COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
THE OFFICE OF APPEALS AND DISPUTE RESOLUTION

In re Easterly Wastewater Treatment Facility) Groundwater Discharge Permit No. 1018-0)	OADR No. 2026-013 DEP No. 25-WP79-0137-APP/1018-0

Pre-filed Testimony of Dr. Christopher Neill

I, Christopher Neill, submit this pre-filed testimony on behalf of Petitioners:

1. I have been retained by Petitioners as an expert and submitted public comments on their behalf on the draft groundwater discharge permit at issue in this appeal. I have previously qualified as an expert in prior OADR cases, including In re Villages at Brookside, No. 2019-23.

Personal Qualifications

2. I have been a Senior Scientist at the Woodwell Climate Research Center in Woods Hole, Massachusetts since August, 2016. Prior to that, I was employed as a Senior Scientist at the Marine Biological Laboratory, where I served as the Director of the Ecosystems Center at the from 2012 to 2016. I received my Bachelor of Science from Cornell University in 1980, my Master of Science from the University of Massachusetts, Amherst in 1988, and my Ph.D. from the University of Massachusetts, Amherst in 1992. A copy of my CV is attached.

3. My research focuses on how land use and human activities influence the hydrology, soils, and water quality in watersheds. I work on these issues in coastal southeastern Massachusetts and in the Amazon region of Brazil. Because land use, agriculture, urban development and other activities strongly influence the amounts of nitrogen that enter and move through watersheds, and because nitrogen influences the quality of rivers and coastal waters, a lot of my work focuses on understanding the sources and movement of nitrogen in soils and watersheds.

4. I have overseen the laboratory analyses of water samples collected in the Buzzards Bay Coalition's Baywatchers water quality monitoring program since 2013. This program collects samples from more than 200 stations in more than 30 individual coastal bays and salt ponds along the Buzzards Bay shoreline four times per summer. I participate in the data production, data checking and data interpretation. I have been Chair of the Buzzards Bay Coalition's Science Advisory Committee since 2013.

5. I currently oversee a research project that attempts to quantify the amount of water and nitrogen that reaches Buzzards Bay in the water that flows into Buzzards Bay in twelve streams and rivers from Westport to Bourne.

6. I also lead a four-year research project funded by the National Science Foundation that evaluates the potential to transition from traditional methods of measuring water quality parameters in Massachusetts coastal estuaries (temperature, salinity, dissolved oxygen) to automated methods

using a distributed network of automated sensors.

7. I was a member of the board of a citizens' water quality group in Falmouth, Falmouth Associations Concerned with Estuaries and Salt Ponds (now called Falmouth Water Stewards) from 2003 to 2022. I served as President from 2008 to 2013. Since 1995 I have written regular columns in the Falmouth Enterprise newspaper that attempt to explain environmental and water quality issues to the general public.

8. I also serve on the Board of Directors of the Coonamessett River Trust, one of the Petitioners in this appeal.

Nitrogen Impacts on Coastal Waters

9. A large body of scientific research links delivery of nitrogen from coastal watersheds to declines in water quality, estuarine habitat, and salt marshes in Cape Cod, Buzzards Bay, and coastal Massachusetts.

10. Some of the most important papers, all of which I have reviewed, that establish connection between nitrogen delivery (or loading) to estuaries and the growth of algae and declines in water quality are listed below:

    1) Caraco, N., A. Tamse, O. Boutros, and I. Valiela. 1987. Nutrient limitation of phytoplankton growth in brackish coastal ponds. Canadian Journal of Fisheries and Aquatic Sciences 44(2)473-476.

    2) Deegan, L. A., A. Wright, S. G. Ayvazian, J. T. Finn, H. Golden, R. R. Merson and J. Harrison. 2002. Nitrogen loading alters seagrass ecosystem structure and support of higher trophic levels. Aquatic Conservation: Marine and Freshwater Ecosystems 12:193-212.

    3) Deegan, L. A., D. S. Johnson, R. S. Warren, B. J. Peterson, J. W. Fleeger, S. Faherazzi and W. W. Wolheim. 2012. Coastal eutrophication as a driver of salt marsh loss. Nature 490:388-394.

    4) Deegan, L. A., J. L. Bowen, D. Drake, J. W. Fleeger, C. T. Friedrichs, K. A. Galvan, J. E. Hobbie, C. Hopkinson, D. S. Johnson, J. M. Johnson, L. E. LeMay, E. Miller, B. J. Peterson, C. Picard, S. Sheldon, M. Sutherland, J. Vallino and R. S. Warren. 2007. Susceptibility of salt marshes to nutrient enrichment and predator removal. Ecological Applications 75(5):S42-S63.

    5) Hauxwell, J. J. Cebrián, and I. Valiela. 2003. *Zostera marina* loss in temperate estuaries: relationship to land-derived nitrogen loads and effect of light limitation imposed by algae. Marine Ecology Progress Series 247:59-73.

    6) Hauxwell, J., J. Cebrian, C. Furlong and I. Valiela. 2001. Macroalgal canopies contribute to eelgrass (*Zostera marina*) decline in temperate estuarine ecosystems. Ecology 82:1007-1022.

    7) Howarth, R. W., and R. Marino. 2006. Nitrogen as the limiting nutrient for eutrophication in coastal marine ecosystems: Evolving views over three decades. Limnology and Oceanography 51(1, part 2): 364-376.

8) Kroeger, K. D., M. L. Cole, J. K. York and I. Valiela. 2006. Nitrogen loads to estuaries from wastewater plumes: Modeling and isotopic approaches. Ground Water 44(2):188-200.

9) McClellan. J. W., I. Valiela and R. H. Michener. 1997. Nitrogen-stable isotope signatures in estuarine food webs: A record of increasing urbanization in coastal watersheds. Limnology and Oceanography 42(5):930-937.

10) United States Environmental Protection Agency 2012. National Coastal Condition Report IV. USEPA, Office of Research and Development/Office of Water, Washington, DC. EPA-842-R-10-003.

11) Valiela, I., and J. E. Costa. 1988. Eutrophication of Buttermilk Bay, a Cape Cod coastal embayment: Concentrations of nutrients and watershed nutrient budgets. Environmental Management 12:539-553.

12) Valiela, I., G. Collins, J. Kremer, K. Lajtha, M. Geist, B. Seely, J. Brawley and C. H. Sham. 1997. Nitrogen loading from coastal watershed to receiving estuaries: A new method and application. Ecological Applications 7(2):358-380.

13) Valiela, I., M. Geist, J. McClelland and G. Tomasky. 2000. Nitrogen loading from watersheds to estuaries: Verification of the Waquoit Bay nitrogen loading model. Biogeochemistry 49:277-293.

11. The link between nitrogen loading and poor water quality in Massachusetts estuaries is not disputed. Quantifying nitrogen loads was a central component of the Massachusetts Department of Environmental Protection sponsored Massachusetts Estuaries Project (https://www.mass.gov/guides/the-massachusetts-estuaries-project-and-reports). Massachusetts Estuaries Project reports calculate nitrogen loads for dozens of Massachusetts estuaries for which reports have been produced. These reports focus on nitrogen loads precisely because nitrogen is the nutrient that drives declines in estuarine water quality. The Massachusetts Estuaries Project reports also calculate target concentrations of nitrogen that must be attained at sentinel stations to reduce the harmful effects of nitrogen arriving from watersheds.

12. Reducing nitrogen loads to estuaries is also the focus of the Massachusetts Department of Environmental Protection's issuance of Watershed Permit Regulations in 2023 that require towns to develop plans for reducing nitrogen loads to estuaries designated as nitrogen sensitive areas (https://www.mass.gov/regulations/314-CMR-2100-watershed-permit-regulations). The reason nitrogen is the focus of these watershed regulations is that the Massachusetts Department of Environmental Protection considers nitrogen to be the nutrient that drives decline in water quality.

Nitrogen transport from discharge to watershed.

13. Cape Cod and the area of the Coonamessett River Watershed into which the Saxon project drains is underlain by a single, connected aquifer (https://pubs.usgs.gov/publication/sir20045181). Water moves through this aquifer at a rate of approximately 1 to 2 feet per day before it discharges to rivers or directly to the shorelines of estuaries.

14. Nitrogen that is released from leaching fields, wastewater treatment plants, and fertilizers moves vertically through soils to groundwater, and then horizontally with groundwater flow to streams and estuarine shorelines. Some limited attenuation occurs in the soil unsaturated (vadose) zone of nitrogen in the groundwater. Less attenuation occurs from leaching fields than fertilizer applications because nitrogen from leaching fields is released below the rooting depth of plants. Attenuation is higher for fertilizer nitrogen because some nitrogen is retained by plants. The overall attenuation will depend on the amount and timing of fertilizer application. Nitrogen attenuation is greater if groundwater is intercepted by ponds or wetlands during its travel path to the estuary. The overwhelming weight of evidence is that almost all nitrogen from leaching fields moves into groundwater and then to estuaries.

15. Nitrogen from these sources moves predominantly as nitrate. Nitrate is a form of inorganic nitrogen that is mobile in soils because it is a cation (ion) with a negative charge that does not adhere by electrostatic attraction to soil particles in the vadose zone or aquifer. Although in some places nitrate can be removed from organic soils and groundwaters by the process of denitrification, which converts nitrate to gaseous nitrous oxide or di-nitrogen gas, Cape Cod soils typically do not have the conditions of low oxygen and high organic matter, that favor denitrification. Cape Cod soil and groundwaters tend to be well oxygenated because of their porous, sandy nature. Nor do the waters released from leaching fields tend to have much useable carbon, because these systems are designed to remove organic material and release water that is nitrate-rich but carbon-poor. Dissolved organic nitrogen also travels in groundwater, however, concentrations of dissolved organic nitrogen in groundwater and streams tends to increase less in response to wastewater and fertilizer releases compared with nitrate.

16. Watersheds that have more sources of nitrogen from septic systems and fertilizers per unit of land area have higher loads to downstream estuaries. This pattern has been verified by comparative studies of loading across densely developed to less densely developed estuaries, by modeling studies, and by Massachusetts Estuaries Project reports.

17. Nitrate produced from these human activities on land travels in the groundwater of watersheds and reaches estuaries either in streams or by seepage along shorelines into estuaries. Historically almost all Cape Cod and Southeast Massachusetts estuaries had low amounts of nitrogen delivered from watersheds. As a result, they had clear water and supported beds of the submersed aquatic plant eelgrass (*Zostera marina*). When nitrogen reaches estuarine waters, it stimulates the growth of algae, which in turn decimates eelgrass. This occurs because nitrogen is the limiting nutrient for algae growth in saline coastal waters. This relationship is overwhelmingly supported by years of research.

18. Because of the sandy nature of Cape Cod soils, relatively low attenuation, and the presence of a connected single-source aquifer, the discharge of any additional nitrogen from wastewater leaching fields or from fertilizer application will result in additional nitrogen delivery to the downstream estuary.

19. Increased algae growth in estuaries consists of three predominant algal forms: phytoplankton, periphyton, and macroalgae. Phytoplankton are free-floating algae in the water column. Phytoplankton growth caused by increased nitrogen reduces water clarity. It also reduces the amount of light that penetrates the water and hence reduces the growth of eelgrass. Periods of

high phytoplankton production, or "blooms" can produce low water clarity. When these blooms end and phytoplankton begin to decompose, they consume oxygen and reduce dissolved oxygen in estuarine water. In some cases, this can lead to oxygen levels low enough to kill bottom-dwelling organisms, and in rarer cases, fish.

20. Periphyton are algae that grow on surfaces such as rocks or the leaves of other plants. Periphyton that grow on eelgrass are particularly important because they reduce the light available for eelgrass. The combination of increased periphyton and increased phytoplankton combine to reduce light to eelgrass leaves, restrict eelgrass growth, and eliminate eelgrass entirely in deeper waters where total light penetration is less.

21. Marcroalgae are unattached bottom-living colonial algae that can form thick mats on the bottoms of estuaries. Macroalgae growth can be very prolific in high nitrogen conditions. It can cover both sandy and muddy bottoms, and often smothers eelgrass. Because of its high production of biomass, macroalgae are a major cause of daily fluctuations of dissolved oxygen in estuarine waters. Dissolved oxygen levels are high during the day when algae photosynthesize and produce oxygen, but dissolved oxygen levels then decrease during the night when algae respire and consume oxygen but do not photosynthesize. Excess growth of all algae forms can lead to low nighttime oxygen concentrations in heavily nitrogen-loaded waters. Warm temperatures and still, cloudy days in summer often cause the largest declines in dissolved oxygen and can periodically create conditions lethal to bottom animals and fish.

22. Excess growth of algae degrades the quality of habitat for estuarine fishes by eliminating the eelgrass that provides structure and substrate for bay scallops (*Agropecten irradians),* winter flounder (*Pseudopleuronectes americanus*), and other fish and shellfish. Low oxygen conditions also degrade habitat for a wide variety of estuarine fishes and macroinvertebrates.

