

I, Scott W. Horsley, depose and state as follows.

1. My name is Scott W. Horsley. I am a Hydrologist and Water Resources Consultant based in Cotuit, Massachusetts.
2. I am currently employed as a water resources consultant and University Lecturer. Prior to 2019, I was the Founder and President of the Horsley Witten Group, Inc., with offices at Sandwich, MA, Boston, MA, and Portsmouth, NH.
3. I have a Bachelor of Science Degree in Biology from Southeastern Massachusetts University and a Master's Degree in Marine Affairs – Environmental Protection from the University of Rhode Island.
4. I have been professionally engaged in a range of technical, planning, and policy issues associated with water resources and land use management projects since 1979. During that time, I have served as an expert witness in the field of hydrology in numerous state and federal court cases.
5. A true and accurate copy of my CV is included at Exhibit A.
6. Any opinion given in this Affidavit is made based upon my training and experience as detailed herein and is further made to a reasonable degree of professional certainty.
7. For purposes of this Affidavit I reviewed engineering plans produced by G.A.F. Engineering Co. (“GAF”) in connection with earth removal operations by AD Makepeace Co. (“ADM”), aerial photographs, and various government databases including Massachusetts Bureau of Geographic Information (MassGIS), United States Geological Survey (USGS), the United States Environmental Protection Agency (USEPA), and Massachusetts Department of Environmental Protection (MassDEP).
8. My Affidavit concerns an area in Carver, Massachusetts bounded generally to the north by Cranberry Road, to the south by the Wareham/Carver border, to the east by the Wankinko River which forms part of the boundary between Plymouth and Carver, and to the west by Wareham Road, subdivisions and eventually the Weweantic River.
9. The Wankinko River and the Weweantic River eventually flow to Buzzards Bay.
10. I reviewed topographic maps of the area showing elevations prior to 2010. This showed varying topography with primarily forested land.
11. I have reviewed engineering plans prepared by G.A.F. Engineering showing proposed earth removal by ADM located on and adjacent to three sites on Federal Road in Carver, Massachusetts (Project Sites) and permits including:
 - 46 Federal Road, plans dated 2011 and January 12, 2017 depicting a total earth removal of 2,385,000 cubic yards (“Site 1”);
 - 24 Federal Road/Hammond Road, plans dated June 13, 2019 depicting a total earth removal of 580,000 cubic yards (“Site 2”);

- 59 Federal Road, plans dated February 14, 2020 depicting proposed earth removal of 4,045,000 cubic yards (“Site 3”).
12. The G.A.F. Engineering site plans for Sites 1, 2 and 3 show earth removal at a location proposed to be used in the future for an agricultural project (cranberry bog and associated reservoir). I understand these site plans to be part of the applications submitted by ADM to obtain Earth Removal Permits from the Carver Earth Removal Committee (“ERC”) under the Town of Carver Earth Removal Bylaw.
 13. The site plans show the agricultural projects to be located on areas with varying topography. Permits state that the total volume of earth removal from the sites is 7,956,000 cubic yards. This earth removal entails removing trees, vegetation and excavation of earth materials that lowers the elevation of the land’s surface and depth to the water table (groundwater). This results in a permanent change to the pre-existing conditions and permanent changes in the surface contours of the land.
 14. The total land area altered on these three Sites between 2020 and 2022 is approximately 153 acres. This has caused significant alterations to the hydrology and water quality in downstream water resources. Additionally, it significantly increases the vulnerability of water resources due to the substantially reduced depth to groundwater.
 15. I have prepared hydrologic budget and nitrogen loading analyses to evaluate the impacts of these projects (see Table 1). The hydrologic budget analysis is based upon an existing groundwater recharge rate of 27 inches/year (USGS, 2009) and a post-development recharge rate of 40 inches/year. The increase in recharge rate is a result of the loss of evapotranspiration due to the clear-cutting of trees throughout the project sites. This analysis indicates an increased recharge volume of 54 million gallons/year. The increased recharge will alter wetland levels and baseflow rates in streams.
 16. The nitrogen loading analysis utilizes coefficients published by the Massachusetts Estuaries Project (MEP). Average nitrate-nitrogen concentrations in rainfall are estimated at 0.75 mg/liter. In naturally forested areas more than 90% of this nitrogen is assimilated into the forest ecosystem. The clear-cutting of forest on the three project sites has eliminated this assimilation allowing the nitrogen to be exported downstream to the Agawam River that has already been determined to be impaired due to excess nutrients. My nitrogen loading analysis indicates that the three Project Sites have increased the downstream nitrogen loading by 440 kg/year.

