



State of Rhode Island  
Coastal Resources Management Council  
Oliver H. Stedman Government Center  
4808 Tower Hill Road, Suite 3  
Wakefield, RI 02879-1900

(401) 783-3370  
Fax (401) 783-2069

### PUBLIC NOTICE

File Number: 2022-04-046

Date: May 16, 2022

This office has under consideration the application of:

**Roger Williams University  
Dept of Biology; Attn: T. Scott  
One Old Ferry Road  
Bristol, RI 02809**

for a State of Rhode Island Assent to construct and maintain: **a two-acre education/research aquaculture site adjacent to the university's Learning Platform in Mount Hope Bay. The application seeks Council approval for the listed activities pursuant to 650-RICR-20-00-1.3.1(K)(5)(a)(15).**

Project Location:	Mount Hope Bay adjacent to RWU Bristol Campus
City/Town:	Bristol
Waterway:	Mount Hope Bay
Related Files	2021-07-043

Plans of the proposed work can be seen attached or requested at [Cstaff1@crmc.ri.gov](mailto:Cstaff1@crmc.ri.gov).

In accordance with the Administrative Procedures Act (Chapter 42-35 of the Rhode Island General Laws) you may request a hearing on this matter.

You are advised that if you have good reason to enter protests against the proposed work it is your privilege to do so. It is expected that objectors will review the application and plans thoroughly, visit site of proposed work if necessary, to familiarize themselves with the conditions and cite what law or laws, if any, would in their opinion be violated by the work proposed.

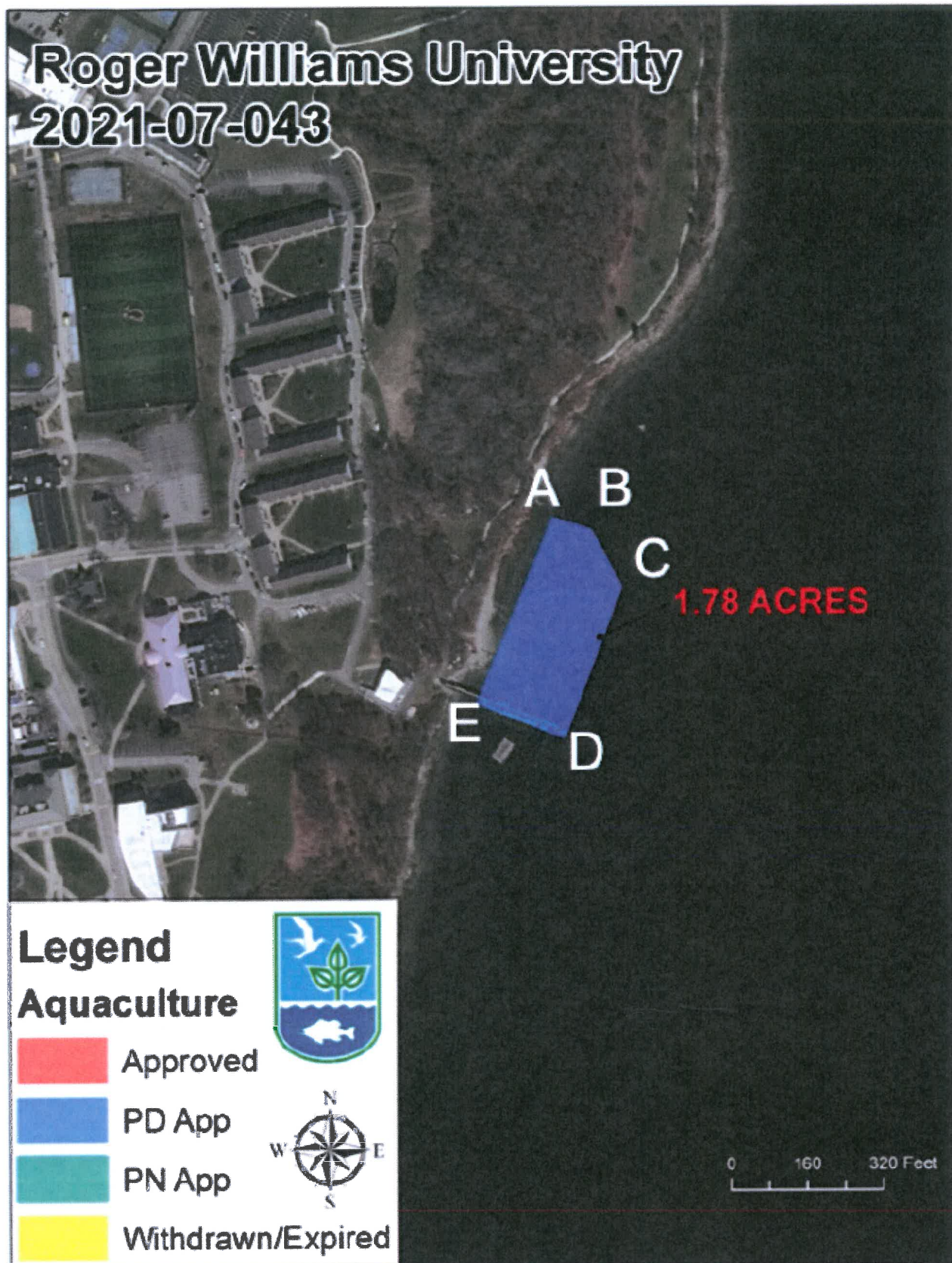
If you desire to protest, you must attend the scheduled hearing and give sworn testimony. A notice of the time and place of such hearing will be furnished you as soon as possible after receipt of your request for hearing. If you desire to request a hearing, to receive consideration, it should be in writing (**with your correct mailing address, e-mail address and valid contact number**) and be received at this office on or before June 16, 2022.

Please email your comments/hearing requests to: [cstaff1@crmc.ri.gov](mailto:cstaff1@crmc.ri.gov); or mail via USPS to: Coastal Resources Management Council; O. S. Government Center, 4808 Tower Hill Road, Rm 116; Wakefield, RI 02879.

/lat





# Roger Williams University

2021-07-043




## Legend

### Aquaculture

-  Approved
-  PD App
-  PN App
-  Withdrawn/Expired



0 160 320 Feet



A horizontal scale bar with three segments, corresponding to the values 0, 160, and 320 feet.



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File Number (CRMC use only): 2022-04-046

## CRMC RESEARCH/EDUCATIONAL AQUACULTURE APPLICATION

Applicant's Name: Roger Williams University, Contacts: Skylar Bayer & Tim Scott, Biology Department

School and/or affiliation: Roger Williams University

Mailing Address: One Old Ferry Way, Bristol

State: RI Zip: 02809 Telephone Number: 401-254-3091 (Bayer)

E-Mail: sbayer@rwu.edu TScott@rwu.edu

### PROJECT LOCATION

Waterway: Mt. Hope Bay adjacent to the RWU Bristol Campus

City/Town: Bristol

Latitude-longitude coordinates of site: 41 39.055 North, 71 15.366 West

On a separate piece of paper, please describe the proposed project. If this is a research project, please provide an experimental design including null hypothesis and proposed statistical analysis. If this is an educational project, please describe your pedagogy and how this project will fit in with your classroom instructional plan. For either type of project, provide a detailed operational plan, i.e. what you propose to do, how you propose to do it, where you propose to do it, and why you are proposing this plan.

Proposed species (common name; genus and species): See attached

Proposed start and end dates for experiment: N/A -- education and research permit

**NOTE:** The applicant acknowledges by evidence of their signature that they have reviewed the Rhode Island Coastal Resources Management Program, and have, where possible adhered to the policies and standards of the program. The applicant also acknowledges by evidence of their signature that to the best of their knowledge the information contained in the application is true and valid. The filing of false information can result in the Coastal Resources Management Council revoking the state assent.

