PUBLIC NOTICE

US Army Corps of Engineers ®
New England District
696 Virginia Road
Concord, MA 01742-2751

Comment Period Begins: October 20, 2020
Comment Period Ends: November 19, 2020
File Number: NAE-2020-01780
In Reply Refer To: Ruth Brien
Phone: (978) 318-8054
E-mail: ruthann.a.brien@usace.army.mil

The District Engineer has received a permit application to conduct work in waters of the United States from Dale Leavitt representing Blue Stream Shellfish LLC of 60 East Street, Ware, Massachusetts. This work is proposed in Nasketucket Bay off the coast of Mattapoisett, Massachusetts. The site coordinates are: Latitude 41.609769 Longitude -70.808500.

The work involves the placement of structures below the mean high water mark in order to establish a commercial shellfish and macroalgae farm on approximately 50.78 acres of water located in the Town of Mattapoisett, Massachusetts. The project will focus primarily on (but not limited to) the aquaculture of the eastern oyster (*Crassostrea virginica*) and sugar kelp (*Saccharina latissima*). Gear for oyster aquaculture will consist of 5 ft. x 3.75 ft. bottom cages in strings of 10 connected by a single sinking line and marked with two end buoys. 100 trawl lines of 10 cages each are proposed for a total of 1,000 bottom cages within the site. The kelp aquaculture lines will consist of a 300 ft. line that includes bottom anchors, the horizontal longline, and flotation buoys that will keep the horizontal line at the appropriate depths for kelp growth. Maximum build of kelp lines would total 96 300 ft. lines through the site.

The work is shown on the enclosed plans entitled "**Operations Plan for Blue Stream Shellfish – Mattapoisett Site**," on fifteen (15) sheets, and undated.

AUTHORITY
Permits are required pursuant to:
__X__ Section 10 of the Rivers and Harbors Act of 1899
_____ Section 404 of the Clean Water Act
_____ Section 103 of the Marine Protection, Research and Sanctuaries Act.

The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which may reasonably accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered, including the cumulative effects thereof; among those are: conservation, economics, aesthetics, general environmental concerns, wetlands, cultural value, fish and wildlife values, flood hazards, flood plain value, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people.

The U.S. Army Corps of Engineers, New England District (Corps), is soliciting comments from the public; Federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider

and evaluate the impacts of this proposed activity. The Corps will consider all comments received to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires all federal agencies to consult with the National Marine Fisheries Service on all actions, or proposed actions, permitted, funded, or undertaken by the agency, that may adversely affect Essential Fish Habitat (EFH). Essential Fish Habitat describes waters and substrate necessary for fish for spawning, breeding, feeding or growth to maturity.

This project will impact up to 50 acres of EFH. This habitat consists of sand overlain by a layer of silt. Loss of this habitat may adversely affect species that use these waters and substrate. However, the District Engineer has made a preliminary determination that the site-specific adverse effect will not be substantial. Further consultation with the National Marine Fisheries Service regarding EFH conservation recommendations is being conducted and will be concluded prior to the final decision.

NATIONAL HISTORIC PRESERVATION ACT

Based on his initial review, the District Engineer has determined that little likelihood exists for the proposed work to impinge upon properties with cultural or Native American significance, or listed in, or eligible for listing in, the National Register of Historic Places. Therefore, no further consideration of the requirements of Section 106 of the National Historic Preservation Act of 1966, as amended, is necessary. This determination is based upon one or more of the following:

a. The permit area has been extensively modified by previous work.
b. The permit area has been recently created.
c. The proposed activity is of limited nature and scope.
d. Review of the latest published version of the National Register shows that no presence of registered properties listed as being eligible for inclusion therein are in the permit area or general vicinity.
e. Coordination with the State Historic Preservation Officer and/or Tribal Historic Preservation Officer(s).

ENDANGERED SPECIES CONSULTATION

The Corps has reviewed the application for the potential impact on Federally-listed threatened or endangered species and their designated critical habitat pursuant to section 7 of the Endangered Species Act as amended. It is our preliminary determination that the proposed activity for which authorization is being sought is designed, situated or will be operated/used in such a manner that it is not likely to adversely affect a listed species or their critical habitat. We are coordinating with the National Marine Fisheries Service and/or U.S. Fish and Wildlife

Service on listed species under their jurisdiction and the ESA consultation will be concluded prior to the final decision.

OTHER GOVERNMENT AUTHORIZATIONS

The states of Connecticut, Maine, Massachusetts, New Hampshire and Rhode Island have approved Coastal Zone Management Programs. Where applicable, the applicant states that any proposed activity will comply with and will be conducted in a manner that is consistent with the approved Coastal Zone Management Program. By this Public Notice, we are requesting the State concurrence or objection to the applicant's consistency statement.

The following authorizations have been applied for, or have been, or will be obtained:

(X) Permit, license or assent from State.
(X) Permit from local wetland agency or conservation commission.
( ) Water Quality Certification in accordance with Section 401 of the Clean Water Act.

COMMENTS

In order to properly evaluate the proposal, we are seeking public comment. Anyone wishing to comment is encouraged to do so. Comments should be submitted in writing by the above date. If you have any questions, please contact Ruth Brien at (978) 318-8054, (800) 343-4789 or (800) 362-4367, if calling from within Massachusetts.

Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider the application. Requests for a public hearing shall specifically state the reasons for holding a public hearing. The Corps holds public hearings for the purpose of obtaining public comments when that is the best means for understanding a wide variety of concerns from a diverse segment of the public.

The initial determinations made herein will be reviewed in light of facts submitted in response to this notice. All comments will be considered a matter of public record. Copies of letters of objection will be forwarded to the applicant who will normally be requested to contact objectors directly in an effort to reach an understanding.

THIS NOTICE IS <u>NOT</u> AN AUTHORIZATION TO DO ANY WORK.

JACEK.CHRISTINE.M.1394987901
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Date: 2020.10.16 11:50:46 -04'00'

Christine Jacek
Acting Chief, Permits and Enforcement Branch
Regulatory Division

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FILE NO. NAE-2020-01780

If you would prefer not to continue receiving Public Notices by email, please contact Ms. Tina Chaisson at (978) 318-8058 or e-mail her at bettina.m.chaisson@usace.army.mil. You may also check here ( ) and return this portion of the Public Notice to: Bettina Chaisson, Regulatory Division, U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751.

NAME: _____
ADDRESS: _____
PHONE: _____

Blue Stream Shellfish, LLC

Operations Plan for Blue Stream Shellfish – Mattapoisett Site

Location:

Blue Stream Shellfish LLC has been awarded an initial municipal aquaculture license, approved by the Mattapoisett Board of Selectmen, MA (effective 20 October 2019), to undertake marine bivalve and marine macroalgae culture at a former shellfish farm site located at the convergence of Nasketucket Bay and Buzzards Bay. Figure 1 presents a wide scale indicator of the site, which is more closely identified in Figure 2. The actual coordinates for the corners of the site are listed in Table 1.