Table 1 - Hydrologic Budget and Nitrogen Loading Analysis

| Hydrology | | | |
|---|------|----------------------|-----------------|
| Land Altered | 153 | acres | |
| Natural (Pre-Development) Recharge Rate | 27 | inches/year | Masterson, USGS |
| Post-Development Recharge Rate | 40 | inches/year | |
| Net Increase | 13 | | |
| Net Increase (Volume) | 166 | acre-feet/year | |
| | 54 | million gallons/year | |
| Nitrate Loading | | | |
| Natural (Pre-Development) | 0.05 | mg/liter | |
| Post-Development | 0.75 | mg/liter | |
| Net Increase | 0.7 | mg/liter | |
| Net Increase (Mass) | 440 | kg N/year | |

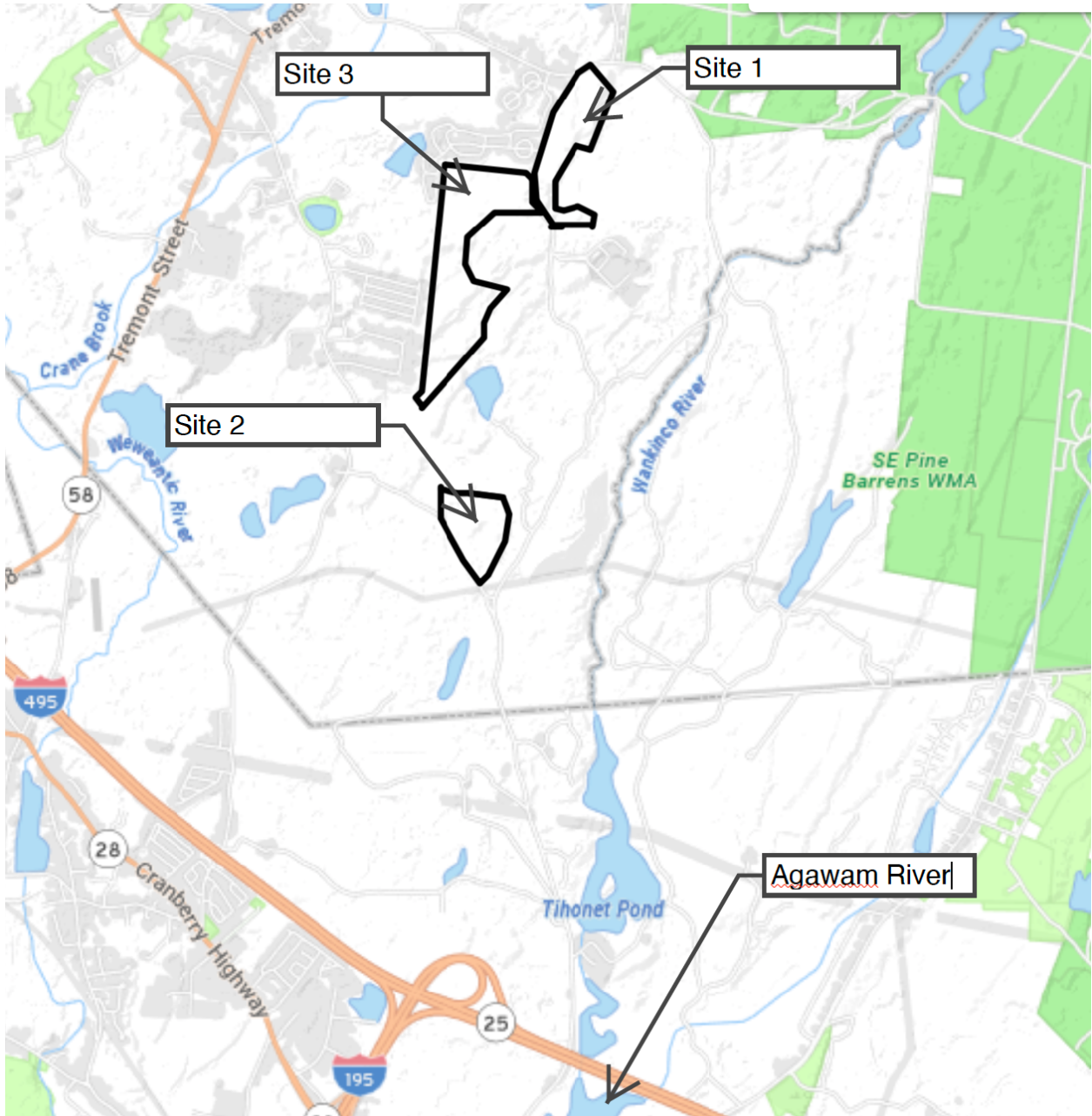


Figure 1 - Locus Map

17. The development is inconsistent with the Carver General Bylaws. The Carver General Bylaws, Chapter 9.1 governs earth removal (“the Bylaw”). Section 9.1.1, purposes clause, states the purpose is to ensure that permanent changes in the surface contours of the land caused by earth removal do not create danger to public or private property and have minimal detrimental effect on the district in which the earth removal occurs. Section 9.1.5(c) requires that the following

provisions and safeguards relative to the submittal of project plans by the applicant be established before any earth removal activities are undertaken:

“The plan shall include, but not be limited to, pertinent information on the following: lot boundaries, names of abutting owners and other parties in interest, streets contiguous to the site, vegetation, existing and proposed roadways, existing and proposed buildings, location of sources of water, wetlands, primary recharge areas...” (emphasis added).

“The site plan shall show existing intermediate and final ground levels with those of adjacent properties and shall indicate natural surface water flows and drainage ditches if any. The site plan shall also show groundwater elevations before and after removal.” (emphasis added).