Skylar R. Bayer  
Applicant's Signature





Ben Goetsch, Aquaculture Coordinator  
Rhode Island Coastal Resources Management Council  
Stedman Government Center  
4808 Tower Hill Road  
Wakefield, RI 02879-1900

4 April 2022

Mr. Ben Goetsch:

Please find enclosed a request from Roger Williams University (RWU) for a CRMC Aquaculture Permit for an experimental aquaculture farm on the western side of Mt. Hope Bay, adjacent to RWU Bristol campus. Through its Center for Economic and Environmental Development (CEED), the University has been involved in aquaculture research and education for much of the past two decades. Currently, we operate the Luther H. Blount Shellfish Hatchery, an Aquatic Animal Diagnostic Laboratory and an extensive Marine Ornamental Fish Rearing Program. Most of this activity is conducted within the Marine and Natural Sciences (MNS) Building. We have entered into formal partnerships with the Rhode Island Department of Environmental Management, the Rhode Island Shellfishermen's Association, the New England Aquarium and the Audubon Society of Rhode Island, among others, to contribute the institution's knowledge and skills to the development of regional aquaculture.

A significant component of RWU's aquaculture program is our capacity to conduct experimental deployments to demonstrate aquaculture technologies as teaching tools for our various programs and courses, and to develop new and improved technologies for advancing the aquaculture industry in the region. As such, we require access to an experimental area that will allow us to test new equipment and to demonstrate existing technology as we provide outreach and research services to the aquaculture sector. Therefore, with this application, RWU is requesting an extended educational aquaculture lease for a 1.78 plot adjacent to our campus shoreline on Mt. Hope Bay, and encompassing the RWU Learning Platform.

After a preliminary determination (PD) public meeting with the Bristol Harbor Commission on September 13<sup>th</sup>, 2021, per the recommendations of the attendees, we adjusted our proposal to make the eastern edge of the lease site parallel with the end of the learning platform. Additionally, we will add five hazard buoys added along the offshore and northern boundary of the site. Two of these buoys will mark the bottom plant area that will also serve as a fairway to the beach for the RWU Sailing Team. They will be beneficial aids to navigation per the recommendation of CRMC.

Thank you for your consideration of this request.



Skylar R. Bayer, PhD  
Aquaculture Extension Specialist  
[sbayer@rwsu.edu](mailto:sbayer@rwsu.edu); 401-254-3091



Timothy M. Scott, PhD  
CEED Director  
[tscott@rwu.edu](mailto:tscott@rwu.edu); 401-254-3563

## **I. Introduction**

Through its Center for Economic and Environmental Development (CEED), Roger Williams University (RWU) engages in a broad range of aquaculture activities involving faculty, staff and the ~250 undergraduate students studying marine biology, aquaculture and aquarium science. In addition, CEED collaborates extensively on a variety of research and restoration projects with the private industry, commercial fishing, environmental, regulatory and scientific communities. We conduct training sessions for the public (*e.g.*, shellfish aquaculture) and professional groups. As a consequence, the CEED facilities are used to hold and produce specimens for research, demonstration, restoration, class exercises and breeding experiments. Our shellfish aquaculture permit request reflects this in that it is species-rich but the actual number of individuals held at any given time is small relative to a commercial lease. Not all species listed are on site at present, but we try to anticipate our needs as the programs continue to expand.

One of our Faculty – Dr. Roxanna Smolowitz – is a member of the CRMC Biosecurity Board, which regularly reviews aquatic health concerns and offers recommendations regarding best management strategies to minimize environmental risk. Under the direction of Dr. Smolowitz, CEED operates an Aquatic Animal Diagnostic Laboratory, which provides diagnostic services for research and commercial operations when fish and shellfish disease outbreaks occur. At the same time, this lab works collaboratively to further understand disease processes and to develop new and improved diagnostic tools and techniques.

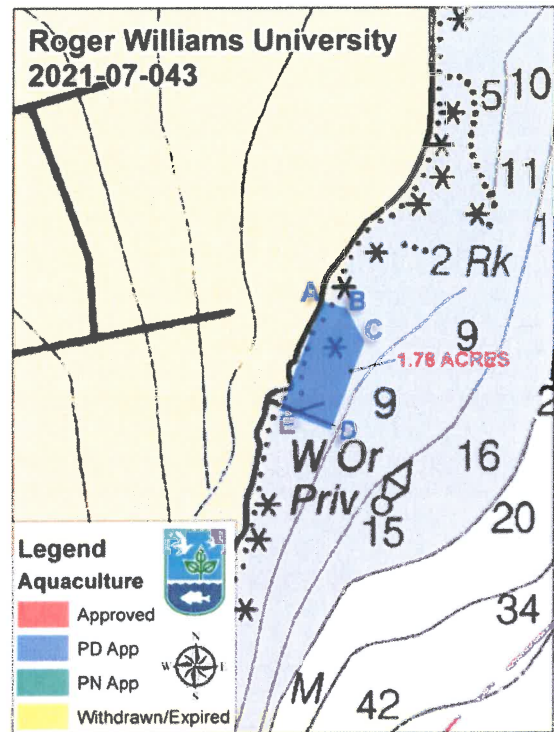
We are requesting a 1.78-acre research/education aquaculture field site to be located in Mt. Hope Bay adjacent to the RWU campus. The lease will be used for both demonstration projects that are important for educational and outreach purposes and for research projects that will be conducted to address new technologies or management strategies for the aquaculture industry. It is important to note, no shellfish or aquaculture products grown on the lease will be sold on the commercial market. Excess oysters produced through our research and demonstration activities will be donated to local non-profit groups (*e.g.*, Rhode Island Shellfisherman's Association, Town of Warren Restoration Program).

All shellfish and kelp operations will be conducted in accordance with the Rhode Island Biosecurity board protocols. All handling of shellfish to be consumed will follow the recommendations/regulations set forth by RIDEM (Rhode Island Marine Fisheries Regulations, Part IV Shellfish) and in accordance with the RIDEM Vibrio Management Plan, as instituted 1 July 2014.

## II. Operational Plan

1. **Name and address:**  
Roger Williams University  
Center for Economic and Environmental  
Development.  
One Old Ferry Rd,  
Bristol, RI 02809
2. **CRMC file number:** 2021-07-043
3. **DEM aquaculture license number:** N/A
4. **Type of facility:** Education/Research
5. **Location of facility:**

Bristol, Rhode Island  
Mount Hope Bay  
Shellfish Growing Area 17



6. **Species grown:**

<i>Crassostrea virginica</i>	Eastern oyster
<i>Mercenaria mercenaria</i>	Hard clam
<i>Argopecten irradians</i>	Bay scallop
<i>Spisula solidissima</i>	Atlantic surf clam
<i>Ensis directus</i>	Atlantic razor clam
<i>Tagelus plebeius</i>	Stout razor clam
<i>Mya arenaria</i>	Soft shell clam
<i>Mytilus edulis</i>	Blue Mussel
<i>Anadara granosa</i>	Blood Ark
<i>Solemya velum</i>	Atlantic awning clam
<i>Saccharina latissimi</i>	Sugar kelp
<i>Gracilaria tikvahiae</i>	Graceful redweed
<i>Palmaria palmate</i>	Dulse

Corner Point	Latitude	Longitude	Side	Length (ft)
A	41.65092	-71.25615	A-B	85.66
B	41.65085	-71.25585	B-C	135.73
C	41.65052	-71.25562	C-D	339.24
D	41.64965	-71.25606	D-E	196.69
E	41.64985	-71.25673	E-A	463.91
A-B-C-D-E	<b>Perimeter</b>		<b>Area</b>	
	1,221.23 ft		77,536.80 ft <sup>2</sup>	1.78 acres

Figure 1. RI DEM map of lease site with associated Latitude and Longitude coordinates, perimeter and area measurements.