Impairment of Great Pond

23. Great Pond lies downstream of the Coonamessett River watershed and downstream of the Saxon Project. Great Pond suffers from nutrient over-enrichment. A Massachusetts Estuaries Project assessment of Great Pond was completed in 2005. That report stated, "The primary ecological threat to Great, Green and Bournes Pond resources is degradation resulting from nutrient enrichment. Loading of the critical eutrophying nutrient, nitrogen, to the embayment waters has been greatly increased over the past few decades with further increases certain unless nitrogen management is implemented." (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mass.gov/doc/great-perch-pond-green-pond-bournes-pond-falmouth-ma-2005/download). The report also stated,

> "Both of the upper tributary basins to Great Pond are presently showing poor water quality and "Hyper-Eutrophic" conditions. Eelgrass is absent from these regions and periodic fish kills have been reported, resulting from oxygen depletion."
>
> "In Great Pond both the oxygen and chlorophyll a records in the upper tributary indicate a highly nitrogen enriched estuarine reach. Dissolved oxygen levels routinely declined below 2 mg L-1 coupled with very high chlorophyll a levels, in excess of 20 ug L-1 over 64% of the time and with three bloom periods in excess of 40 ug L-1."

24. Nitrate concentrations in groundwater in the lower portion of the Great pond Watershed are very high and provide further evidence that groundwater is delivering high amounts of nitrogen to the Coonamessett River and Great Pond. Concentrations measured by the U.S. Geological Survey exceeded 6 mg NO_3^- -N/L (USGS Scientific Investigations Report 2021-5130). Concentrations of nitrate measured in wells on the west side of the Coonamessett River in the vicinity of the Saxon property exceeded 7 mg NO_3^- -N/L (Grobmeyer and Neill 2022).

25. The Cape Cod Commission states that the water threat level for Great Pond is "high." (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://ww2.capecodcommission.org/208/appendices/Chapter%205%20Appendices/Appendix%205B:%20Watershed%20Summaries/Appendix%205B_UC_Great,%20Green%20and%20Bournes%20Ponds.pdf).

26. There is no question that the water quality of Great Pond is impaired as thoroughly documented by the Massachusetts Estuary Project report. Nitrogen loads and nitrogen concentrations in 2005 when the MEP study was completed greatly exceeded those necessary to restore eelgrass and target estuarine water quality conditions.

27. The Massachusetts Estuaries Report for Great Pond concluded that the concentration of total nitrogen at the sentinel station in Great Pond would have to be reduced from 0.59 mgN/L to less than 0.40 mgN/L. The report also concluded that total septic loads of 100% from the lower Great Pond watershed and 50% from the Coonamessett River portion of the watershed would be required to meet the target reductions at the sentinel station.

28. Great Pond was included on the Massachusetts Department of Environmental Protection's 303d list of impaired waters in 2002 and has remained on that list ever since.

29. A Total Maximum Daily Load was issued and approved by the U.S. Environmental Protection Agency for Great Pond in July 2007.

30. It is clear from this evidence that Great Pond has been impaired to over two decades since 2005. Because no municipal nitrogen reductions have yet taken place, water quality conditions have become worse today. Major reductions in nitrogen delivery to Great Pond are required to meet water quality targets.

31. The Cape Cod Commission states that to meet the current TMDL, Great Pond watershed requires a target load reduction of 63% in the entire watershed and a reduction of 82% of the current septic load.

Requirement for Nitrogen Offsets

32. Great Pond's inclusion on the 303d list of impaired water requires that new wastewater discharge permits that would introduce new nitrogen discharges include offsets for that new nitrogen discharge. This is a well-established principle within the Massachusetts Department of Environmental Protection's own regulations.

33. Massachusetts Groundwater Discharge regulations say that MassDEP "shall not issue a permit

pursuant to 314 CMR 5.00 when the discharge will cause or contribute to a violation of 314 CMR 4.00: "*Massachusetts Surface Water Quality Standards"* (MSWQS). 314 CMR 5.06(1). These regulations provide that all permits shall contain limits that "are adequate to protect surface waters for their existing and designated uses and to assure the attainment and maintenance of the [water quality standards]. The regulations require that MassDEP consider natural background conditions and any TMDLs established by Mass DEP. They require DEP to protect existing uses of hydrologically connected downgradient ground waters and surface waters, and not interfere with the maintenance and attainment of beneficial uses in hydrologically connected downgradient waters [314 CMR 5.10(3)].

34. The water quality standards state that MassDEP "will limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained or attained." [314 CMR 4.03(1)(a)]. The Massachusetts Surface Water Quality regulations make clear that "discharges shall be limited or prohibited to protect existing uses and not interfere with the attainment of designated uses in downstream and adjacent segments. Further, Mass DEP will provide a reasonable margin of safety to account for any lack of knowledge concerning the relationship between the pollutants being discharged and their impact on water quality.

35. The Massachusetts water quality standards require Mass DEP to apply additional minimum nutrient criteria requiring that all surface waters "shall not exceed the site-specific criteria developed in a TMDL [314 CMR 4.05(c)]. **Because Great Pond is an officially-listed 303(d) impaired water with a TMDL, <u>any</u> increase in nitrogen will exceed the TMDL criteria. No additional nitrogen releases should be allowed under this permit.**

36. Saxon Partners acknowledges the requirement for nitrogen offsets for this project by their claim that they will provide necessary offsets by a payment of $750,000 to the Town of Falmouth. This claim is inadequate because no plan for attaining offsets is presented, either by Saxon Partners or by the Town of Falmouth.

37. The principle of offsets is firmly established by precedents in other permits issued the Massachusetts Department of Environmental Protection. In a modified groundwater discharge permit issued June 17, 2008 for the River Run development in Plymouth the DEP concluded:

> It has been determined that the Agawam/Wareham River Estuarine Watershed is impaired due to nitrogen. Based on surface water quality impacts within the watershed the Modified Permit includes the following measures which are expected to achieve a no net nitrogen load impact as a result of the discharge:
>
> - Eliminate the use of nitrogen in any fertilizer on bogs as identified in Appendix A- provided however that permittee may pursue and implement other measures in lieu of cessation of fertilizers provided permittee demonstrates that such measures provide at least equivalent nitrogen reduction. The reduction of nitrogen to these bogs shall be reflected in the appropriate bog# s NRCS/USDA Farm Plan.
>
> - Prohibit the application of nitrogen-based fertilizers for

any lawn and/or landscape maintenance within the project# s boundaries.

- Reserve approximately 52-000 gallons per day excess treatment capacity at the treatment facility and in the associated collection system in order to connect existing properties within proximity of the development and located within the Agawam/Wareham River Estuarine Watershed.

- Create a fund in the amount of $500,000 to be used to reduce other sources of nitrogen within the Agawam/Wareham River Estuarine Watershed.

Falmouth's Efforts to Address Nitrogen Pollution of Great Pond

38. In April of 2025, Falmouth Town Meeting voted to appropriate $60 million dollars to fund the construction of sewers for an area adjacent to Great Pond. In May of 2025, the Town voted yes on Question 1, a proposition 2 ½ debt exemption for the construction of Phase 1 of a larger sewering project.

39. Phase 1 of the plan to meet nitrogen limits for Great Pond involves sewering the northeast portion of the Maravista peninsula as well as the Teaticket Path peninsula. A future Phase 2 of this project will involve sewering the Acapesket peninsula.

40. Since the mid 2010s the Town of Falmouth secured more than $8 million from state and federal sources to restore wetlands in former cranberry bogs along the Coonamessett River. These restored wetlands occur in an area of high nitrate concentrations in the groundwater. This makes it likely this investment has increased watershed-scale nitrate removal based on a broader regional analysis of what cranberry bogs would likely reduce nitrogen export to estuaries if they were restored (Weigman, Kennedy, Neill et al. 2025 JGR 10.1029/2025JG008742).

41. Falmouth is currently developing a detailed Targeted Watershed Management Plan for the Great Pond watershed (https://www.falmouthma.gov/1350/Final-Great-Pond-Targeted-Watershed-Mana). The plan considers expanded sewering as well as non-traditional nitrogen removal technologies such as shellfish aquaculture, urine-diverting toilets, permeable reactive barriers, and fertilizer management.

I declare under penalty of perjury that the foregoing is true and correct.

Christopher Neill, PhD

Date July 24, 2026

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EDUCATION:

1992. Ph.D. University of Massachusetts, Amherst, MA.
1988. M.S. University of Massachusetts, Amherst, MA.
1980. B.S. Cornell University, Ithaca, NY.

PROFESSIONAL APPOINTMENTS:

July 2016 –present. Senior Scientist, Woods Hole Research Center, Falmouth, MA
November 2012 – June 2016. Director, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA
February 2010 – June 2016. Senior Scientist, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA
February 2010 – 2017. Director, Brown-MBL Partnership and Brown-MBL Graduate Program in Biological and Environmental Sciences
August 2004 – January 2010. Associate Scientist, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA
June 2005 – 2017. Associate Professor (MBL), Brown University, Providence, RI
June 2001 – February 2015. Director, Hands-on Environmental Laboratory for MBL's Logan Science Journalism Program.
May 1997 – July 2004. Assistant Scientist. The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA
July 1994 - May 1997. Research Associate. The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA.
November 1991 - July 1994. Post-Doctoral Research Associate, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA.
June – August during 1991 and 1993. Graduate Faculty, Masters of Science in Environmental Studies Program, Bard College, Annandale-on-Hudson, NY. Taught *Ecosystem Ecology.*
September 1985 - October 1991. Graduate Research Assistant and Instructor, University of Massachusetts, Amherst, MA.

RESEARCH INTERESTS:

Watershed biogeochemistry, ecosystem responses to deforestation and other land use changes, soil carbon and nutrient dynamics and trace gas exchanges, ecosystem restoration, tropical agriculture, wetland plant ecology and biogeochemistry, use of stable isotopes in ecosystem research

RECENT AWARDS AND PROFESSIONAL ACTIVITIES:

2025. Outstanding Public Service Award. Massachusetts Association of Conservation Commissions.

2019-present. External member, Hubbard Brook Ecosystem Study Committee of Scientists, Hubbard Brook Ecosystem Study.
2017-2022. Review team for NSF Long-term Ecological Research Program.
2015. Review team, Computer, Environmental and Life Sciences Division, Argonne National Laboratory, Lamont, IL. September 15-17.
2015. Review team, Centro de Energia na Agricultura, University of São Paulo, Piracicaba, SP, Brazil. August 17-19.
2012. Collaborating PI on the Northeast Climate Science Center, University of Massachusetts, Amherst, MA.
2010. Bullard Fellow in Amazon Ecology. Harvard University, Petersham, MA. January to August 2010
1998 - present. Teach in MBL's Semester in Environmental Science undergraduate semester
2007 - present. Advise 1 PhD student at Brown University
1994 - present. Co-advised 4 PhD students and 2 MS student at CENA/USP, 3 PhD and 2 MS students at the University of Potsdam, 1 MS student at the University of Central Florida
2007. Fulbright Fellowship, Brazil. Residence at University of São Paulo, Piracicaba, January to June 2007
2007. Organizer and guest editor, Special issue of *Biological Conservation* on the ecology and management of coastal New England sandplains
2000-2006. Science team, NASA Large-Scale Biosphere-Atmosphere (LBA) Experiment in Amazônia
2006. Organizer and guest editor, Special LBA issue of *Hydrological Processes*
2006. Leader of LBA small watershed synthesis activity
2002-2007. Subject editor, *Plant and Soil*
2000-2007. Supervised Research Experience for Undergraduates as part of "Coastal Bays of New England" REU site
2002. Review team for International Center for Tropical Agriculture, Amazon Program, Cali, Colombia, April 8-12.

Reviewer for: NSF, EPA, USDA, Conservation Biology, Biogeochemistry, Ecological Applications, Ecosystems, Forest Ecology and Management, Global Change Biology, Hydrological Processes, Limnology and Oceanography, Nature, Nature Geoscience, PNAS.

PUBLICATIONS:

2026. Poppin, G. V., M. E. B. de Resende, M. Siqueira-Neto, A. Huddell, K. J. Jankowski, L. Maracahipes-Santos, D. Nunes, A. C. de Azevdo, C. Neill and C. E. P. Cerri. Legacy of land use: Deep soil nitrogen accumulation driven by deforestation and agriculture in the Southeastern Amazon. *Soil Use and Management,* 2026; 42:e70168, https://doi.org/10.1111/sum.70168.
2026. Almada, H. K., D. V. Silvério, C. Neill, E. L.d. Oliveira, L. Maracahipes-Santos and M. N. Macedo. Hydrological impacts of deforestation on flow dynamics of small watersheds in the Brazilian Cerrado Amazon transition region. *Journal of Hydrology X*, 2026, https://doi.org/10.1016/j.hydroa.2026.100214
2025. Atwood, A., M. T. Coe, C. Neill, L. Maracahipes-Santos, P. Brando, S. H. Riskin, A. Castanho, L. Deegan, A. C. Silvéiro and M. N. Macedo. Deep soil water reservoirs modulate land use and drought effects on the water budget of Amazon headwaters. *Water Resources Research 61, e2024WR039729.* https://doi.org/10.1029/2024WR039729.

2025. Wiegman, A. R. H., C. D. Kennedy, C. Neill, R. Jakuba, M. Welsh, D. Millar and A. Buda. Modeling nitrogen reductions to coastal estuaries from ecological restoration of cultivated wetlands: opportunities and limitations. *Journal of Geophysical Research—Biogeosciences* 130, e2025JG008742. https://doi.org/10.*1029/2025JG008742.*

2025. Klionsky, S. M., C. Neill, A. M. Pulak and B. Lawrence. 2025. Seed bank composition and plant community trajectory before and after restoration of retired cranberry farms. *Applied Vegetation Science* 28:e70024.