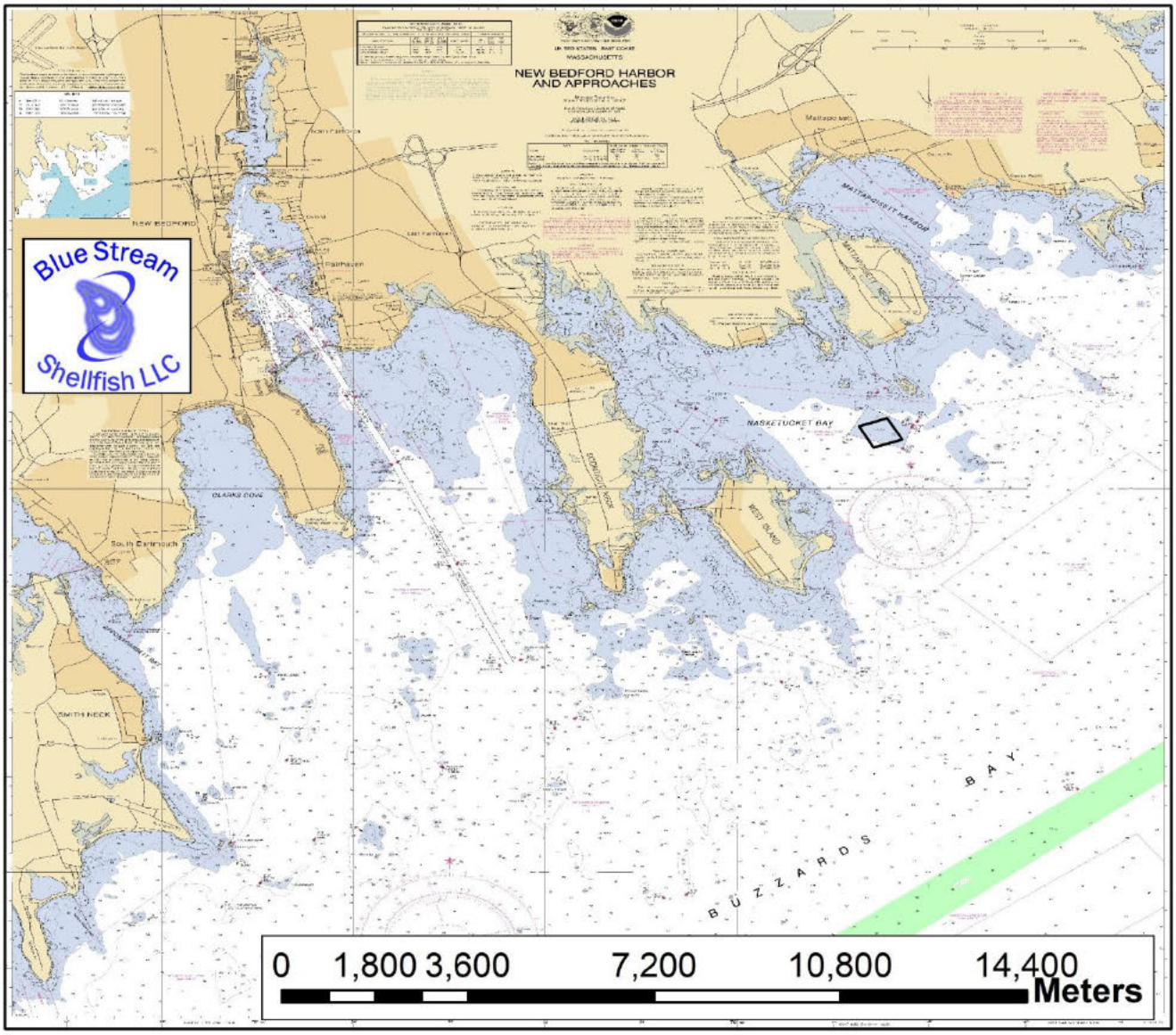

Figure 1: Wide range view of Mattapoisett Site location, overlaid on a geo-referenced NOAA chart (#13232). The site is outlined as the dark blue quadrangle to the northeast of West Island.

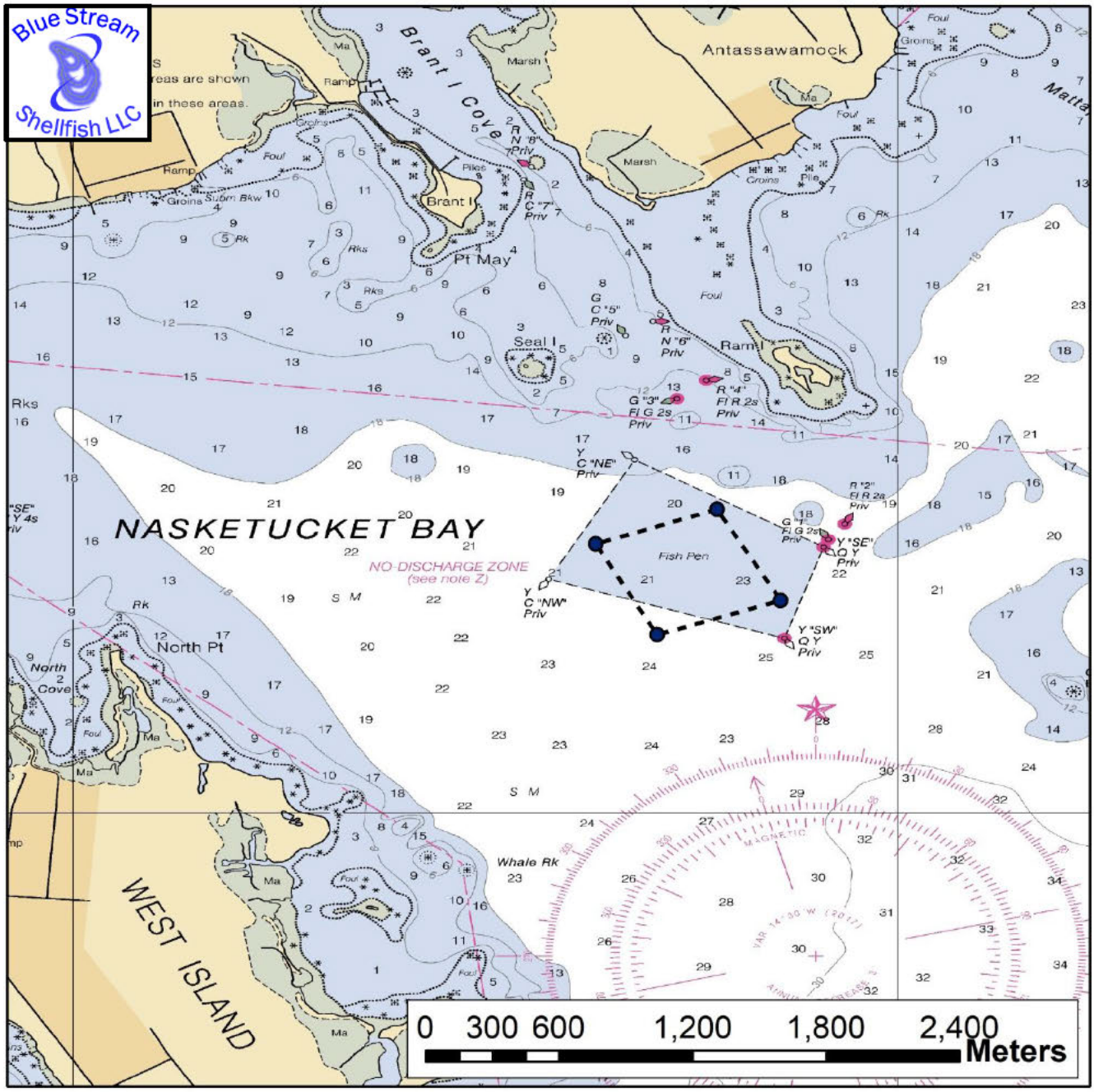

Figure 2: Close up view of proposed Blue Stream Shellfish Mattapoisett farm location (dark blue dashed line), laid out on a geo-referenced NOAA chart (#13232).

Table 1: Coordinates of the proposed 50 acre Mattapoisett Site, reported in degrees-minutes-seconds, degrees-decimal minutes, and decimal degrees.

Proposed 50 acres	Lat degrees	minutes	seconds	Long degrees	minutes	seconds
N	41	36	44.6	-70	48	26.1
E	41	36	31.0	-70	48	17.0
S	41	36	26.0	-70	48	35.0
W	41	36	39.3	-70	48	43.9

Lat degrees	d-minutes	Long degrees	d-minutes
41	36.7430	-70	48.4342
41	36.5167	-70	48.2833
41	36.4333	-70	48.5833
41	36.6550	-70	48.7312

Lat d-degrees	Long d-degrees
41.6124	-70.8072
41.6086	-70.8047
41.6072	-70.8097
41.6109	-70.8122

The site lies mostly within the footprint of a previously registered aquaculture site, as was indicated on NOAA chart #13232 as a "fish pen" (Figure 2). Interestingly, the original geographical coordinates registered with the Coast Guard and indicated on the

NOAA chart were incorrect, resulting in the NOAA chart-based demarcation for the original 100-acre site to be misplaced. The geographical coordinates represented in Figure 2 and provided in Table 1 are the true coordinates for the site identified in this proposal.