Note: Oysters are the only species grown in perpetuity on the proposed lease. Other species may be grown on the lease dependent upon project and research needs.

## 7. Gear Description

General culturing of shellfish and macroalgae will include deployment of data loggers. RI Department of Environmental Management's Office of Water Resources in the effort to address increasing water temperatures and the potential threat of a *Vibrio* illness outbreak are asking all lease holders to monitor water temperature at lease their site and keep records of actual temperatures of bottom, surface and at depth waters where the shellfish are being grown during the Summer months (June-September).

The NSSP Model Ordinance includes a requirement that if aquaculture gear is found to attract birds or mammals to the extent that their waste presents a human health risk then a written operation plan to mitigate that risk is required. In consultation with RIDEM Division of Marine Fisheries methods to deter waterfowl attraction will be completed if any gear described below or experimental gear is found to attract birds.

### a.) Oyster Culture

**Rack and Bag system:** Oysters will be grown from nursery phase to market size or subsequent seeding for restoration in a rack and bag system. Racks are made of uncoated rebar iron with dimension of 12' (L) x 2.6' (W) x 1.4' (H) (Figure 2). Each rack will hold six ADPI mesh oyster bags with dimensions of 3.3' (L) x 1.7' (W), fastened to the rack with ¼" bungee cord. The farm is currently set up with 12 racks oriented in an east-east grid with a minimum of 2' between racks. Gear will be placed at subtidal depth to a maximum depth of 5' below mean low water. We anticipate removing all but three racks and replacing them with bottom cages, as they are better suited for the physical conditions of the site.

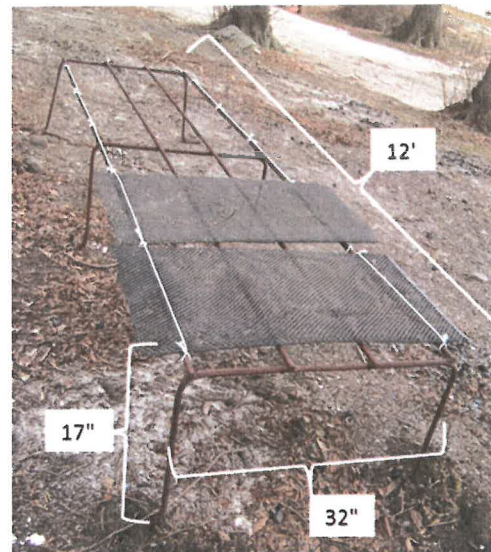


Figure 2. Rack and bag culture system.

**Bottom cages:** Oyster will also be grown from nursery to market phase in wire cages placed on the bottom and configured in a trawl system of up to 10 cages tied to surface buoys. Each cage consists of two rows with three tiers each, capable of holding a total of six 3' (L) x 1.7' (W) ADPI oyster bags. Cage dimensions are racks are 45.0" (L) x 40.5" (W) x 20.5" (H) (Figure 3). The farm will currently hold 18 bottom cages with potential for expansion up to a maximum of 50 cages. All cages will be located in subtidal waters within the lease footprint.

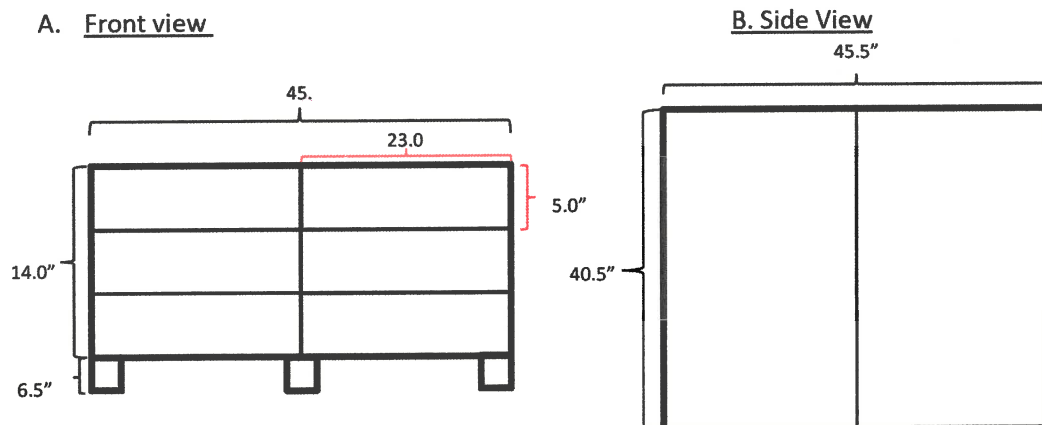


Figure 3. Bottom oyster cage.



**Floating cages:** Floating cages (e.g. Oyster Gro®, Flow N Grow™, Oyster Ranch™) may be used dependent upon research needs. The cages are wire mesh with three rows of two tiers, capable of holding six 3.3' (L) x 1.7' (W) ADPI oyster bags. Two polyethylene floats are fixed to the top side of cages to provide floatation during the growing season. During winter months the floats are filled with water and cages sunk to the bottom. Dimensions of the cages are 5.2' (L) x 3.5' (W) x 1.6' (H) (Figure 4). Cages will be tied together in a long line outhaul system running north of the RWU learning platform.

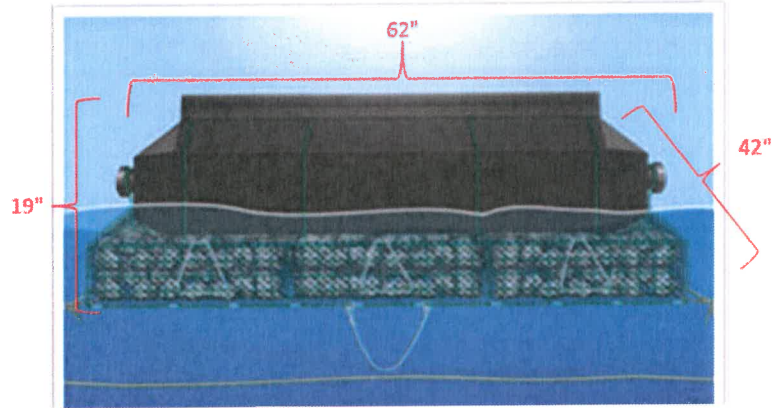


Figure 4. OysterGro® cage

**Australian longlines:** Australian longlines are used to raise oysters from 1-inch valve height to market size. The system consists of long lines suspended between dock pilings or poles inserted into the sediment. The backbone is held at mid tide and oyster baskets (e.g., Seapa, Hexyl, Zappco) are suspended from the line with 12-inches

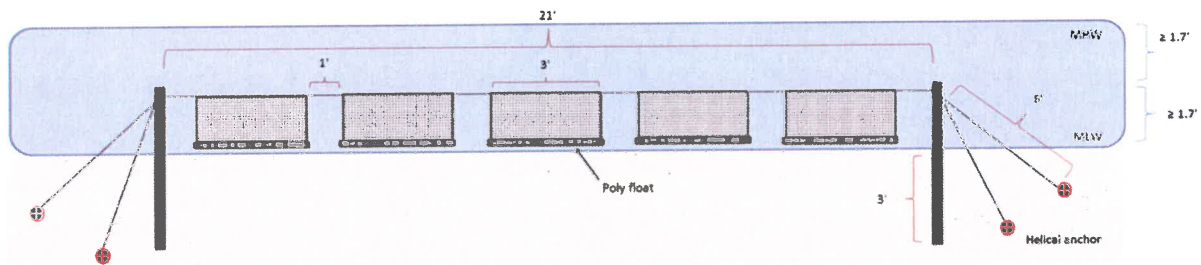


Figure 5. Australian longline.

between baskets (Figure 5). The lines will be located within the lease in subtidal waters during the growing season (May – November) and removed during the low growth season (December – April). We have a maximum of a total of 50 bags suspended on this system.