2025. Poppin, G., M., E. B. De Resende, J. L. Locatelli, R. F. Santos, M. Siqueira-Neto, P. M. Brando, C. Neill and C. E. P. Cerri. *Agriculture, Ecosystems and Environment* 381 (2025) 109451. https://doi.org/10.1016/j.agee.2024.109451.

2024. Klionsky, S. M., C. Neill, A. M. Helton and B. Lawrence. 2024. Groundwater seeps are hot spots of denitrification and N_2O emissions in a restored wetland. *Biogeochemistry* 167:1041-1056. https://doi.org/10.1007/s10533-024-01156-w.

2023. Mejia, G., P. Groffman, M. Avolio, A. Bratt, J. Cavender-Bares, N. Grijseels, S. J. Hall, J. Heffernan, S. Hobbie, S. Lerman, J. Morse, D. Narango, C. Neill, J Padulles Cubino and T. Trammel. Woody plant-soil interactions in urban interstitial spaces have implications for future forests within and beyond urban areas. *Ecosystems*. https://doi.org/10.1007/s10021-023-00881-x.

2023. Neill, C., A. Pulak, H. Miller, B. Hoekstra and S. Klionsky. Vegetation trajectories in Massachusetts, U.S.A. cranberry farms discontinued from agriculture. *Wetland Ecology and Management* 31(5): 697-715.

2023. Maracahipes-Santos, L., D. V. Silvério, L. Maracahipes, M. N. Macedo, E. Lenza, K. Jankowski, M. Wong, A. C. Silerio da Silva, C. Neill, G. Durigan and P. Brando. Trait plasticity facilitates tree species persistence along riparian forest edges in the Southern Amazon. *Scientific Reports* 13, Article 12454 (2023).

2023. Grijseels, N. H., E. Litvak, M. L. Avolio, A. R. Bratt, J. Cavender-Bares, P. M. Groffman, S. J. Hall, S. E. Hobbie, S. B. Lerman, J. L. Morse, D. L. Narango, C. Neill, J. O'Neil-Dunne, J. Cubino, T. L. E. Trammell and D. E. Pataki. Evapotranspiration of residential lawns across the United States. *Water Resources Research* 59, e2022WR032893. https://doi.org/10.1029/2022/WR032983.

2023. Bois, S., C. Neill, M. Whittemore, L. Champlin, K. Beattie, R. Hopping, J. Karberg, K. Lombard, K. Omand, P. L. Weigand and R. Wernerehl. Challenges, successes, and recommendations for management of coastal sandplain grasslands as regional biodiversity hotspots in the Northeast U.S. *Restoration Ecology 31(5), e13928*

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1983. Costanza, R., C. Neill, S. G. Leibowitz, J. R. Fruci, L. M. Bahr, Jr., and J. W. Day, Jr. Ecological characterization of the Mississippi Deltaic Plain Region. Data collection and presentation. U.S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS-82/69.
1983. Bahr, L. M., Jr., J. W. Day, Jr., S. E. Bayley, R. Costanza, C. Neill, S. G. Leibowitz, and J. R. Fruci. Ecological characterization of the Mississippi Deltaic Plain Region. A narrative. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, D. C. FWS/OBS-82/68.
1983. Turner, R. E., S. G. Leibowitz, and C. Neill. A study design for the application of the U.S. Fish and Wildlife Service geographical information system in a study of the impacts of dredged spoil levees on habitat changes in coastal Louisiana. National Coastal Ecosystems Team, Office of Biological Services, U.S. Fish and Wildlife Service, Washington, D.C.
1982. Neill, C. Louisiana acts to save its wetlands. Not Man Apart 12(2):11.

1981. Cleveland, C. J., C. Neill, and J. W. Day, Jr. The impact of artificial canals on land loss in the Barataria Basin, Louisiana. Pages 425-434, in W. J. Mitsch, R. W. Bosserman, and J. M. Klopatek, eds., Energy and Ecological Modelling. Elsevier Scientific Publ. Co., NY.
1981. Costanza, R. and C. Neill. The energy embodied in the products of the biosphere. Pages 745-756, in W. J. Mitsch, R. W. Bosserman, and J. M. Klopatek, eds., Energy and Ecological Modeling. Elsevier Scientific, NY.

FUNDING HISTORY:

2025. SCC-IRG Track 1: Connecting Coastal Communities with Continuous, Sensor-based Monitoring of Water Quality. REU Supplement. NSF-CNS-231735. $9,322 (C. Neill).
2024-2029. BII: Evolving Meta-ecosystems in the Arctic. National Science Foundation Division of Biological Infrastructure. NSF-2320675. $14,999,460 (L. Deegan, J. Wegrzyn, M. Urban, N. Boelman, C. Neill).
2024-2025. Vegetation Monitoring at Cranberry Bog Restoration Sites in Southeastern Massachusetts. $59,716. Massachusetts Division of Ecological Restoration (C. Neill).
2023-2025. Climate Risk and the Sustainability of Brazilian Agriculture: Ccience to Improve Resilience in a System Under Threat. Bayer Corporation (L. Rattis, M. Coe, C. Neill, L. Deegan).
2023-2027. Surviving Disturbances in a Changing Climate: Mechanisms of Resistance and Resilience of Amazon Forest Edges. National Science Foundation Biodiversity on a Changing Planet. $649,769. (P. Brando, L. Rattis, C. Neill and others).
2023-2024. Assessing Climate Change Impacts and Opportunities for Climate-resilient Management of the Woodlands and Early Successional Habitats of Camp Edwards. Massachusetts National Guard. $59,678 (C. Neill).
2023. Determining Nitrogen Inputs to Buzzards Bay from Coastal Rivers. Massachusetts Office of Coastal Zone Management. $39,716. (C. Neill).
2023-2027. SCC-IRG Track 1: Connecting Coastal Communities with Continuous, Sensor-based Monitoring of Water Quality. NSF Smart and Connected Communities, NSF-231735. $1,975,240 (C. Neill, R. Jakuba, A. Milman, L. Deegan and M. Jakuba).
2022-2023. SCC-PG Connecting Communities with Real-time Data Collection and Downscaled Climate Risk Models to Improve Water Quality and Sustain Salt Marshes in the Buzzards Bay Watershed. NSF Smart and Connected Communities, NSF-2125409, $148,959 (C. Neill, R. Jakuba, A. Milman, L. Deegan, Z. Zobel).
2022-2023. Determining Nitrogen Inputs to Buzzards Bay from Coastal Rivers. Massachusetts Office of Coastal Zone Management. $44,616 (C. Neill).
2022-2023. Multiple DER Priority and Provisional Project Sites - Wetland Restoration on Former Cranberry Farmland Southeastern Massachusetts and Cape Cod. $218,657. Massachusetts Division of Ecological Restoration (C. Neill).
2022-2024. Assessing the Land Carbon Dynamics and Storage Potential of Martha's Vineyard. Family foundations and private individuals. $400,000. (W. Walker, C. Neill, J. Sanderman).
2022-2026. Buttonwood Brook-Apponagansett Bay restoration Action Plan. Southern New England Program, Environmental Protection Agency. $53,666 (K. Petersen, M. Rasmussen, C. Neill and others).
2020. Wetland Restoration on Former Cranberry Farmland in Southeastern Massachusetts and Cape Cod. Massachusetts Division of Ecological Restoration, $29,958 (C. Neill).
2017-2021. INFEWS/T1: Intensification in the World's Largest Agricultural Frontier: Integrating

Food Production, Water Use, Energy demand, and Environmental Integrity in a Changing Climate. NSF EAR 1739724, $2,430,000 (M. Coe, M. Macedo, P. M. Brando, L. A. Deegan and C. Neill).

2018-2020. A watershed-scale analysis of nitrogen loading from cranberry agriculture in the Weweantic Watershed of Southeastern Massachusetts, Woods Hole Oceanographic Institution Sea Grant, $54,842 (C. Neill, C. Kennedy and R. Jakuba).

2018-2021. Water Quality Monitoring to Evaluate Nitrogen Removal by Wetland restoration in the Lower Coonamessett River. Town of Falmouth, $30,000 (C. Neill, L. Deegan and C. Kennedy).

2017-2018. Baseline Vegetation and Soil Moisture Monitoring, Tidmarsh West restoration project. Massachusetts Division of Ecological Restoration, $10,000 (C. Neill).

2017-2018. Long Point Wildlife Refuge vegetation monitoring in response to grazing study. The Trustees of Reservation, $14,504 (C. Neill).

2017-2021. Collaborative Research: MSB-FRA: Alternative Ecological Futures for the American Residential Macrosystem. NSF-Emerging Frontiers Macrosystems Biology, $360,200 (C. Neill, collaborative with P. Groffman and others).

2016-2017.Quantifying Nitrogen Removal by Innovative Alternative Septic Systems and Potential for Enhanced Nitrogen Removal by Labile Carbon Additions. MA Division of Coastal Zone Management (C. Neill, collaborative with R. Jakuba and G. Heufelder), $175,918.

2014-2024. Baywatchers—A Long-Term Ecological Monitoring Program for Buzzards Bay. Buzzards Bay Coalition, $1,019,192. (C. Neill).

2015-2016. Reducing Nutrient Losses from Cranberry Agriculture. Massachusetts Department of Energy and Environmental Affairs, Coastal Zone Management, $113,719. (C. Neill, collaborative with R. Jakuba, C. DeMoranville, C. Kennedy).

2015-2018. Collaborative Research: The Sustainability of Riparian Forests in Expanding Amazonian Agricultural Landscapes. NSF DEB 1457662, $774,713. (C. Neill, collaborative with L. Deegan, M. Macedo, P. Brando and others).

2011-2016. Science to Support Cultural Landscape Management and Restoration, Beech Tree and Paine Conservation Trusts, $300,000 (C. Neill).

2013-2016. Collaborative Research: Disrupted Nitrogen Cycles in the Brazilian Amazon, NSF Division of Environmental Biology, $493,458 (C. Neill, collaborative with M. Macedo, M. Coe and E. Davidson).

2013-2016. Belmont Forum Collaborative Research: XINGU—Integrating Land Use Planning and Water Governance in Amazonia. NSF Belmont Forum, $453,523 (C. Neill, collaborative with Alex Kruche and others).

2012-2016. Plum Island LTER. National Science Foundation, Division of Environmental Biology (LTER), $1,880,000. (A. Giblin, L. A. Deegan, J. Vallino, C. Neill)

2011-2015. Ecological Homogenization of Urban America. National Science Foundation, Ecosystems Studies Macrosystems Biology, $208,994 (C. Neill, collaborative with P. Groffman and others).

2010-2015. PIRE: Land Use, Ecosystem Services and Human Wellbeing: Responses to Millennium Village Interventions. National Science Foundation, Office of Informal Science Education, $1,199,999. NSF OISE 0968211 (C. Neill, C. A. Palm, L. K. Vanwey and others).

2010-2013. MSM Collaborative Research: Agricultural Expansion in the Brazilian Amazon and its Influence on the Water, Energy and Climate Cycles. National Science Foundation, Ecosystem Studies, $337,010 (C. Neill, collaborative with M. T. Coe).
2010. Project on Naushon Island Vegetation. Beech Tree Trust, $10,000 (C. Neill)
2011-2012. Socioenvironmental Impacts of "Green" Energy in the Amazon. Brown Office of the Vice President for International Affairs, $50,000 (L. VanWey, C. Neill, A. Foster).
2011-2012. Cranberry Bog Nutrient Loss Study. Massachusetts Department of Environmental Protection, $58,620 ($38,400 to MBL for sampling). Collaboration with Buzzards Bay Coalition, University of Massachusetts Cranberry Experiment Station, Cape Cod Cranberry Growers Association and the Town of Carver, MA.
2009-2014. Baywatchers—A Long-Term Ecological Monitoring Program for Buzzards Bay. Buzzards Bay Coalition, $396,328 (C. Neill)
2010-2010. MRI-R2: Acquisition of Trace Gas Analytical Instrumentation for Ecosystem Analysis, National Science Foundation, Division of Biological Infrastructure, $418,048 (H. Ducklow, J. Tang, M. Conte, C. Neill).
2010-2011. Naushon Sandplain Vegetation. Beech Tree Trust, $10,000 (C. Neill).
2009. Coupled Social and Natural Drivers of deforestation and Ecosystem Change at the Amazon Cropland Frontier. Brown University Environmental Change Institute, $50,000 (C. Neill and L. VanWey).
2007-2009. Sandplain grassland restoration at Herring Creek. The Nature Conservancy, $90,000 (C. Neill).
2008. Land use Change, Carbon Offsets and Carbon Sequestration: A Case Study in Essex and Middlesex Counties, MA. Hubbard Brook Research Foundation, $10,000 (C. Neill).
2008-2011.IPY: Improving the public's understanding of polar research through hands-on fellowships for science journalists in the Arctic and Antarctic. National Science Foundation, Informal Science Education, $365,289 (C. Neill, H. Ducklow, J. Hobbie, G. Shaver, B. Peterson).
2007-2011. Collaborative Research: Influence of Land Use on Watershed Hydrology and Biogeochemistry at the Amazon Agricultural Frontier. National Science Foundation, Ecosystem Studies Program, $831,395 (C. Neill, H. Elsenbeer, A. Krusche, E. Davidson).
2004-2007. Building the Scientific Base for Coastal Plain Pond Conservation. Massachusetts Environmental Trust, $61,340 (C. Neill, R. McHorney).
2004-2006. Overland F in the Humid Tropics Under Distinct Land Uses. German Government DADD. (Collaboration with Helmut Elsenbeer)
2004-2007. Science Journalism Program for the Arctic. National Science Foundation Office of Polar Programs. $45,864 (J. E. Hobbie, C. Neill, K. Foreman, P. Clapp).
2004-2005. Scientific and Practitioner Network for Sandplain Conservation. The Kohlberg Foundation. $25,000. (C. Neill)
2003-2006. Nitrogen Movement from Uplands to Streams in Forested and Deforested tropical watersheds. National Science Foundation, Ecosystems Studies Program. $600,000. (C. Neill, H. Elsenbeer, A. V. Krusche, P. A. Steudler, J. M. Moraes).
2003. Hydrological Science to Support Biodiversity Conservation in Massachusetts. The Nature Conservancy, Massachusetts Chapter. $95,000 (C. Neill)
2002-2003. The Nature Conservancy-MBL Sandplain Restoration and Conservation Experiment. Massachusetts Environmental Trust. $20,389. (C. Neill)