As defined in Table 1, the site awarded to Blue Stream Shellfish is calculated to be 50.78 acres of total surface area (Table 2). While this application addresses permitting for the entire site, the conditions of the Mattapoisett Aquaculture Permit phase in the development of the site based on a three year performance record. As conditioned by the Town, Blue Stream will develop the eastern most 10 acres during the year 2020-2021. Upon successful management of the initial area, a second 20 acres will be awarded in the fall of 2021 for the year 2021-2022 and the third 20 acre parcel will be awarded in the fall of 2022, for a total of 50 acres licensed. This operations plan covers the entire 50-acre parcel and projects the completed development of the site, scheduled to occur by 2022.

Table 2: Calculation of the aerial coverage of the proposed site.

	Start - Latitude	Start - Longitude	End - Latitude	End - Longitude	Distance (m)
N-E	41.6124	-70.8072	41.6086	-70.8047	468.6
S-E	41.6086	-70.8047	41.6072	-70.8097	443.5
N-W	41.6109	-70.8122	41.6124	-70.8072	442.7
S-W	41.6072	-70.8097	41.6109	-70.8122	459.1

Average side	Length		Area
	m	ft	acres
N-W;S-E	443.1	1,453.7	50.78
N-E;S-W	463.9	1,521.8	

Site Marking:

As per the Mattapoisett Aquaculture Regulations (Town of Mattapoisett 2019), Blue Stream Shellfish will adhere to the corner marking of the aquaculture site, as described in the regulations or as allowed by the Mattapoisett Harbormaster in collaboration with the U.S. Coast Guard:

Mattapoisett Aquaculture Regulations: Signs and markers.
A. Off-shore corner markers must be a minimum diameter of 60", be colored yellow, and with a flashing white light.

All aquaculture corner markers must have the following text printed on each one, on at least two (2) sides in three-inch (3") letters as follows:

- *PRIVATE SHELLFISH AREA*
- *THE NUMBER OF THE AQUACULTURE LICENSE*
- *NO SHELLFISHING*

The corner buoy anchoring system may consist of a configuration similar to that indicated in Figure 3, taken from the Sealite Buoy Installation Manual (https://www.sealite.com/wp-content/uploads/SLB1250_Manual_V2-1_LR.pdf).

The final deployment of the corner marker system(s) is contingent on approval by the Mattapoisett Harbormaster.

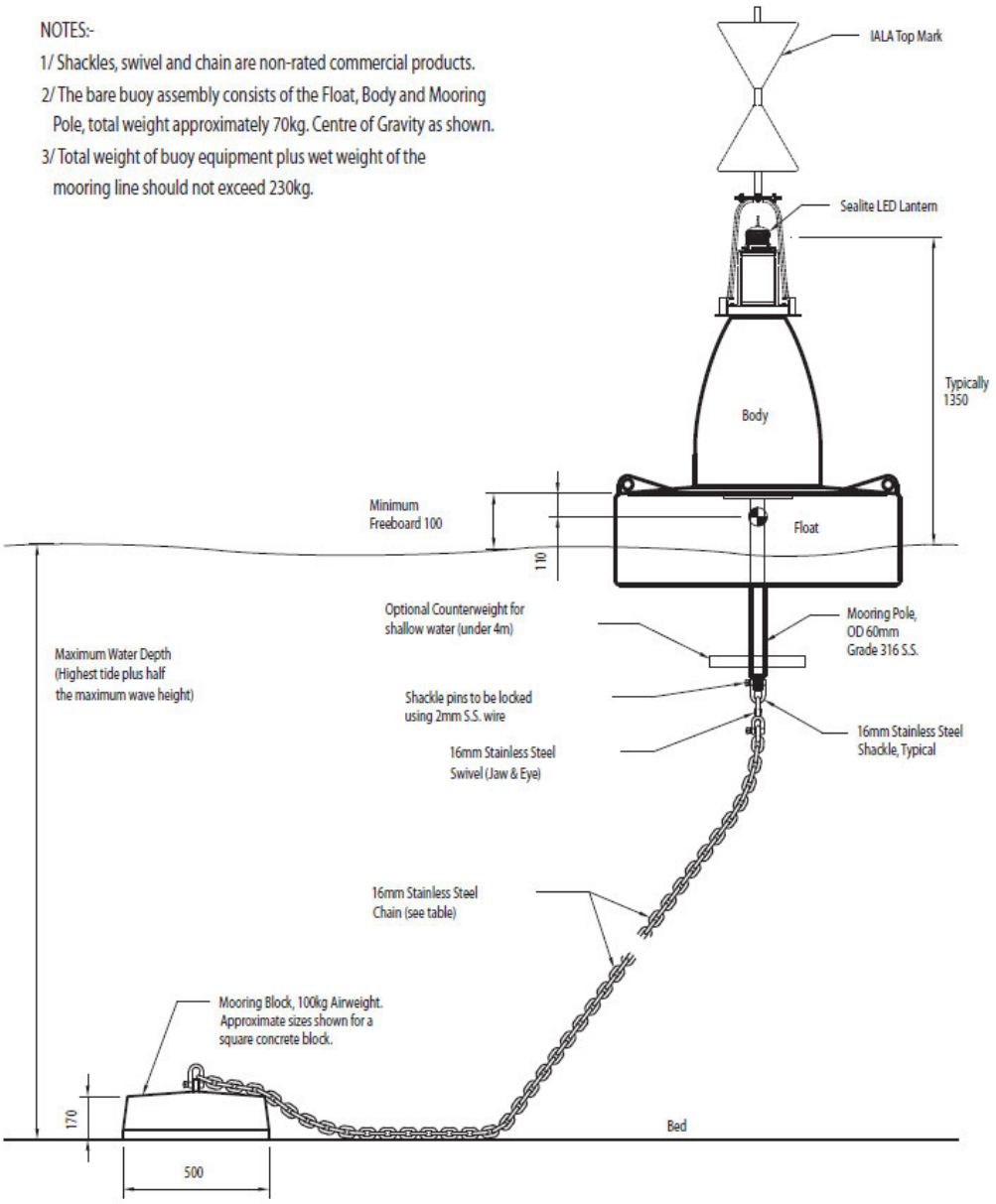

Figure 3: A diagram of a proposed marker buoy anchoring system, taken from the Sealite Buoy Installation Manual (https://www.sealite.com/wp-content/uploads/SLB1250_Manual_ V2-1_LR.pdf).

Site Resource Considerations:

Based on the lack of significant natural resources, as determined by MA-Division of Marine Fisheries during the original site inspection and confirmed in their 17 July 2020 site inspection, the site has been permitted to be used for shellfish aquaculture since 1990. The predominant natural resource in question with respect to important habitat, is the presence of submerged aquatic vegetation, in the form of eelgrass (*Zostera marina*) or widgeon grass (*Ruppia maritima*), and, as can be observed in Figure 4, the most recent submerged aquatic vegetation (SAV) survey (2013) indicates that the proposed site is not in the vicinity of recognized SAV locations nor was any obsevred during the DMF site incpection. At a depth of >20 feet (>6.1 m) and an average Secchi transparency measure ranging between 0.85 to 2.3 m (Figure 5A, Buzzards Bay Coalition 2019), the depth limit for eelgrass growth is considerably shallower than that observed on site (Figure 5B,

Nielson et al. 2002). The proposed site is not suitable for either eelgrass or the shallow water widgeon grass.

