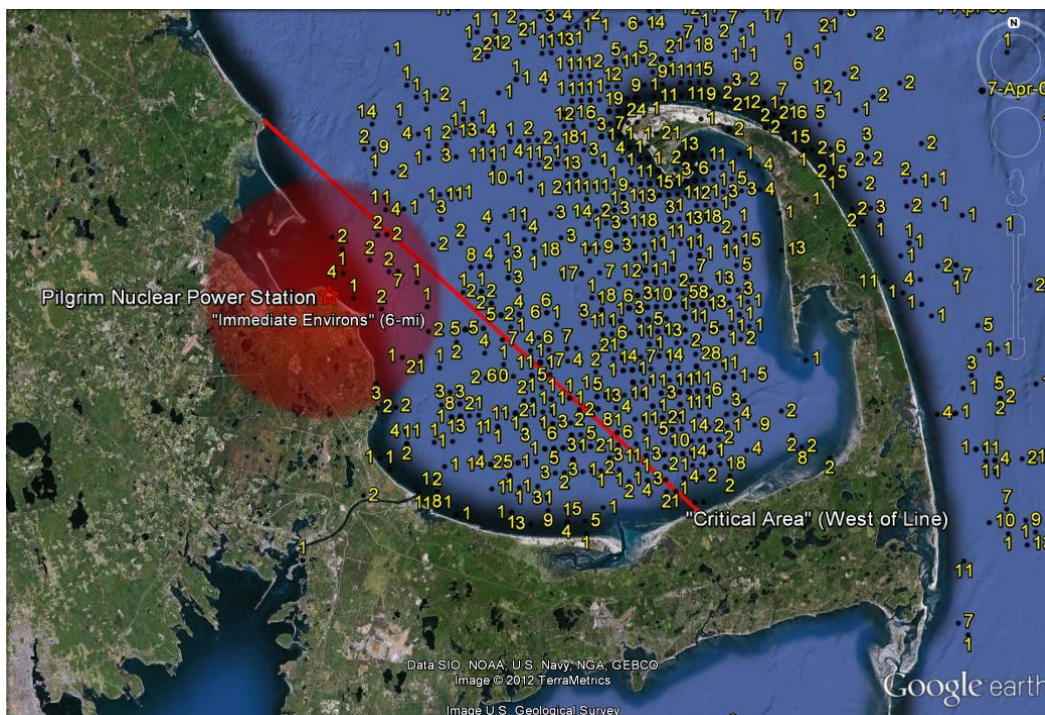


Figure 3. Right Whales Sightings 1/1/2007 – 2/28/2012. Labels Indicate Number of Whales Sighted in Group.

15. The data compiled in Figures 2 and 3, above, shows that North Atlantic Right Whales are found within the "critical area" identified in Figure 1 of the Fish Summary Report. Figures 1 and 2 show North Atlantic Right Whales spotted within the 6 mile radius of PNPS.

16. I have reviewed the NRC staff BA of 2006. It does not contain the information shown in Figures 2 and 3 of this affidavit, or similar commercially available scientific data. The information contained in Figures 2 and 3 of this affidavit is scientific and commercially available data which could have been obtained prior to July 2007. This data shows that marine species, including North Atlantic Right Whales are present in much broader spatial scales than the narrow areas defined by the GEIS and the 2006 BA.

17. Both NMFS (Waring et al 2011) and the International Whaling Commission (Best et al. 2001) consider the North Atlantic Right Whales to be one of the most critically endangered populations of large whales in the world, and have identified the need for significant protections for this species. NMFS has indicated that “given that PBR [potential biological removal] has been set to 0.7, no mortality or serious injury for this stock can be considered insignificant. This is a strategic stock because the average annual human-related mortality and serious injury exceeds PBR, and also because the North Atlantic right whale is an endangered species.”