2002-2005. Key Connections in Amazonian Stream Corridors. NASA LBA Program. $754,661. (L. A.. Deegan, C. Neill, R. L. Victoria, A. V. Krusche, M. V. Ballester).
2002. $240,000. Controlled Environment Facilities for Examination of the Effects of Climate Change and Human Land Use on Terrestrial and Aquatic Ecosystems. NSF Field Stations and Marine Laboratories Program (G. R. Shaver and C. Neill).
2000-2003. $900,000. The Biogeochemical consequences of Agricultural Intensification in the Amazon. NASA LBA Program. (J. M. Melillo, C. Neill, P. A. Steudler and C. C. Cerri).
2000. $173,889. An Analytical Laboratory for Examination of Land Use Change and its Consequences for Aquatic Ecosystems. NSF Field Stations and Marine Laboratories Program (A. E. Giblin, C. Neill).
1998-2001. $477,000. Linking Soil Biogeochemistry to surface Water Chemistry in Small Drainage Basins of the Amazon. NASA LBA Program. (L. A. Deegan, C. Neill, R. A. Victoria).
1996-1999. $900,000. Trace Gas Fluxes Associated with Land-use and Land-cover Changes in the Brazilian Amazon Basin. NASA (J. M. Melillo, P. A. Steudler and C. Neill).
1996-1997. $50,000. Biogeochemical Consequences of Land use Change in the Amazon Basin. National Science Foundation Inter-American Institute for Global Change Research (J. Melillo, C. Neill and P. Steudler).
1996-1998. $290,000. Links Between Soil Nutrient Dynamics and Surface Water Biogeochemistry Following Deforestation for Pasture Agriculture in Amazonia. National Science Foundation Environmental Geochemistry and Biogeochemistry Program (L. Deegan and C. Neill).
1988-1990. $30,700. Flooding, Primary Production and Plant Resource Allocation in Prairie Marshes. North American Wildlife Foundation, through the Delta Waterfowl and Wetlands Research Station, Portage la Prairie, Manitoba (C. Neill).
1989. $600. Sigma Xi Grant-in-Aid of Research. Flooding, Primary Production and Resource Allocation in Prairie Marshes (C. Neill).
1986-1987. $25,700. Control of the primary Production of Emergent Macrophytes in Prairie Marshes: Effects of Water Depth and Nutrient Availability. North American Wildlife Foundation (C. Neill).

TEACHING:

1997-present. Teach ecosystem ecology in the Ecosystems Center's Semester in Environmental Science Program. Developed and present lectures on photosynthesis, scaling of production measurements, ecosystem water budgets, nitrogen cycling, ecosystems disturbance, tropical deforestation, land-water nitrogen movement. Developed and teach laboratories on biomass in terrestrial ecosystems, primary productivity, soil nutrient stocks and cycling, water budgets and land-water nutrient fluxes.
2012. Taught Brown graduate seminar, "Natural and Social Dynamics of Land Use Change." This was developed as a core course for the Brown-MBL NSF PIRE (Partnership for International Research and Education) project.
2006-present. Supervised Brown PhD students: Shelby Riskin (2012), Chelsea Nagy (2015); committees of Stephanie Spera (2015), Maya Almaraz (2016) and Marc Mayes (2016).
2006-present. Brown undergraduate theses supervised: Emily de Moor (2006), Elisabeth Ward (2013), Emma Dixon (2013), Adam Bouché (2014), Lena Champlin (2016).

2001-2014. Teach the Environmental Science component of the Marine Biological Laboratory's Hands-On Science Writing Laboratory, a 2-week immersion fellowship program for working science journalists. The program leads journalists through research questions, field data collection, laboratory water chemistry analysis, data analysis and public data presentation. It focused on polar environmental change at Toolik Field Station, Alaska and Palmer Station, Antarctica in 2007-2010 and on environmental change in the Northeast US (2011-present).

2000. Taught science writing seminar in Ecosystems Center Semester in Environmental Science Program.

1991-1993. Graduate Faculty, Masters of Science in Environmental Studies Program, Bard College, Annandale-on-Hudson, NY. Taught Ecosystem Ecology.

1989-1990. Department of Forestry and Wildlife Management, University of Massachusetts, Amherst, MA. Taught introductory course in the wildlife biology major, Wildlife and Fisheries Biology 197, "Fauna of New England Ecosystems."

PRESENTATIONS:

2025. Management and restoration to promote biodiversity and climate resilience. Keynote talk at the Southeastern Massachusetts Land Trust Convocation, February 1, 2025.

2025. Science and outreach to enhance healthy coastal ecosystems by restoring wetlands on former cranberry bogs. Invited talk for the Woods Hole Oceanographic Institution Sea Grant program, February 5, 2025.

2024. Sandplain grasslands in cranberry restoration projects. Sandplain Grassland Network Symposium, December 11, 2024

2024. O papel crítico dos solos profundos no apoio à agricultura sustentável. Simpósio de Celebração dos 20 anos da Estação de Pesquisa Tanguro. Brasilia, June 11.

2024. Conserving sandplain grasslands as biodiversity hotspots. The Three Hundred Committee land trust invited talk. March 28.

2024. Plants. Invited talk on bog restoration for Massachusetts Division of Ecological Restoration. January 26.

2023. Incorporating sandplain grasslands into cranberry bog restorations. Sandplain Grassland Network Conference. December 5.

2023. Vegetation responses to cranberry bog restoration. Invited field presentation for the staff of the Massachusetts Division of Ecological Restoration. October 13.

2023. Sustaining biodiversity in coastal grasslands. Invited lecture, Harvard School of Design, September 15.

2023. Opportunities for restoration of cranberry bog wetlands. Woods Hole Women's Club. April 11.

2023. Update on study of Vegetation change and carbon Storage in the Manuel Correllus State Forest and on Martha's Vineyard. Friends of Correllus State Forest, March 1.

2023. Vegetation responses to restoration in the Coonamessett River. Falmouth Conservation Commission public meeting. January 9

2022. Planning resilient landscapes for biodiversity conservation in a rapidly-changing climate. Invited presentation to the Trustees of Reservations, Edgartown, MA, September 22.

2022. Make research that guides nature-based solutions to nutrient removal and coastal Resiliency an urgent SNEP priority. Southern New England Program of the Environmental Protection Agency. May 18.
2022. Nitrogen dynamics in response to restoration in the Coonamessett River 2018-2021. Town of Falmouth Water Quality Management Committee. April 25.
2022. Plant responses following retirement and restoration of former cranberry bogs. Living Observatory Summit, April 11.
2022. The science behind yard management to increase plant, insect and bird biodiversity. Long Island Native Species Management Area and Long Island Native Plant Initiative Conference, April 7.
2022. The science behind yard management to increase plant, insect and bird biodiversity. Ecological Landscaping Association invited presentation, February 24.
2022. Modeling climate risk to Massachusetts cranberry agriculture. University of Massachusetts Cranberry Station Annual Growers' Meeting. January 27.
2021. Managing backyards for plant biodiversity. Native Plant Trust, June 24.
2021. Wetland restoration in cranberry bogs as part of a climate adaptation strategy for Massachusetts. Living Observatory Summit webinar, Plymouth, MA. May 7.
2021. The Yard Futures Project: The science of backyard ecosystems. Perennial Garden Club webinar, Bethesda, MD. April 13.
2021. The science behind yard management to increase plant, insect and bird biodiversity. Linda Loring Nature Foundation webinar, Nantucket, MA. With Desiree Narango. February 8.
2020. Managing coastal ecosystem and biodiversity in a future climate. Chappaquiddick Island Association webinar. December 3.
2020. Managing yards for plant biodiversity. Native Plant Trust webinar, June 20.
2020. The ecological homogenization of suburban America: Why it happens and what we can do about it. Invited talk (webinar) to Native Plant Trust, Framingham, MA. May 7.
2020. From mild to wild: How our backyard choices impact the environment. Kaneb Speaker Series (webinar), Woods Hole Research Center, April 29.
2020. Nitrogen dynamics in the Coonamessett River. Living Observatory Annual Meeting, Cambridge, MA March 6.
2020. Sustaining biodiversity in our coastal grasslands. Orleans Conservation Trust, Orleans, MA, March 5.
2020. In search of urban ecological homogenization. Native Plant Trust Story Slam, Framingham, MA, February 29.
2019. Wetland restoration to promote conservation and climate adaptation. Public presentation at Woods Hole Research Center, Falmouth, MA, October 28.
2019. Deforestation and the future of the Amazon. Wendell Public Library, Wendell, MA, April 26.
2019. A field laboratory for future tropical Earth: Long-term experiments on forests, fire and agriculture at Fazenda Tanguro, Mato Grosso, Brazil. Invited distinguished speaker, Department of Geosciences, Michigan State University, Lansing, MI, March 22.
2019. Watershed consequences of deforestation and the intensification of crop agriculture in the Amazon, Invited speaker, University of Massachusetts, Dartmouth, MA, February 27.
2019. New research on nutrient balances of cranberry bogs in southeastern Massachusetts watersheds. Annual Cranberry Growers meeting sponsored by the University of Massachusetts Cranberry Station, Plymouth MA, January 30.

2019. Deforestation, climate and the future of the Amazon. Mass Audubon's Nature on Tap series, Framingham, MA, January 9.
2018. Helping Falmouth's natural infrastructure adapt to climate change. Presentation to Town of Falmouth Coastal Resiliency Committee, Falmouth, MA, December 18.
2018. Sustaining biodiversity in coastal grasslands of the Northeast. Sheriff's Meadow Foundation, West Tisbury, MA, December 6.
2018. Reducing nitrogen loads to Squeteague Harbor, Presentation to a Squeteague Harbor community group, Bourne, MA, October 27.
2018. From Crane to Maine: Sustaining biodiversity in coastal grasslands of Falmouth and the Northeast, Public talk at Woods Hole Research Center, Falmouth, MA, May 24.
2018. Higher fertilizer use in Amazon crop agriculture does not increase nitrogen and phosphorus watershed export, Ecological Society of America Annual Meeting, New Orleans, LA, August 6.
2018. The changing Massachusetts cranberry industry, NRCS Restoration Workshop, Falmouth, MA, June 12.
2018. Understanding nitrogen and phosphorus balances of active cranberry bogs can help to prioritize future restoration at farm to watershed scales, Society of Wetland Scientists Annual Meeting, Denver, CO, May 30.
2018. Water quality monitoring in Buzzards Bay. Briefing to the MA Legislature, Boston, MA, April 2.
2018. New thinking about cranberry farming in southeast Massachusetts watersheds, The Three Hundred Committee Land Trust, Falmouth, MA, March 8.
2018. Nitrogen balances of cranberry bogs in Southeastern Massachusetts—Insights to guide restoration, Cranberry Restoration and Living Laboratory Working Group, Cambridge, MA, February 1.
2018. Agriculture, climate and the future of the Amazon. Keynote talk at the University of Massachusetts Department of Environmental Conservation Graduate Student Symposium, Amherst, MA, January 26.
2017. Adapting coastal landscapes ahead of climate change. Public talk at the Shalin Liu Performance Center, Rockport, MA. October 12.
2017. Nutrient exchanges in Southeast Massachusetts cranberry bogs. National Cranberry Research and Extension Workshop, Plymouth, MA, August 31.
2017. Nitrogen and phosphorus in agricultural systems: Understanding and avoiding impacts. Workshop on Intensification of the world's largest agriculture frontier: reconciling agricultural production and environmental integrity in a changing climate, Brasilia, May 2.
2017. Changes to water resources and water quality associated with expansion and intensification of Amazon commercial agriculture. Symposium on Commercial Agriculture in Tropical Environments, Third Annual International Food Security Symposium, University of Illinois, Urbana-Champaign, April 4.
2017. A framework for understanding the role of grazing and biodiversity in coastal landscapes. Grazing and Conservation on Martha's Vineyard, March 13, Martha's Vineyard Agricultural Society.
2016. Sensing environmental change in tropical forests and croplands. Workshop for Lightweight and Low-power Sensors for Environmental Measurements, Argonne National Laboratory, September 20.

