



**HUMBOLDT BAY  
HARBOR, RECREATION AND CONSERVATION  
DISTRICT**



P.O. BOX 1030  
Eureka, California 95502  
(707) 443-0801  
(707) 443-0800 fax

Date Filed 05-17-13

General Information	For Commission Use
1.) Name & Address of Developer, Project Sponsor and Legal Owner: Humboldt Bay Harbor, Recreation and Conservation District: 601 Startare Drive, Eureka, CA 95501	A. Application No. <u>13.03</u>  Application Type: Franchise <input type="checkbox"/> Permit <input checked="" type="checkbox"/> Lease <input type="checkbox"/>
2.) Address of Project and Assessor's block, lot and Parcel Number: (See Attachment A)	B. Date Received by Harbor District <u>05-17-13</u>
3.) Name, Address and Telephone No. of Person to be contacted concerning this Project: Adam Wagschal H. T. Harvey & Associates 1125 16 Street, Suite 209 Arcata, CA 95521 707-496-2088	C. Date Accepted for filing by BOC
4.) Attach list of names and addresses of all adjoining property owners: (See Attach. A)	D. Date of Public Notice
5.) List and Describe any other related Permits & Other Public Approvals required for this Project, including those required by City, Regional, State & Federal Agencies: - City of Eureka Use Permit - Coastal Development Permit - US Army Corps Permit - Regional Water Board Certification	E. Date of Acceptance EIR or Negative Declaration
6.) Existing Zoning District: County: Industrial Coastal Dependent and Natural Resources; City of Eureka: Conservation and Water	F. Date of Public Notice
7.) Proposed Use of Site (Title of Project for which this form is filed): Humboldt Bay Mariculture Pre-Permitting Project	G. Date of Public Hearings
	H. Date of Approval  Disapproval _____ Conditional _____ Approval _____
	I. Expiration Date
	Comments

Describe in detail the proposed project:

(See Attachment B)

Answer all questions completely on a separate sheet of paper. If the question does not apply to your project, so indicate by marking N.A. If you have questions, please contact the Harbor District Office.

### Project Description

8. Site Size: **(see Attachment B)**
9. Square Footage: **(see Attachment B)**
10. Number of floors of construction: **N/A**
11. Amount of off-street parking provided: **N/A**
12. Attach plans: **(see Attachment B)**
13. Proposed scheduling: **Implementation estimated to begin in late 2014 / early 2015.**
14. Associated projects: **None**
15. Anticipated incremental development: **N/A**
16. If residential, include the number of units, schedule of unit sizes, range of sale prices or rents, and type of household size expected: **N/A**
17. If commercial, indicate the type, whether neighborhood, city or regionally oriented, square footage of sales area, and loading facilities: **N/A**
18. If industrial, indicate type, estimated employment per shift, and loading facilities: **N/A**
19. If institutional, indicate the major function, estimated employment per shift, estimated occupancy, loading facilities, and community benefits to be derived from the project: **N/A**
20. If the project involves a variance, conditional use or recognizing application, state this and indicate clearly why the application is required. **N/A**

Are the following items applicable to the project or its effects? Answer yes or no. Discuss all items answered yes.

21. Change in existing features of any bays, tidelands, beaches, lakes or hills, or substantial alteration of ground contours: **No**
22. Change in scenic views or vistas from existing residential areas or public lands or roads: **Yes, addition of shellfish culture infrastructure in Humboldt Bay.**
23. Change in pattern, scale or character of general area of project: **No**
24. Significant amounts of solid waste or litter: **No**
25. Change in dust, ash, smoke, fumes or odors in vicinity: **No**
26. Change in ocean, bay, lake, stream or ground water quality or quantity, or alteration of existing drainage patterns: **Yes, potential improvements to water quality in addition to a reduction in plankton abundance in Humboldt Bay.**
27. Substantial change in existing noise or vibration levels in the vicinity.

- A. During Construction: **No**
- B. During Project Utilization: **No**

- 28. Site on filled land or on slope of 10% or more: **Yes, some sites where shellfish culture is sited may have a slope of 10% or more.**
- 29. Use of disposal or potentially hazardous materials, such as toxic substances, flammable or explosives: **Yes, use of fuel for boats.**
- 30. Substantial change in demand for municipal services (police, fire, water, sewage, etc.): **No**
- 31. Substantially increase fossil fuel consumption (electricity, oil, natural gas, etc.): **No**
- 32. Relationship to larger project or series of projects **No**

ENVIRONMENTAL SETTING:

- 33. Describe the project site as it exists before the project including information on topography, soil stability, plants and animals, and any cultural, historical, or scenic aspects. Describe any existing structures on the site and the use of the structures. Attach photographs of the site. Snapshots or polaroid photos will be accepted. **(See Attachment A)**
- 34. Describe the surrounding properties, including information on plants and animals and any cultural, historical, or scenic aspects. Indicate the type of land use (residential, commercial, etc.) intensity of land use (one-family, apartment houses, shops, department stores, etc.) and the scale of development (height, frontage, set-back, rear yard, etc.) Attach photographs of the vicinity. Snapshots or polaroid photos will be accepted. **(See Attachment A)**

-----Questions 35; 36 and 39 MUST BE ANSWERED!-----

- 35. How will the proposed use or activity promote the public health, safety, comfort, and convenience? **The project will create jobs and produce a sustainable supply of seafood.**
- 36. How is the requested grant, permit, franchise, lease, right, or privilege required by the public convenience and necessity? **Through creation of jobs and sustainable seafood production.**
- 37. Financial statement:
  - A. Estimated cost of the project. **\$1,000,000+**
  - B. How will the project be financed. **Through public and private funding.**
- 38. Describe fully directions necessary to arrive at project site. **Transportation by boat is required. The maps and coordinates provided in Attachment B are sufficient for navigation to the sites.**

39. Will the Applicant agree that as a condition of the permit being issued to Applicant, to indemnify and hold harmless the Humboldt Bay, Harbor Recreation and Conservation District from any and all claims, demands, or liabilities for attorneys' fees obtained from or against demands for attorney's fees, costs of suit, and costs of administrative records made against District by any and all third parties as a result of third party environmental actions against District arising out of the subject matter of this application and permit, including, but not limited to, attorney's fees, costs of suit, and costs of administrative records obtained by or awarded to third parties pursuant to the California Code of Civil Procedure Section 1021.5 or any other applicable local, state, or federal laws, whether such attorneys' fees, costs of suit, and costs of administrative records are direct or indirect, or incurred in the compromise, attempted compromise, trial, appeal, or arbitration of claims for attorneys' fees and costs of administrative records in connection with the subject matter of this application and permit? **N/A, the Humboldt Bay Harbor, Recreation and Conservation District is the permittee.**

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NOTE

The District hereby advises the Applicant that, under California Public Resources Code Section 21089, the District when a lead agency under the Environmental Quality Act of 1970, as amended, pertaining to an Environmental Impact Report (EIR) or a Negative Declaration may charge and collect from the Applicant a reasonable fee in order to recover the estimated costs incurred by the District in preparing an Environmental Impact Report (EIR) or Negative Declaration for the project and the procedures necessary to comply with the provisions of the public resources code on the Applicants project. In the event your project contains an analysis of issues pertaining to the Environmental Quality Act of 1970, as amended, for which District staff is not competent to independently review, or District requires the same in preparation of an Environmental Impact Report (EIR) or Negative Declaration for the project, the District may retain a reviewing consultant to evaluate the content of the Administrative-Draft EIR and Final EIR or Negative Declaration with respect to these issues. The cost of such reviewing consultant services shall be borne by the Applicant.

CERTIFICATION: I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this initial evaluation to the best of my ability, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief.

Dated: \_\_\_\_\_

For \_\_\_\_\_



**H. T. HARVEY & ASSOCIATES**  
**ECOLOGICAL CONSULTANTS**

**Attachment A: Humboldt Bay Mariculture Pre-Permitting  
Project: Responses to Questions 2, 4, 33 and 34**



2) Address of Project and Assessor's block, lot and Parcel Number:

APN	Name	Address
40018103	Sprague Joanne E (c/o Sam Sprague)	330 E Pierson Phoenix, AZ 85012
40018105	Manila Community Services District	n/a
40018106	Manila Community Services District	n/a
40019101	Kahle Sven UM JT	1580 Victor Blvd Arcata, CA 95521
40019102	Gabrych Eugene M & Marion & Marian G TR	2006 Old Hwy 395 Fallbrook, CA 92028
40021201	Gabrych Eugene M & Marian G TR	2006 Hwy 395 Fallbrook, CA 92028
40103140	Humboldt Bay Harbor, Recreation & Conservation District	PO Box 1030 Eureka, CA 95502-1030
40111211	State of California (Leased to Louisiana-Pacific Co)	n/a
40111212	State of California (Leased to Louisiana-Pacific Co)	n/a
40112205	Calm Acquisition Inc. (c/o Evergreen Pulp Inc.)	1 TCF Drive Samoa, CA 95564
40501107	City of Eureka	n/a
40505108	City of Eureka	531 K ST Eureka, CA 9550
50124104	Mangus Suzanne S & Allen Glenn L III & S	11 Dover Ct Orinda, CA 94563
50124120	State of California (Department of Fish & Wildlife)	n/a
50124121	State of California (Department of Fish & Wildlife)	n/a
50124125	Aalfs Charles D & Rebecca HW CP	PO Box 96 Willow Creek, CA 95573-0096
50124126	State of California (Department of Fish & Wildlife)	n/a
50125103	Mangus Suzanne S & Allen Glenn L III & S	11 Dover Ct Orinda, CA 94563
50125108	State of California (Department of Fish & Wildlife)	n/a
50125109	State of California (Department of Fish & Wildlife)	n/a
50125110	Gabrych Eugene M & Marian G TR	2006 Old Hwy 395 Fallbrook, CA 92028
50125111	Gabrych Eugene M & Marian G TR	2006 Old Hwy 395 Fallbrook, CA 92028