**Experimental gear:** Shellfish culture technology not described herein may be used on an experimental basis. This technology will fall within the same parameters as the proposed gear which is on site in perpetuity (i.e. bottom culture, mid-water culture, floating culture). Prior to deployment of experimental gear, CEED staff will contact the CRMC aquaculture coordinator with detailed descriptions of the technology and site plans.



## b.) Infaunal Clam Culture

Hard clams, razor clams, softshell clams, Atlantic surf clams, blood arks and Atlantic awning clams may be grown on the lease, dependent upon project and outreach needs.

**Bottom cages:** Clams will be raised in nursery culture within bottom cages described in part 7a. Oyster Culture. Clams will be held in 3.3' (L) x 1.7' (W) ADPI mesh bags with varying substrates within the bags (e.g., Hydroton, pumice, pea stone). All cages will be placed in subtidal waters within the lease.

**Bottom netting:** Clam growout will take place within conventional bottom net systems using raceways of approximately 10' by 10' or smaller dimensions. Nets will be pinned into the substrate with 2' rebar staples. Florida soft bags are also a possible grow out system we will use for clams.

**Experimental gear:** Shellfish culture technology not described herein may be used on an experimental basis. This technology will fall within the same parameters as the proposed gear which is on site in perpetuity (i.e., bottom culture, mid-water culture, floating culture). Prior to deployment of experimental gear, CEED staff will contact the CRMC aquaculture coordinator with detailed descriptions of the technology and site plans.

## c.) Scallop Culture

Bay Scallops may be grown on the lease, dependent upon project and outreach needs. Scallops will either originate from the RWU shellfish hatchery or be sourced from an approved commercial hatchery.

**Spat bags:** When produced, juvenile scallops (5-10 mm shell height) will be transferred from the hatchery to our field nursery in June and July. Scallops will be held in hanging spat bags with dimensions of 2.4(L) x 1.4' (W) until growth to 15-20 mm and subsequent transfer to bottom cages or rack and bags. Spat bags will be suspended from surface longlines. Total number of spat bags deployed on the lease will be dependent upon project needs.

**Bottom cages:** Bottom cages will be used to rear scallops after transfer from spat bags. Bottom cages to be used are four tiered 2' (L) x 2' (W) x 2' (H) wire mesh cages (Figure 6). Scallops are held in 2.3' (L) x 2.3' (W) plastic mesh bags, with a total of four bags per cage. Cages will be tied together in groups of five and marked with a surface float. All cages will be placed in subtidal waters within the leased footprint. Total number of scallop cages deployed on the lease will be dependent upon project needs.

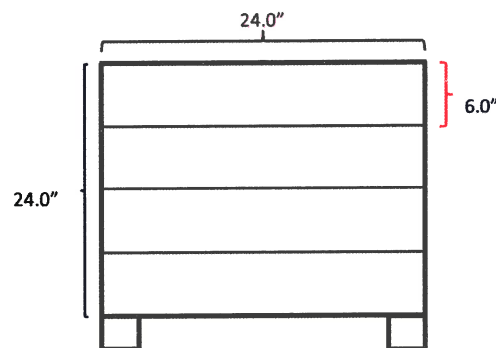


Figure 6. Scallop bottom cage.

**Experimental gear:** Shellfish culture technology not described herein may be used on an experimental basis. This technology will fall within the same parameters as the proposed gear which is on site in perpetuity (*i.e.*, bottom culture, mid-water culture, floating culture). Prior to deployment of experimental gear, CEED staff will contact the CRMC aquaculture coordinator with detailed descriptions of the technology and site plans.

#### d.) Macroalgae Culture

During winter months (November-May) sugar kelp and or dulse may be grown on suspended longlines, above the sediment surface and held in place with helical anchors (Figure 7). Long lines will be suspended in the water column using 2-3 ft., ½ in. PVC spacers with a six-pound concrete block tied into the longline and an 11-inch lobster buoy providing floatation. Spacers will be deployed every 50 ft. along the kelp line. After harvest in April, the kelp long line and buoys will be removed and the Oyster Gro cages will be floated to the surface. Longline length is anticipated at 100 feet with a maximum of 5 lines in place. Total production will be dependent upon project needs.

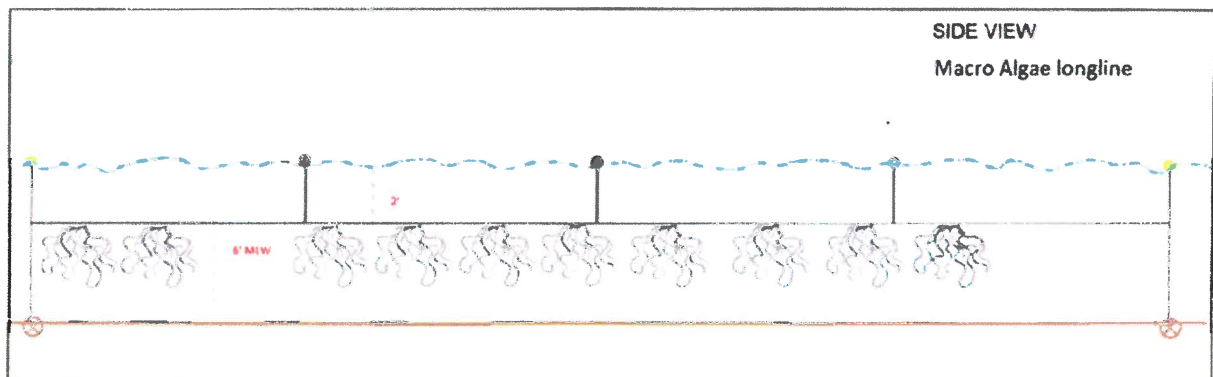


Figure 7. Macro algae longline.

#### Legend

- 11" Lobster buoy
- 11" Lobster Buoy
- 🌿 Kelp
- ⊗ Helical Anchor
- Longline
- 1/2" PVC spacer

#### e.) Mussel Culture

Mussels will be grown in suspended 100 foot longlines, secured with helical anchors and floated to the surface with 11-inch lobster buoys (Figure 8). Seed will be placed in mussel socks and attached to the backbone of the longline.

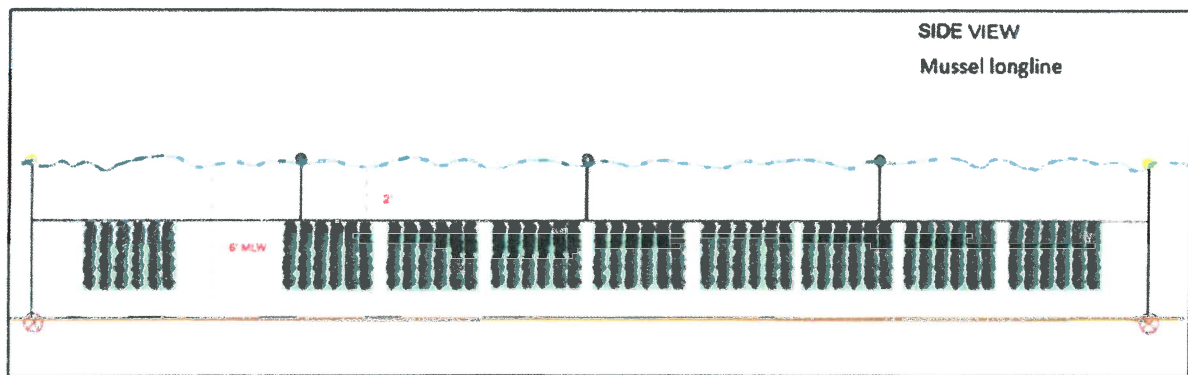


Figure 8. Mussel longline.