2016. Deforestation and the future of the Amazon, and Ecological dynamics at the Amazon agricultural frontier. Two lectures recorded for the iBio on-line biology lecture series. July 15 and 18.
2016. Wetland restoration to increase ecosystem resilience and ecosystem services. Keynote talk at the Atlantic White Cedar Conference, Plymouth, MA, May 23.
2016. Deforestation, agriculture and the future of the Amazon. Invited talk, Cornell University, Ithaca, NY, April 13.
2016. Not on my lawn! How fertilizer-free lawns help water and wildlife. Talk for Falmouth Water Stewards, Falmouth, MA, March 10.
2015. Water music. Commentary at a choral concert presented by the Rockefeller Memorial Chapel Choir, MBL, September 28.
2015. The ecological homogenization of urban America. Invited seminar, the Ecosystems Center, MBL, April 28.
2015. The sacred powers of water. Commentary at a choral concert premier. Rockefeller Memorial Chapel, University of Chicago, Chicago, IL, February 28.
2014. Amazon soybeans, China and the future of the Earth's greatest forest. "Science Before Supper" series, Falmouth, MA, December 18.
2014. The nitrogen pollution problem, status and opportunities for action. Invited talk to the Buzzards Bay Coalition Leadership Council, Marion, MA, October 17.
2014. Land purchase and restoration as key components of Cape Cod's water quality solutions. Invited speaker at The 300 Committee annual meeting, July 10.
2014. Ecological restoration and wastewater management on Cape Cod as novel ecosystem experiments. Invited talk at Environmental Protection Agency's Atlantic Ecology Division, Narragansett, RI. July 1.
2014. Deforestation, agriculture and the future of the Amazon. MBL Invited "Friday Night Lecture." July 3.
2014. Wastewater and sea level rise: Cape Cod's biggest environmental problems as ecological restoration opportunities. Keynote address, Society for Environmental Restoration, Amherst, MA, April 25.
2014. Temperature regime of a Cape Cod groundwater river influenced by impoundment and cranberry agriculture. Society for Environmental Restoration, April 25, Amherst, MA
2014. Wastewater and sea level rise: Cape Cod's biggest environmental problems as ecological restoration opportunities. Keynote address, Society for Ecological Restoration, Amherst, MA, April 15.
2013. Invited presentation on intensifying Agriculture in Latin America at launch of Columbia University Center for Agriculture and Food Security, September 22.
2013. Water flows and feedbacks in intensifying Amazon agriculture. Brown International Advanced Research Institutes, Brown University, Providence, RI, June 20.
2013. Deforestation, intensive agriculture and the future of the Amazon. Unitarian Society of Falmouth, Falmouth, MA, June 19.
2013. State of the Cape's bays and estuaries: Threats and impacts to coastal ecosystem health. Opening keynote talk for *The State of the Cape: Changing Waters and Shorelines,* Waquoit Bay National Estuarine Research Reserve 1st Annual Cape Coastal Conference, Hyannis, MA, June 13

2013. Intensification of agriculture in the Amazon soybean region of Mato Grosso, Brazil. Talk to Columbia School of Journalism students, Marine Biological Laboratory, Woods Hole, MA, April 25.
2013. Intensification of agriculture in the soybean region of Mato Grosso, impact or resilience—and what's next. Workshop on Agricultural Intensification, Marine Biological Laboratory, Woods Hole, MA, January 14.
2011. Linking land use, fire and climate in the Amazon. Invited speaker, Symposium on Climate Change in Latin America, Brown University, April 8.
2010. New England's coastal plain ponds—local biodiversity hotspots in the face of global change. Rhode Island Natural History Survey, Sept 29.
2010. Influences of soil and scale on land-water fluxes of water, carbon and nitrogen in lowland Amazon headwater streams. American Geophysical Union Meeting of the Americas, Foz do Iguaçu, August 10.
2010. Soybean cropland expansion and impacts to Amazon headwater stream ecosystems. American Geophysical Union Meeting of the Americas, Foz do Iguaçu, August 10.
2010. Deforestation, climate and the future of the Amazon. Brown Latin American Student Association, April 12.
2010. Deforestation, climate and the future of the Amazon. Harvard Forest, Petersham, MA, March 12.
2009. Valuing ecosystems for water filtration and nitrogen removal. University of New Hampshire, Durham, NH, October 15.
2009. Biodiversity hotspots on Cape Cod and the Islands. Falmouth Friends Society, Falmouth, MA, September 13.
2009. Deforestation, Brown University research and the future of the Amazon. Brown Club of Cape Cod, Hyannis, MA, June 9.
2009. Insights from experimental manipulation and management of Massachusetts coastal plain grasslands and shrublands. Harvard Forest, Petersham, MA, May 8.
2009. Dangerous synergies: Deforestation, climate and the future of the Amazon. Department of Biology, University of Central Florida, Orlando, FL, January 9.
2008. Deforestation, farming, fire and drought: Emerging insights into the future of the Amazon, Washington and Lee University, Lexington, VA, November 6.
2008. The implications of soil seed banks for conservation and restoration in two endangered ecosystems of Massachusetts. Marine Biological Laboratory, Woods Hole, MA. October 21.
2008. Deforestation, farming, fire and drought: Emerging insights into the future of the Amazon. Massachusetts Institute of Technology Knight Journalism Fellows Program. Marine Biological Laboratory, Woods Hole, MA. October 9.
2008. Deforestation and the future of the Amazon. Watson Fellows Program, Brown University, Providence, RI. April 8.
2007. C. Neill, S. Germer, J. Chaves, A. V. Krusche and H. Elsenbeer. Land use and soils control the fate of dissolved nitrogen in Amazon watersheds. Fourth International Nitrogen Conference, Costa do Sauípe, Brazil. October 3.
2007. C. Neill, S. Germer, A. Krusche, J. Chaves, H. Elsenbeer, S. Gouveia Neto and A. Castellanos Bonilla. Water and solute balances in small Amazonian watersheds. Thirteenth LBA-Ecology Meeting, September 27-29, Salvador, Brazil.
2007. Águas. Conferências do Pan-Gnósio 2007, Invited talk in a series on advances, problems and questions, Escola Superior de Agricultura "Luiz de Queiroz," Piracicaba, SP, March 26.

2007. Deforestation decreases biodiversity but increases nitrogen retention in lowland Amazon streams. Stroud Water Research Center, Avondale, PA, March 8.
2006. What are the environmental and social consequences of soybean expansion in the Amazon? Brown University, Environmental Change Institute, November 19.
2006. The importance of scale and riparian zones in modifying solute inputs from land to streams. Tenth LBA-ECO Science Team Meeting, Brasilia, October 5.
2006. The biogeochemistry of Amazon deforestation. Brown University, Department of Ecology and Evolutionary Biology, September 16.
2006. Amazon watershed research. Council of Visitors, Marine Biological Laboratory, July 23.
2006. Dangerous synergies: the future of the Amazon basin. Invited lecture, Symposium on Climate Change, Marine Biological Laboratory, June 30.
2006. Deforestation and the future of the Amazon. Invited lecture, Potsdam Climate Impact Research. June 20.
2006. Deforestation and the future of the Amazon. Invited lecture, Institute of Geoecology, Potsdam University, June 13.
2006. Deforestation and the future of the Amazon. MBL Science Journalism Program, June 3.
2006. Physical and anthropogenic controls of the biogeochemistry of small stream in western Amazônia. Presentation at LBA Small Basin Synthesis Workshop, Piracicaba, Brazil, May 14
2006. Diversity and distribution of Cape Cod coastal plain pond seed banks. Cape Cod Natural History Conference, Barnstable, MA. March 25.
2006. Temperature regime of a Cape Cod groundwater river influenced by impoundment and agriculture. Cape Cod Natural History Conference, Barnstable, MA. March 25.2006. Amazon deforestation. Brown University, March 10.
2006. Abordagens para entender fluxos de água e material em pequenas bacias Amazonicas. Best Practices Workshop, Fazenda Tanguro, Canarana, Brazil. February 15.
2005. The effect of deforestation on Amazon streams. Sewanne College. October 3.2005. September 24. How well do mechanical land clearing and dormant-season prescribed burning promote establishment of coastal sandplain grassland and shrubland communities? September 24.
2005**.** The conservation implications of habitat and biogeochemical alteration of small lowland Amazonian streams caused by deforestation. Brasilia, July 19.
2005. Appearance on Cape Cod Environmental Connections television program, May 11.
2005. Deforestation and the future of the Amazon. Lecture to ISIS fellows, Southern Connecticut State University, March 16. MBL.
2005. Why restore ecosystems? Presentation to The Three Hundred Committee (Falmouth Land Trust), February 16, Falmouth, MA.
2004. Vegetation and Biogeochemical Responses to Sandplain Land Management: Results from Management Manipulations on Martha's Vineyard. Coastal Sandplain Science and Conservation Workshop, December 9-10, MBL
2004. From soils to solutes to stream channels: how deforestation is altering Amazonian stream ecosystems. Invited lecture, Biology Department, Grinnell College, Grinnell, Iowa. November 5.
2004. Controls of land-water nitrogen movement through small lowland Amazonian forest and pasture drainage basins in Rondônia (C. Neill, L. A. Deegan, A. V. Krusche, M. V. R.

Ballester, H. Elsenbeer, J. M. Moraes, R. L. Victoria, S. M. M. Thomas, C. L. Haupert and M. C. Piccolo). LBA Third Science Meeting, Brasilia, July 28.

2004. Deforestation and the future of the Amazon. Lecture to MBL Science Journalism Program, June 11.

2004. Deforestation and the future of the Amazon. Lecture to Brown University Luce Scholars Program, May 6.

2004. Land-water nitrogen movement following severe disturbance of a coastal forest: Insights from a conservation management experiment on Martha's Vineyard. The Ecosystems Center, March 16.

2004. Amazon update. Segment on National Public Radio's "Earth and Sky," February 18.

2003. Using ^{15}N to trace nitrogen transformations and organic matter turnover in an Amazonian rainforest stream. VI Congresso Ecologia do Brasil, 9-14 November, Fortaleza, Brazil. (C. Neill, L. A. Deegan, A. V. Krusche, M. V. Ballester, S. M. Thomas, R. L. Victoria. and A. F. Gessner).

2003. Soil nitrogen transformations and soil solution fluxes following clearing of Amazonian tropical forest for pasture. Large-Scale Biosphere-Atmosphere Experiment in Amazonia Science Meeting, November 5-8, Fortaleza, Brazil. (C. Neill, M. C. Piccolo, P. A. Steudler, L. A. Deegan, A. V. Krusche, S. M. Thomas, J. M. Melillo, D. C. Garcia-Montiel, M. V. Ballester, C. C. Cerri, R. L. Victoria and H. Elsenbeer).

2003. Key connections in Amazon stream corridors: Using ^{15}N to trace N transformations and transport. Large-Scale Biosphere-Atmosphere Experiment in Amazonia Science Meeting, Novembe 5-8, Fortaleza, Brazil. (L. A. Deegan, C. Neill, M. V. Ballester, S. M. Thomas. A. V. Krusche)

2003. Fluxes of nitrogen following clearing of Brazilian Amazon tropical forest for pasture. (M. Piccolo, C. Neill, C. C. Cerri, J. Melillo. Controlling N flows and losses, 12th N Workshop, Institute for Grassland an d Environmental Research, Devon, UK, 21-24 September.

2003. Conservation of ecosystem process in the Massachusetts Coastal Plain: What we have learned from the TNC-MBL experiments on Job's Neck. Martha's Vineyard Conservation Partnership, West Tisbury, MA, July 2.

2003. The land-water connection: Action steps to protect coastal salt ponds. West Tisbury's Coastal Salt Ponds Watershed Meeting, West Tisbury, MA, June 27.

2003. Conservation of ecological processes and rare species in the human-dominated Massachusetts Coastal Plain. Presentation to MBL's Hands-On Science Writing Program, June 6.

2003. Conservation of ecological processes and rare species in the Coastal Plain: Results of the MBL-TNC experiment on Job's Neck. Presentation to MA Chapter of The Nature Conservancy, April 15.

2003. Cape Cod birds as indicators of global change. MBL Elderhostel program, April 2.

2003. Restoring our back yards. Falmouth Garden Club, February 3.

2002. Land use and global change in the Amazon. Invited lecture to the Luce Scholars Program of Brown University, Woods Hole, MA, December 3.

2002. Martha's Vineyard Sandplain Ecosystem Study at Job's Neck: A synopsis of our field work tracking nitrogen and water flow. Annual meeting of the Great Ponds Foundation, Martha's Vineyard, MA, August 15.

2002. Land use change alters the biogeochemistry and downstream movement of nitrogen in small drainage basins, Oral presentation at the LBA All-Scientists Meeting, Manaus, Brazil, July 7-10. (Christopher Neill, Linda A. Deegan, Alex V. Krusche, Suzanne M. Thomas, M. Victoria R. Ballester, and Reynaldo L. Victoria).2002. Alterations to nitrate and ammonium concentrations in pasture soils subjected to tilling. Poster presented at the LBA Science Meeting, Manaus, Brazil, July 7-10. (Carmo, J. B., C. C. Cerri, C. Neill, M. C. Piccolo and D. Garcia).