4) Attach list of names and addresses of all adjoining property owners:

APN	Name	Address
40112204	Calm Acquisition Inc. (c/o Evergreen Pulp Inc.)	1 TCF Drive Samoa, CA 95564
40111213	Samoa Properties, Inc CR DBA Small Log Mill	PO Box 1089 Arcata, CA 95518-1089
40111214	Calm Acquisition Inc. (c/o Evergreen Pulp Inc.)	1 TCF Drive Samoa, CA 95564
40103150	Humboldt Bay Harbor, Recreation & Conservation District	PO Box 1030 Eureka, CA 95502-1030
40103156	Humboldt Bay Harbor, Recreation & Conservation District	PO Box 1030 Eureka, CA 95502-1030
40103154	Samoa Properties, Inc CR	PO Box 1089 Arcata, CA 95518-1089
40103155	Samoa Pacific Group, LLC	5251 Ericson Way Arcata, CA 95521
40103141	Humboldt Bay Harbor, Recreation & Conservation District	PO Box 1030 Eureka, CA 95502-1030
50124133	Bracut Lumber Co CR (c/o Rick Hess)	1788 Virginia Way Arcata, CA 95521
50124112	State of California, Eureka Pocket Marshes	N/A
50124131	Bracut Lumber Co CR (c/o Rick Hess)	1788 Virginia Way Arcata, CA 95521
40014214	Northwestern Pacific Railroad Co SB	419 Talmage Rd M Ukiah, CA 95482-7433
40015306	Northwestern Pacific Railroad Co SB	419 Talmage Rd M Ukiah, CA 95482-7433
40011304	Kahle Sven UM JT	1580 Victor Blvd Arcata, CA 95521

APN	Name	Address
40003119	Williams Cheri SW JT	2020 Peerless Ave Arcata, CA 95521
40003104	Hasiuk W George UM	1974 Peerless St Arcata, CA 95521
40003105	Johnson Kay WS (c/o Manila Marketing)	1061 Samoa Blvd Arcata, CA 95521
40003134	Manila Marketing, Inc CR	1061 Samoa Blvd Arcata, CA 95521
40003135	Retzloff Jack L UM	2439 S St Eureka, CA 95501
40006212	Kahle Sven & Salena HW JT	1580 Victor Blvd Arcata, CA 95521
40006211	Kahle Sven & Salena HW JT	1580 Victor Blvd Arcata, CA 95521
40006210	Coughran F F & Vollie HWJT LE	1580 Victor Blvd Arcata, CA 95521
40003108	Hafner Patricia L UW	1930 Peerless Ave Arcata, CA 95521
40003120	Johnson Kay WS (c/o Manila Marketing)	1061 Samoa Blvd Arcata, CA 95521
40003131	Hasiuk Walter G UM	1974 Peerless St Arcata, CA 95521
40005101	Manila Community Services District	1901 Park St Arcata, CA 95521
40006204	Rotter Gerald R SM	PO Box 756 Arcata, CA 95518-0756
40006205	Woolley John S & Ann M HW JT	147 Melvin Ave Arcata, CA 95521
40006303	Riley Scott SM	106 B Melvin Rd Arcata, CA 95521
40008204	Riley Robert S	106 B Melvin Rd Arcata, CA 95521
40006304	Riley Robert S	106 B Melvin Rd Arcata, CA 95521
40008227	Wilhelm Robert P UM	PO Box 372 Eureka, CA 95501-0372
40008226	Riley R Scott	106 Melvin Rd Arcata, CA 95521
40008220	Wilhelm Robert P UM	PO Box 372 Eureka, CA 95501-0372
40010131	Wilhelm Robert P UM	PO Box 372 Eureka, CA 95501-0372
40008207	Shelley T H	170 Holly Dr Arcata, CA 95521
40010133	Vander Meer Carol S & Steven T TR	PO Box 12 Arcata, CA 95518-0012
40010143	Kaiser Kenneth & Constance HW	215 2nd Street Eureka, CA 95501
40010105	Kennedy James M SMSE (c/o Professional Property Mgmt)	PO Box 117 Eureka, CA 95502-0117
40010152	Kennedy James M SMSE (c/o Professional Property Mgmt)	PO Box 117 Eureka, CA 95502-0117
40010151	Polk William H & Dunn Mary T UWTC	1664 Victor Blvd Manila, CA 95521
40010141	Headstrom Ward HW JT	215 Dean Ave Manila, CA 95521
40010140	Oetker Larry P & Pierre-Oetker Leigh HWJ	204 Dean Ave Manila, CA 95521
40010109	Beasley Lillie L SW JT	4234 Walnut #A Eureka, CA 95503
40011311	Ihara Danny M & Nancy R HW JT	231 Dean St Arcata, CA 95521
40011303	Wright Dale S & Ronk Martha C TR	2060 Escarpa Dr Los Angeles, CA 90041
40501111	City of Eureka	N/A
40501110	Table Bluff Reservation –Wiyot Tribe	1000 Wiyot Dr Loleta, CA 95551
40020101	Coast Ostrea Company CR (c/o Coast Seafoods Company)	14711 NE 29th Place Suite 111 Bellevue, WA 98007
40020102	Karamu Corporation (c/o Forest B Tilley)	29850 Sherwood Rd Fort Bragg, CA 95437
40021102	Gabrych Eugene M & Marian G TR	2006 Hwy 395 Fallbrook, CA 92028
40022102	Coast Ostrea Company CR (c/o Coast Seafoods Company)	14711 NE 29th Place Suite 111 Bellevue, WA 98007
40101112	Samoa Dunes I LLC	323 Fifth St Eureka, CA 95501
40112207	Samoa Properties, Inc CR	PO Box 1089 Arcata, CA 95518-1089
40112211	State of California- Leased Land	N/A



APN	Name	Address
40505107	City of Eureka- Humboldt Bay	N/A
40506104	City of Eureka- Humboldt Bay	N/A
40506106	City of Eureka- Humboldt Bay	N/A
50106114	US Fish & Wildlife Service	1020 Ranch Rd Loleta, CA 95551
50124119	State of California, Department of Fish & Wildlife	N/A
50611206	Cue IV LLC	323 5th St Eureka, CA 95501
50612101	Cue IV LLC	323 5th St Eureka, CA 95501

33) Describe the project site as it exists before the project including information on topography, soil stability, plants and animals, and any cultural, historical, or scenic aspects. Describe any existing structures on the site and the use of the structures. Attach photographs of the site. Snapshots or polaroid photos will be accepted.

The project site includes intertidal and subtidal portions of Humboldt Bay (see Attachment B). The topography is fairly flat and includes mudflats and incised tidal channels. Soil is relatively instable, typical of tidal areas. Humboldt Bay hosts over 400 plant species, 300 invertebrate species, 100 fish species, and 260 bird species, including species listed under the Endangered Species Act and California Endangered Species Act. Cultural and historic artifacts occur within Humboldt Bay, but are not expected to occur at the project sites. Also see Attachment B.

34) Describe the surrounding properties, including information on plants and animals and any cultural, historical, or scenic aspects. Indicate the type of land use (residential, commercial, etc.) intensity of land use (one-family, apartment houses, shops, department stores, etc.) and the scale of development (height, frontage, set-back, rear yard, etc.) Attach photographs of the vicinity. Snapshots or polaroid photos will be accepted.

Surrounding properties either (1) are similar to the project site (see response to #33); (2) have existing shellfish culture operations; (3) consist of industrial coastal dependent uses (along Samoa Peninsula); or (4) are salt marsh habitat. Also see Attachment B.



**H. T. HARVEY & ASSOCIATES**  
**ECOLOGICAL CONSULTANTS**

**Attachment B: Humboldt Bay Mariculture Pre-Permitting  
Project: Project Description**



## Project Summary

The Humboldt Bay Mariculture Pre-Permitting Project is an economic development project of the Humboldt Bay Harbor, Recreation and Conservation District, supported by grant funding from the Humboldt County Headwaters Fund. The project will result in an expansion of commercial mariculture activities in Humboldt Bay, and is being undertaken to create jobs and improve the local economy. The first step of the project includes obtaining all the necessary permits to allow mariculture activities at the proposed sites. Once those permits are in place, the Harbor District will lease the permitted sites to commercial mariculture enterprises and will oversee culture activities to ensure that operations are consistent with all permit requirements and project conditions.

This project description identifies the specific locations within Humboldt Bay proposed for new mariculture activities, as well as the types of mariculture proposed to be allowed at those sites. An analysis of the project's potential environmental effects will be addressed pursuant to the California Environmental Quality Act prior to the Harbor District considering approval of this permit, but is not included as a part of filing the Harbor District Use Permit application.

## Project Sites

The project consists of 4 intertidal and 3 subtidal sites where culture of Kumamoto oysters (*Crassostrea sikamea*), Pacific oysters (*C. gigas*) and Manila clams (*Tapes philippinarum*) would occur. These sites were identified based on the following general criteria:

1. Good potential for shellfish culture based on input from local shellfish growers.
2. Minimize environmental effects:
  - a. Avoid marine mammal haul-out areas.
  - b. Avoid eelgrass beds by locating sites at higher elevations where eelgrass is absent or sparse.
3. Avoid existing tideland leases.
4. To the extent possible, the vertices of each culture site are positioned on full "degree-minute-second" coordinates. This makes it easier to identify site boundaries in the field and to survey the sites.