18. NMFS has published a Recovery Plan for the North Atlantic Right Whale (NMFS 2005). “The ultimate goal of this recovery plan is to promote the recovery of North Atlantic right whales to a level sufficient to warrant their removal from the List of Endangered and Threatened Wildlife and Plants under the ESA.” To meet that goal NMFS has targeted steady population increases over the course of at least 35 years. NMFS does not even attempt to cite criteria for delisting North Atlantic right whales “since the current abundance of North Atlantic right whales is an order

of magnitude less than an abundance at which NMFS would even consider delisting the species, and decades of population growth likely would be required before the population could attain such an abundance.” Neither the GEIS nor the 2006 BA consider NMFS’s targeted population increases for North Atlantic Right Whales.

19. As described in GEIS, four federally endangered sea turtles could occur in the vicinity of PNPS. See, Table 2-4 from the GEIS.

20. As described in the GEIS, pg. 2-84, migratory sea turtles that are still present in Cape Cod Bay in late fall and winter may become cold-stunned and wash ashore. In the winter of 1999 to 2000, 277 sea turtles were found on Cape Cod beaches. In 2003 there were 89 turtles stranded. In 2003, a loggerhead turtle was stranded on Priscilla Beach approximately 0.63 mi south of PNPS.

21. As climate change impacts ocean temperatures migratory species are expected to adjust their ranges accordingly. The sea turtles found in Cape Cod Bay are generally at the northern end of their migratory ranges. Mid-term changes (i.e. 20 years) to water temperatures may result in the northward expansion of many migratory species’ ranges. The GEIS has not addressed how mid-term changes (i.e. 20 years) to water temperatures could impact migratory marine species, including endangered turtles, during the time span of the proposed continued operations of PNPS, i.e. 2012 to 2032.

22. "River herring" includes two species, alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). Starting in January 2006 Massachusetts Division of Marine Fisheries implemented a three year moratorium on the harvest, possession and sale of river herring (322 CMR 6.17). In 2008, the state moratorium

was extended to the end of 2011. As of January 1, 2012 the Atlantic States Marine Fishery Commission (ASMFC) requires states to declare a moratorium on fishing for river herring unless a Sustainable Fishery Plan (SFP) is prepared and approved. Massachusetts has not prepared a SFP and continues to operate under the moratorium (322 CMR 6.17). They are currently listed as a candidate species by NMFS under the ESA (76 FR 67652).

23. River Herring are consistently impinged by PNPS operations. Alewives have had the third highest number of individuals impinged at PNPS, based on annual extrapolated totals (Normandeau 2006).

24. I have reviewed the 2010 “Marine Ecology Monitoring Report” prepared by Normandeau Associates in relation to PNPS for Entergy Corporation. It shows entrained and impinged fish species from 1980 to 2010 at PNPS. (Normandeau 2011). This report shows that both alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) were impinged by PNPS *every* year from 1980 to 2010. The total number of river herring impinged in this time period was estimated at 92,001 (68,489 alewife + 23,512 blueback herring). Peak impingement years included:

- 1995 when alewife alone was the greatest single species impinged at the plant and total river herring impinged was 41,128 individuals (39,884 alewife + 1,244 blueback herring)
- 2010 when alewives were the second most impinged species (after Atlantic silversides) at an extrapolated total of 12,680 fish plus an additional 271 blueback herring. This is more than three times greater than the total number of fish estimated for the entire 2010 Jones River river herring population.

25. The high levels of impingement of river herring have not been addressed in the NRC Staff BA or in the GEIS. In addition to impingement of adult and juvenile river herring the GEIS states that Alewife larvae and juveniles have been collected in the PNPS entrainment sampling (GEIS, p. 2-34). The GEIS does not address the reasons why river herring larvae and juveniles are found in the PNPS facility when these species spawn in freshwater rivers, tributaries, ponds and lakes. The reproductive cycle of river herring is such that the eggs and hatched fry remain in freshwater. Juveniles eventually migrate out to marine environments in the late summer and fall.