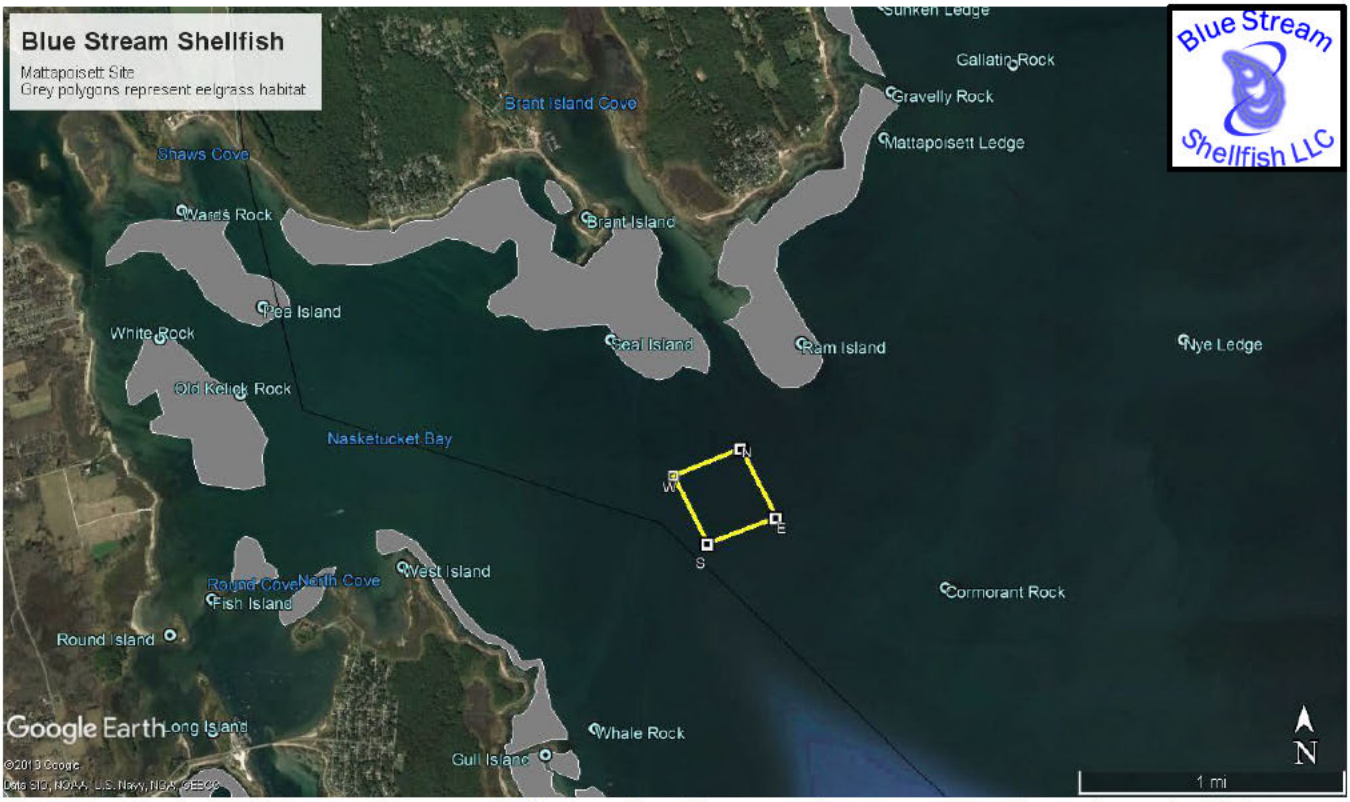

Figure 4: Google Earth image of proposed 50 acre site with grey polygons representing eelgrass habitat, as assayed during the most recent (2013) survey (MassGIS).

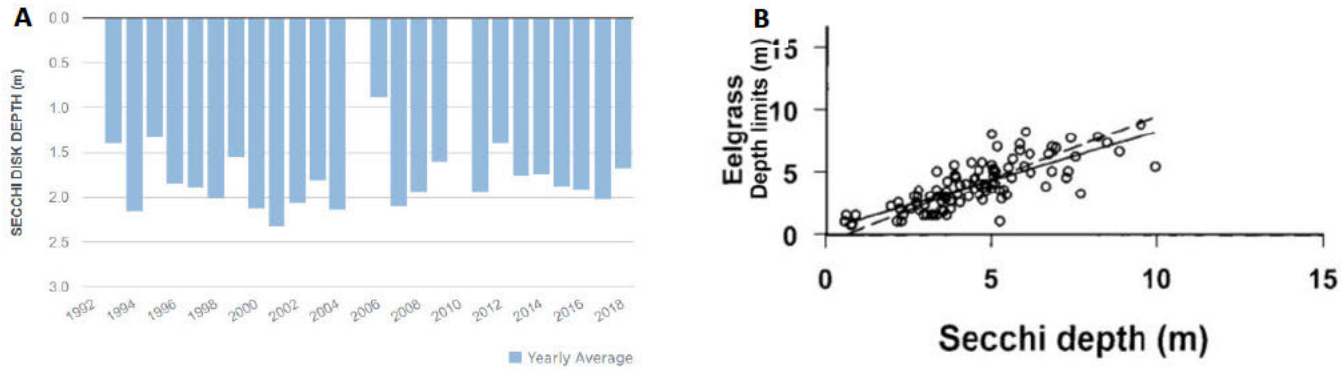

Figure 5: A) average Secchi disk depth for Nasketucket Bay from 1992 through 2018 (Buzzards Bay Coalition, https://www.savebuzzardsbay.org/bay-health/waterway/nasketucket-bay-little-bay/nasketucket-bay/), B) observed depth limitation for eelgrass relative to the Secchi depth of the water body (Nielsen, S. L., K. Sand-Jensen, J. Borum, & O. Geertz-Hansen. 2002. Depth colonization of eelgrass (*Zostera marina*) and macroalgae as determined by water transparency in Danish coastal waters. Estuaries. 25(5):1025–1032).

A second natural resource group that should be addressed with this application is the presence of marine macrofauna that may be at risk to entanglement in the deployed aquaculture gear. Those macrofauna at risk to entanglement include cetaceans and large marine reptiles and, given the occurrence of vertical lines at each end of the cage trawls (see Gear Set-up section below), the threat is present for entanglement.

Information on the occurrence of large cetaceans in the vicinity of the proposed site is very sparse. While there are occasional anecdotal reports of large whales in Buzzards Bay, it is the uniqueness of a whale occurrence that warrants the reporting. What little information is available suggests that cetaceans have the potential to passage through the area; however, it is not considered a high usage area (Buzzards Bay Project National Estuary Program. 1991. Comprehensive Conservation and Management Plan. Chapter 3 - The Buzzards Bay Setting: The Bay, Its Drainage Basin and Living Resources [http://www.buzzardsbay.org/cCmp/setting2.html]). It has been suggested that the lack of topographic and oceanographic features that allow for prey species to congregate, coupled with the shallow depth of the Bay, may explain the absence of cetaceans in the area (Howes, B.L., and D.D. Goehringer. 1996. Ecology of Buzzards Bay: An Estuarine Profile. National Biological Service Biological Report 33. vi +141pp.)

Sea turtles, particularly leatherbacks (*Dermochelys coriacea*) and loggerheads (*Caretta caretta*), have been observed to frequent the Buzzards Bay area, including in the vicinity of the proposed farm site (Figure 6). Large marine turtles, especially the leatherback, are susceptible to entanglement with vertical lines (Dwyer, K., C.E. Ryder, & R. Prescott. 2003. Anthropogenic mortality of leather back turtles in Massachusetts waters. NOAA Tech. Memo., NMFS-SEFSC-503, pp. 260.). Therefore, a strategy to minimize the risk of entanglement will be employed at the Mattapoisett site by Blue Stream Shellfish.