The proposed sites are depicted in Figures 1-9<sup>1</sup>. Spatial coordinates for each site are provided in Appendix A.

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<sup>1</sup> The aerial imagery used in Figures 1-9 was collected by NOAA Coastal Services Center in 2009.

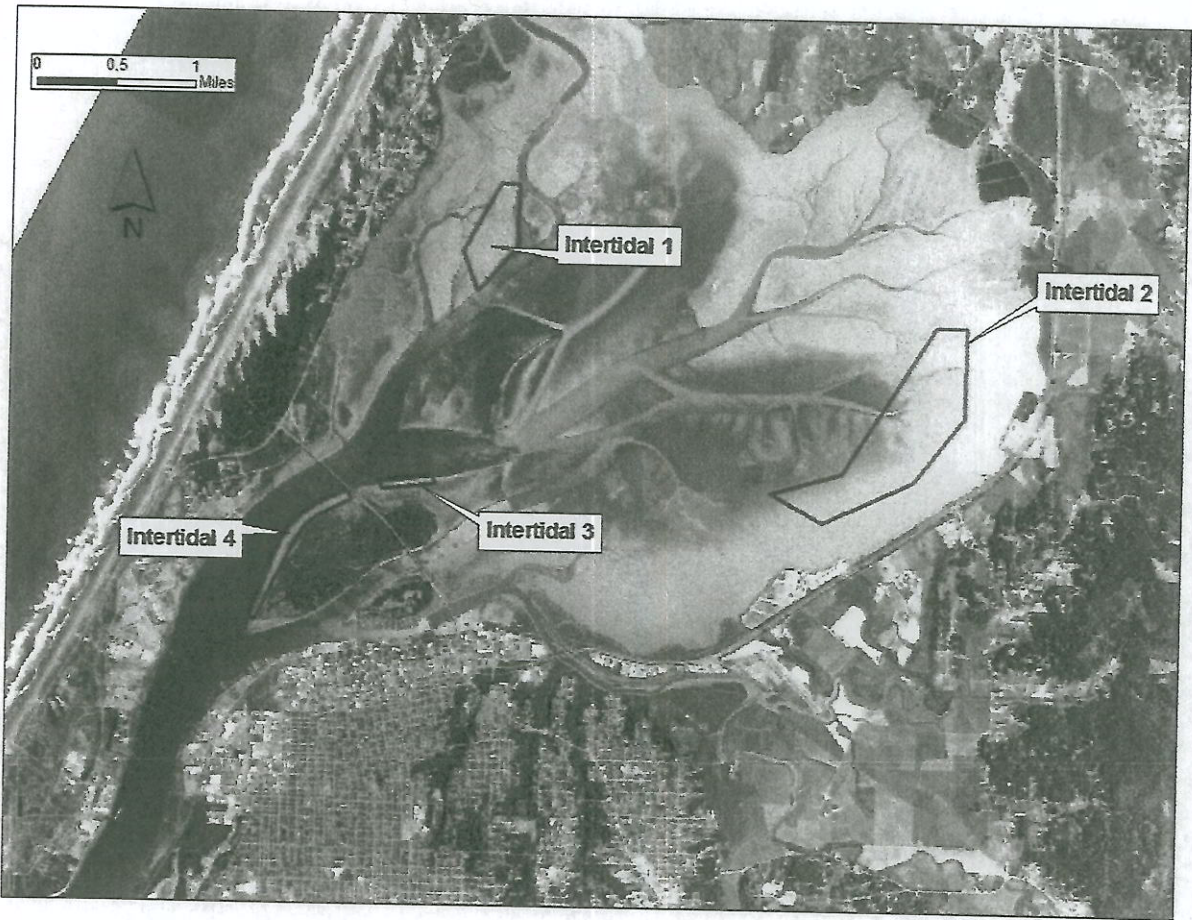
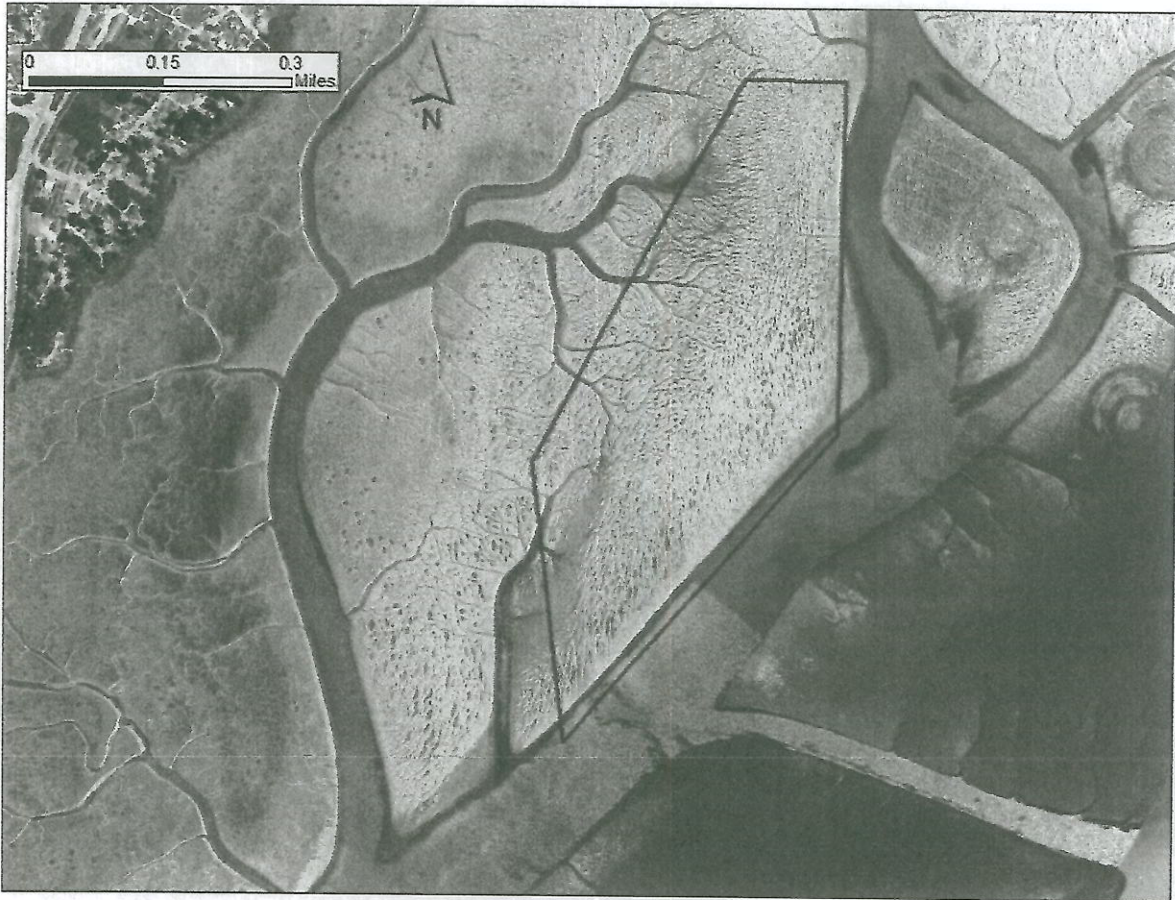
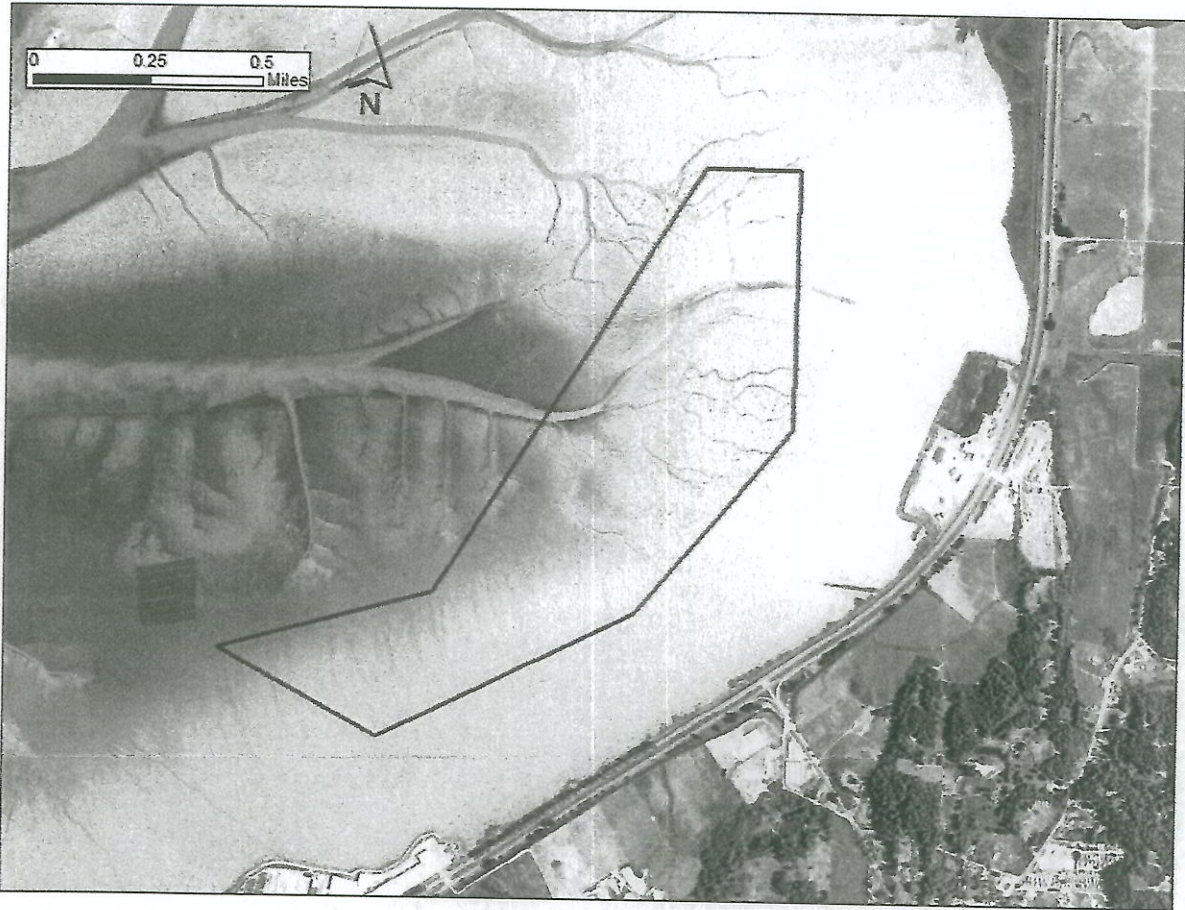