2002. Variability of soil microbial biomass carbon in different pasture restoration systems in Rondônia, Brazil. Poster presented at the LBA Science Meeting, Manaus, Brazil, July 7-10. (K. C., M. C. Piccolo, B. J. Feigl, C. C. Cerri, C. Neill, J. M. Melillo, P. A. Steudler and D. C. Garcia).

2002. Changes to inorganic nitrogen in soil solution following forest clearing for pasture in Rondônia. Poster presented at the LBA Science Meeting, Manaus, Brazil, July 7-10. (Cassiolato, M. E., M. C. Piccolo, C. Neill and C. C. Cerri)

2002. Neill, C., P. A. Steudler and M. C. Piccolo. Control of N_2O and N_2 emissions from Amazonian pastures under intensified use: Availability of nitrogen, carbon and the effects of soil tillage. Poster presented at the LBA Science Meeting, Manaus, Brazil, July 7-10.

2002. C. Neill, L. A. Deegan, A. V. Krusche, S. M. Thomas, M. V. Ballester, and R. L. Victoria. Land use change alters the biogeochemistry and downstream movement of nitrogen in small drainage basins. Talk presented at the LBA Science Meeting, Manaus, Brazil, July 7-10.

2002. Rates and controls of nitrogen oxide emissions from soils following deforestation for pasture in Rondônia, Brazil. Invited lecture in the symposium, Land-Use Change and Greenhouse Gas Emissions, Soil C and Nutrient Cycling in the Tropics, Tsukuba, Japan, February 21-23.2002. Three segments highlighting my research were broadcast on the National Public Radio program, “Earth and Sky.” The first was on methane emissions from Amazon forests and pastures, the second was on the effect of Amazon deforestation on stream chemistry, the third was on the future consequences of intensification of agriculture in the Amazon. Broadcast in January.

2002. Deforestation and the future of the Amazon. Lecture to the Cape Cod Group of the Sierra Club, Barnstable, MA, January 22.

2001. Deforestation and the future of the Amazon. Invited lecture, Massachusetts Chapter, Sierra Club, Boston, MA, June 15.

2001. Restoration of coastal shrublands and grasslands on the Cape and Islands. Norfolk Medical Society, Needham, MA. April 25.

2001. Deforestation, ecosystem science and the future of the Amazon, Department of Geography, Boston University, April 6.

2001.Deforestation and the future of the Amazon, Guest lecture to Connecticut science teachers education program in Woods Hole. March 2.

2001. Restoration of coastal shrub and grasslands on the Cape and the Islands. Invited lecture, Maria Mitchell Association, Nantucket, MA. January 26

2001. Deforestation and the future of the Amazon, Maria Mitchell Association, Nantucket, MA. January 12

2000. Deforestation, ecosystem science and the future of the Amazon. The Ecosystems Center 25th Anniversary Celebration, Woods Hole, MA. Oct. 14

2000. The ecosystem consequences of deforestation for pasture in Rondônia. Ecological Society of America, Snowbird, UT. August 8.

2000. Linking changes in ecosystem structure to changes in water balance and nitrogen retention during shrub and grassland restoration on Martha's Vineyard. 2000 Pine Barrens Research Forum, Brookhaven National Laboratory, Upton, NY.
2000. Links between soil biogeochemistry and water chemistry following deforestation for pasture in small watersheds in Rondônia. First LBA Scientific Conference, Belem, Brazil. June 27.
1999. Soil warming experiments at Abisko, Sweden. Soil Warming Workshop, National Center for Ecological Analysis and Synthesis, Santa Barbara, CA. February 1-5.
1999. Nitrogen cycling responses to elevated temperature and CO_2. Invited talk. GCTE conference on how nutrient cycles constrain carbon balances in boreal forests and arctic tundra, June 15-18, Abisko, Sweden.
1999. Links between soil nutrient cycling, deforestation and water chemistry in small Amazonian streams. North American Benthological Society, May 25-28.
1999. Links between deforestation, soil nutreint cycling and water chemstry in Amazonian streams. Ecological Society of Amercia, August 8-12.
1998. Links between soil nutrient cycling and surface water chemistry following deforestation in the Brazilian Amazon. Invited seminar, Division of Biology, Kansas State University, April 3.
1997. Nitrogen dynamics immediately following cutting and burning of tropical forest for pasture in Rondônia. Ecological Society of America, Albuquerque, NM, August 10-14.
1997. Factors influencing soil carbon accumulation of loss following deforestation for pasture in the Brazilian Amazon. Invited talk, Carbon pools and dynamics in tropical ecosystems, Belem, Brazil, December 1-5.
1996. Changes to nitrogen cycling caused by deforestation for pasture in Rondônia. Inter-American Institute for Global Change Research Workshop, "The Biogeochemical Consequences of Land Use Change in the Western Brazilian Amazon Basin, December 9-13, Cuiabá, MT, Brazil.
1996. Links between soil nutrient dynamics and stream biogeochemistry following deforestation in the Brazilian Amazon. Ecological Society of America, Providence, RI, August 11-15.
1996. Restoration of biogeochemical functioning in forests regrowing on abandoned pastures in the Brazilian Amazon. Ecological Society of America, Providence, RI, August 11-15.
1995. The vernal flood: how spring inundation controls plant production in prairie marshes. Society of Wetland Scientists, Cambridge, MA, May 29-June 1.
1994. Changes to soil carbon and nitrogen stocks and cycling rates following forest conversion to pasture in the Brazilian Amazon Basin. Ecological Society of America, August 7-11.
1994. Changes to soil carbon nitrogen stocks and nitrogen cycling rates caused by forest conversion to pasture in the Brazilian Amazon Basin. First GCTE Science Conference, Woods Hole, MA, May 23-27.
1993. The fate of the forest soil: implications of deforestation in the Brazilian Amazon for global climate change and the sustainability of tropical agriculture. Invited lecture, Bard College, Annandale, NY. July 30.
1991. Comparison of factors controlling emergent plant production in inland saline marshes and coastal salt marshes. Estuarine Research Federation, San Francisco, CA, November 10-14.
1991. Control of emergent plant production in saline prairie marshes: do they behave like coastal salt marshes? New England Estuarine Research Society, Yarmouth, NS, May 2-4.

1990. The effect of early spring flooding on nitrogen availability and plant biomass in a prairie marsh. Ecological Society of America, Snowbird, UT, July 29-August 2.
1987. Nitrogen limitation along a water depth gradient in a Manitoba prairie marsh. The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA, December 15, 1987.
1987. Backfilling canals to mitigate canal dredging in Louisiana coastal marshes. Estuarine Research Federation, New Orleans, LA, October 26-30.
1985. Backfilling canals to create habitat for wintering waterfowl. Waterfowl in winter: a symposium and workshop, Galveston, TX, January 7-10.
1984. A comparison of the fish communities in open and plugged backfilled canals in Louisiana coastal marshes. Gulf Estuarine Research Society, Galveston, TX, October 25-27.
1984. Cyclical succession in wetlands of the Mississippi River deltaic plain. Ecological Society of America, Fort Collins, CO, August 6-9.
1984. Backfilling to mitigate the effects of oil and gas dredging in coastal Louisiana. Gulf Estuarine Research Society, Dauphin Island, AL, May 17-19.

LOCAL SERVICE:

2013-present. Board of Directors and Chair, Science Advisory Committee, Buzzards Bay Coalition, a local non-profit with a mission to protect Buzzards Bay. Organized and Chair, Science Advisory Committee.
2003 - present. Board of Directors, Falmouth Water Stewards (formerly Falmouth Associations Concerned with Estuaries and Salt Ponds).
2010 - present. Board of Directors. Coonamessett River Trust, a local non-profit dedicated to restoring the Coonamessett River in Falmouth.
2010 - present. Board of Directors, BiodiversityWorks, a local non-profit dedicated to wildlife research, monitoring and public outreach.
1994 – 2011 and 207- - present. Wrote monthly op-ed column on environmental issues for *The Enterprise*, local newspaper in Falmouth, MA.
2013-2017. Cape Cod Commission Section 208 Science Advisory Committee. Provide expertise on regional wastewater plan.
2008 – 2013. President, Falmouth Associations Concerned with Estuaries and Salt Ponds, a local non-profit group that promotes actions to improve water quality in Falmouth, MA.
2006 - 2010. President, Coonamessett River Trust, a local non-profit devoted to river restoration
2011 - 2014. Advisory Board, Regional Technology Development Corporation of Cape Cod Water Incubator, an attempt to develop new water and wastewater technologies.
2003 - 2009. Board of Directors and Science Advisory Board, Association to Preserve Cape Cod, a regional non-profit environmental group.
2004. Outstanding achievement award, Massachusetts Chapter of the Sierra Club.
1996 - 2003. Chairman, Cape Cod Group of the Sierra Club.
2001 - 2002. Communications Committee and Capital Campaign Planning Committee, The 300 Committee, a Falmouth-based land trust.
1998 - 2000. Member of Executive Committee, Massachusetts Chapter of the Sierra Club.
1987 - 1989. Chairman, Solid Waste Planning Committee, Town of Wendell, MA.
1986 - 1989. Associate Member, Conservation Commission, Town of Wendell, MA.

EXHIBIT A

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE
20 RIVERSIDE DRIVE, LAKEVILLE, MA 02347 508-946-2700

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

IAN A. BOWLES
Secretary

LAURIE BURT
Commissioner

MODIFIED GROUNDWATER DISCHARGE PERMIT

Name and Address of Applicant: River Run WWTF c/o ADM Agawam Development LLC, 158 Tihonet Road, Wareham, Massachusetts 02571

Date of Application:	June 17, 2008
Application/Permit No.	SE# 0-890
Date of Issuance:	July 8, 2010
Date of Expiration:	July 8, 2017[1]
Effective Date:	August 7, 2010

AUTHORITY FOR ISSUANCE

Pursuant to authority granted by Chapter 21, Sections 26-53 of the Massachusetts General Laws, as amended, 314 CMR 2.00, and 314 CMR 5.00, the Massachusetts Department of Environmental Protection (the Department) hereby issues the following Modified Permit to: ADM Agawam Development LLC (hereinafter called "the permittee") authorizing discharges from the on-site wastewater treatment facility to the ground located at River Run Development, Off Wareham Road, Plymouth, Massachusetts such authorization being expressly conditional on compliance by the permittee with all terms and conditions of the Modified Permit hereinafter set forth.

Jonathan E. Hobill
Acting Deputy Regional Director

7/8/2010
Date

[1] Includes 2 year automatic extension by operation of the Permit Extension Act

I. SPECIAL CONDITIONS

A. Effluent Limits

The permittee is authorized to discharge into the ground from the wastewater treatment facilities for which this Modified Permit is issued a treated effluent whose characteristics shall not exceed the following values within one month of startup and continuing thereafter:

Effluent Characteristics	Discharge Limitations
Flow	395,000 GPD
Oil and grease	15 mg/l
Total Suspended Solids (TSS)	30 mg/l
Biochemical Oxygen Demand, 5-day @20°C (BOD_5)	30 mg/l
Total Nitrogen (NO2 + NO3 + TKN)*	5 mg/l
Nitrate-Nitrogen*	5 mg/l

* Refer to Supplemental Condition #20 Appendix A, & Modified Fact Sheet

a) The pH of the effluent shall not be less than 6.5 nor greater than 8.5 at any time or not more than 0.2 standard units outside the naturally occurring range.

b) The discharge of the effluent shall not result in any demonstrable adverse effect on the groundwater or violate any water quality standards that have been promulgated.

c) The monthly average concentration of BOD and TSS in the discharge shall not exceed 15 percent of the monthly average concentrations of BOD and TSS in the influent into the permittee's wastewater treatment facility.

d) When the average annual flow exceeds 80 percent of the permitted flow limitations, the permittee shall submit a report to the Department describing what steps the permittee will take in order to remain in compliance with the Modified Permit limitations and conditions, inclusive of the flow limitations established in this Modified Permit.

B. Monitoring and Reporting

INFLUENT:

The permittee shall monitor and record the quality of the **influent** waste stream to the facility according to the following schedule and other provisions:

Parameter	Minimum Frequency of Analysis	Sample Type
BOD_5	Monthly	24-Hour Composite
Total Suspended Solids	Monthly	24-Hour Composite
Total Solids	Monthly	24-Hour Composite
Ammonia Nitrogen	Monthly	24-Hour Composite
pH	Daily	Grab
Oil & Grease	Monthly	Grab
Volatile Organic Compounds*	Annually	Grab

* (USEPA Method #624)

EFFLUENT:

The permittee shall monitor and record the quality and quantity of **effluent** at the effluent pump chamber to the leaching area according to the following schedule and other provisions:

Parameter	**Minimum Frequency of Analysis**	**Sample Type**
Flow	Daily	Meter reading
pH	Daily	Grab
Total Suspended Solids	Monthly	24-Hour Composite
Total Solids	Monthly	24-Hour Composite
Oil & Grease	Monthly	Grab
BOD_5	Monthly	24-Hour Composite
Nitrate Nitrogen	Monthly	24-Hour Composite
Total Nitrogen (NO_2 + NO_3 + TKN)	Monthly	24-Hour Composite
Total Phosphorus[2] (as P)	Quarterly	Grab
Orthophosphate[2] (as P)	Quarterly	Grab
Volatile Organic Compounds[1]	Annually	Grab

[1]USEPA Method #624
[2]After one full year of monitoring the Total Phosphorus and Orthophosphate results, the Department may determine, upon the request of the permittee, that the frequency of monitoring may be reduced if, in the judgment of the Department, the results of the sampling indicate that existing phosphorus levels will not adversely impact downgradient receptors.