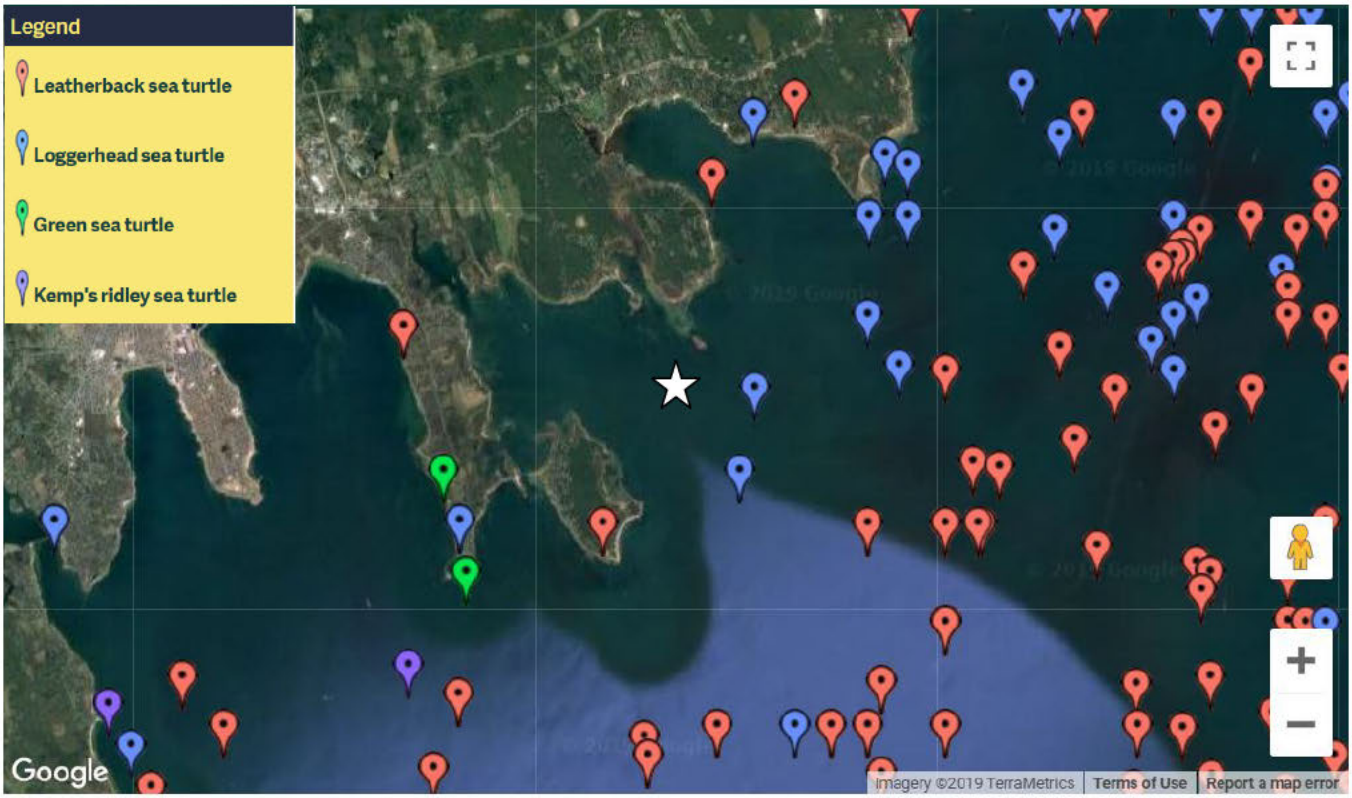

Figure 6: Locations of sea turtle sightings (by species), logged by the Sea Turtle Hotline since 2002, in the vicinity of the proposed shellfish farm (approximate farm location indicated by the white star.) (https://seaturtlesightings.org/maps.html).

In consultation with former personnel at MA-Division of Marine Fisheries (Chris Schillaci – Aquaculture & Vibrio Specialist – now NOAA Aquaculture Coordinator in the Greater Atlantic Region) and as a condition to the certification provided by the MA Division of Marine Fisheries (Christian Petitpas – MA DMF Aquaculture Specialist), utilization of the proposed site is conditioned on the installation of 600 lb break-away links to all vertical

lines on the farm, as required for lobster trap buoys deployed in Massachusetts waters (322 CMR 12.06(2)). As an aside, Blue Stream Shellfish is currently developing a system of trawl retrieval that will be facilitated by a sidescan sonar coupled with a remotely operated vehicle (ROV), thereby allowing the elimination of all vertical lines from the farm site. It is anticipated that the system will be evaluated during the summer/fall of 2021, potentially negating the need for surface buoys (with the exception of site boundary markers) at all Blue Stream Shellfish sites.

Lastly, the proposed aquaculture site is located within the Massachusetts Natural Heritage and Endangered Species Program (NHESP) site PH945. The site is adjacent to estimated habitat for rare wildlife that is identified for Arctic tern (*Sterna paradisaea*), common tern (*Sterna hirundo*), least tern (*Sternula antillarum*) and roseate tern (*Sterna dougallii*) (Figure 7). With no surface structure to support perching, the primary use of the area by these tern species is for feeding. Given that the predominant structures associated with this effort will be at the bottom in 20+ feet of water, coupled with tern plunge-diver feeding behavior being confined to the top 50 cm (~20 inches) at the water's surface, there is no anticipated interference between the farm structure/operations and the use of the area by terns (NHESP Fact Sheets on the four tern species, 2015). NHESP reviewed the Blue Stream application and concluded there would be no adverse impacts to endangered of threatened species with the proposed farming activities.

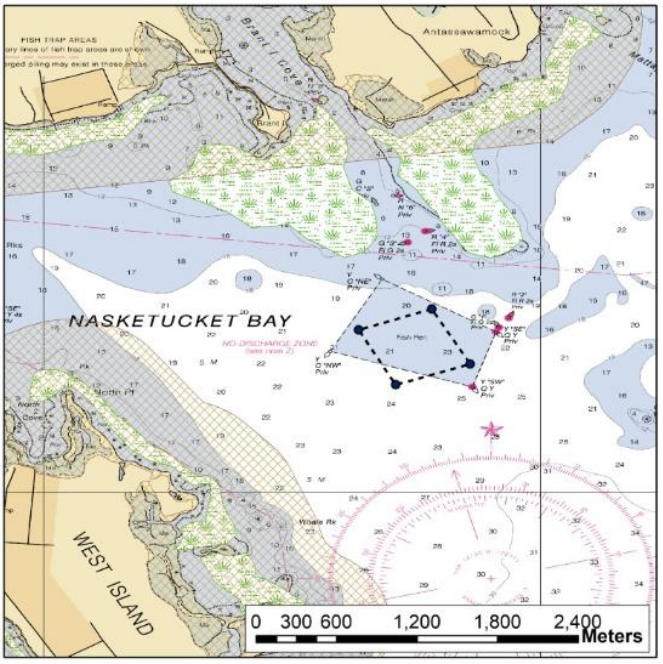

Figure 7: Chart of proposed aquaculture area overlaid with recent data on eelgrass distribution and tern feeding habitat areas (MA GIS, accessed 7 July 2020)

Massachusetts Endangered Species Act (MESA) review was exempted as the farm site has been actively involved in farming within the past 5 years prior to the application date.

Site Access:

Given the off-shore location of the proposed site, access to the farm will be limited to boat only. Blue Stream Shellfish currently owns a 25 foot Nauset work boat configured with a 12-inch pot-hauler capable of lifting 600 lbs via a side davit (F/V Severance). The vessel will be berthed at a local marina either in Mattapoisett, Fairhaven, or New Bedford, MA so all gear and product transport will originate and end at the berth site. In the future, Blue Stream Shellfish has plans to construct a powered barge that will allow for extended on-site work on the farm although the design and construction has not been fully developed at this time.

Operations - Bivalve Mollusk Culture

At this point in time, the focus of this application is the eastern oyster (*Crassostrea virginica*). However, Blue Stream Shellfish intends to experiment with the culture of a variety of bivalve species on the farm site to investigate other species for commercial culture. Therefore, Blue Stream Shellfish requests that the following species be included on the list of acceptable species (Table 4), provided the culture technology does not vary from the current described practices. All of the species listed are native to the area with the exception of the European flat oyster, which was introduced to the area in 1940s and 1950s and has naturalized from Maine to Rhode Island since that time (National Research Council. 2004. Nonnative Oysters in the Chesapeake Bay. Washington, DC: The National Academies Press. 344 pgs.) Should a new technology be considered for commercial adoption by Blue Stream Shellfish, we will notify all oversight agencies to gain a modification of the individual shellfish culture permit from its original description as presented with this document.

Table 4: A list of potential candidate species of bivalve mollusks to be considered for experimental evaluation and potential commercial cultivation at the Mattapoisett site by Blue Stream Shellfish.

- Surf Clam (*Spisula solidissima*)
- Razor Clam (*Ensis directus*)
- Stout Razor Clam (*Tagelus plebius*)
- Soft Shell Clam (*Mya arenaria*)
- Blue Mussel (*Mytilus edulis*)
- Quahog (*Mercenaria mercenaria*)
- Blood Ark (*Anadara ovalis*)
- Bay Scallop (*Argopecten irradians*)
- Sea Scallop (*Placopecten magellanicus)*
- European Flat Oyster (*Ostrea edulis*)

Proposed Shellfish Gear Set-up:

The technology proposed to be utilized for growing bivalve mollusks by Blue Stream Shellfish consists of commonly accepted and routinely used bottom cage culture equipment. Oysters will be contained in conventional extruded plastic mesh oyster bags, such as is represented in Figure 8.

Figure 8: A typical oyster square-mesh bag used in the bottom cages proposed for the Mattapoisett Site. Dimensions. The bags are approximately 36” length by 17” width by 3” depth and a single bag will house 200 market-sized oysters.