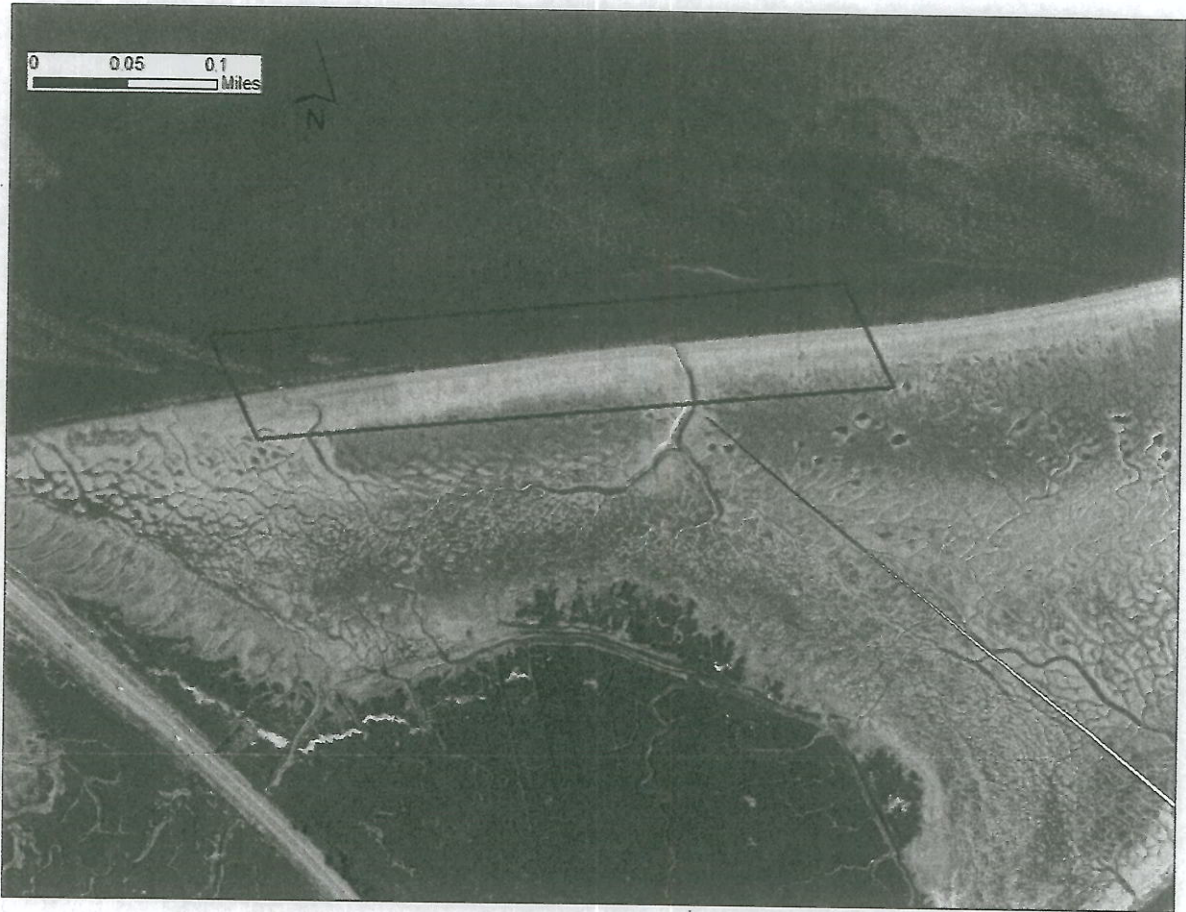
Figure 1. Intertidal Culture Sites



**Figure 2. Intertidal Culture Site 1 (Intertidal 1) is 98.5 Acres**



**Figure 3. Intertidal Culture Site 2 (Intertidal 2) is 364.0 Acres**



**Figure 4. Intertidal Culture Site 3 (Intertidal 3) is 13.6 Acres**



**Figure 5. Interstitial