“The E.R.C. may require drainage calculations based on D.E.P. drainage program T-55 and a sediment control plan for during and after the operation with phasing as required. These computations shall indicate 10 and 100-year storm effects.”

18. The Town of Carver has also adopted a Water Resources Protection District Zoning Bylaw (“Zoning Bylaw”). The District covers the entire Town including Sites 1, 2 and 3. This Zoning Bylaw is consistent with the USEPA Sole Source Aquifer designation discussed below and the fact that the entire Town relies upon public and private wells that get water from the Aquifer and that private drinking water wells are the primary source of drinking water for the majority of Carver’s residents.
19. Section 4310 of the Zoning Bylaw (Water Resources Protection) states, “The purpose of this Section 4300 is to protect the public health, safety, and welfare by preserving the quality of ground and surface water which provides existing or potential water supply for the Town's residents, cranberry growers, institutions and businesses.” Section 4353 requires that projects **“will not, during construction or thereafter, have an adverse environmental impact on the aquifer or recharge area (i.e., quality, or quantity of groundwater); and will not adversely affect an existing or potential water resource”** (emphasis added).
20. The Project Sites lie within the Plymouth Carver aquifer which has been declared a Sole Source Aquifer by the United States Environmental Protection Agency (USEPA) under the authority of the Safe Drinking Water Act. See, 55 FR 32137; NOTICES ENVIRONMENTAL PROTECTION AGENCY [FRL-3817-7] Sole Source Aquifer Designation for the Plymouth-Carver Aquifer, Massachusetts, Tuesday, August 7, 1990.