**Legend**

- 11" Lobster buoy
- 11" Lobster Buoy
- Mussel sock
- ⊗ Helical Anchor
- Longline
- 1/2" PVC spacer

**f.) Nursery Culture**

CEED currently operates a conventional shore-based upweller system, installed on the RWU Learning Platform, that consists of three 12-foot troughs (12' by 3' by 3'), each with nine 16" silos. At present this is driven by two 2 HP submersible pumps with the capacity to install a third submersible pump, as needed. All shellfish seed used are either generated on-site at the RWU Shellfish Hatchery or are purchased from a commercial source (with appropriate pathology testing and reports) as allowed by the CRMC Aquaculture Coordinator, with proper notification (described in 10a.)



Figure 10. The RWU Shellfish Nursery located on the Learning Platform.



**8. Identifying markers:**

Each corner of the site will be marked with a Coast-Guard approved 12-inch hazard buoy with the CRMC assent number printed on each marker (Figure 11). Additionally, two buoys will be added along the offshore part of the lease to mark a fairway to the beach for the RWU Sailing Team. Markers will be held in place with 3' helical anchors and 3/8" sinking polysteel line.



Figure 11. Image of a hazard buoy in the water. From Getty Images.

**9. DEM Shellfish Harvesting Classification:**

Mount Hope Bay – Area 17 – Conditional waters

**10. Description of practices and procedures:**

**10a. Seed Source and Husbandry**

**Oysters:** Oyster seed will be sourced from the RWU shellfish hatchery, a commercial shellfish hatchery or oyster farm with an approved pathology report. Determination of exact seed source will be dependent upon hatchery supply and project needs. The CRMC Aquaculture Coordinator will be notified of seed source and provided a corresponding pathology report (if source is outside the biosecurity zone) at least five days in advance of moving any seed onto the farm. Throughout the growing season oysters will be sorted according to size and density of oysters in bags will be thinned to mitigate overcrowding and food competition. Floating gear with juvenile oysters will be submerged during the winter months (November-April). Number of seed planted annually will be dependent upon project needs.

**Infauanal clams:** Clams will be sourced from the RWU shellfish hatchery, a commercial shellfish hatchery or aquaculture farm with an approved health certificate. Determination of exact seed source will be dependent upon hatchery supply and project needs. The CRMC Aquaculture Coordinator will be notified of seed source and provided a corresponding pathology report at least five days in advance of moving any seed onto the farm. Clams will be reared in nursery cage culture or raceways as described in 7b. Annual production will be dependent upon project and research needs.

**Bay Scallops:** Scallop seed will be sourced from the RWU shellfish hatchery, a commercial shellfish hatchery or aquaculture farm, with an approved health certificate. Determination of exact seed source will be dependent upon hatchery supply. The CRMC Aquaculture Coordinator will be notified of seed source and provided a corresponding pathology report at least five days in advance of moving any seed onto the farm. Scallops will be grown in, spat bags, bottom cages or floating gear as described in section 7c. Throughout the growing season scallops will be sorted according to size and density of scallops in bags will be thinned to mitigate overcrowding and food competition. Number of scallops produced annually will be dependent upon project and research needs.

**Macroalgae:** Macroalgae will be produced in the RWU shellfish hatchery or purchased from a commercial producer. Reproductively active algal tissue will be harvested from Rhode Island water and provided to the hatchery for spore production. The CRMC Aquaculture Coordinator will be notified at least five days prior to planting kelp and provided required documentation if needed. Kelp will be

planted on the longlines in November, timing dependent upon water temperature (<50°F), and grown until March or April. Growing kelp does not require maintenance of shoot density or anti-fouling practices, therefore, husbandry will be limited to making sure lines are secure and correctly positioned in the water column. Annual production will be dependent upon project and research needs.

*10b. Gear Maintenance*

All gear used in our lease will be cleaned as needed, with a minimum of once per growing season, via a land-based power washer. All fouling material removed from bags will be air-dried and disposed of.

*10c. Harvest, Storage and Transportation*

All handling of shellfish to be consumed will follow the recommendations/regulations set forth by RIDEM (Rhode Island Marine Fisheries Regulations, Part IV Shellfish) and in accordance with the RIDEM Vibrio Management Plan, as instituted 1 July 2014. All handling of macroalgae to be consumed will follow recommendations/regulations set forth by regulating agencies as protocols are developed. All shellfish/kelp movement and donations will be recorded with appropriate tagging as mandated by the RI shellfish regulations and those records will be maintained by CEED and will be available for review upon request.

Our proposed site is located in conditional approved waters. The Rhode Island shellfish closure hotline will be checked prior to commencement of any work. Harvest will not take place during any closure. The CRMC coordinator will be contacted prior to commencement of work during a shellfish harvest closure.

Aquaculturists in areas where emergency shellfish closures have been enacted will be allowed access to their leases for the purposes of preparing for and planting seed and when extreme weather could result in loss or damage of gear to conduct necessary maintenance/retrieval of their equipment. All other activities on the aquaculture lease, including but not limited to the harvest of shellfish, will remain prohibited until the water quality is acceptable to allow for harvest. Aquaculturists seeking permission to access their lease during an emergency closure must seek authorization by contacting Benjamin Goetsch, CRMC's aquaculture coordinator at 783-3370.

*10d. Time table of work performed.*

Farm work described herein will take place 3-5 days per week, between sunrise and sunset.

*11. Procedures for maintaining records for operations using seed acquired from out-of-state. Description of notification, disease certification, and labeling/tagging of product.*

Records of seed purchases will be maintained by CEED for review by CRMC upon request. CRMC will be notified prior to seed purchases and supplied with the appropriate documentation including: the origin of the seed (hatchery name and location), spawn date, number purchased, date of delivery and pathology report(s).

**12. *Procedures for maintaining records for upwellers in prohibited waters.***

Our upweller is located adjacent to this proposed lease in conditional waters. Seed will be removed from the upweller at a maximum size of 25 mm. Seed movement will not take place during a shellfish harvest closure.

**13. *Procedures for maintaining records for operations using seed from prohibited waters.***

Seed purchased from a third party that originated from prohibited waters will be kept separate from other cohorts by marking bags with red tags. Tags will contain the date the seed was purchased to insure movement or donations do not occur prior to 6 months of growth in approved waters of the lease. Seed which originated in prohibited waters will not be mixed with seed originating from approved waters.

**III. Written responses to CRMP section 300.1**

**1. *Demonstrate the need for the proposed activity or alteration:***

Roger Williams University is a private liberal-arts school with a well-established (50-year) history of education in the marine sciences. RWU has been a leader in aquaculture education in the region for the past 15 years and is internationally recognized for its contributions to aquaculture research and outreach. It is essential that RWU have a location where they have the capability to educate, demonstrate and conduct research on aquaculture activities that are relevant to the northeast region. The facility will be used to train students in the full cycle of shellfish production as a component to our newly developed major/minor in Aquaculture and Aquarium Sciences. In addition, the facility will be used in support of our Applied Shellfish Farming course, a training program for shellfish aquaculture business start-ups. This site will also be used for research projects that will be conducted to address new technologies or management strategies for the aquaculture industry.

**2. *Demonstrate that all applicable local zoning ordinance, building codes, flood hazard standards, and all safety codes, fire codes, and environmental requirements have or will be met.***

Permits required for the proposed lease will be obtained through RI CRMC pending approval of subsequent applications.