Culture Site 4 (Interstitial 4) is 49.9 Acres**



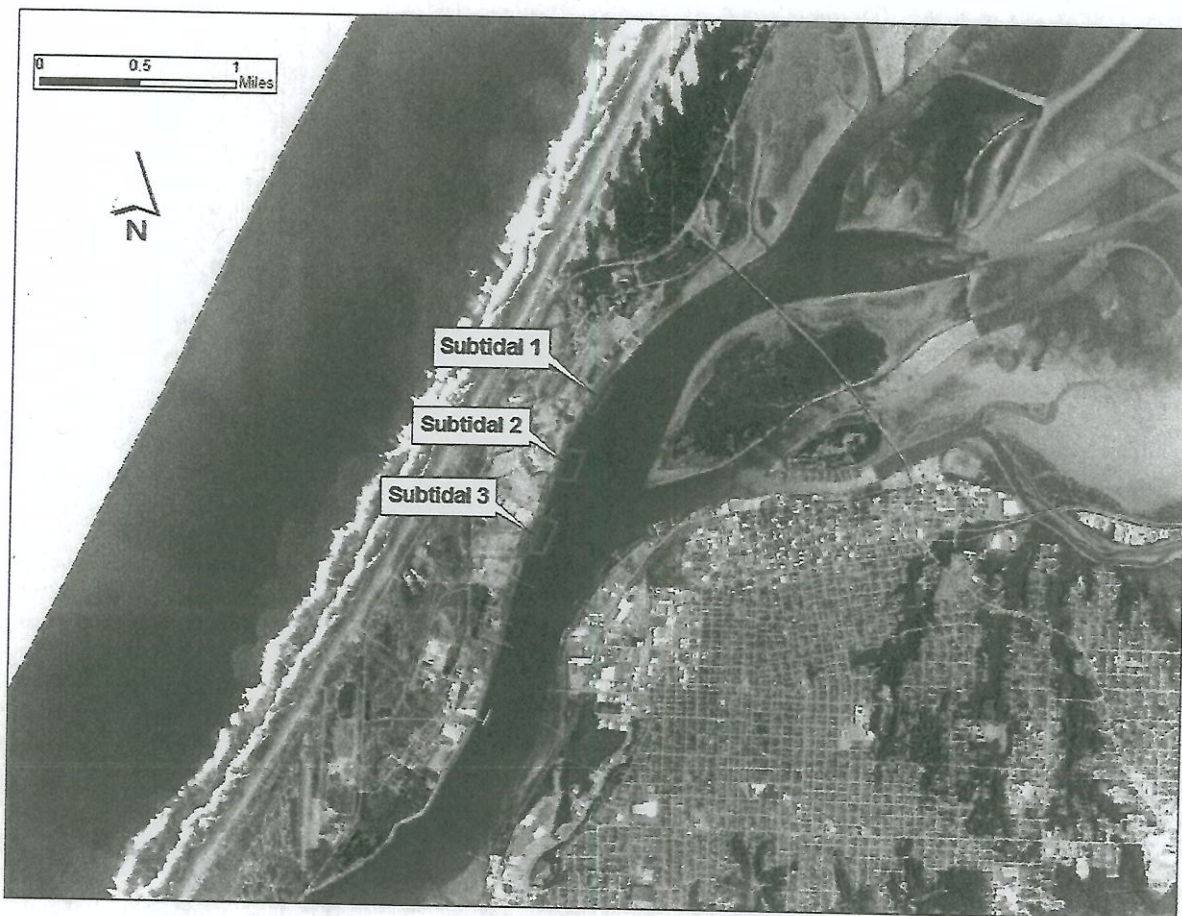


Figure 6. Subtidal Culture Sites

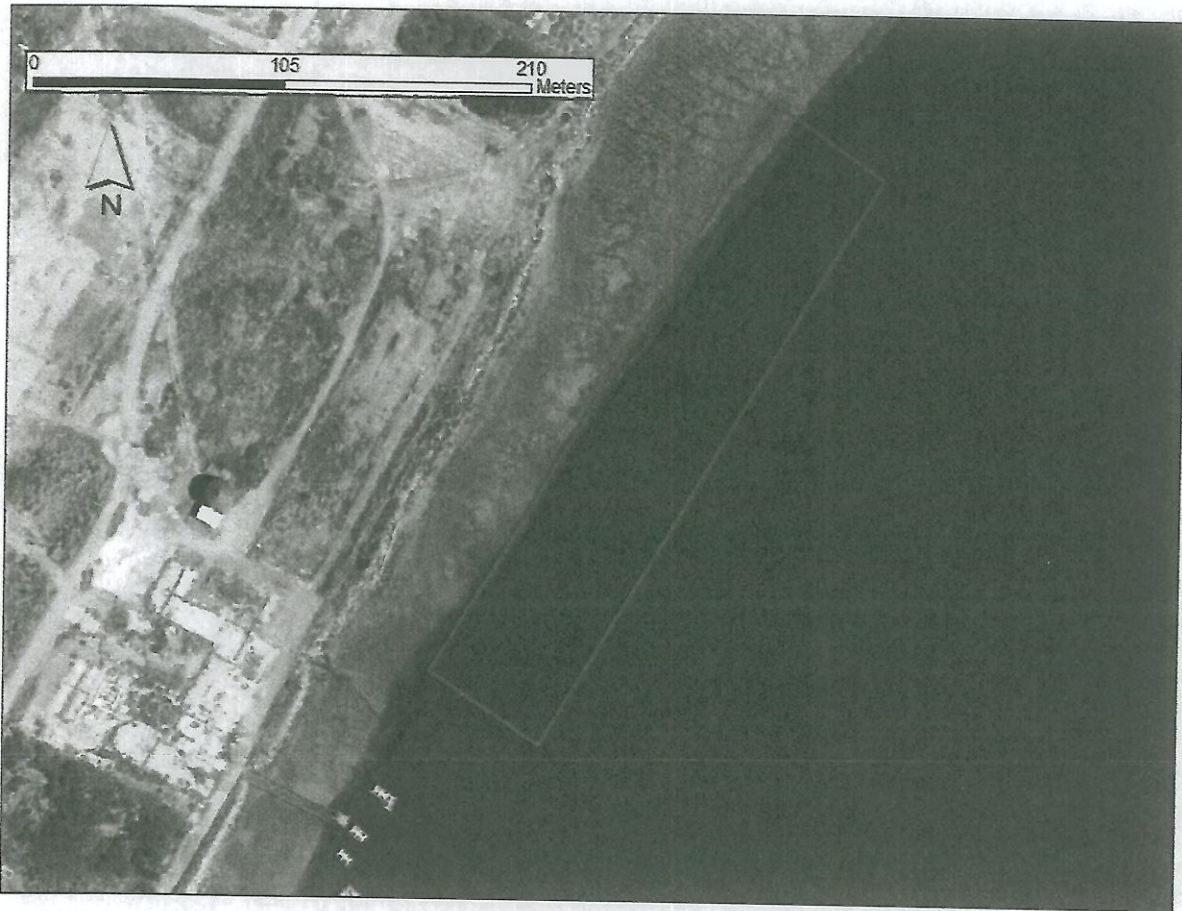


Figure 7. Subtidal Culture Site 1 (Subtidal 1) is 3.9 Acres

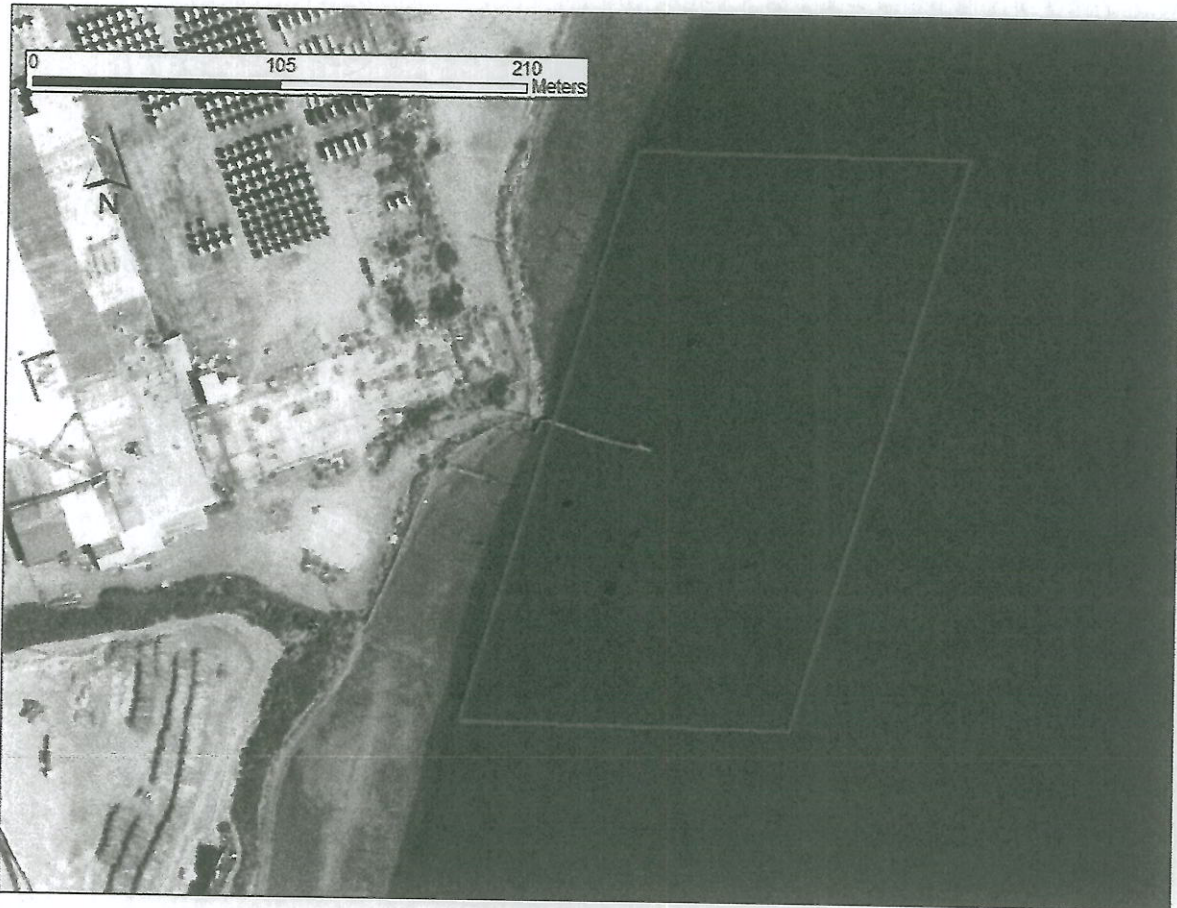
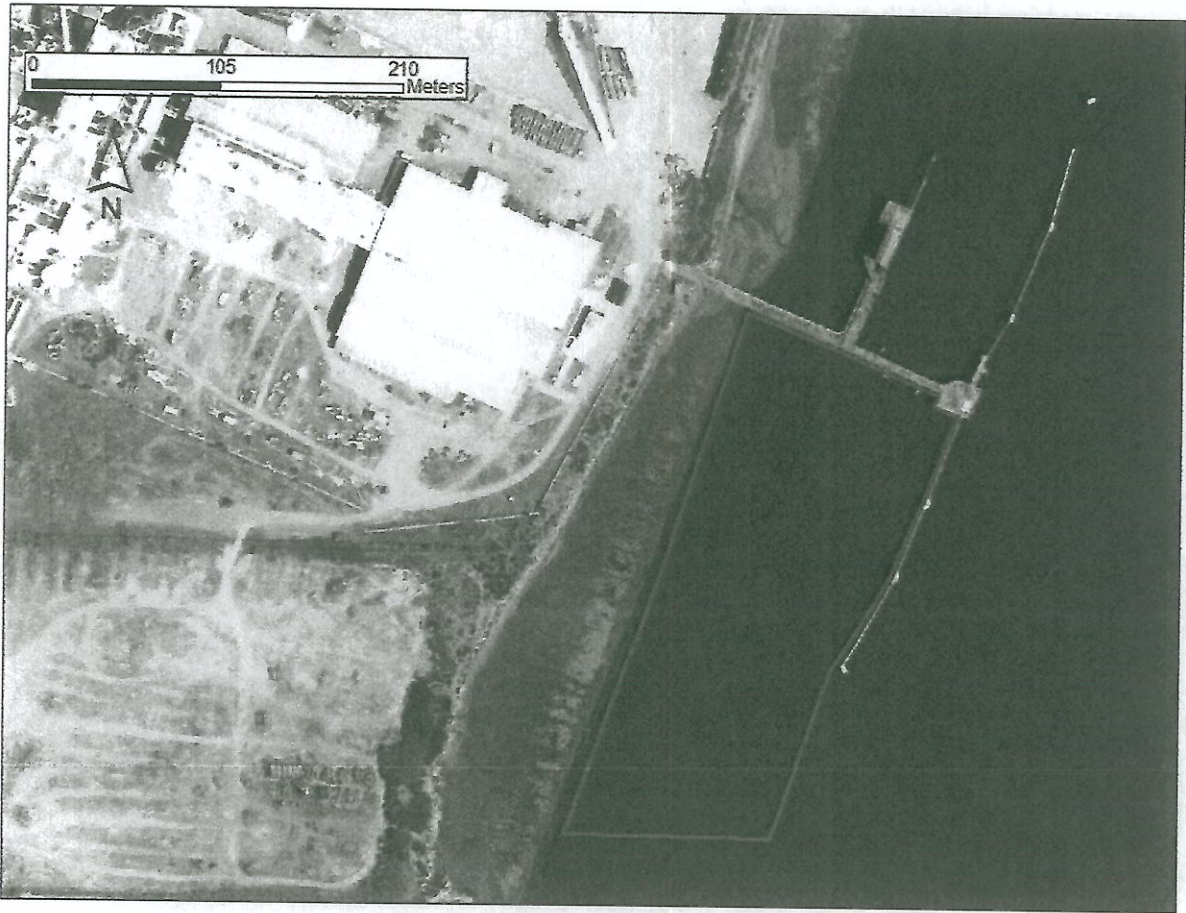