USEPA’s designation of the Plymouth Carver aquifer as a Sole Source Aquifer recognizes the dependence on the groundwater system as the only viable (sole) source of drinking water. It also documents the sensitivity of the groundwater system to contamination for overlying land uses due to the high permeability of the native soils (surficial geologic deposits). The USEPA designation states, “Although the quality of the aquifer’s ground water is rated as good to excellent, it is highly vulnerable to contamination due to its geological characteristics (including shallow depths to groundwater). Because of this, contaminants can be rapidly introduced into the aquifer system from a number of sources with minimal assimilation. This may include contamination from several sources such as the following: chemical spills; highway, urban and

rural runoff; septic systems; leaking storage tanks, both above and underground; road salting operations; saltwater intrusion; and landfill leachate. Since nearly all residents are dependent upon the aquifer for their drinking water, a serious contamination incident could pose a significant public health hazard and place a severe financial burden on the service area's residents” (emphasis added).

21. The Plymouth-Carver Aquifer Action Plan was developed to provide a framework¹ for its management, USEPA and MassDEP have developed groundwater protection guidance to protect drinking water supplies. This guidance includes MassDEP’s Wellhead Protection Guidance - The Best Effort Requirement 310 CMR 22.21(1). This document includes several protective provisions that are directed to municipalities for incorporation within the local land use codes and permit decisions including a prohibition against “the removal of soil, loam, sand, gravel or any other mineral substances within four feet of the historical high groundwater table elevation (as determined from monitoring wells and historical water table fluctuation data compiled by the United States Geological Survey).” Maintaining a vertical buffer between land uses and activities and the underlying groundwater is widely accepted as minimal protection. This vertical buffer provides filtration and attenuation of potential contaminants including pathogens and a broad range of chemical compounds including motor oils and hydraulic fluids (that commonly leak from heavy equipment including excavators). Pesticides and herbicides used in cranberry agriculture are also potential sources of contaminants. Without this vertical buffer, groundwater and downgradient drinking water wells are highly vulnerable to contamination. Therefore, the Makepeace earth removal activities threaten the only viable source of drinking water for residents and the use of potable water for other uses such as the adjacent Ocean Spray Cranberry processing facility located at 60 Federal Road, Carver.

22. The three development projects compromise the protection of public and private drinking water supplies. Sites 1, 2 and 3 are surrounded by several public and private drinking water supply wells and include on-site wetland resource areas. Sites 1, 2 and 3 also contain interim Zone 2 protection areas. The USGS has conducted a groundwater study of the Plymouth-Carver aquifer. This study includes a water table map showing groundwater flow directions.²

The direction of groundwater flow around Sites 1, 2 and 3 is generally southerly under static conditions. However, the pumping of public supply wells will modify groundwater flow directions inducing a gradient towards the pumping wells.

¹ Plymouth-Carver Sole Source Aquifer Action Plan FINAL REPORT Contract No. CT-ENV 122106000000002210 Executive Office of Energy and Environmental Affairs Boston, MA, August 2007, Developed in consultation with the Plymouth Carver Aquifer Advisory Committee and the citizens of the Plymouth Carver Aquifer by Fuss & O’Neill.

² United States Geological Survey, Geohydrology and Simulated Ground-Water Flow, Plymouth-Carver Aquifer, Southeastern Massachusetts, Water Resources Investigations Report 90-4204

Sites 1 and 3 are within or directly adjacent to multiple public and private drinking water supply sources (see Figure 2). The specific public supply wells are as follows:

Site 1: MassGIS shows that the project site lies within the wellhead protection areas to three public supply wells. The wells include MassDEP numbers 4052067-02G, 4052067-01G, and 4052066-01G. There is also a large jurisdictional wetland immediately adjacent at the east side of the site.