**3. *Describe the boundaries of the coastal waters and land areas that are anticipated to be affected.***

The proposed RWU aquaculture research site runs from the subtidal boundary on-shore to approximately 10 feet of water depth (@MLW) on the off-shore boundary. The substrate is rock cobble in the shallow subtidal transitioning to sand at 2-3 feet of water. Along the northern half of the shoreline, the intertidal is bounded on the upland side by a short extent of fringing marsh dominated with cordgrass (*Spartina alterniflora*) and with *Phragmites* spp. further inland. No aquaculture or shoreside activities will occur in the intertidal and upland area that is bounded by the fringing marsh. There is no evidence of any submerged aquatic vegetation within the bounds of the site. The land adjacent to the proposed lease is owned by Roger Williams University



4. *Demonstrate that the alteration or activity will not result in significant impacts on erosion and/or deposition process along the shore and tidal waters.*

The shoreline adjacent to the proposed lease is rock cobble transitioning to a hard sand substrate. It is a protected shoreline that has not experienced any significant shoreline erosion, with the exception of the occasional storm blowing directly out of the northeast. The equipment that we will be placing on the bottom will have no impact on shoreline erosion or deposition as the structures are primarily off-shore and highly unlikely to impact hydrodynamics in the area.

5. *Demonstrate that the alteration or activity will not result in significant impacts on the abundance and diversity of plant and animal life.*

The proposed lease will not result in significant impacts on the abundance and diversity of plant and animal life. Eastern oysters play a critical ecological role within our coastal environment by providing complex biogenic structures, which increase species density, biomass and richness over nearby mud habitats (Tolley and Volety 2005, Manley *et al.* 2010, Abeels *et al.* 2012, Quan *et al.* 2012). Shellfish and associated culture gear serve as essential fish habitat (Coen *et al.* 1999, Peterson *et al.* 2003, Forrester 2007); ultimately increasing productivity within our coastal waters (Grabowski *et al.* 2004, Grabowski *et al.* 2008). Sugar kelp provides habitat for sessile and mobile species. There is no submerged aquatic vegetation on the proposed lease.

6. *Demonstrate that the alteration will not unreasonably interfere with, impair, or significantly impact existing public access to, or use of, tidal waters and/or the shore.*

There will be no interference with public access or use of tidal waters and or the shore. The proposed lease is sited in shallow subtidal water out to 10 feet at mean low tide. Aquaculture gear within the proposed lease will be spaced with adequate distance between gear items (e.g. bottom cages, floating cages, spat bags) to safely allow for small boat navigation. Allowances have been made to allow shoreline access for the RWU Sailing Team, as they train in the surrounding waters (see Figure 14)

7. *Demonstrate that the alteration will not result in significant impacts to water circulation, flushing, turbidity, and sedimentation.*

Impacts of water circulation, flushing, turbidity, and sedimentation are not applicable to this project as the gear used will have little effect on the hydrodynamics in the area.

8. *Demonstrate that there will be no significant deterioration in the quality of water in the immediate vicinity as defined by DEM.*

The proposed lease will have no negative effect on water quality. Oysters are capable of benthic-pelagic coupling by filtering phytoplankton and seston and transporting this organic matter to the benthos, thus supplementing benthic food webs and accelerating nutrient cycling within the system (Dame 1993, Smaal and Prins 1993, Pietros and Rice 2003). Through filter feeding activities, oysters increase water clarity, reduce turbidity (Cloern 1982, Newell 1988) as well as reduce carbon, nitrogen, (Hargis and Haven 1999) and pollutants from the water column (Tolley *et al.* 2005).

**9. *Demonstrate that the alteration or activity will not result in significant impacts to areas of historic archeological significance.***

There is no known historic archeological significance in the propose lease. We will not be excavating or disrupting the shoreline or upland areas with our activities.

**10. *Demonstrate that the alteration or activity will not result in significant conflicts with water-dependent uses and activity such as recreational boating, fishing, swimming, navigation and commerce.***

The area we propose to occupy is a foul-area with considerable rocks exposed at low tide and outside of commercial boat traffic routes. The primary boating activity in the area is from the RWU Sailing Team and we have an open line of communication to avoid any conflicting activities.

The area is lightly fished by recreational shore diggers; they will not be affected by this proposal as they target the intertidal habitat, outside of the proposed lease footprint. We have not observed any appreciable harvest from the intertidal area adjacent to the lease and none within the lease boundary. Commercial whelk harvest takes place east of the proposed the lease, primarily along the 15-foot contour line and deeper. We have not witnessed commercial fishing within the proposed lease boundary. Impacts to recreational fin fishermen will be limited as the proposed lease is located entirely within shallow water in a area not suitable for appreciable fin fish activity.

**11. *Demonstrate that measures have been taken to minimize any adverse scenic impacts.***

The proposed lease is bordered entirely by Roger Williams University property. View of the proposed lease from on-campus buildings is obscured from view by mature hardwood trees. The proposed lease is not visible from private domiciles or businesses. The nature of the demonstration/research farm limits the number of individual gear items on the lease, as the intention is not maximizing production for commercial sale. Consequently, we will have the ability to maintain an organized and orderly aquaculture facility.

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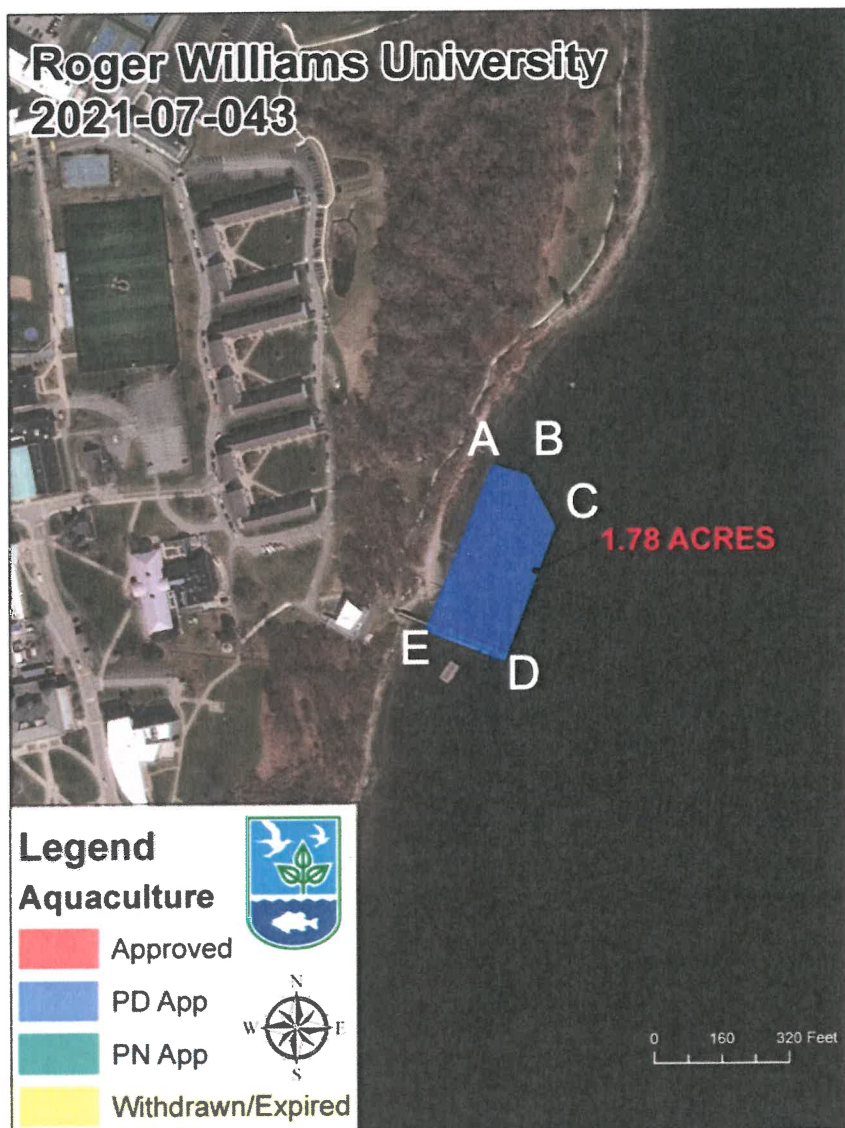
**Figure 12.** Elevated view of the RWU campus at the tip of Bristol Point and the location of the proposed Aquaculture Research Area. The entrance to the Mount Hope Bridge is at the bottom of the image.