2) The permittee shall sample the upgradient monitoring well AP-07-WW1, three (3) downgradient monitoring wells AP-07-WW2, AP-07-WW 3& AP-07-WW4 and two (2) surface water monitoring locations as shown on a plan dated August 2010, prepared by Weston & Sampson and titled “River Run Groundwater Discharge Permit Groundwater Monitoring Proposal”. Labels identifying each monitoring well’s identification in accordance with the above-referenced approved plan shall be affixed to the steel

protective casing of each monitoring well and visible stone bounds set at surface water sampling locations.

The permittee shall monitor, record and report the quality of water in the monitoring wells according to the following schedule and other provisions:

Parameter	**Frequency of Analysis**
Static Water Level[1]	Monthly
Specific Conductance	Monthly
pH	Monthly
Total Nitrogen (NO_2+NO_3+TKN)	Quarterly
Nitrate-Nitrogen	Quarterly
Total Phosphorus[3] (as P)	Quarterly
Orthophosphate[3] (as P)	Quarterly
Volatile Organic Compounds[2]	Annually

[1]Static Water Level shall be expressed as an elevation and shall be referenced to the surveyed datum established for the site. It shall be calculated by subtracting the depth to the water table from the surveyed elevation of the top of the monitoring well's PVC well casing/riser.
[2]USEPA Method #624
[3]After one full year of monitoring the Total Phosphorus and Orthophosphate results, the Department may determine, upon the request of the permittee, that the frequency of monitoring may be reduced if, in the judgment of the Department, the results of the sampling indicate that existing phosphorus levels will not adversely impact downgradient receptors.

3) Any grab sample or composite sample required to be taken less frequently than daily shall be taken during the period of Monday through Friday inclusive. All composite samples shall be taken over the operating day.

The permittee shall submit all monitoring reports within 30 days of the last day of the reporting month. Reports shall be on an acceptable form, properly filled and signed and shall be sent to the Department of Environmental Protection, Southeast Regional Office, 20 Riverside Drive, Lakeville, MA 02347, and to the Director of Watershed Permitting, Department of Environmental Protection, Watershed Permitting Group, One Winter Street, Boston, MA 02108, the Plymouth Board of Health, 11 Lincoln Street, Plymouth, Massachusetts 02360 and to the Wareham Board of Health, 54 Marion Rd, Wareham, MA 02571. Submission of monitoring reports in electronic format is available through eDEP and serves as data submission to both the Regional and Boston offices. To register for electronic submission go to: *http://www.mass.gov/dep/service/compliance/edeponlf.htm*

C. Supplemental Conditions

1. The permittee intends to transfer the Modified Permit to Agawam Wastewater Capital LLC, upon its creation in accordance with 314 CMR 5.12(4). The permittee shall notify the Department at least thirty (30) days in advance of the proposed transfer to Agawam Wastewater Capital LLC, or any other entity, of ownership of the treatment works for which this Modified Permit is written. Said notification shall include a written agreement between the existing and new permittees containing a specific date for transfer of permit, responsibility, coverage and liability between them.

2. A staffing plan for the treatment works shall be submitted to the Department once every two years and whenever there are staffing changes. The staffing plan shall include the following components:

    a) The operator(s)'s name(s), operator grade(s) and operator license number(s);
    b) The number of operational days per week;
    c) The number of operational shifts per week;
    d) The number of shifts per day;
    e) The required personnel per shift;
    f) Saturday, Sunday and holiday staff coverage;
    g) Emergency operating personnel

3. The permittee is responsible for the operation and maintenance of all sewers, pump stations, grease traps and treatment units for the permitted facility, which shall be operated and maintained under the direction of a properly certified wastewater operator.

4. The permittee shall contract to have any and all solids and sludges generated by the treatment works for which this Modified Permit is issued removed off site by a properly licensed waste hauler for disposal at an EPA/DEP approved facility. The name and license number of the hauler along with the quantity of wastes removed and the date(s) of removal shall be reported by the permittee in writing to the Department.

5. Operation and maintenance of the proposed facility must be in accordance with 314 CMR 12.00, "Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges", and, 257 CMR 2.00, "Rules and Regulations for Certification of Operators of Wastewater Treatment Facilities."

    a. The facility has been rated (in accordance with 257 CMR 2.00), to be a Grade 6 facility. Therefore, the permittee shall provide for oversight by a Massachusetts Certified Wastewater Treatment plant operator (Chief Operator) Grade 6. The permittee will also provide for a backup operator who shall possess at least a valid Grade 5 license.

b. The date and time of the operator's inspection along with the operator's name and certification shall be recorded on the required monthly monitoring reports.

6. If the operation and maintenance of the facility is to be contracted to a private concern, the permittee shall submit a copy of the contract, consistent with what is required by the approved Operation & Maintenance manual and signed only by the contractor, to MassDEP Regional Office within ninety (90) days prior to request for authorization to operate the PWTF. Along with the contract, a detailed listing of all contract operation obligations of the proposed contractor at other facilities shall also be submitted.

7. Any connections to the sewer system shall be approved in accordance with 314 CMR 7.00 or any successor code.

8. All tests or analytical determinations to determine compliance with permit standards and requirements shall be done using tests and procedures found in the most recent version of *Standard Methods for the Examination of Water and Wastewater* and shall be performed by a Massachusetts certified laboratory.

9. The permittee shall notify the Department, in writing, within thirty (30) days of the following events:
   a. Any interruption of the treatment system operation, other than routine maintenance.
   b. Final shutdown of the treatment system.
   c. The date of wastewater treatment plant start up.

10. The permittee shall establish and maintain a financial assurance mechanism that provides for the continued availability of an immediate repair and replacement account to be used by the permittee solely for the immediate repair and replacement of any failing components of the PWTF. To create an immediate repair and replacement account, the permittee shall deposit at least 15% of the estimated construction cost of the PWTF into an interest bearing escrow account in accordance with the financial assurance mechanism and 314 CMR 5.15. The permittee shall also establish and maintain a financial assurance mechanism in accordance with 314 CMR 5.15 that provides for the accumulation in a capital reserve account of sufficient funds to make any necessary modifications to the PWTF and other related equipment within twenty years from the date the PWTF commenced operation or such other period determined to be appropriate by the Department based on the age and condition of the PWTF. The financial assurance mechanism shall provide for the accumulation in the capital reserve account of an amount equal to at least 25% of the estimated construction cost of the PWTF. On or before January 31st of each year, the permittee shall submit an annual financial report identifying the initial and current balances in the immediate repair and replacement account and the capital reserve account and confirming the continuing availability of the funds in said account for the purposes specified in the Modified Permit and 314 CMR 5.15. Said report shall be prepared in accordance with generally accepted accounting principles.

Reports pertaining to the required financial assurance mechanism(s) shall be sent to the Wastewater Management Section Chief at the appropriate Regional Office.

11. The permittee shall meet the obligation to establish all required financial assurance mechanisms by using Department-approved form documents and shall submit said Department-approved form documents to the Department for its review and approval as follows:

    a. A permittee that constructs the wastewater treatment facility after the issuance of the individual permit may submit the financial assurance mechanism(s) to the Department for its review and approval no later than ninety (90) days prior to the start-up of the facility. Such a permittee shall not operate the facility unless and until the Department has approved the required financial assurance mechanism(s), the financial assurance mechanisms are in full force and effect, and the permittee has made all contributions required thirty (30) days prior to the start-up of the facility.

    b. A permittee with a wastewater treatment facility in existence prior to the submission of the individual permit renewal application may submit the financial assurance mechanisms to the Department for its review and approval no later than ninety (90) days from the date of submission of the individual permit renewal application. Said permittee shall be in compliance with the provision of each approved financial assurance mechanism requiring contributions to the immediate repair and replacement account and the capital reserve account no later than thirty (30) days prior to the date on which the renewal is issued.

12. The permittee shall maintain the current form documents evidencing all required financial assurance mechanisms approved by the Department. The permittee shall perform all its obligations under the required financial assurance mechanisms as approved by the Department.

13. For purpose of the financial assurance mechanism requirement, the estimated construction cost of the wastewater treatment facility shall include the cost of constructing the wastewater treatment plant, collection system, associated mechanical equipment, but not including the land, ground and disposal area.

14. In the event that effluent limits are not met, the permittee may be obligated to modify, supplement or replace the permitted treatment process so as ensure compliance with the Modified groundwater discharge permit and 314 CMR 5.00.

15. In the event that the groundwater quality in the downgradient monitoring wells does not meet the Modified groundwater discharge permit and 314 CMR 5.00, the permittee may be obligated to conduct an engineering evaluation to determine whether effluent limits are being met and, if not what if any modifications are needed to return to compliance.

16. All future sewer extensions and connections shall comply with the provisions of 314 CMR 7.00 or any successor code.

17. The Modified Permit is subject to applicant submitting to MassDEP no later than ninety (90) days prior to commencing construction of the treatment facility sufficient information to demonstrate to MassDEP's satisfaction that the requirements established under 314 CMR 5.15 have been met.

18. No later than ninety (90) days prior to commencing construction of the effluent disposal area, for the discharge from the proposed wastewater treatment facility, arrangements must be made with the MassDEP Southeast Regional Office to witness percolation tests and deep observation test pits.

19. No later than ninety (90) days prior to commencing start-up of the proposed wastewater treatment facility final plans and specification that are consistent with the permit application package application must be submitted the MassDEP Southeast Regional Office.

20. It has been determined that the Agawam/Wareham River Estuarine Watershed is impaired due to nitrogen. Based on surface water quality impacts within the watershed the Modified Permit includes the following measures which are expected to achieve a no net nitrogen load impact as a result of the discharge:

    - Eliminate the use of nitrogen in any fertilizer on bogs as identified in Appendix A, provided however that permittee may pursue and implement other measures in lieu of cessation of fertilizers provided permittee demonstrates that such measures provide at least equivalent nitrogen reduction. The reduction of nitrogen to these bogs shall be reflected in the appropriate bog's NRCS/USDA Farm Plan.

    - Prohibit the application of nitrogen-based fertilizers for any lawn and/or landscape maintenance within the project's boundaries.

    - Reserve approximately 52,000 gallons per day excess treatment capacity at the treatment facility and in the associated collection system in order to connect existing properties within proximity of the development and located within the Agawam/Wareham River Estuarine Watershed.

    - Create a fund in the amount of $500,000 to be used to reduce other sources of nitrogen within the Agawam/Wareham River Estuarine Watershed.

    - Mitigation measures as described in Appendix A and the Modified Fact Sheet.

21. Permittee may, with prior written approval of the MassDEP, substitute alternative nitrogen offset measures provided that the permittee demonstrates that such alternative offset measures provide at least equivalent nitrogen reduction.

22. The permittee shall institute a pre- and post-construction monitoring program in accordance with the following schedule:

a. Pre-construction monitoring shall commence no later than March 31, 2011 and continue for 24 months. The Department may require the permittee to continue the pre-construction monitoring for more than 24 months to fill in data gaps, if low flow conditions caused by extreme events, including but not limited to a declared drought, preclude sampling or stream gauging.

b.

Sampling Location	Water Level Sampling Frequency	Stream Flow Sampling Frequency	Water Quality Sampling Frequency	Sampling Parameters (Field)	Sampling Parameters (Laboratory)
AP-08-WW1	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-08-WW2	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-07-MW27S	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-010-WW27D	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-08-WW3S	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance,	Total nitrogen, Nitrate-nitrogen, total phosphorus,

				dissolved oxygen, alkalinity	orthophosphate, Boron, Chloride
AP-010-WW3D	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-08-WW4S	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-010-WW4D	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-010-WW5S	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-010-WW5D	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-010-WW6S	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride

AP-010-WW6D	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-010-WW7S	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-010-WW7D	Every 4 hours	NA	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-08-SW1	Every 4 hours	Monthly plus 7 other flow conditions over the 2 year sampling period as required by the Department	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-08-SW2	Every 4 hours		Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride
AP-010-SW3	Every 4 hours	Monthly plus 7 other flow conditions over the 2 year sampling period as required by the Department	Quarterly	Temperature, pH, specific conductance, dissolved oxygen, alkalinity	Total nitrogen, Nitrate-nitrogen, total phosphorus, orthophosphate, Boron, Chloride

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c. Post-Construction Monitoring:

Postconstruction monitoring will commence once the Department authorizes the permittee to commence operation of the PWTF and will continue for 24 months as follows: The post construction monitoring will commence when 25% of the units are occupied or March 31, 2016 whichever first occurs. If 25% of the units are occupied within five years of the date construction of the River Run Development commences, the permittee shall continue the post construction monitoring for two years. If 25% if the units are not occupied within five years of the date construction of the River Run Development commences, the permittee shall perform one year of post construction monitoring as provided herein and one additional year of post construction monitoring commencing when 50% of the units are occupied. Construction of the River Run Development shall be deemed to commence when construction of the first unit commences.