Site 3: MassGIS shows two public water supply wells that are located west of Site 3 and one to the east. These include MassDEP numbers 4052070-01G, 4052070-02G, and 4052055-01G (located at Ocean Spray's cranberry processing facility at 60 Federal Road). The interim Zone 2 areas surround and include the project site. There is also a subdivision immediately to the southwest of the project parcel that is served by private on-lot wells.

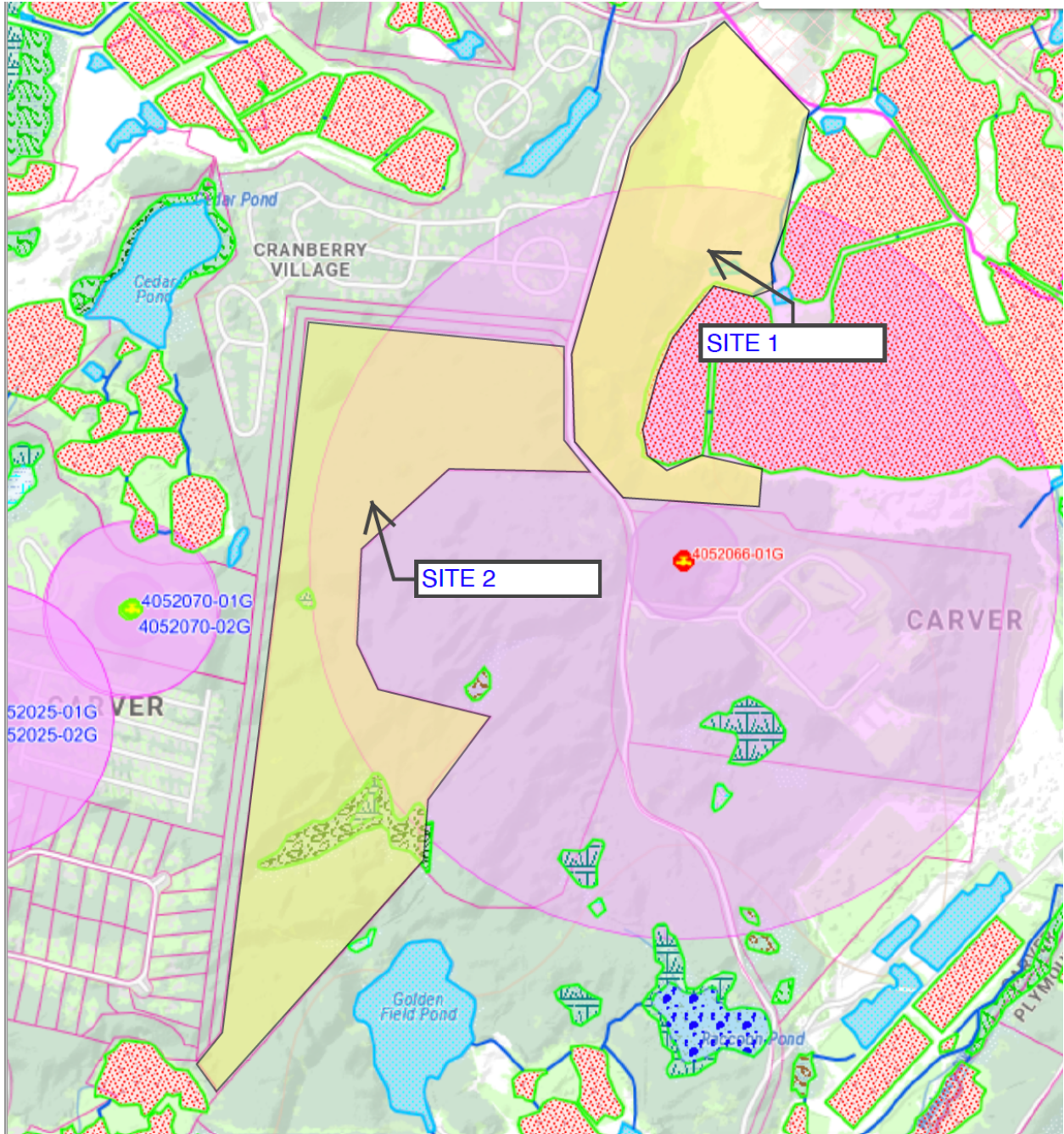


Figure 2 - Public and Private Drinking Water Supplies Adjacent to Project Sites

23. The Sites have been significantly excavated to depths minimizing depth to groundwater, effectively eliminating the naturally occurring pollutant attenuation capacity associated with soils above the groundwater. The elimination of the filtration capacity of the soils above the water table could have a detrimental effect on the quality of drinking water within the wellhead protection areas.

24. According to the records that I have reviewed, ADM did not submit to the ERC information regarding groundwater levels, groundwater flow directions, primary recharge areas, or water sources even though this information was required by the Bylaw for permit applications. This constitutes a violation of the minimum requirements under the Bylaw and should warrant a comprehensive review of water quality impacts, groundwater flow direction and recharge rates.

To my knowledge there has not been an evaluation of water quality impacts associated with ADM's earth removal at the Sites. ADM's earth removal clearly is located within a Sole Source Aquifer, the town's Water Resource Protection District, and is within an interim Zone 2 area for public drinking water supply wells.

- 25. The Town of Carver has also enacted a local wetlands bylaw.** The purpose of the Carver Wetlands Bylaw is to protect wetlands related water resources, and adjoining land areas by controlling activities likely to have a significant cumulative effect on wetland values, including public or private water supply, groundwater and groundwater quality, surface water and surface water quality, flood control, erosion and sedimentation control, prevention of water pollution, storm drainage, fisheries, wildlife habitat, recreation, agriculture, aesthetics, fish-shellfish habitat, rare plant and animal species and riverfront areas. Bylaw Section 9.2, Section 1(B). The state Wetlands Protection Act also regulates areas affecting wetlands to contribute to protection of public and private water supply, groundwater supply, and other interests also protected under the Bylaw (310 CMR 10.01).