26. In the GEIS, section 4.8.1 Cumulative Impacts on Marine Aquatic Resources, concludes,

*Cumulative impacts on the marine aquatic food web also could potentially occur as a result of reductions in the prey base of higher-trophic-level predators. If major reductions in Cape Cod Bay populations of forage fish, such as rainbow smelt, alewife, herring, menhaden, and silverside, resulted from mortality due to entrainment and/or impingement at PNPS, then predatory fish, as well as some bird species, dependent on these prey populations might be adversely affected. **Although populations of some forage species, such as the rainbow smelt, have declined relative to historical levels, stocks of most forage species are relatively healthy.***

And also,

*Impingement and entrainment impacts from PNPS may also contribute to reduced stock sizes, in turn lowering the catch per unit effort for both commercial and recreational fishing. **With the exception of winter flounder and rainbow smelt, most of the fish stocks potentially affected by PNPS are considered to be healthy or the levels of take by PNPS are very minimal.***

27. River herring are not addressed in the discussion and conclusion above. In 2007, when the SEIS was issued, river herring had already been nationally listed as a species of concern and Massachusetts had declared three year moratorium on

the harvest, possession and sale of river herring (see above paragraph 22).

Entergy's reports have shown that river herring have been impinged every year of the past thirty years and that alewives have had the third highest number of individuals impinged at PNPS of any species (see paragraph 24 above).

28. River herring are not the only ecologically important species impinged and entrained by PNPS. Other critical, low trophic level species such as Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), Atlantic menhaden (*Brevoortia tyrannus*), Atlantic silverside (*Menidia menidia*), Rainbow smelt (*Osmerus mordax*), Atlantic sand lance (*Ammodytes americanus*) and others are routinely impinged and entrained at very high rates.

For example:

- 1991 an estimated 90,449 Atlantic silversides were impinged
- 2005 an estimated 277,601 Atlantic menhaden were impinged
- 2003 an estimated 30,763 Sand Lance were impinged
- Eggs of these species are frequently entrained by the hundreds of millions or more.

29. The direct impact on the low trophic species has not been addressed in the GEIS. Moreover, the cumulative impacts of food web dynamics and ecological function at higher trophic levels, especially for state and federally listed endangered and threatened species, and candidate species river herring, has not been addressed. For example, as pointed out in the GEIS "Sand lance is an important prey species for many demersal fish species and the endangered fin whale (*Balaenoptera physalus*) and humpback whale (*Megaptera novaengliae*)". Other frequently entrained and impinged species (Atlantic herring, Menhaden, etc) are also common

prey and/or incidental food for endangered species including Humpback whales, Fin whales, Sei whales, etc. Yet no cumulative impacts are described in the GEIS.

30. The action area for purposes of the ESA is defined in 50 CFR 402.02 as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.” The GEIS does not address how thermal loading, impingement, and entrainment impact the food web, food supply for the listed species and critical habitat.

31. References:

Best, P.B., J.L. Bannister, J. R.L. Brownell and G.P. Donovan, eds. 2001. Right whales: worldwide status. *J. Cetacean Res. Manage.* (Special Issue) 2: 309.

Executive Office of Energy and Environmental Affairs (EOEA). 2009. Massachusetts Ocean Management Plan. Volume 2 - Baseline Assessment and Science Framework.


National Marine Fisheries Service. 2005. Recovery Plan for the North Atlantic Right Whale (*Eubalaena glacialis*). National Marine Fisheries Service, Silver Spring, MD.

Normandeau Associates (Normandeau). 2006. Impingement of Organisms on the Intake Screens at Pilgrim Nuclear Power Station; January to December 2005. *Marine Ecology Studies, Pilgrim Nuclear Power Station, Report Number 67*

Normandeau Associates (Normandeau). 2011. Marine ecology studies related to operation of pilgrim station. Report number 77.

NUREG-1437. 2007. Supplement 29. Vol. 1. Generic Environmental Impact Statement for License Renewal of Pilgrim Nuclear Power Station.

Waring GT, Josephson E, Maze-Foley K, Rosel, PE, editors. 2011. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2010. NOAA Tech Memo NMFS NE 219; 598 p



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Alex Mansfield, Environmental Director, JRWA, Inc.
alex@jonesriver.org
14 Puritan Lane
Marshfield, Massachusetts
Tel. 781-585-2322

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