Figure 8. Subtidal Culture Site 2 (Subtidal 2) is 8.6 Acres



**Figure 9. Subtidal Culture Site 3 (Subtidal 3) is 8.7 Acres**

## Project Description Overview

The continued success of shellfish culture in Humboldt Bay will require adaptation of culture methods as new technologies are developed. New methods can result in higher production, improved product quality and reduced environmental effects. To allow for adaptation of culture methods, the following process was used to develop the project description:

1. For each site, a project layout was developed based on the following culture methods, which are currently used in Humboldt Bay. These methods are examples of the type of culture that would occur under the project.
  - a. For intertidal sites:
    - i. Rack-and-Bag
    - ii. Cultch-on-Longline
    - iii. Basket-on-Longline
  - b. For subtidal sites:
    - i. Floating Upwelling Systems (FLUPSYs) or Pump Systems
    - ii. Rafts
2. The following characteristics of each culture method were assessed. These culture characteristics are related to specific environmental effects of shellfish culture (Table 1).
  - a. Levels of activity by farm workers
  - b. Water surface area occupied by culture equipment and shellfish
  - c. Volume of culture equipment and shellfish
  - d. Maximum number or biomass of shellfish soft tissue that could be present at any given time
3. Based on the culture characteristics of each method, thresholds were established for the project. Under the project, culture can occur within each site as long as it (1) does not exceed these culture characteristic thresholds; (2) follows other minimization measures established by the project, which will be determined during development of the project's regulatory approval documents; and (3) does not result in any environmental effects that were not considered for the project. If there are environmental effects that were not considered for the project, then additional regulatory approvals may be required.

**Table 1. Shellfish Culture Characteristics and Related Potential Environmental Effects**

<b>Culture Characteristics</b>	<b>Potential Environmental Effect</b>
Levels of activity by farm workers	Environmental effects by farm workers (e.g., trampling, wildlife disturbance)
Water surface area occupied by culture equipment and shellfish	Increased shading and overwater cover
Volume of culture equipment and shellfish	Effects on currents and sedimentation
Maximum number or biomass of shellfish	Phytoplankton consumption by cultured shellfish

## **Example Culture Methods**

As described above, the project is designed to allow for the use of diverse culture methods and adaptation of methods through time. The following culture methods were used to evaluate the potential environmental effects of shellfish culture and to develop thresholds for the shellfish culture characteristics described above.

### **Intertidal: Rack-and-Bag Method**

The following description was adapted from Coast Seafoods Company (2007). Rack-and-bag culture is used for growing Kumamoto oysters and Pacific oysters. The oysters are grown as “singles”, meaning they are not attached to any structure such as shells or to each-other (they are “loose” in the bags). Rack-and-bag culture uses polyethylene mesh bags and rebar frames. Each rebar frame is 3 ft x 12 ft and supports 3-6 bags attached to the frame via industrial rubber bands (see Appendix B). Each bag is initially seeded with oysters and placed in intertidal areas. It takes 1 – 1.5 years for the seed to grow into oysters of market size, depending on tidal height and primary productivity, and then the bags of oysters are harvested by hand (lifted from the racks into a skiff), processed and brought to market.

### **Intertidal: Cultch-on-Longline Method**

The following description was adapted from Coast Seafoods Company (2007). Cultch-on-longline culture is used for growing Kumamoto oysters and Pacific oysters. Prior to planting in the bay, oyster seed is attached to shells, which are attached to longlines. Planting is accomplished by placing seeded longlines on notched PVC stakes that are arranged in rows on the mudflats. The longlines are strung through notches on top of the PVC stakes, suspending the oyster seed approximately one ft above the bay bottom (see Appendix B).

Longline beds are harvested when they have oysters of a harvestable size and market conditions are right. It usually takes 1.5 – 3 years for oysters to reach a harvestable size. One of 2 methods is used to

harvest longlines. The first, hand picking, involves placing around 20 bushel tubs on the bed at high tide using an oyster scow. The tubs are then filled at low tide by hand. The picking crew cuts the longline into manageable single clusters and places them in the picking tub. A floating ball is attached to each tub, and at high tide an oyster scow is used to pull the tub out of the water. The oysters are dumped on the deck of the scow, and the tub is placed back on the bed to be refilled. The second method of harvest, the longline harvester, involves positioning a scow over the longline bed at high tide. Individual lines are then pulled onto the floating scow either by hand or by means of a hydraulically operated roller. If the lines are pulled by hand then the lines need to be cut into individual clusters, usually at the plant. If the lines are pulled mechanically they run through a breaker that strips the clusters from the line. The longline harvester does not come in contact with the bottom while harvesting longlines.

### **Intertidal: Basket-on-Longline Method**

Basket-on-longline culture is used to grow Kumamoto oysters and Pacific oysters as singles. This method utilizes baskets that hang off a monofilament line suspended off the bottom using 2 inch schedule 80 PVC pipe. The monofilament line is 5mm in diameter and protected by a 3/8 in. polyethylene sleeve that the monofilament is slid inside (see Appendix B). The baskets are approximately 24 in. x 10 in. x 6 in. and are held on the line with plastic clips. A float, which is approximately 2.5 in. diameter and 5.5 in. long, is often attached to the baskets so that the baskets float up during high tides. Once the oysters reach a harvestable size, in approximately 1.5 – 2 years, the baskets are removed from the water, and the oysters are accessed through end caps on the baskets.

### **Subtidal: Floating Upwelling System (FLUPSY) or Pump System**

The following description was adapted from Coast Seafoods Company (2007) and Taylor Mariculture LLC (2011). The FLUPSY method is used to mature Kumamoto oyster, Pacific oyster and Manila clam seed. A FLUPSY is an in-water, raft-like structure that upwells nutrient rich-water through upwelling bins to provide a consistent source of nutrients to growing shellfish. They are moored by chain and line to a pier and adjacent pilings or anchored with concrete or steel anchors. They are constructed of aluminum with poly-encapsulated floats for floatation, and have a submerged trough containing a paddle wheel or propeller. This trough is surrounded by open wells containing the upwelling bins. The paddle wheel or propeller moves the water out of the trough; in order for the trough to refill, water must pass through the upwelling bins containing oyster seed. The bottoms of the upwelling bins are a 1.2-1.8 mm mesh screen, which allows water to come up through the upwelling bin and exit the bin at the top (see Appendix B). Alternatively, instead of using a paddle wheel or propeller, water may be pumped to the shellfish seed (a Pump System). The FLUPSYs only contain seed, which is grown to market size using different methods.

### **Subtidal: Raft Method**

The following description was adapted from Coast Seafoods Company (2007). Rafts are used to mature Kumamoto oyster, Pacific oyster and Manila clam seed. Nursery rafts are anchored to concrete anchors, accessible by skiff. The rafts are about 12 ft wide x 24 ft long constructed from aluminum with polyethylene encapsulated Styrofoam for floatation. Each raft has 24 tray wells, which contain seed nursery trays in stacks of about 8-20 suspended in each well (see Appendix B). The rafts only contain seed, which is grown to market size using different methods.

## **Assessment of Culture Characteristics**

### **Environmental Effects by Farmworkers**

Farmworkers may have environmental effects when they are working at the culture sites, for example by trampling vegetation or disturbing wildlife. Mr. Greg Dale (Coast Seafoods Company operations manager) and Mr. Ted Kuiper were interviewed to determine the type and number of visits for each method.

### **Surface Area**

Cultured shellfish and associated equipment can affect eelgrass and other habitat features by increasing shade over these features. Overwater structure can also provide habitat for different species, including plants, birds, fish and invertebrates. The water surface area per acre occupied by culture equipment and shellfish under each method was calculated based on the following assumptions (also see Appendix B):

For rack-and-bag culture:

- Racks are 12 ft x 3 ft.
- Racks are set in groups of 9, with a distance of 3 ft between subgroups of 3 racks.
- Each group of 9 racks is 10 ft apart from each other group of 9 racks.

For cultch-on-longline culture:

- Surface area of individual longlines with cultch is based on measurements of sampled cultch on longlines in 2012 in Humboldt Bay.
- Lines are in groups of 5, with a distance of 2.5 ft between each line.
- Each group of 5 lines is separated by 5 ft within a given row.
- Rows are 10 ft apart.



- Lines are a maximum of 100 ft, but areas where a 100 ft line won't fit are filled by partial lines.

For basket-on-longline culture:

- Baskets are 24 in. x 10 in.
- Basket floats are 2.5 in. diameter and 5.5 in. long.
- Lines are in groups of 3, with a distance of 3 ft between each line.
- Each group of 3 lines is separated by 20 ft.
- Lines are a maximum of 100 ft, but areas where a 100 ft line won't fit are filled by partial lines.

For floating upwelling system or pump system culture:

- Each FLUPSY is 82 ft x 22 ft (note that rafts with pumps are generally up to 50 ft x 60 ft).
- 18 FLUPSYs can be placed in an 8.6 acre area.
- For each 18 FLUPSYs, 2 gangway or floating work platforms of 600 ft<sup>2</sup> each (total of 1,200 ft<sup>2</sup>) is also used. These may be anchored or moored to existing docks or piles.

For raft culture:

- Each raft is 12 ft x 24 ft.
- 18 rafts can be placed in a 3.9 acre area.
- For each 18 rafts, 3 gangway or floating work platforms of 288 ft<sup>2</sup> each (total of 864 ft<sup>2</sup>) are also used. These may be anchored or moored to existing docks or piles.