Sampling Location	Water Level Sampling Frequency	Stream Flow Sampling Frequency	Water Quality Sampling Frequency
AP-08-WW1	Every 4 hours	NA	Quarterly
AP-08-WW2	Every 4 hours	NA	Quarterly
AP-07-MW27S	Every 4 hours	NA	Quarterly
AP-010-WW27D	Every 4 hours	NA	Quarterly
AP-08-WW3S	Every 4 hours	NA	Quarterly
AP-010-WW3D	Every 4 hours	NA	Quarterly
AP-08-WW4S	Every 4 hours	NA	Quarterly
AP-010-WW4D	Every 4 hours	NA	Quarterly
AP-010-WW5S	Every 4 hours	NA	Quarterly
AP-010-WW5D	Every 4 hours	NA	Quarterly
AP-010-WW6S	Every 4 hours	NA	Quarterly
AP-010-WW6D	Every 4 hours	NA	Quarterly
AP-010-WW7S	Every 4 hours	NA	Quarterly

AP-010-WW7D	Every 4 hours	NA	Quarterly
AP-08-SW1	Every 4 hours	4 times per year	Quarterly
AP-08-SW2	Every 4 hours	N/A	Quarterly
AP-010-SW3	Every 4 hours	4 times per year	Quarterly

The location of the sampling stations shall be as shown on the plan titled "Revised Groundwater and Surface Water Monitoring Plan Agawam Parcel" prepared by Weston and Sampson, dated August 2010.

23. The permittee has submitted a sampling plan to the Department. This sampling plan describes the monitoring well construction, the data collection and sampling protocol, procedures for using modeling to confirm the location of the monitoring wells, and standard operating procedures. This sampling plan is incorporated and made part of this Modified Permit.

24. The permittee shall submit an annual report on or before January 31 of each year for which this Modified Permit is in effect that describes all development which has taken place in the previous calendar year and shall include square foot coverages of impervious surfaces (road and roof), lawn area, natural surfaces and active cranberry bog areas. The report shall also describe all efforts to insure compliance with restrictions on nitrogen fertilizer within the development area and the nitrogen mitigation measures implemented at the cranberry bogs identified in Appendix A. The Department shall evaluate this information to insure compliance with the conditions of this Modified Permit, including nitrogen mitigation, and reserves the right to require the permittee to take any action necessary to maintain a nitrogen neutral loading from the development.

25. Within 30 days of any local subdivision approval the permittee shall submit to MassDEP a copy of approved subdivisions in both a hard copy and an electronic overlay. The electronic overlay shall be in the MassGIS Digital submittal standard, level III.

D. Appeal Rights

This Modified Permit is an action of the Department. Any person aggrieved by this action may request an Adjudicatory Hearing. A request for a hearing must be made in writing and postmarked within thirty (30) days of the Modified Permit issuance date. Under 310 CMR 1.01(6)(b), the request must state clearly and concisely the facts, which are the grounds for the request, and the relief sought.

The Hearing request along with a valid check payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100.00) must be mailed to:

Commonwealth of Massachusetts

Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

The request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver as described below. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority. The Department may waive the adjudicatory hearing filing fee for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file, together with the hearing request as provided above, an affidavit setting forth the facts believed to support the claim of undue financial hardship.

II. GENERAL PERMIT CONDITIONS

The following conditions apply to all individual and general permits:

(1) No discharge authorized in the permit shall cause or contribute to a violation of the Massachusetts Surface Water Quality Standards (314 CMR 4.00) or any amendments thereto. Upon promulgation of any amended standard, this permit may be revised or amended in accordance with such standard and 314 CMR 2.10 and 3.13 or 5.12. Except as otherwise provided in 314 CMR 5.10 (3)(c), 310 CMR 5.10(4)(a)2 and 314 CMR 5.10(9), no discharge authorized in the permit shall impair the ability of the ground water to act as an actual or potential source of potable water. Evidence that a discharge impairs the ability of the ground water to act as an actual or potential source of potable water includes, without limitation, analysis of samples taken in a downgradient well that shows one or more exceedances of the applicable water quality based effluent limitations set forth in 314 CMR 5.10. In those cases where it is shown that a measured parameter exceeds the applicable water quality based effluent limitations set forth in 314 CMR 5.10 at the upgradient monitoring well, evidence that a discharge impairs the ability of the ground water to act as an actual or potential source of potable water is deemed to exist if a measured parameter in any downgradient well exceeds the level of that same measured parameter in the upgradient well for the same sampling period. . A statistical procedure approved by the Department shall be used in determining when a measured parameter exceeds the allowable level.

(2) Duty to comply. The permittee shall comply at all times with the terms and conditions of the permit, 314 CMR 5.00, M.G.L. c. 21, §§ 26 through 53 and all applicable state and federal statutes and regulations.

(3) Standards and prohibitions for toxic pollutants. The permittee shall comply with effluent standards or prohibitions established under § 307(a) of the Federal Act, 33 U.S.C § 1317(a), for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

(4) Proper operation and maintenance. The permittee shall at all times properly operate and maintain all facilities and equipment installed or used to achieve compliance with the terms and conditions of the permit, and the regulations promulgated at 314 CMR 12.00 entitled "Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges, and 257 CMR 2.00, Rules and Regulations for Certification of Operators of Wastewater Treatment Facilities".

(5) Duty to halt or reduce activity. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or discharges or both until the facility is restored or an alternative method of treatment is provided. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

(6) Power Failure. In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

(a) provide an alternative power source sufficient to operate the wastewater control facilities; or

(b) halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

(7) Duty to mitigate. The permittee shall take all reasonable steps to minimize or prevent any adverse impact on human health or the environment resulting from non-compliance with the permit.

(8) Duty to provide information. The permittee shall furnish to the Department within a reasonable time as specified by the Department any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit, or to determine whether the permittee is complying with the terms and conditions of the permit.

(9) Inspection and entry. The permittee shall allow the Department or its authorized representatives to:

(a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records required by the permit are kept;
(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit;
(c) Inspect at reasonable times any facilities, equipment, practices, or operations regulated or required under the permit; and
(d) Sample or monitor at reasonable times for the purpose of determining compliance with the terms and conditions of the permit.

(9A) The permittee shall physically secure the treatment works and monitoring wells and limit access to the treatment works and monitoring wells to those personnel required to operate, inspect and maintain the treatment works and to collect samples.

(9B) The permittee shall identify each monitoring well by permanently affixing to the steel protective casing of the well a tag with the identification number listed in the permit.

(10) Monitoring. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136 unless other test procedures are specified in the permit.

(11) Recordkeeping. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and all records of all data used to complete the application for the permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time. Records of monitoring information shall include:

(a) The date, exact place, and time of sampling or measurements;
(b) The individual(s) who performed the sampling or measurement;
(c) The date(s) analyses were performed;
(d) The individual(s) who performed the analyses;
(e) The analytical techniques or methods used; and
(f) The results of such analyses.

(12) Prohibition of bypassing. Except as provided in 314 CMR 5.16(13), bypassing is prohibited, and the Department may take enforcement action against a permittee for bypassing unless:

(a) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the permittee could have installed

adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(c) The permittee submitted notice of the bypass to the Department:
   1. In the event of an anticipated bypass, at least ten days in advance, if possible; or
   2. In the event of an unanticipated bypass, as soon as the permittee has knowledge of the bypass and no later than 24 hours after its first occurrence.

(13) Bypass not exceeding limitations. The permittee may allow a bypass to occur which does not cause effluent limitations to be exceeded, but only if necessary for the performance of essential maintenance or to assure efficient operation of treatment facilities.

(14) Permit actions. The permit may be modified, suspended, or revoked for cause. The filing of a request by the permittee for a permit modification, reissuance, or termination, or a notification of planned changes or anticipated non-compliance does not stay any permit condition.

(15) Duty to reapply. If the permittee wishes to continue an activity regulated by the permit after the expiration date of the permit, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Department in writing.

(16) Property rights. The permit does not convey any property rights of any sort or any exclusive privilege.

(17) Other laws. The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, and local laws and regulations.

(18) Oil and hazardous substance liability. Nothing in the permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under § 311 of the Federal Act, 33 U.S.C. § 1321, and M.G.L. c. 21E.

(19) Removed substances. Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed in a manner consistent with applicable Federal and State laws and regulations including, but not limited to, the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26 through 53 and the Federal Act, , 33 U.S.C. § 1251 *et seq*, the Massachusetts Hazardous Waste Management Act, M.G.L. c. 21C, and the Federal Resource Conservation and Recovery Act, 42 U.S.C. § 6901, *et seq.*, 310 CMR 19.000 and 30.000, and other applicable regulations.

(20) Reporting requirements.

(a) Monitoring reports. Monitoring results shall be reported on a Discharge Monitoring Report (DMR) at the intervals specified elsewhere in the permit. If the permittee monitors any pollutant more frequently than required by the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

(b) Compliance schedules. Reports of compliance or non-compliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit shall be submitted no later than 14 days following each schedule date.

(c) Planned changes. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility or activity which could significantly change the nature or increase the quantity of pollutants discharged. Unless and until the permit is modified, any new or increased discharge in excess of permit limits or not specifically authorized by the permit constitutes a violation.

(d) Anticipated non-compliance. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in non-compliance with permit requirements.

(e) 24 hour reporting. The permittee shall report any non-compliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the non-compliance, including exact dates and times, and if the non-compliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the non-compliance. The following shall be included as information which must be reported within 24 hours:
   1. Any unanticipated bypass which exceeds any effluent limitation in the permit.
   2. Violation of a maximum daily discharge limitation for any of the pollutants listed by the Department in the permit to be reported within 24 hours.

(f) Other non-compliance. The permittee shall report all instances of non-compliance not reported under 314 CMR 5.16(20)(a), (b), or (e) at the time monitoring reports are submitted. The reports shall contain the information listed in 314 CMR 5.16(20)(e).

(g) Toxics. All manufacturing, commercial, mining, or silvicultural dischargers must notify the Department as soon as they know or have reason to believe:
   1. That any activity has occurred or will occur which would result in the discharge of any toxic pollutant listed in 314 CMR 3.17 which is not limited in the permit, if that discharge will exceed the highest of the following notification levels:
      a. 100 micrograms per liter (100 ug/l);
      b. 200 micrograms per liter (200 ug/l) for acrolein and acrylonitrile; 500 micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
      c. Five times the maximum concentration value reported for that pollutant in the permit application; or
   2. That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application.

(h) Indirect dischargers. All Publicly Owned Treatment Works shall provide adequate notice to the Department of the following:
   1. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to § 301 or 306 of the Federal Act, 33 U.S.C. § 1311 or 1316, if it were directly discharging those pollutants; and

2. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

(i) Information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

(21) Signatory requirement. All applications, reports, or information submitted to the Department shall be signed and certified in accordance with 314 CMR 3.15 and 5.14.

(22) Severability. The provisions of the permit are severable, and if any provision of the permit, or the application of any provision of the permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of the permit, shall not be affected thereby.

(23) Reopener clause. The Department reserves the right to make appropriate revisions to the permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26 through 53 or the Federal Act, 33 U.S.C. §1251 *et seq* in order to bring all discharges into compliance with said statutes.

(24) Approval of treatment works. All discharges and associated treatment works authorized herein shall be consistent with the terms and conditions of this permit. Any modification to the approved treatment works shall require written approval of the Department prior to the construction of the modification.

(25) Transfer of Permits.

(a) RCRA facilities. Any permit which authorizes the operation of a RCRA facility which is subject to the requirements of 314 CMR 8.07 shall be valid only for the person to whom it is issued and may not be transferred.

(b) Transfers by modification. Except as provided in 314 CMR 5.16(25)(a) and (c), a permit may be transferred by the permittee to a new owner or operator provided that the permit has been modified or revoked and reissued or a minor modification is made to identify the new permittee in accordance with 314 CMR 5.12(3) and (4).

(c) Automatic transfers. For facilities other than Privately Owned Wastewater Treatment Facilities (PWTFs) that treat at least some sewage from residential uses, hospitals, nursing or personal care facilities, residential care facilities, and/or assisted living facilities, PWTFs that have been required to establish financial assurance mechanism(s) pursuant to 314 CMR 5.15(6), and RCRA facilities subject to the requirements of 314 CMR 8.07, a permit may be automatically transferred in accordance with 314 CMR 5.12(5).

(26) Permit Compliance Fees and Inspection Information. Except as otherwise provided, any permittee required to obtain a surface water or ground water discharge permit pursuant to M.G.L. c. 21, § 43 and 314 CMR 3.00 and 5.00, shall be required to submit the annual compliance assurance fee established in accordance with M.G.L. c. 21A, § 18 and 310 CMR 4.00 as provided in 314 CMR 2.12. The requirement to submit the annual compliance fee does not apply to any local government unit other than an authority. Any permittee required to obtain a surface water or ground water discharge permit pursuant to M.G.L. c. 21, §43 and 314 CMR 3.00 and 5.00 may be required to submit inspection information annually as a condition of the permit as provided in 314 CMR 2.12.