Therefore, protecting wetlands is determined to be a contributing factor to protection of drinking water supplies as well as other public and private interests. The earth removal sand mining activities of ADM have a detrimental effect on drinking water supplies by changing surface water quality and quantity of wetlands, altering the flood regime and drainage rates of wetlands, and causing siltation of wetlands.

Sites 1, 2 and 3 include and are adjacent to extensive wetlands resource areas as mapped by MassDEP and MassGIS. The existing excavation activities and associated clearing of trees has caused significant alterations to the surrounding hydrology and to the wetland resource areas.

The clear-cutting of trees has significantly reduced evapotranspiration (ET) rates which increases groundwater recharge rates, changes groundwater flow directions, and ultimately alters the hydrologic regime of the wetlands (including downstream headwater streams).

The Massachusetts Wetlands Protection Regulations define alter as, "the changing of pre-existing drainage characteristics, flushing characteristics, salinity distribution, sedimentation patterns, flow patterns and flood retention areas" (310 CMR 10.04). The term "alter" also refers to, "the changing of water temperature, biochemical oxygen demand (BOD), and other physical, biological or chemical characteristics of the receiving water" (310 CMR 10.04 (40)(d)). The higher recharge rates associated with ADM's excavation activities causes groundwater mounding (higher levels) and alterations to existing drainage characteristics. Headwater streams and their associated habitats are very sensitive to relatively small changes in hydrology and water quality (including temperature).

The clear-cutting of vegetation at the sites will result in temperature increases associated with loss of natural shading. This will cause increases in water temperatures at the site and downgradient of the site. Increased water temperatures exacerbate eutrophication and impairs aquatic habitats.