## Volume

Cultured shellfish and associated equipment can alter water currents and sedimentation rates. The overall volume of shellfish and associated equipment is a reasonable metric for assessing effects on currents and sedimentation. The volume of each culture method per acre was assessed based on the following assumptions (also see Appendix B):

For rack-and-bag culture:

- Rack dimensions are 12 ft x 3 ft x 0.7 ft.
- Racks are set in groups of 9, with a distance of 3 ft between subgroups of 3 racks.
- Each group of 9 racks is 10 ft apart from each other group of 9 racks.

For cultch-on-longline culture:

- Volume of individual longlines with cultch is based on measurements of sampled cultch-on-longlines in 2012 in Humboldt Bay.
- Lines are in groups of 5, with a distance of 2.5 ft between each line.
- Each group of 5 lines is separated by 5 ft within a given row.
- Rows are 10 ft apart.
- Lines are a maximum of 100 ft, but areas where a 100 ft line won't fit are filled by partial lines.

For basket-on-longline culture:

- Basket dimensions are 24 in. x 10 in. x 6 in.
- Floats are 2.5 in. diameter and 5.5 in. long.
- Lines are in groups of 3, with a distance of 3 ft between each line.
- Each group of 3 lines is separated by 20 ft.
- Lines are a maximum of 100 ft, but areas where a 100 ft line won't fit are filled by partial lines.

For floating upwelling system or pump system culture:

- Each FLUPSY is 82 ft x 22 ft x 4 ft.
- 18 FLUPSYs assumed in an 8.6 acre area.
- 2 work platforms assumed in an 8.6 acre area.

For raft culture:

- Each raft is 12 ft x 24 ft x 4 ft.
- 18 rafts assumed in a 3.9 acre area.
- 3 work platforms assumed in a 3.9 acre area.

### **Number of Cultured Shellfish**

Phytoplankton consumption by cultured shellfish is proportional to the number of shellfish cultured. The numbers of adult shellfish in one acre was calculated based on the following:

For rack-and-bag culture:

- Each Rack-and-Bag unit contains 6 bags per rack, with 90 adult (large) oysters per bag.
- Racks are set in groups of 9, with a distance of 3 ft between subgroups of 3 racks.
- Each group of 9 racks is 10 ft apart from each other group of 9 racks.

For cultch-on-longline culture:

- Each 100-ft longline contains 40 dozen oysters.
- Lines are in groups of 5, with a distance of 2.5 ft between each line.
- Each group of 5 lines is separated by 5 ft within a given row.
- Rows are 10 ft apart.

For basket-on-longline culture:

- Each basket contains 70 adult oysters, with 40 baskets/line.
- Lines are in groups of 3, with a distance of 3 ft between each line.
- Each group of 3 lines is separated by 20 ft.
- Lines are a maximum of 100 ft, but areas where a 100 ft line won't fit are filled by partial lines.

For floating upwelling system or pump culture:

- There are 15 kg of seed per bin (40% is soft tissue), with 30 bins per FLUPSY.
- Each FLUPSY is 82 ft x 22 ft.
- 18 FLUPSYs assumed in an 8.6 acre area.
- 2 work platforms assumed in an 8.6 acre area.

For raft culture:

- 1 kg of seed per tray (40% is soft tissue), with 8 trays per module and 24 modules per raft.
- Each raft is 12 ft x 24 ft.
- 18 rafts assumed in a 3.9 acre area.
- 3 work platforms assumed in a 3.9 acre area.

## **Results and Thresholds**

Based on the assumptions described above, culture characteristics for each example culture method are depicted in Tables 2-5. Activity levels (Tables 2-3) at culture sites are informative for assessment of the project's potential environmental effects. Maximum values derived for culture characteristics establish thresholds that cannot be exceeded by culture operations (Tables 4-5).

**Table 2. Type and Number of Visits by Farmworkers to Different Types of Intertidal Shellfish Culture Operations**

Method	Type of Visit	# Visits per Year	Note
Rack-and-Bag	Place racks	0.2	Once every 5 years
	Inspections	104	Range of 1 - 3 times per week, assumed average of twice per week
	Flip bags	26	Bags flipped on average every two weeks
	Grade oysters	6.4	Every 6-8 wks in summer (Feb to Oct) and every 8-12 wks in winter (Nov to Jan)
	Plant and harvest	1	Plant and harvest once per 2 years
Cultch-on-Longline	Staking lines	0.2	Once every 5 years
	Monthly inspection	12	
	Plant and Harvest	1	Plant and harvest once every two years
Basket-on-Longline	Stake lines	0.2	Once every 5 years
	Grade oysters	6.4	Every 6-8 wks in summer (Feb to Oct) and every 8-12 wks in winter (Nov to Jan)
	Plant and harvest	1	Plant and harvest once per 2 years

\*The information provided is for individual culture units (i.e., a single bag, longline or basket). A group of units would generally be visited more frequently.

**Table 3. Type and Number of Visits by Farmworkers to Different Types of Subtidal Shellfish Culture Operations**

Method	Type of Visit	# Visits per Year	Note
Floating Upwelling System or Pump System*	Place FLUPSY or Pump System	.1	Once every ten years
	Rinse and Inspect seed	365	This figure is for Pump Systems, FLUPSY's require less rinsing and inspection.
	Grade seed	36	Every 10 days
Raft Culture*	Place raft	.1	Once every 10 years
	Inspections	365	Daily visual inspection from nearby docks or land
	Rinse seed	12	Once every month
	Grade seed	8	Once every month between March-October and every other month between November and February

\*The information provided is for individual culture units (i.e., a single raft or FLUPSY). A group of units would generally be visited more frequently.

**Table 4. Culture Characteristics of Example Intertidal Culture Methods**

Method	Proportion of Water Surface Area in Shellfish Culture per Acre	Volume of Shellfish Culture Equipment and Shellfish per Acre (ft <sup>3</sup> )	# of Shellfish per Acre
Rack-and-Bag	30%	8,736	196,560
Cultch-on-Longline	11%	1,947	80,582
Basket-on-Longline	8%	1,623	126,806

- "Shaded cells" represent the maximum values for each culture characteristic. Under the project, these maximum values are the culture characteristic thresholds that cannot be exceeded by shellfish culture operations.

**Table 5. Culture Characteristics of Example Subtidal Culture Methods**

Method	Proportion of Water Surface Area in Shellfish Culture per Acre	Volume of Shellfish Culture Equipment and Shellfish per Acre (ft <sup>3</sup> )	Biomass (kg) of Shellfish Soft Tissue per Acre
FLUPSYs	9%	15,661	377
Rafts	4%	6,203	354

- "Shaded cells" represent the maximum values for each culture characteristic. Under the project, these maximum values are the culture characteristic thresholds that cannot be exceeded by shellfish culture operations.

## Site Specific Thresholds

The following site specific thresholds were determined by scaling the thresholds depicted in Tables 4 and 5 to the size of each site (i.e., multiplying each site's acreage by the relevant threshold values) (Tables 6 and 7).

**Table 6. Site Specific Culture Characteristic Thresholds for Intertidal Sites**

Site	Acres	Allowed Surface Area of Water that Can be in Shellfish Culture Production (Acres)	Allowed Volume of Shellfish Culture Equipment and Shellfish (ft <sup>3</sup> )	Allowed # of Adult (Market Size) Shellfish*
Intertidal 1	99	30	864,864	19,459,440
Intertidal 2	364	109	3,179,904	71,547,840
Intertidal 3	14	4	118,810	2,673,216
Intertidal 4	50	15	435,926	9,808,344

\*There are different age classes of shellfish present at any given time. This characteristic is based on a theoretical situation in which all the shellfish equipment is "full" of adult (market size) shellfish.

**Table 7. Site Specific Culture Characteristic Thresholds for Subtidal Sites**

Site	Acres	Allowed Surface Area of Water that Can be in Shellfish Culture Production (Acres)	Allowed Volume of Shellfish Culture Equipment and Shellfish (ft <sup>3</sup> )	Allowed Biomass of Shellfish Soft Tissue (kg)
Subtidal 1	3.9	0.35	61,078	1,470
Subtidal 2	8.6	0.77	134,685	3,242
Subtidal 3	8.7	0.78	136,251	3,280

## References

- Coast Seafoods Company. 2007. Coast Seafoods Application for Continued Mariculture Operations in Humboldt Bay, California. Draft Mitigated Negative Declaration. Prepared for Humboldt Bay Harbor, Recreation and Conservation District.
- Taylor Mariculture LLC. 2011. Draft Mitigated Negative Declaration and Initial Study, Taylor Mariculture Berth 2 Facility. Prepared for Humboldt Bay Harbor, Recreation and Conservation District.