The bottom cage will consist of a cube structure constructed from 3” mesh, plastic coated, welded wire that is laid out to hold 12 oyster bags in a 4 rows by 3 columns configuration (Figure 9). The resulting bays are sized to hold a single oyster bag in each bay. Each cage is estimated to weigh approximately 150-200 lbs dry weight when stocked with 1,200 market sized oysters. Each cage will be configured with a 3/8” rope bridle attached to the four uppermost corners of the cage and converging to a single lifting point at the top that will extend approximately 1 foot from the top of the cage when taut.

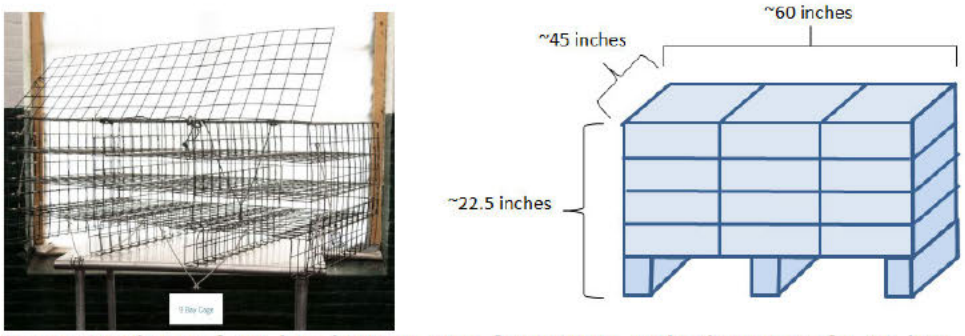

Figure 9: Photo of a 9-bay bottom cage for oysters and schematic of a 12-bay cage that will used by Blue Stream Shellfish on the Mattapoisett site. A single oyster bag will be inserted in each bay compartment.

Ten bottom cages will be linked in a single trawl line that will be stretched across the seafloor in a linear array (Figure 10). The trawl lines will be anchored at each end with 180 lb air weight (100 lb submerged weight) concrete anchors, cast in an inverted pyramidal DorMor-type of configuration. The 10 cages in the trawl line will be connected from bridle to bridle by 3/8" sinking poly rope with 30-50 feet of line between cages to allow for a single cage to be raised from the seafloor to the surface (20-25 foot water depth on site) for tending without lifting a second cage from the bottom. Each end of a trawl line will be marked with a surface buoy (16 inch yellow spherical buoy constructed of HDPE with a molded eye). A 600 lb weak link will be in-line on each vertical line placed adjacent to the buoy to protect against large animal entanglements.

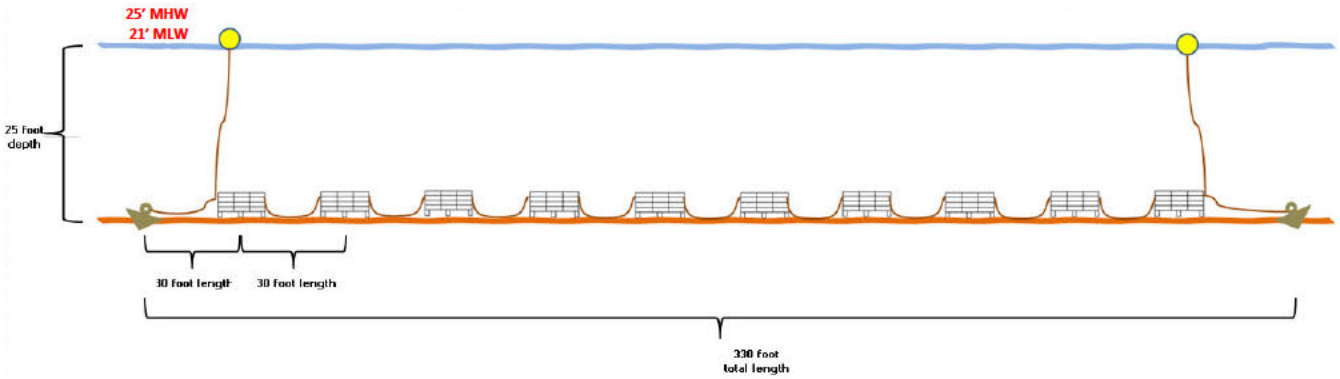

Figure 10: Schematic diagram of a 10 cage trawl line, configured to allow retrieval of an individual cage without lifting adjacent cages from the bottom (not drawn to scale). The trawl line will be anchored at each end with 100 lb DorMor-style concrete pyramid anchors (180 lbs weight in air) with end buoys attached using 600 lb breakaway links on all vertical lines.

The 50-acre site (1522' by 1454') will be fully populated by 100 trawl lines of 10 cages each in a 4 by 25 array, as depicted in Figure 11, with 30 ft spacing between lines. The topography of the proposed site is relatively flat (based on bathymetry) with little bottom relief thereby permitting this ordered array of trawls to be placed on the sandy substrate, characteristic of the site.

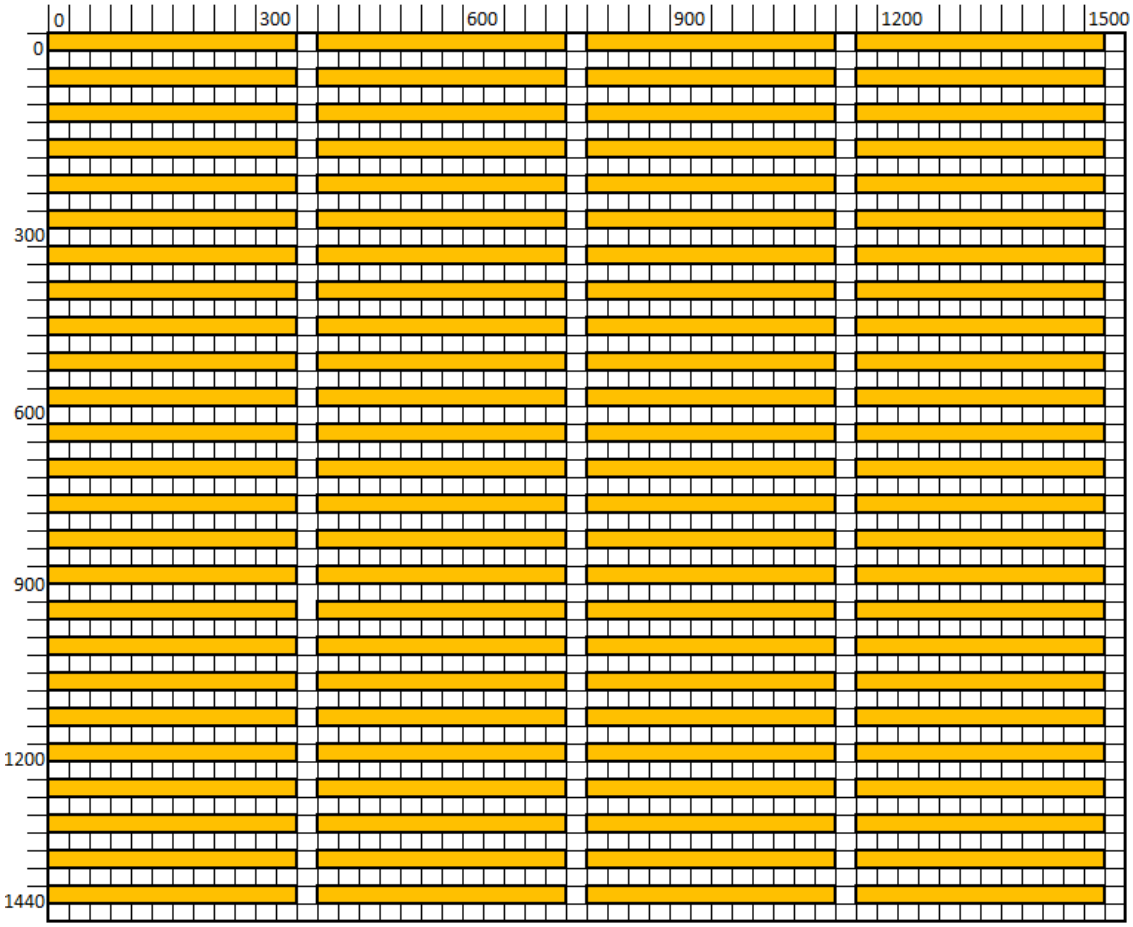

Figure 11: Top view schematic of the array of 10 cage trawls (yellow rectangles) that are proposed for the Blue Stream Mattapoisett Site. The scales on the horizontal and vertical axes are in feet. Total capacity of the site is 100 10-cage trawl lines.