The MassDEP Stormwater Standards and Stormwater Handbook provide guidance and criteria to ensure that the hydrologic budget of associated wetlands is maintained and protected. Wetlands are dependent upon both surface water and groundwater inputs and are sensitive to hydrologic shifts and alterations (they can be impacted by both increases and decreases of water levels and flow). They are impacted by both short-term runoff events and longer-term groundwater changes in recharge rates that alter baseflow. Recharge is the process of precipitation infiltrating into the ground and replenishing the underlying groundwater. MassDEP Stormwater Standard 3 requires that annual groundwater recharge rates be maintained and preserved.

MassDEP Stormwater Standard 3 is designed to maintain the hydrologic balance in wetlands. It requires that post- development recharge is maintained at existing pre-development recharge. MassDEP Stormwater Handbook, Volume 2, Chapter 1 provides guidance and clarification regarding this requirement to maintain natural hydrology. Page 6 of this document states, ***“Standard 3 of the Stormwater Management Standards requires that proponents preserve infiltration at predevelopment levels in order to maintain base flow and groundwater recharge”***. Recharge provides baseflow to wetlands and contributes to their hydroperiod (the natural cycle of water levels through the seasons). Changes to this hydrologic balance of recharge areas to a wetland constitute “alterations.”

MassDEP Stormwater Manual, Volume 3, Chapter 1, page 17 provides guidance on how to evaluate impacts on wetlands associated with proposed infiltration/recharge facilities designed in accordance with Stormwater Standard 3. It states, ***“Evaluate Where Recharge Is Directed: The infiltration BMP must be evaluated to determine if the proposed recharge location will alter a Wetland Resource Area by causing changes to the hydrologic regime.”*** The existing excavation activities and associated clearing of trees has caused significant alterations to the surrounding hydrology and to the wetland resource areas.

26. In conclusion, my opinions are as follows:

- A). The Sites are within sensitive water resource areas within the Plymouth-Carver Sole Source Aquifer that provides the only source of public and private drinking water in the region.
- B) The ERC has not taken steps outlined in the Bylaw for site plans to ensure that ADM’s earth removal at the Sites will not create a danger of damage to public and private property caused by permanent changes in the surface contours of the land. They have not taken steps outlined in the Bylaw for site plans to ensure that the earth removal is done in a safe manner to protect drinking water and the public health, safety and welfare of the residents of Carver and to have minimal detrimental effect on the district.
- C) The clear-cutting of trees on Sites 1, 2 and 3 has significantly reduced evapotranspiration (ET) rates which increases groundwater recharge rates, changes groundwater flow directions, and

ultimately alters the hydrologic regime of onsite and nearby wetlands, adjacent and downstream headwater streams).

D) This project will result in significant alterations to these recharge rates and to the hydrologic regime of the wetland.

E) According to the records that I have reviewed, no information regarding groundwater levels, groundwater flow directions, primary recharge areas, or water sources was provided by the earth removal permit applicant ADM despite these submittal requirements in the Bylaw Section 91.5c. This constitutes a violation of the minimum requirements under the Bylaw and should warrant a comprehensive review of water quality impacts and impacts to groundwater flow direction.

F) To my knowledge there has not been an evaluation of water quality impacts associated with ADM's earth removal at the sites. ADM's earth removal clearly is located within a Sole Source Aquifer, the town's Water Resource Protection District, and is within an interim Zone 2 area for public drinking water supply wells.

G) There is no information provided about drainage, natural surface water flows, 10 and 100-year storm effects or drainage calculations described in Site Plans, Section 9.1.5. These are minimum requirements for land alteration projects of this size and duration.

H) It is my opinion that ADM's earth removal threatens public and private drinking water supplies by removing protective topsoils and reducing the depth to groundwater, both of which significantly reduce the pollutant attenuation capacity within the recharge areas to the drinking water supplies.

I) The changes in surface water runoff, rates of ET change the hydrologic regime and impact wildlife habitat including fisheries. These hydrologic alterations include increased baseflow in the Wankinko River.

Signed under the pains and penalties of perjury this 12th day of September 2022.

A handwritten signature in black ink, appearing to read 'Scott W. Horsley', written in a cursive style.

Scott W. Horsley