**Table 2:** Coordinates of proposed aquaculture area.

Corner Point	Latitude Side	Longitude		Length (ft)
A	41.65092	-71.25615	A-B	85.66
B	41.65085	-71.25585	B-C	135.73
C	41.65052	-71.25562	C-D	339.24
D	41.64965	-71.25606	D-E	196.69
E	41.64985	-71.25673	E-A	463.91

**Figure 13.** Closer view of the proposed site relative to the Roger Williams University campus: Marine and Natural Sciences Building, housing our Marine Sciences Program and the location of our aquaculture activities on campus.





**Figure 14.** General location of the proposed RWU aquaculture lease.

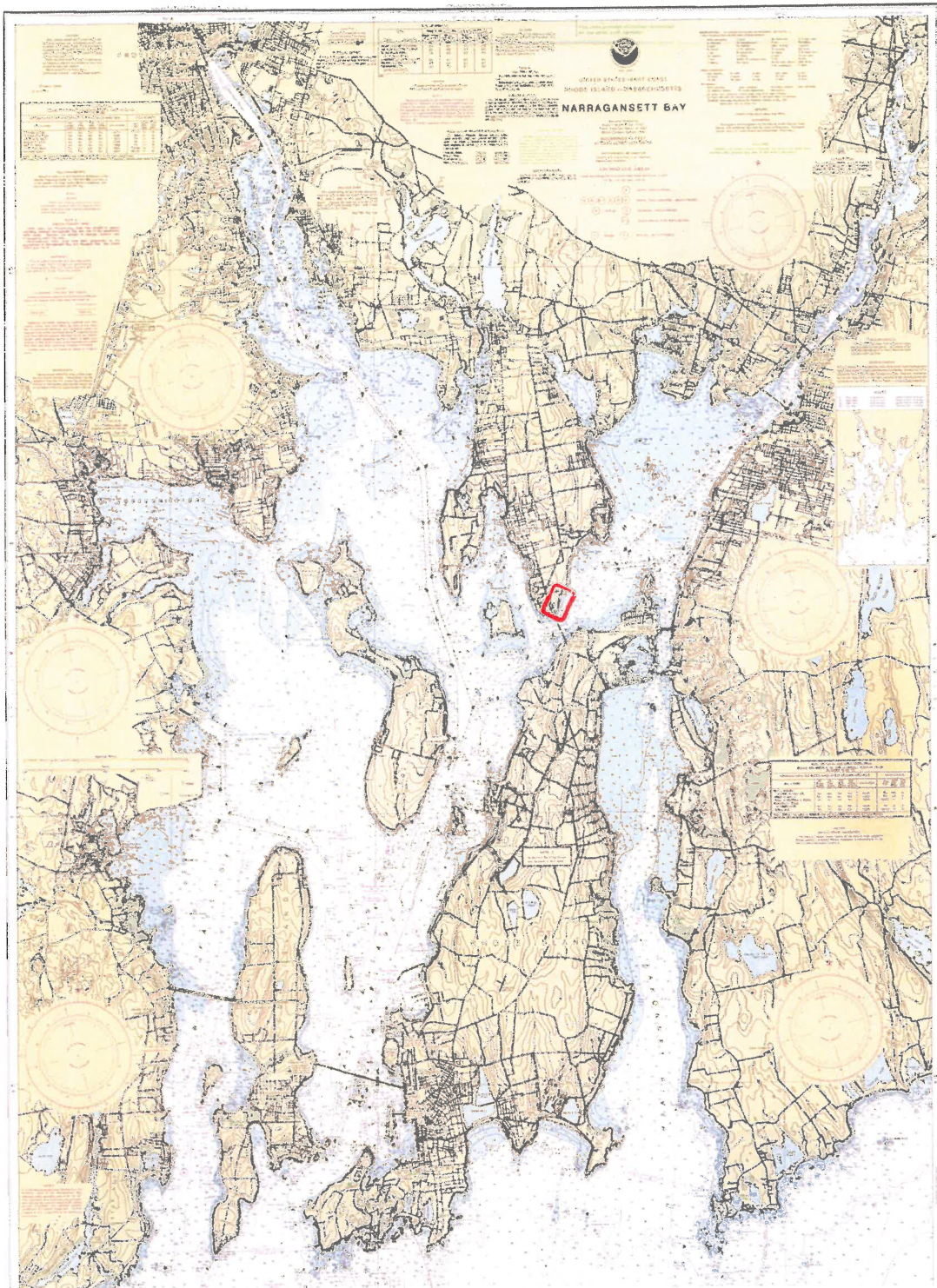
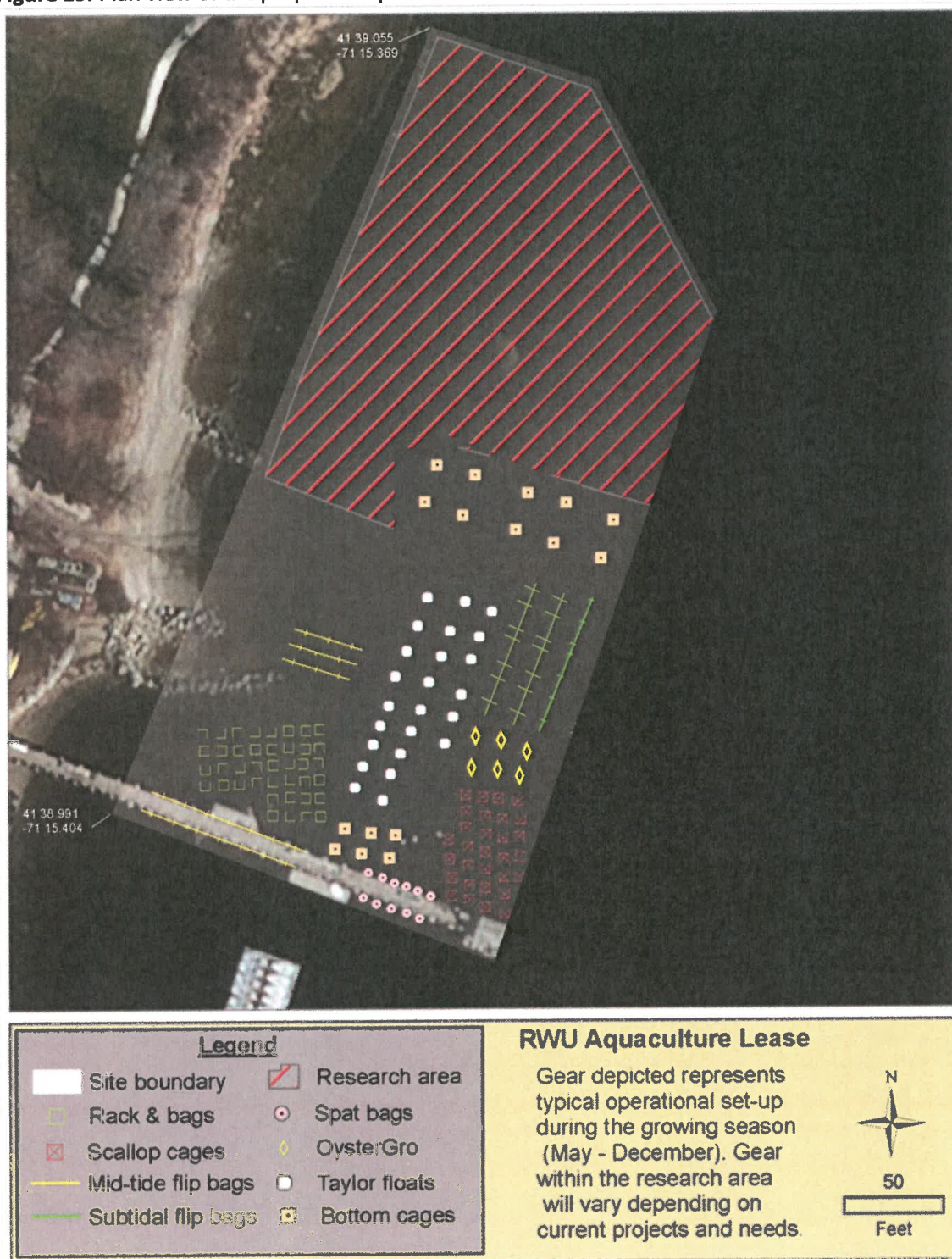
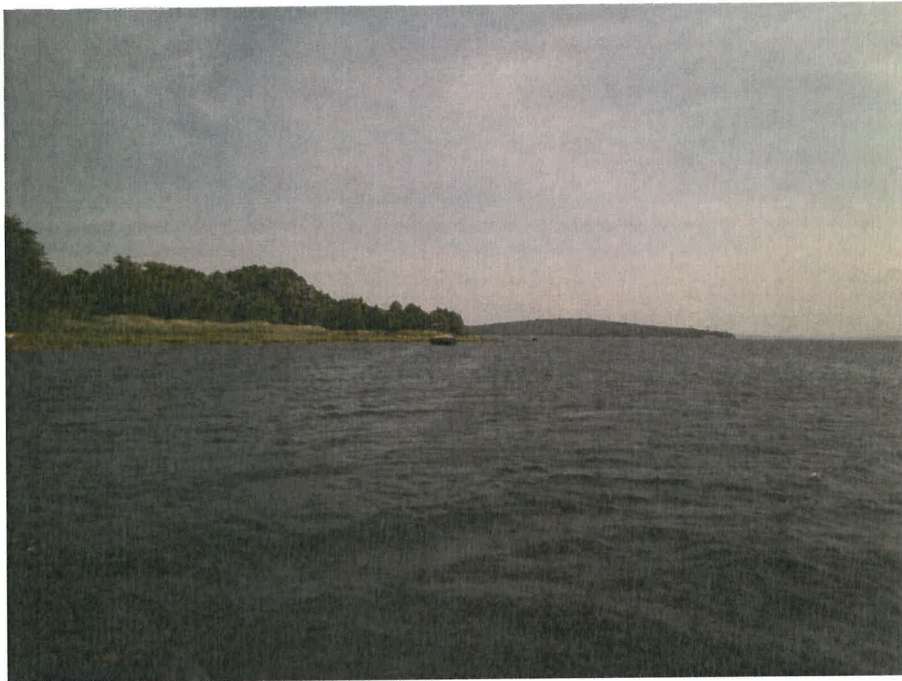