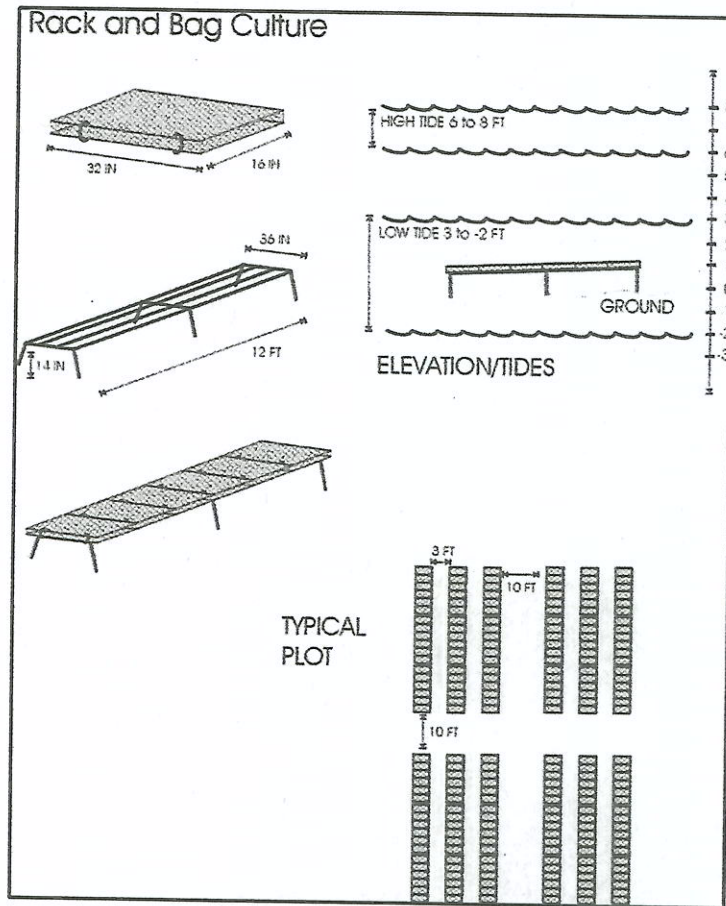


## Appendix A: Spatial Coordinates of Culture Sites

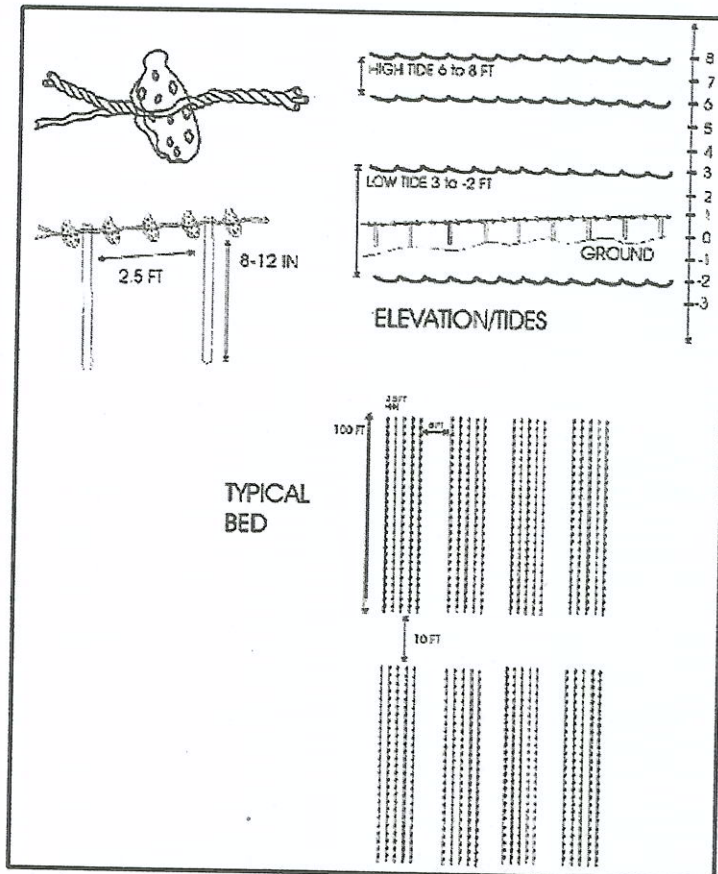
	Longitude	Latitude
Intertidal 1	124° 9' 01" W	40° 50' 57" N
	124° 08' 53" W	40° 50' 57" N
	124° 08' 53" W	40° 50' 36" N
	124° 09' 16" W	40° 50' 15" N
	124° 09' 17" W	40° 50' 34" N
Intertidal 2	124° 05' 47" W	40° 50' 13" N
	124° 05' 33" W	40° 50' 13" N
	124° 05' 33" W	40° 49' 43" N
	124° 05' 56" W	40° 49' 21" N
	124° 06' 35" W	40° 49' 06" N
	124° 06' 59" W	41° 49' 16" N
	124° 06' 27" W	40° 49' 23" N
Intertidal 3	124° 09' 52" W	40° 49' 17" N
	124° 09' 28" W	40° 49' 19" N
	124° 09' 26" W	40° 49' 16" N
	124° 09' 50" W	40° 49' 14" N
Intertidal 4	124° 10' 06" W	40° 49' 13" N
	124° 10' 04" W	40° 49' 10" N
	124° 10' 18" W	40° 49' 04" N
	124° 10' 23" W	40° 49' 01" N
	124° 10' 29" W	40° 48' 53" N
	124° 10' 44" W	40° 48' 28" N
	124° 10' 47" W	40° 48' 29" N
	124° 10' 39" W	40° 48' 47" N
	124° 10' 30" W	40° 49' 01" N
	124° 10' 18" W	40° 49' 09" N
Subtidal 1	124° 11' 03" W	40° 48' 51" N
	124° 11' 01" W	40° 48' 50" N
	124° 11' 07" W	40° 48' 42" N
	124° 11' 09" W	40° 48' 43" N
Subtidal 2	124° 11' 16" W	40° 48' 32" N
	124° 11' 10" W	40° 48' 32" N
	124° 11' 13" W	40° 48' 24" N
	124° 11' 19" W	40° 48' 24" N
Subtidal 3	124° 11' 23.817" W	40° 48' 13.793" N
	124° 11' 21.342" W	40° 48' 13.034" N
	124° 11' 19.186" W	40° 48' 12.359" N
	124° 11' 19.284" W	40° 48' 12.149" N
	124° 11' 18.728" W	40° 48' 11.979" N
	124° 11' 19.507" W	40° 48' 10.331" N
	124° 11' 20.213" W	40° 48' 8.999" N
	124° 11' 21.64" W	40° 48' 7.216" N
	124° 11' 23" W	40° 48' 04" N
124° 11' 28" W	40° 48' 04" N	

# Appendix B: Example Culture Method Diagrams and Pictures

## Rack-and-Bag Culture (from Coast Seafoods Company 2007)

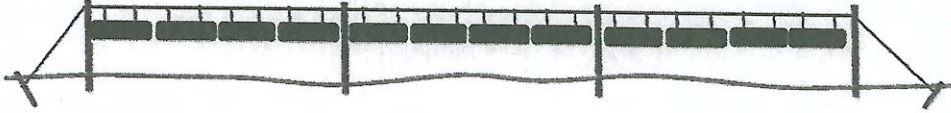


# Cultch-on-Longline Culture (from Coast Seafoods Company 2007)

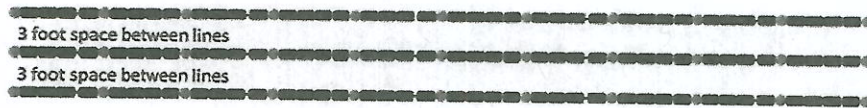


## Basket-on-Longline Culture

**Structure (Side View):** Lines are held up by 2 inch PVC pipe driven into the mud every 10 feet. Anchors made of galvanized fence posts are driven at the ends of each line. The lines are attached to the anchors and tension is created by a fence tightener. The baskets can be clipped and unclipped from the lines.



**Spacing (Top View):** Lines are 100 feet long and there are 40 baskets on each line. Lines are in groups of 3, with a 3 foot space between each line and a 20 foot space between each group of 3 lines. The 20 foot space is used to access the baskets with a boat.



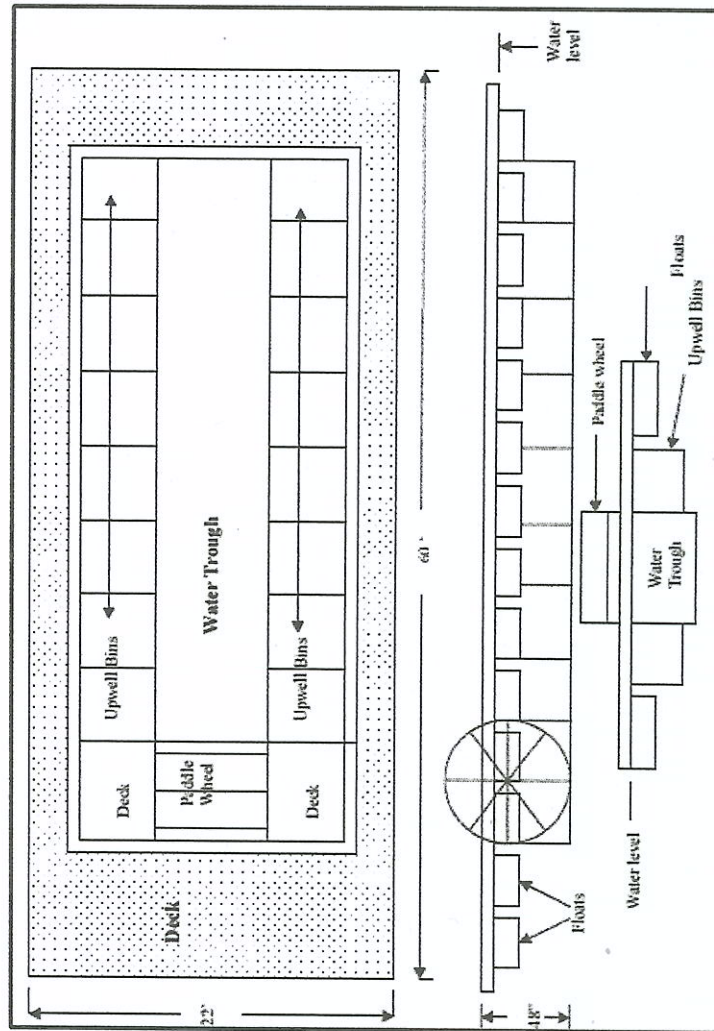
3 foot space between lines

3 foot space between lines

20 foot space between groups of 3 lines.



# Floating Upwelling System (from Coast Seafoods Company 2007)



Culture Rafts and a Work Platform (from Coast Seafoods Company 2007)