Shellfish Operations:

Although subject to modification as the on-site work and growing conditions are realized, the overall operations plan is designed to minimize the amount of effort required to handle large cages and their oyster contents. It is anticipated that the growout will consist of a 2-year production cycle from initial deployment of ¾-inch juvenile oysters to the final harvest of 3-inch market-sized bivalves.

The overall strategy for production is to stock each individual cage with approximately 4,000 small (¾") oysters. These initially will be housed in 2 oyster bags in an otherwise empty cage. As the oysters grow, the cage will be retrieved for cleaning and oyster size grading approximately once a month (at first) and only during the warmer water months (bottom water temperature >50°F (10°C) (Figure 12), with an increasing soak interval as the oysters get larger and their relative growth slows. When the water temperature drops below 50°F, oyster feeding and activity are greatly reduced (along with biofouling growth) and the handling of the cages will be avoided until the spring temperature increases to the 50°F threshold (Figure 12).

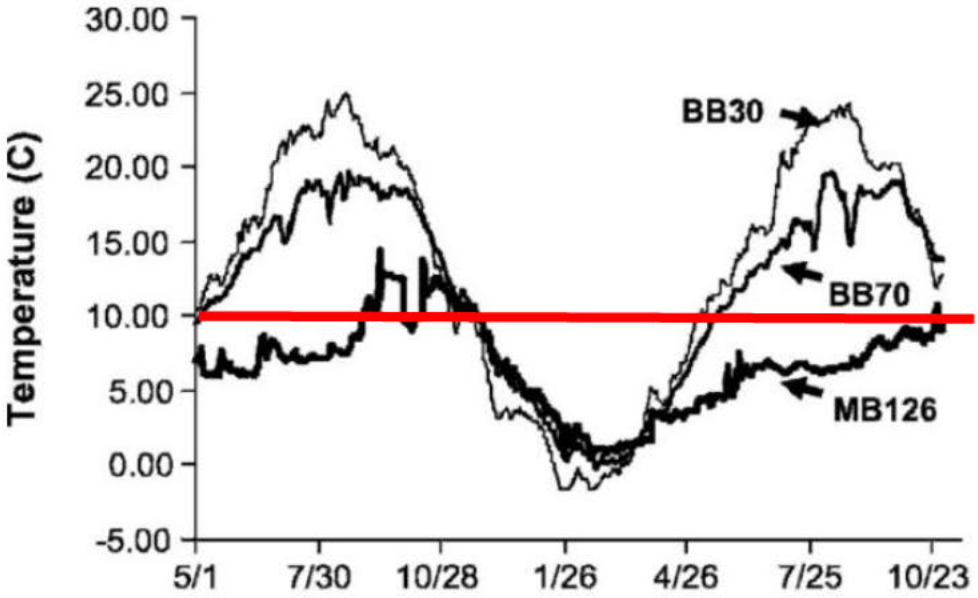

Figure 12: The time interval when water temperature was greater than 50°F (10°C) in Buzzards Bay at a depth of 30 feet (BB30) (Tlusty, M., A. Metzler, E. Malkin, J. Goldstein, and M. Koneval. 2008. Microecological impacts of global warming on crustaceans—temperature induced shifts in the release of larvae from American lobster, *Homarus americanus*, females. J. Shellf. Res. 27(2):443–448.)

As the oysters grow and in order to maintain a similar biomass in each bag, their density will be reduced per bag by splitting the initial contents into 4 then 8 and finally 12 bags contained within the single cage system. The bag mesh size will be steadily increased as the oysters grow to reduce the impact of mesh size on food flux through the system. It is anticipated that survival will be approximately 60% from initial cage stocking to final market, resulting in a cage being fully stocked at 2,400 oysters in 12 bags upon harvest. As the cage is harvested, it will be restocked with juvenile seed to start the production cycle over again, where the initial stocking density per cage will be adjusted, as data are collected on survival and growth rates for the site. This reduces the need for land-based storage of grow-out gear as the cages are stocked and in production on the farm site at all times.

All oyster seed will be sourced from commercial hatcheries in the northeast with importation according to MA-DMF regulations and accompanied by a valid health certificate. Initially the stocking size of seed will be ¾" in valve length from the supplier but, as the Blue Stream Shellfish business progresses, we will be operating our own nursery system in a location to be determined but within the same water body as the farm is located.

With a consistent depth of 20 to 25 feet of water (3 to 4 meters) at the site, Blue Stream assumes that the fouling community will differ somewhat from that commonly observed in inter-tidal to shallow sub-tidal sites. It is anticipated that the bulk of the fouling community will be comprised of soft body invertebrate species (tunicates, bryozoans, etc.) with reduced occurrence of photosynthetic organisms (macroalgae) or hard bodied invertebrates (barnacles). Nevertheless, fouling control will be a primary concern for maintenance of the structures placed on the farm.

Unless biofouling is excessive, fouling on the cages will be managed on-site within the confines of the work vessel. Given the relatively small surface area of the 3" mesh wire used to construct the cages, compared to conventional 1" mesh wire, it is anticipated that the volume of biomaterials needed to be removed from the cages will not be substantial. When needed, the cages will be power-washed on the deck of the boat with the discarded organic material trapped in the scuppers by screens on the outflow and retained on deck for land disposal. Should the cage biofouling be excessive, the cage will be replaced with a clean one and the fouled cage will be returned to shore for drying and cleaning in a land-based facility. Excessive fouling is determined as the point where the water flow and food flux through the system is compromised to the point that it impacts the growth rate of the oysters. This will be investigated empirically using mini-flow meters placed in experimental oyster bags as a component to a research project currently underway by Dr. Leavitt.

Biofouled oyster bags removed from the cages during grading will be switched out as need during each grading step. Clean replacement bags of increasing mesh size will be used for deployment following the grading step, with the fouled bag being returned to a shoreside facility (location TBD) for drying and cleaning.

Due to the variability in growth rates of farmed oysters, it is necessary to grade the oysters regularly to ensure that like-sized animals are grouped together; thus reducing the competitive edge for feeding that larger oysters have over smaller. As a component to grading, the apparatus used is an oyster grader/tumbler, consisting of a near horizontal rotating cylinder with steadily increasing sized holes in the side wall, allowing the oysters to be selectively dropped out of the tube as they encounter an opening large enough to fit through. As the oysters are selectively dropped out, they are captured in bins to retain like-sized animals together. Following oyster grading, the like-sized animals are stocked together in an appropriately sized bag within the cage system.

An added advantage to tumbling in a rotating cylinder is to chip the leading growth edge off the juvenile oysters. This induces the oyster to form a deeper cup aspect to shell growth thus producing a better quality oyster for the half-shell market. We anticipate grading and tumbling to occur on a monthly to bimonthly basis during the growing season, depending on the overall growth rate of the stock.

As mentioned above, as the oysters are harvested from the cage system, the individual cage immediately will be restocked with young of the year oysters and put into a new production cycle. Therefore, the individual cages are continually in production and not left empty and idle for any length of time leading to reduction in the production capacity of the farm.

Shellfish farm operations will follow recommended best practices (Leavitt, D.F. 1994. Best management practices for the shellfish culture industry in southeastern Massachusetts. Publication of the Southeastern Massachusetts Aquaculture Center. https://www.mass.gov/files/documents/ 2016/08/xm/shellfish-bmp.pdf) All activities will be recorded in a daily log and complete records will be compiled in appropriate software designed for managing a shellfish farm. Using a cloud-based product, such as OysterTracker® (https://www.oystertracker.com/), will allow a full record of farm layout and performance, market oyster production and overall sales to be compiled quickly and easily for annual production reporting, as is required by both Mattapoisett and the MA-DMF.

Operations - Kelp Culture

The culture of macroalgae in local waters is a relatively new aquaculture effort for the region. As such, collectively it is still an experimental crop with an uncertain future in terms of consumer acceptance and marketing. Blue Stream Shellfish proposes to experiment with growing sugar kelp (*Saccharina latissima*) on the Mattapoisett site with the intention of producing a commercial quantity should the production potential be proven and the markets allow for the crop to be raised profitably. In addition to sugar kelp, a number of other macroalgae species have been proposed for regional culture. As was true for the bivalves, Blue Stream requests that the following species be included as culture candidates for this application (Table 5). All of the listed species are native to the waters of southern Massachusetts and have been suggested for cultivation on an experimental basis. Should the culture technology for any of the alternate species listed in Table 5 vary from that proposed for sugar kelp (below), Blue Stream would consult with all regulatory agencies for a modification of conditions prior to installing any alternative gear.