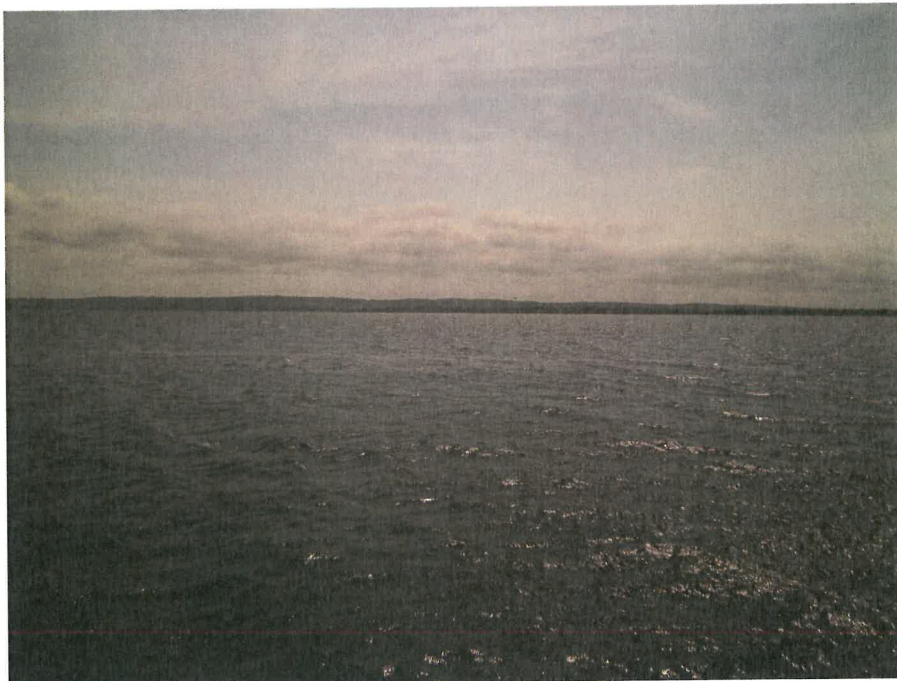
Figure 15. Plan view of the proposed aquaculture lease.



**Figures 16a-d.** Views of water and surrounding area, taken from the center of the proposed aquaculture site.

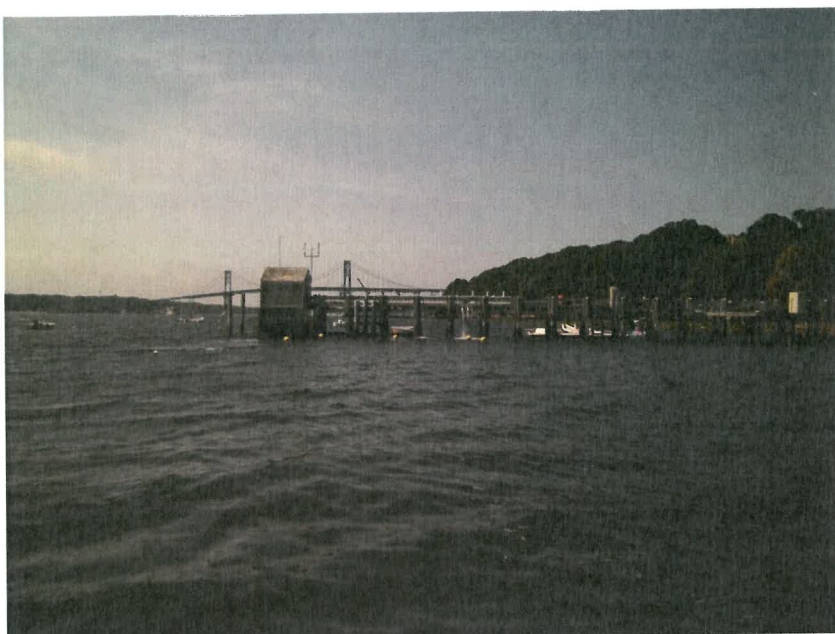


a. View looking north



b. View looking east





c. View looking south



d. View looking west

**Figure 17.** Southerly view of the entire proposed aquaculture area.