Table 5: A list of potential candidate species of macroalgae to be considered for experimental evaluation and potential commercial cultivation at the Mattapoisett site by Blue Stream Shellfish.

- Horsetail Kelp (*Laminaria digitata*)
- Sargassum (*Sargassum filipendula*)
- Dulse (*Palmaria palmata*)
- Sea Lettuce (*Ulva lactuca & linza*)
- Gracilaria (*Gracilaria tikvahiae*)
- Irish moss (*Chondrus crispus*)
- Nori (*Porphyra* spp.)

Proposed Kelp Gear Set-up:

Kelp culture protocols have been well documented in two publications that provide a best practices approach to the subject. Blue Stream Shellfish proposes to follow the protocols for kelp field grow-out outlined in the Ocean Approved Kelp Manual (Flavin, K., N. Flavin, and B. Flahive. 2013. Kelp Farming Manual: A Guide to the Processes, Techniques, and Equipment for Farming Kelp in New England Waters. Ocean Approved Publication. 130 pgs.Available at: https://static1.squarespace.com/static/52f23e95e4b0a96c7b53ad7c/t/52f78b0de4b0374e6a0a4da8/1391954701750/OceanApproved_KelpManualLowRez.pdf) and Cultivating *Laminaria digitata* (Edwards, M. and L. Watson. 2011. Aquaculture Explained #26: Cultivating *Laminaria digitata*. Irish Sea Fisheries Board Publication, Dublin, IR. 72 pgs. Available at: http://www.bim.ie/media/ bim/content/publications/BIM,Aquaculture,Explained,Issue,26,-,Cultivating,Laminaria,digitata.pdf.) These published practices will be adapted to allow for Blue Stream to overlay the bottom tending oyster cage grid with the midwater suspended kelp culture technology during the kelp growing season.

The layout of gear is typical for growing kelp and involves the suspension of a midwater longline under tension, suspended by buoys and anchored by moorings (similar to that depicted in Figure 13). Blue Stream Shellfish proposes to place 300 ft longlines in the 30 foot alleys between the trawl lines of cages within the Mattapoisett site. A single 300 foot kelp line will consist of the moorings, the longline, and a series of weighted droppers to maintain the kelp line at the desired depth.

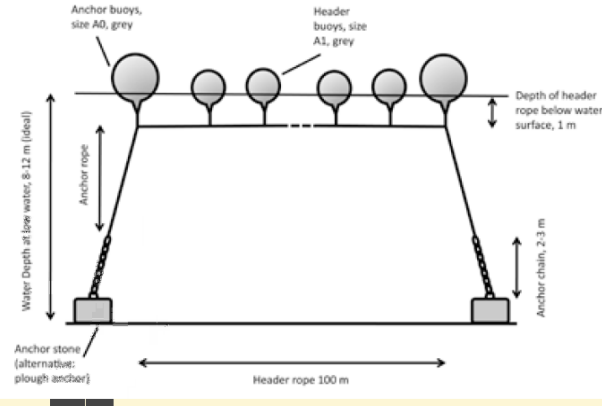

Figure 13: A schematic of the overall layout of a midwater kelp grow-out system (from Edwards and Watson 2011, cited above).

The longline moorings will be 2,000 lb cement blocks with 1.5 inch chain loops

embedded in the concrete as a holdfast. The block moorings will be set midway between two oyster cage trawl lines in the same directional orientation as the cages. The distance between mooring blocks will be approximately 330 feet to correspond with the oyster cage trawl lines. The longline will consist of 7/16" poly line attached to a 10 foot chain connector from the mooring and will be suspend at approximately 7 feet below the surface from 200 lb displacement buoys at the ends of the longline (Figure 13). Attached along the length of the longline will be weighted spacers that consist of a 7 foot PVC pipe with 5/16" poly line running through the inside of the pipe and a 14 lb displacement lobster buoy at the surface along with a 10 lb concrete weight at the bottom (Figure 14). These spacers will be attached approximately every 75 ft along the longline to ensure that the growing kelp will be maintained at the optimal depth for growth. As the kelp grows it increases in buoyancy so additional 10 lb weights will be added to each spacer as needed to keep the growing kelp at the desired depth.

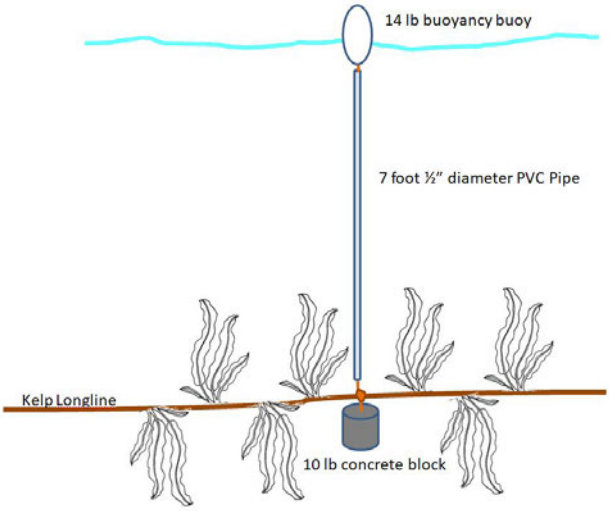

Figure 14: Schematic of a kelp longline spacer to be placed every 75 ft along the longline to maintain depth.

Given the question as to the marketability and therefore the profitability of farming kelp, it is undetermined as to how much of the site will be occupied with kelp lines during the kelp growing season. The best case scenario (that it is manageable to maintain and can be farmed profitably) is that we would have 24 arrays of 3 - 300 ft lines within the 50 acre grid (total of 96 lines). If it works out, it may be more appropriate to install 1,500 ft longlines across the entire span of the site, in which case there would be a total of 24 lines on site. The worst case scenario is that we start in 2020 with an experimental 3 short (200 ft) lines to evaluate the production potential for the species and, if it turns out to be unprofitable, then we abandon the entire effort.

Kelp Operations

Due to biofouling of the kelp blades in the warmer season, thereby reducing its value, kelp production is a cold-water, winter-based activity. It is recommended that kelp sporelings not be placed in the field until the water temperature has dropped to below 52°F (Flavin et al. 2013, cited above), the exact opposite of the recommended interval for handling oysters. Based on Buzzards Bay water temperature projections (Figure 12), the kelp growing season would span from early November through to late April. To that end, the longlines would be set up on site in mid-October and removed from the water entirely (with the exception of the mooring blocks) by early May.

Kelp sporelings are produced in a controlled-environment hatchery where the sporophyte seedlings are induced to attach onto a thin (1 mm) twine wrapped on a PVC spool. Blue Stream Shellfish will acquire spools of sporelings from a state approved commercial hatchery and will strive to ensure that the genetics/lines of sugar kelp represent local/native stocks. The thin line is wrapped on the longline *in situ* where the growing kelp frond holdfast will eventually overgrow the thin twine and attach directly to

the longline itself. Kelp growth will be monitored and the apparatus adjusted on a semi-monthly basis.

As with the oyster farm, access to the kelp farm will be by boat only and Blue Stream Shellfish will use the F/V Severance to access the site from their marina berth. It is anticipated that once the site has been set up and the longlines populated with kelp sporelings, there is little maintenance required other than adjusting buoyancy of the spacers. In anticipation of that maintenance, we believe that we will visit the site on a biweekly schedule to ensure that all is in order.

Harvest entails the cutting of the kelp stipes from the holdfast and into a deck receptacle. The harvested kelp will be returned to shore in a timely manner based on any handling requirements implemented by the state Division of Marine Fisheries or the Department of Public Health.

All activities associated with the kelp operations will be recorded in a trip log as will the harvest statistics. These data can be reported to any regulatory agency that should request the information.

Closing Comments

Blue Stream Shellfish respectfully submits this operations plan for a 50 acre farm site located in Mattapoisett, MA. Should any other information be required or clarification of presented information is needed, do not hesitate to contact: