RESPONSE TO SEPA COMMENTS (SEP2008-00128)
Proposed Floating Geoduck Seed Nursery System in
Case Inlet, Harstine Island, Mason County, Washington

The following is a response to comments on the state environmental policy act (SEPA) mitigated determination of nonsignificance (MDNS). The project is the Seattle Shellfish Floating Nursery project (SEP2008-00128) located in Spencer Cove (Case Inlet), Harstine Island, Mason County, Washington. The comments are provided by various sources. Each comment is identified by the commenter's name and/or their affiliation, and the date it was received. The response to each comment is provided directly below the text that was provided by the commenter.

A. Jules Michel, March 25, 2010

1. *In discussion about the impact from this project virtually all is focused on the effects from the pilings, log booms, and rafts. What is not found is the additional impact from the 6' (70") platforms extending below each of the rafts which hold what appear on page 7 to be multiple layers of plastic seed trays. As each raft holds 64 trays per layer, and there appears to be multiple layers, it is not an insignificant structure. Whether the resulting shade created; re-direction of current around the structure; or acceleration of current underneath the structure, its impact on the subtidal habitat needs to be considered. According to WDFW maps published last year there are priority habitats immediately adjacent to this project (e.g., saltwater wetlands) and potential surf smelt/sand lance spawning areas which would be impacted by a change in current or wave direction from this project.*

   Response: The rafts were the main structure discussed according to potential shading, flow, and sediment effects of the proposed action. Because this is a new project, there are a few specific elements that are still in the developmental stages. Although the dimensions of each raft will be consistent, it is not known whether it will work better to use vertically suspended trays stacked atop each other, or place them on the raft bottom beneath the water's surface. In either case, the draft of the raft structure with the trays either suspended or resting on the raft bottom will be the same. The potential effects were evaluated for the direct footprint of each raft, total area of rafts, and associated structures (log boom and pilings), in a broader action area encompassing Spencer Cove.

   The proposed floating nursery system can be compared to the four floating docks reviewed by Burdick and Short (1999). These authors determined that for a 1-m-wide (3.3 ft) floating dock at noon, the dock must be 2.0 m (6.6 ft) above the bottom for 20% ambient light levels to reach the canopy. (Note that no docks greater than 3.4 m [11.2 ft] in height from the bottom were sampled). Their recommendation was to allow for a buffer of greater than 3 m (9.8 ft) above the bottom in areas with tidal ranges less than 1 m (3.3 ft). In addition, for fixed docks with a north-south orientation, Burdick and Short (1999) recommend a buffer depth of 5.6 feet (BE page 29).

   This information was taken into consideration in determining the recommended buffer depth for the proposed floating nursery project:

   a. The mean tidal range in Spencer Cove is 3 m (9.99 ft)[1], three-fold greater than that discussed by Burdick and Short (1999) in their recommendations for depth under floating docks.

   b. Both recommended buffers by Burdick and Short (1999) were for light penetration levels for eelgrass beds, a habitat that does not exist in Spencer Cove. (The majority of macroalgae observed under the footprint of the proposed floating nursery system was *Gracilaria* and drift

[1] This is based on the tidal data reported by NOAA for Ballow, WA at http://tidesandcurrents.noaa.gov/data_menu.shtml?stn=9446583 Ballow, WA&type=Datums

Ulva; no eelgrass was observed). The light threshold levels below the Photosynthetically Active Radiation (PAR) at which vegetation is limited in growth is 300 nm PAR for eelgrass compared to <100 nm PAR for subtidal macroalgae (Nightingale and Simenstad 2001). In other words, subtidal macroalgae requires 3x less light for growth than eelgrass.

According to the depth survey and additional information obtained regarding raft positioning within the project footprint, we are able to provide further clarification regarding the depths beneath the rafts and nursery trays. Under the most extreme low tide conditions (-4.46 ft mean lower low water (MLLW)) the minimum depth under the rafts would be 3.0 feet. Because the log boom would dissipate most of the wave action, this depth was determined to be sufficient, as wave scour should not be significant. Further, as noted in the response to Comment A.2, below, a depth lower than -4 ft MLLW occurs in southern Puget Sound 0.4% of the year, approximately half of which occurs in night time hours. The majority of the year (>75%) would have low tides above 0 ft MLLW and a resulting minimum depth under the rafts of 7.5 feet.

Based on this information, it was determined that a minimum buffer distance of 3.0 feet during extreme low tides would be sufficient to address habitat concerns related to spacing underneath the rafts holding suspended nursery trays. Given the relatively narrow width of the rafts, and their nearly north-south orientation (~30-degrees off due north, with the shallowest eastern dog-leg raft [6] positioned nearly due north), subtidal shading from the rafts will be minimized and should not prevent the growth of macroalgae that may be present beneath the rafts or in the broader action area. .

Mr. Michel has also questioned how the project could redirect current around or increase velocities around the rafts. We offer the following clarification. The log boom will alter flow around the structure (which runs 300 ft northwest-southeast and 60 ft north-south). The main purpose of the log boom is to reduce the fetch of this specific area to protect growing geoduck seed. The orientation of the rafts, ~30-degrees off of due north/south, is intended to protect geoduck seed maintained in the raft structure from wind generated from the north-northeast direction that would predominate during the spring geoduck seed development phase (King County 2001). In a field study completed by the Delta In-channel Work Group (2006), it was determined that a log wave breaker (430 long) reduced boat wake energy by 68%. A laboratory-controlled study performed by Jamieson et al. (1995 *as cited in* Nightingale and Simenstad 2001) calculated that a breakwater at an 11.5-degree angle incident to waves reduced wave energy transmissions by 18%. It is therefore expected that the log boom design for the proposed floating nursery system will reduce the energy of the waves on the beach behind the log boom. Although the extent of this reduction has not been quantified, it is assumed to be similar to the above studies but likely less due to the shorter length of the boom. Wave induced erosion of beach habitat is therefore not expected and effects on habitat from this mechanism are concluded to be negligible. It is also notable that Nightingale and Simenstad (2001) commented that floating breakwaters are biologically preferable to fixed breakwaters due to their significantly reduced impact to intertidal flora and fauna.

Besides fetch, there are also drift cells along the shoreline. Drift cells are defined as “sediment transport systems in which sediment is suspended by waves or currents and transported along the shoreline in a repetitious cycle of suspension and deposition” (King County 2001). A drift cell has a dominant direction and transport mode (i.e., convergent or divergent zone), which is determined by the dominant direction of the waves and currents in that cell. Drift cells in Spencer Cove produce a convergence zone, also known as a depositional area.

The oblique approach of wind-generated waves contributes to drift cell orientation, which would be partially influenced by the log boom for winds generated from the north-northeast direction. Drift cells are also influenced by circulation (Johannessen 1992 *as cited in* King County 2001). However, because

Spencer Cove is considered a convergence zone (Ecology 2010), storm tracks and circulation patterns approach the cove from two directions, and the log boom would provide protection only in one. This means that although a portion of the circulation from the north would be disrupted, weather patterns from the south predominate in the project area, and winds and circulation from the south would still provide standard transport processes into the cove. Because sediment transport is driven predominantly by drift cells (Johannessen 1992 *as cited in* King County 2001), and these cells will not be blocked, significant changes to sediment deposition or erosional processes are not anticipated. This is assumed from the overall open construction which has 6 pairs of pilings with 50 feet of spacing between each pair. Therefore, the proposed wave break structure and floating nursery rafts would have a negligible impact on water circulation and sediment transport processes that influence potential forage fish spawning habitat.

Sediment scouring under the proposed rafts would result from longshore currents driven by circulation patterns, tidal action, waves generated by winds, and wake action generated by boat traffic. Based on measurements taken at Pickering Passage, at the north end of Case Inlet[2], maximum current speed in the area are 1.1 knots for the flood tide and -1.0 knots for the ebb tide. Specific scouring can be calculated through critical shear stress (that can be determined through two –dimensional coastal engineering sediment transport model) acting on the depth under the rafts. However, because this scouring is not significant, modeling was determined to be unnecessary. This was based on the following information.

According to the current depth analysis of the project, there would be a minimum depth of 3.0 ft below the rafts at an extreme low tide (see response to Comment A.2 below). Although this depth could increase the measurable velocity under the rafts during extreme lows (experienced for ~ 0.4% of the year), it would not have a significant influence on the overall current direction or speed within the project or action areas. More than 75% of the year depth under the rafts would be more than 7.5 feet, allowing for normal circulation patterns under the floating nursery system. Further, circulation around Harstine Island is driven more by wind patterns than tidal forcing (Albertson et al. 2007). Because of the log boom, as discussed above, a portion of the surface circulation would be disrupted from the north-northeast. With this decrease in energy, scour under the rafts would be reduced.

The only structures that would actually interact with the bottom substrate are the pilings. As mentioned on BE page 22, Ratte (1985) reported that open pile structures tend to interfere less with sediment transport compared to a jetty or bulkhead structure. An open piling structure is the design proposed for the floating geoduck seed nursery system. The studies that Nightingale and Simenstad (2001) identified for effects of overwater structures to sediment transport focus on larger structures that had a significant area interacting with the bottom sediments, such as jetties, that partially or completely disrupt the longshore transport process. Because of the open piling structure, this process will not be disrupted, but may be slightly altered, resulting in the potential for some small scour areas adjacent to the pilings.

There are a limited number of studies that have identified scour around pilings under tidal conditions (e.g., most studies are done in rivers with unidirectional flow). Escarameia (1998) investigated local scour under single circular and rectangular piers. The author determined that sediment size had no effect on local scour depth, and scour depths for rectangular piers were 10-14% smaller than square piers. (Note that the proposed rafts are rectangular in shape.) May and Escarameia (2002) reported that scour in tidal flows can be significantly less than scour with unidirectional flow. In contrast, Margheritini et al. (2006) reported that the final equilibrium scour was similar for unidirectional and tidal flows around large diameter piers. Finally, Vasquez and Walsh (2009) determined that under tidal

[2] Current velocity data is from the Tide&Current NOAA Fisheries database at the following website: http://tidesandcurrents.noaa.gov/currents09/tab2pc2.html

conditions, flow reversal temporarily fills the scour holes developed in the previous tidal cycle, which more often results in lower scour than would be observed from unidirectional scour.

Scour around the pilings is not expected to be a significant influence to the development of the benthic community. As reported by Kozloff (1996), floats and pilings are favorable environments for many kinds of seaweeds and invertebrate animals. The animals that typically colonize floats and pilings include hydroids, sea anemones, tube-dwelling polychaetes, barnacles, mussels, and ascidians. Kozloff (1996) goes on to state that "many of the animals and plants on floats are those normally found at lower levels of the intertidal zone, or even subtidally". The organisms that develop on floats and pilings are thought to be extremely diverse, with complex food webs and symbiotic relationships between the colonizing organisms. As discussed by Ricketts and Calvin (1968), pilings offer a unique opportunity to observe depth zonation. The species colonizing in the different zones provided by pilings depends on the amount of exposure to wave energy and dewatering. For example, barnacles are common colonizers of the spray area of exposed piles, while the sea anemone *Metridium senile* (found in the subtidal habitat of Spencer Cove) is found in less exposed areas and prefers bare piling. Additionally, some mobile organisms, such as crabs, sea cucumbers, and jellyfish are found in association with pilings in areas that don't typically dewater. It should be recognized that although these organisms are commonly found on rafts and pilings in Puget Sound, the plastic coating of the rafts, galvanized steel of the pilings, and movement of the rafts up and down the pilings with the tide would discourage colonization.

It should also be recognized that the proposed floating nursery system is a significant improvement, in terms of potential for benthic impacts, to the formerly used system of kiddie pools that rested on the bottom of the substrate, limiting exchange with the overlying water. The floating system will allow for water movement, sediment movement and transport, and benthic colonization in both the intertidal and subtidal environments. In total, the improvements created by this new system would promote a healthier benthic community in Spencer Cove.

2. *Related to the above is an inconsistency in the depth these structures will be, leading to an incomplete description of their adverse impacts. On page 5 it is stated they are in 9 to 30 feet of water. On page 8 they are noted as being at a -7 ft MLLW to -13 MLLW, and referenced to a map with bathymetric lines as support. This significance is in how the subtidal habitat will be impacted. If the latter depth is accepted as being accurate then the structure underneath the rafts will come in direct contact with the sediments at any time there is a minus 1 or lower tide. More likely there will be contact before then as waves will also cause these structures to drop onto the sediments below them. Whether waves from storms or boating activity, this is a dynamic area.*

Response: To account for the variation in depth, a range was always provided for the project as a whole. As was stated in the BE page 5 and on Figure 2, "The minimum depth of water from the water surface elevation to the seafloor would be 9 to 30 feet (in relation to MHW), depending on tidal stage and positioning of the rafts." The range of the height of the pilings above the water surface was 8 to 24 feet (also dependent on tidal stage). Additionally, because the rafts are moored to the log boom, which is then connected to steel pilings using steel collars, the rafts would be both protected from the most active wave energy during months when seed is primarily present and allowed to move up and down with the tide. The tidal range for the project area was consistently given as -7 ft MLLW to -13 ft MLLW. Upon further review, we have determined that these estimates were based on errors in the provided figures, and depth measurements have been have been subsequently verified in the field. The correction of these values, and a full analysis of minimum depths under the proposed rafts, is provided below.

During the field survey performed on March 15, 2010, a comparison of existing bathymetry data (Finlayson 2005) and actual depths within the project area (in relation to MLLW) was made. Depths were measured from 17:46-18:26 during a tidal cycle ranging from 10.5 ft to 11.5 ft MLLW[3]. Depths corresponding to the inshore and offshore ends of five transects were measured in the field, referenced to 0 ft MLLW, and tracked with a Global Positioning System (GPS) unit (Figure 1, Table 1). Based on those measurements, it was noted that the depth range for the project area, in relation to MLLW, should be **-11 ft to -14 ft MLLW**. (Note that the transects extended farther than the project area, and so there is variation around this tidal range for the actual depth measurements).

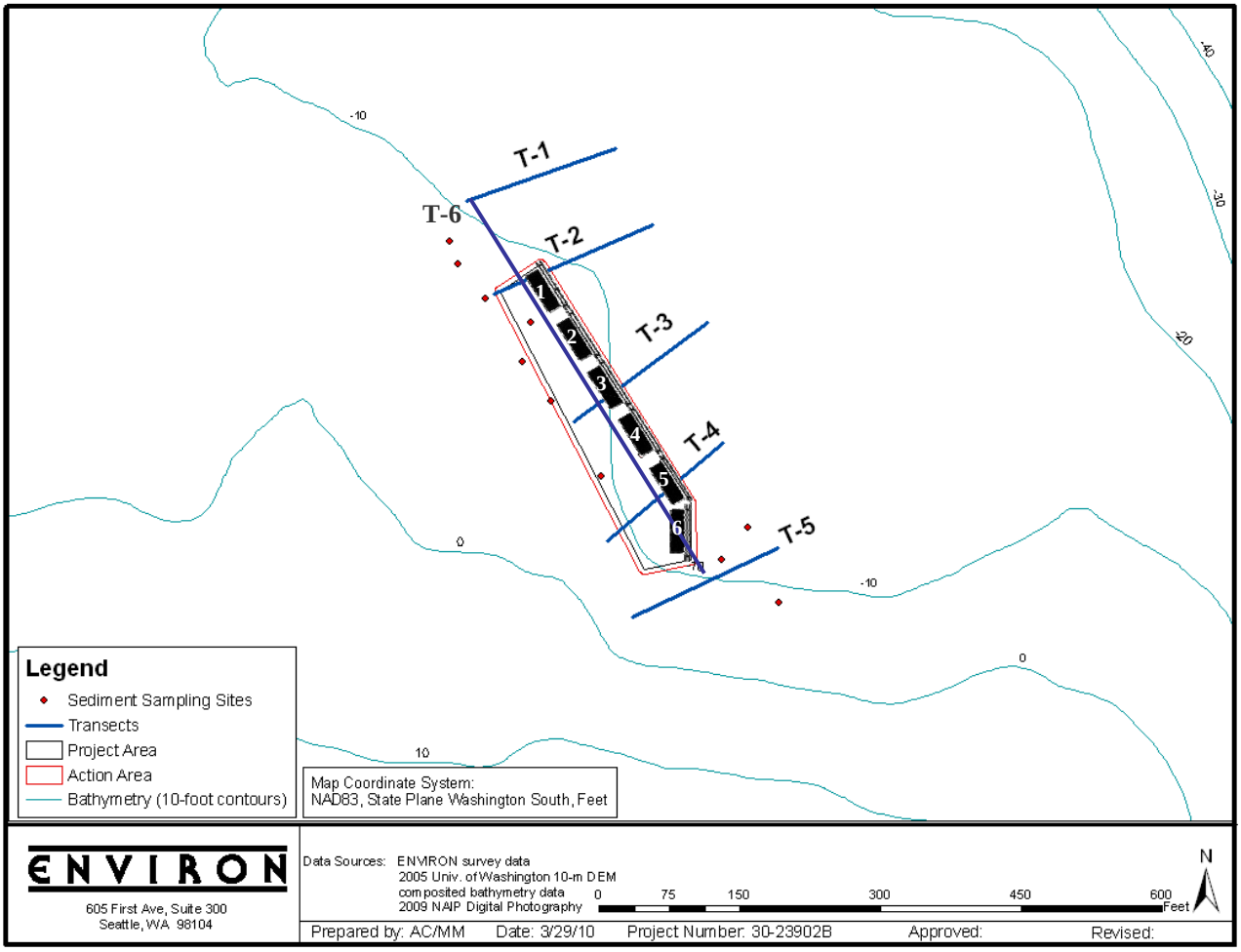


Figure 2. Schematic of the sampling design used in Spencer Cove (Case Inlet) in association with the proposed floating nursery project. All proposed rafts are overlaid on the schematic and labeled in a north to south orientation.

[3] Tidal heights were corrected from predicted tides on March 15, 2010 at Allyn, Washington (9446281) and corrected by the tidal difference between predicted and actual tides calculated at Tacoma, Washington (9446484) (http://www.tidesandcurrents.noaa.gov/)

Table 1. Depth measurements inside and outside the proposed floating nursery project area taken on March 15, 2010 in Spencer Cove (Case Inlet) in relation to tidal height at the time of measurement.

Transect		GPS Coordinates		Depth in Relation to MLLW	
#	Location	Latitude	Longitude	feet	Time
T1 -OUT	offshore	N 47 16.428'	W 122 51.977'	13.5	18:25
	inshore	N 47 16.418'	W 122 52.015'	12.5	18:26
T2 - IN	offshore	N 47 16.415'	W 122 51.967'	14.3	18:18
	inshore	N 47 16.402'	W 122 52.007'	11.4	18:20
T3 - IN	offshore	N 47 16.398'	W 122 51.952'	14.1	18:09
	inshore	N 47 16.380'	W 122 51.986'	13.1	18:11
T4 - IN	offshore	N 47 16.377'	W 122 51.947'	16.7	17:55
	inshore	N 47 16.359'	W 122 51.976'	10.7	17:58
T5 - OUT	offshore	N 47 16.346'	W 122 51.969'	17.5	17:46
	inshore	N 47 16.359'	W 122 51.932'	4.1	17:49

OUT = outside the project/action areas, IN = inside the project/action areas

Based on these measurements, an analysis of minimum depth under each raft was prepared (Table 2). The depth under each raft was calculated based on the transect depth measurements from Table 1, and the associated slope calculated from the inshore to the offshore depth measurement. (Note that all depth measurements were corrected for the tide height at the time of measurement and the actual vs. predicted tide height.) Three out of the six rafts coincided with transects measured in the field (i.e., Raft 1, Raft 3, and Raft 5). For all other rafts, the distance that coincided with the adjacent transect to the north was used for the position of the raft, and the slope was calculated based on the average of adjacent transects. Finally, the minimum depth of each raft was calculated by adding the depth change from the beginning of the transect to the location of each raft.

Table 2. Minimum depth values under each raft in relation to 0 ft MLLW, as measured on March 15, 2010 in Spencer Cove (Case Inlet), Washington.

Raft Location			Minimum Depth (ft)	
Raft Number	Distance Along Log Boom (ft)	Slope (%)	From Water's Surface (@ 0 ft MLLW)	From Bottom of Raft
1	7-52	1.8	12.3	7.8
2	67-112	1.2	12.0	7.5
3	127-172	0.6	13.3	8.8
4	187-232	2.1	13.9	9.4
5	247-292	3.6	13.6	9.2
6	307-352	5.9	13.7	9.3

Note:

1. The draft of the raft was the corrected value of 54 inches (4.5 feet).
2. Slope was calculated based on the transect depth measurements (Table 1) for each raft that coincided with a transect (i.e., Raft 1, Raft 3, and Raft 5). For all other slopes, an average between the two adjacent transects was provided.
3. Depth of each raft was calculated using the distance of each raft along the transect, the change in depth according to slope, and the depth measurement starting from the inshore portion of each transect.

Finally, an analysis of depths relative to mean high water (MHW), MLLW, and extreme low water (ELW) was completed in relation to the lowest depth under the rafts, which occurred under Raft 2

(Table 3). According to this updated analysis, there would not be any grounding of the rafts, even at the most extreme tidal elevation (-4.46 ft MLLW), and a buffer depth of 3.0 feet or greater would be present at all times.

Table 3. Comparison of minimum depth values under the proposed floating nursery system in Spencer Cove (Case Inlet), Washington.

Reference		Minimum Depth (ft)[2]	
Value	**Unit (ft)**	**from Water's Surface**	**from Bottom of Raft**
13.01	MHW	25.0	20.5
0	MLLW	12.0	7.5
-4.46[1]	ELW	8.0	3.0

[1]The minimum depth value was provided by NOAA Fisheries Tides&Currents (http://www.tidesandcurrents.noaa.gov/) historic data for Tacoma, Washington (9446484) from January 1, 2009 to January 1, 2010. Tacoma, WA is the closest tide gage that reports both historic and corrected values.
[2]The draft of the raft was the corrected value of 54 inches (4.5 feet).

According to our field-truthed data, and new information provided by Seattle Shellfish, the following clarifications are provided:

a. According to Seattle Shellfish, the 70-inch measurement associated with the rafts, as originally identified in figures in the JARPA and BE (corrected versions appended) was calculated from the top to the bottom of the raft. However, that included a portion of the raft that would be out of the water (16 inches or 1.3 ft). Therefore, the actual draft of each raft (with weight calculated in) would be the remaining 54 inches (4.5 ft).

b. Based on field measurements, the tidal range has been modified from -7 ft to -13 ft MLLW to a range from -11 ft to -14 ft MLLW. These calculations have been corrected for the tidal height at which they were made and the predicted vs. actual tidal height experienced on the day of measuring.

c. The entire project area was included in the tidal range evaluation; however, in terms of the position of the rafts, they would occur at the very seaward edge of the project area next to the log boom. Additionally, the rafts only extend out a distance of 14 feet (see corrected project drawings below). Because there is a dog-leg in the project area (Figure 1), and the log boom extends farther out than the rafts, the total tidal range for the project extends beyond the rafts. According to the revised tidal range of the project area (-11 to -14 ft MLLW), the first raft would occur at a depth of -12 ft MLLW (Table 2). In other words, there is a full foot of depth between the start of the project area and the first raft.

Based on the above clarifications and field data acquired since the submittal of the JARPA and BE, a buffer depth of 3.0 feet for the most extreme low tides in Spencer Cove would satisfy all light attenuation requirements for this project for the following reasons:

a. Eelgrass and kelp were not observed in subtidal survey of the project area and the area has not been identified in any mapping conducted by the state to support eelgrass. The closest location of kelp (*Larminaria*) to the rafts would be within a distance of 23 m (75 ft) to the northeast. The details of the field survey has been submitted to the ACOE in response to their comments to the BE. According to Mumford (2007), *Laminaria* is typically found within deeper locations (MLLW to -20 m in depth).

b. Scour impacts to the benthic community from the rafts and trays will be insignificant. Based on the total number of low tides (n=707) that occurred in Tacoma, Washington (9446484) from January 1, 2009 to January 1, 2010, a low tide of less than -4.0 ft would occur 0.4% of the year, while a low tide of less than 0 ft would occur 25% of the year. (Note that Tacoma, WA is the

closest tide gage to this project that reports both historic and corrected tide values; also note that half of these low tides would occur at night). Therefore, the depth would be above 7.5 feet 75% of the year at the lowest portion of the project (under Raft 2).

3. *Discussions of shade on page 29 mention metal pilings refracting light and the orientation of the rafts as being important. As noted above, the structures beneath the rafts are not discussed nor considered. ENVIRON's discussion on page 29 notes that a dock oriented north/south should be 5.6 feet above the bottom to provide suitable light. As the bins extend 6' below the rafts, this placed them far below the level suggested, whether using the 9-30 foot range or the -7 to -13 range. Also not considered is the aquatic life which will take hold on these pilings. While when new there may be light refraction, over time this ability will diminish. Given the height; loss of diffusion over the years; and the northeast to southwest orientation of the 360' log boom/rafts, there will likely be a far more significant impact from shade than hoped for. It would be suggested the rafts be moved to deeper water in order to achieve the 5.6' depth and be oriented in a north/south direction. (I would also add that mention of the % of Spencer Cove should not be used to diminish the direct impact on the immediate subtidal area, a complete description of which has still not been submitted.)*

Response: Please see the response to Comment A.1 and Comment A.2 above in regard to the depth and current issues associated with the floating nursery system and current project recommendations.

In regard to light refraction, it is recognized that some loss of refraction would occur over time. It would be possible to clean the encrusting organisms off the pilings at consistent intervals to allow for more light refraction, if that is desired by the agencies as a form of mitigation. It should be noted, however, that pilings do serve as unique strata for colonization. Many researchers (Kozloff 1996, Andersson et al. 2009) have noted that pilings offer a third dimension within the aquatic environment, and cannot be discounted as a new foraging opportunity for pelagic species. Given that consideration, loss of light attenuation to bottom habitat may be balanced by improved foraging opportunities over time.

In regard to the percent estimate of Spencer Cove that the project covers, reviewing agencies often request that information; the area of the project relative to the total area in Spencer Cove was therefore provided for perspective. In addition, studies that document alterations in water and sediment transport patterns are often conducted in relation to very large structures that fully enclose an area (i.e., marina) or protect a significant amount of the area (i.e., jetty). We deemed it appropriate to acknowledge that the scope of this project is less than the projects reviewed in other studies related to structures that potentially change water and sediment transport. We did this by presenting the proposed project area in relation to the larger scope of the habitat processes in which it would be located. Finally, reviewing the potential impacts of the project flow patterns in Spencer Cove as a whole (as in the response to Comment A.1) requires consideration of the overall area that the project encompasses. A structure that is <8% by length and 0.2% by area will not significantly control over the entire hydraulic regime in an area. We recognize that effects within the immediate project area can be expected, as discussed in the BE page 22 and further clarified in the response to Comment A.1.

4. *There appears to be a probability that sediments will be discharged into Spencer Cove during the operation of the nursery. Page 5 notes that sand will be filtered with on-site water using a pump. How these geoducks will be screened without sediments being discharged into the water has not been discussed.*

Response: All sediment associated with the proposed floating nursery would be retained for either repeat use or stored in an upland location for other purposes. When stored in upland locations, it will be covered to ensure suspended sediment runoff is avoided. To ensure that no discharge into waters of

the state occurs, Seattle Shellfish has clarified the process of seed recovery. Please see the response to the next comment below (Comment A5).

5. *Related to this processing is a note that sand no longer usable will be stockpiled at an upland facility for later use. It is assumed the sand will be stockpiled on the upland parcels. Running through these parcels is a stream and wetland area, and on shore is what WDFW has noted are two critical habitat areas: a lagoon and a salt water marsh. How the sand will be transported and where it will be stored such that these habitat areas are protected should be discussed. It would be appropriate to ask that a wetland delineation and rating be performed if this is where activity is to occur.*

   Response: A Gantry crane for lifting the plastic trays containing geoduck seed would be attached to the rafts, or on a separate work platform, which would be moved beside a raft during the seed recovery process. Separate non-perforated plastic bins (fish totes) will be filled with water and the contents of each tray will be dumped over a screen in the top of the bin separating the sand from the geoduck seed and water is flushed over the top to separate the seed from the sediment; similar to sorting sediment particles on sieves. Water used in this process is pumped from Spencer Cove through a gas pump equipped with a NMFS-approved intake screen. The sand is retained in the bins for repeat use or for stockpiling upland.

   Only washed sand is used in the operation. When sand becomes unusable (e.g., over time becomes too coarse), it is stockpiled upland for other uses in landscaping. It is not deposited in nearby wetlands or streams, and none of the project actions will have any associations with these habitats. Sand will be stockpiled in previously developed upland areas owned by Seattle Shellfish. The sand would either be hauled up via tractor along the current road that exists on-site or transported via boat to an off-site location. The sediments would not be stock-piled in shoreline jurisdictional areas, would not influence the priority habitats identified by WDFW (2008), and would not be discharged into the waters adjacent to the project site.

6. *On page 27 a discussion on forage fish notes that Pacific Herring holding areas are six miles south. However, a 2009 WDFW "Surf Smelt, Sand Lance, Rock Sole and Herring Map" identify a large "Documented Herring Holding Area" in Case Inlet, immediately east of the project area. As was noted in ENVIRON's earlier report for Seattle Shellfish, herring in south Puget Sound use atypical spawning areas. Given the size of the holding area in Case Inlet, it is very likely that Herring do spawn in this project area. As noted by WDFW, typical depths for herring spawning are +3 to -20 MLLW, the exact depth where this structure is proposed. In fact, this additional structure may well provide a spawning habitat area. Potential, if not probable impacts to herring spawning needs to be considered. As noted in Point C [now labeled Comment A.3], a complete description has not been submitted and vegetation during the winter months, like deciduous trees, is at its minimum. During the spring there may in fact be abundant vegetation on which herring spawn.*

   Response: According to the most recent Washington State herring stock status report completed by WDFW (Stick and Lindquist 2009), no herring spawn or pre-spawn holding areas occur in the immediate vicinity of Spencer Cove. In fact, that survey confirmed the 2004 survey (Stick 2005) which located herring holding areas six miles south of Spencer Cove. According to Greg Bargmann (pers. comm., WDFW, April 8, 2010), the Stick and Lindquist (2009) report is the most current information available. Because no reference was provided for the 2009 "Surf Smelt, Sand Lance, Rock Sole and Herring Map", and no one at WDFW can locate this map, this reference could not be confirmed as a reliable source. Kurt Stick commented that this map may be referring to general holding areas, not pre-spawner holding areas (pers. comm., WDFW, April 12, 2010). If indeed this is the distinction that the commenter was trying to make, then it should be noted that the BE discussing the potential impacts to forage fish overall, but focused on likely impacts to spawners, which are not known to occur in Spencer Cove.

We do, however, acknowledge that herring have been known to spawn on aquaculture gear, and as such are considered in the discussion of potential forage fish in the action area. Seattle Shellfish would follow the standard protocol employed by shellfish growers to avoid impacts to herring spawn, namely, avoidance of gear if spawn has been deposited on it until the eggs have hatched. However, the timing of herring spawning in south sound should not overlap with typical activities required to operate the floating nursery, which will predominantly occur between April and October. Although there may be some slight overlap, this time period predominantly misses the February/mid April spawning and incubation period of the Squaxin Pass herring stock (Stick 2005). Other activities associated with the floating nursery system that occurs outside of this timeframe (i.e., maintenance, mooring) would not disturb structures available for herring to spawn upon.

7. *Attention to noise during pile driving is given yet none is given to noise after the fact. Currently, there is nothing in Spencer Cove which creates noise, other than the occasional boat traffic. Floating docks are well known producers of noise. This specific construction, as described, attaches the log booms to the steel pilings with a metal collar. Discussion of the noise generated by this during waves, whether from boat traffic or storms, and the effects on the adjacent areas are not discussed.*

Response: The majority of information for overwater structures is related to docks. However, because the proposed floating nursery system needs continuous access to water via spray or gentle wave action, a unique system of the piling collars was derived. Noise from such collars was evaluated in a study of tidal turbines, in the first pilot project for exploitation of marine currents at a commercial scale (SEAFLOW) researched by the European Commission (2005). Although no calculations were provided for the noise generated by the collar connection in that study, it was determined that noise was a minor component if a plastic pad was installed along the collar surface to reduce potential vibrations and noise generated from the interaction of a steel collar on a steel piling. Seattle Shellfish will implement the noise attenuation measures above to ensure noise from raft operation is minimized. The collar that American Construction Company (Kevin Colbert, pers. comm., April 15, 2010) would use is a steel collar fabrication with either plastic rollers or plastic rub pads. To ensure that these pads maintain their effectiveness, Seattle Shellfish will monitor the pads during routine maintenance and replace as necessary.

It should be noted that noise from boats will not increase above current baseline conditions in Spencer Cove due to the proposed project. The need to access the area will be the same, it is only the location of the nursery system that will change, not the amount of activity. In terms of noise generated from storms, because the rafts rest on the water's surface this is not expected to create a significant amount of additional underwater noise.

8. *The placement of this log boom/raft structure will modify the inherent natural qualities of Spencer Cove. While it is understood there is a need for geoduck seed, alternatives need to be considered and do not appear to have been. Currently there are two primary sources, on in Totten Inlet operated by Taylor in their mussel raft area and a second by the Lummi Tribe in an upland area. Both of these operations have already been permitted in the areas they are in. Taylor can easily expand its operation, as can the Lummis if demand warrants it. An economic convenience should not over ride the probable impacts a new facility of this size will have.*

Response: As noted in the original project description, geoduck farmers need to nurse hatchery seed to increase the size of the seed (and therefore the survivability) before outplanting on their farms. Most geoduck growers accomplish this task by using nursery pools at their farm sites. Because of concerns raised with regard to nursery pools, Seattle Shellfish has proposed this floating nursery system; while the system represents a substantial investment of time and money, Seattle Shellfish is proposing to make that investment to address the concerns that have been raised. The fact that other geoduck farmers have their own systems for nursing seed does not in any way impact Seattle Shellfish's need for

a nursery system. Indeed, even if it were feasible for Seattle Shellfish to use another geoduck farmer's nursing system to meet their nursery needs (which it is not), that would not necessarily reduce any environmental impacts of the proposal; it would simply move those impacts to another project location.

Evaluation of alternatives, as Mr. Michel requests, is not required for an MDNS. Indeed, even in the context of an EIS, the SEPA rules make clear that evaluation of off-site alternatives is not required. *See* WAC 197-11-440(5)(d) ("When a proposal is for a private project on a specific site, the lead agency shall be required to evaluate only the no action alternative plus other reasonable alternatives for achieving the proposal's objective on the same site.")

9. *Related to the above, the need for seed is predicated on a continued demand for geoduck. There is no guarantee this demand will continue. Past bubbles in Tulips or internet stocks serve as only two examples of a demand and price collapsing. Whether from a lessening of market demand or an oversupply, there is no guarantee this facility will be needed in the future. If not, the remnants will remain forever, as have older pilings in Totten Inlet no longer used for wave breaks. There should be some guarantee that if this facility is shut down the pilings will be removed so the navigational use of the waterways is not hindered.*

Response: As noted throughout this document, this proposal does not create significant adverse environmental impacts, regardless of the length of time that the project remains in place. In addition, Mason County's Shoreline Master Program makes it clear that aquaculture equipment, structures and materials "shall not be abandoned in the shoreline or wetland areas." Mason County Code Section 7.16.020(c)(14).

10. *This structure creates an impediment to the use of the waterways in Spencer Cove, whether for fishing or other recreational boating. While there may be a perception that there is little activity, Jarrell's Cove is only a short distance away and Case Inlet is a primary pathway for boating. Boating in south Puget Sound will only increase. The ability to enjoy the southern portion of Spencer Cove recreationally, or to "cut the corner" heading south or north will be impacted and is a safety issue not discussed which should not be dismissed (e.g., should they be lit with navigational hazard lights?).*

Response: According to Timothy Westcott (pers. comm., 13th Coast Guard District Prevention District, April 9, 2010), the floating nursery system would be classified as an aquaculture object. Although no formal definition of this exists in the Code of Federal Regulations (CFR), there is precedence for defining mussel rafts, fish pens, etc. in Puget Sound as objects rather than barges or anchored vessels. According to the CFR for Navigation and Navigable Waters, there are defined lighting requirements that should be observed for similar structures (33 CFR 88.13). Accordingly, lighting shall be displayed at night and, if practicable, during periods of restricted visibility.

According to the Coast Guard's official light list for the Pacific region (USCG 2007), other aquaculture objects in Puget Sound (e.g., Penn Cove mussels, fish pens, etc.) use flashing yellow lights with a periodicity of 4 to 6 seconds. These are analogous operations that have successfully addressed navigation concerns as laid out by the U.S. Coast Guard. Before the project can be constructed, Seattle Shellfish would have to obtain a permit by the U.S. Coast Guard. At that time, the exact requirements will be determined for marking to ensure boater safety, and if there would be any restrictions to navigation based on the proposed location of the floating nursery system. In a brief consultation with Timothy Westcott on this issue, he thought that it was more than likely that the floating nursery system to be outside of any main navigational channels.

In regard to the vicinity of Jarrell's Cove, this recreational area is on the other side of Harstine Island (i.e., the west side) from the proposed project area. The closest launch points to access Jarrell's Cove are also located on the west side (e.g., Arcadia Point or Latimer's Landing just outside of Shelton,

Washington). Further, if the floating nursery system maintains the light and placement requirements determined through consultation with the Coast Guard, then there should be no adverse effects to recreational vessels that may occur in the vicinity of Spencer Cove.

B. Department of Ecology, Southwest Regional Office, March 25, 2010

1. *Please clarify the minimum depth of the structure. Statements and drawings in the application assert a minimum depth of 9 feet. However, the text in section 10 of the Biological Evaluation indicates that the nursery footprint will occur in areas ranging from -7 MLLW to -13 MLLW (MLLW = 0 ft). The application also indicates that the structure is approximately 6 feet (70 inches) deep. Thus it appears that, given the reported depths, the structure will ground out at tides lower than -1 MLLW. Grounding would create impacts to infaunal and epifaunal communities and may be inconsistent with the SMP.*

   Response: Please see the response to Comment A.2 above.

2. *Ecology recommends an eelgrass and macroalgae survey be conducted pursuant to established WDFW protocols in the appropriate season. If eelgrass and macroalgae are present in the project area, the facility should be configured to avoid and minimize effects to those resources.*

   Response:

   a. The only eelgrass resources documented near Spencer Cove occur along the shoreline at the northern end of Harstine Island (Ecology 2010), as noted on BE page 15 and page 28. This area includes three small patches (the largest at 10 ft x 5 ft) approximately 1.8 miles from the proposed floating geoduck seed nursery system. No eelgrass is known to occur in Spencer Cove. Additionally, it was noted from the literature that native eelgrass *Zostera marina* has not been observed in the extreme southern reaches of Puget Sound, such as Case Inlet (Dowty et al. 2005, Gaeckle et al. 2008).

   b. An intertidal survey completed by ENVIRON on November 13 to 14, 2008 at a -3 ft MLLW tide noted large deposits (59-100%) of drift *Ulva* (BE page 15), but no eelgrass or kelp. It should also be noted that according to the drift cell maps from Ecology (2010), Spencer Cove is a partially enclosed embayment with some convergence zones near the project area (BE page 26). Anecdotally, this convergence zone is noted by an accumulation of drift wood in Spencer Cove (P. Harris, pers. comm., 2010) and drift macroalgae (*Ulva*).

   c. No eelgrass was observed within the footprint of the proposed nursery system, and outside the proposed area for a distance of 100 m north and south during the February 15 (BE page 16) and March 15, 2010 subtidal surveys conducted to document the benthic habitat resources and presence/absence of eelgrass consistent with WDFW protocols for eelgrass delineation. Because no eelgrass or kelp were observed, and available evidence from Ecology and other sources indicate eelgrass in the project area, further delineation of boundaries and densities is neither possible or necessary. The details of the field survey has been submitted to the ACOE in response to their comments to the BE.

3. *In addition, please provide more detail regarding the storage of the old sediments. If they are to be stored in shoreline jurisdiction, the permit should address this aspect.*

   Response: Please see the response to Comment A.5 above.

4. *Any discharge of sediment-laden runoff or other pollutants to waters of the state is in violation of Chapter 90.48 RCW, Water Pollution Control, and WAC 173-201A, Water Quality Standards for Surface Waters of the State of Washington, and is subject to enforcement action.*

   Response: Please see the response to Comment A.4 above.

5. *During construction, all releases of oils, hydraulic fluids, fuels, other petroleum products, paints, solvents, and other deleterious materials must be contained and removed in a manner than will prevent their discharge to waters and soils of the state. The cleanup of spills should take precedence over other work on the site.*

   Response: We concur with this comment, and will include provisions in the final list of conservation measures to note that spill management provisions will follow a pollution prevention plan. All precautions will be taken to prevent incidental and accidental discharge of petroleum products and other contaminants associated with pile driving. An emergency oil spill response kit and absorbent pads will be maintained on site to allow fast response to small oil spills and accidental discharge of hydrocarbon contaminated bilge waters (NMFS 2005).

C. Laura Hendricks, Sierra Club, March 25, 2010

1. *Various general comments listed on page 2 of the Sierra Club document.*

   Response: All comments provided in the first section of comments are related to the intertidal culture and harvest of geoduck clams. These comments are not relevant to the proposed project because they do not address the action being discussed or the area of the proposed action (i.e., subtidal vs. intertidal habitat). If it is determined by the lead agency (Mason County) that any of these comments should be addressed further, then we will be happy to provide details at that time.

2. *The log boom as constructed will re-direct the wave and tidal energy into the Lagoon and Salt Water Wetland. Erosion from this re-directed energy will have an adverse impact o the wetland which was not considered. In addition, the potential for shoreline erosion of Surf Smelt and Sand Lance habitat will be impacted.*

   Response: Please see the response to Comment A.1 and Comment A.3 above.

3. *The raft structures extend 70" (6') below waterline. These structures are a barrier which will re-direct tidal energies, both onto the shoreline as well as increase flow underneath the structures, scouring sand beneath them.*

   Response: Please see the response to Comment A.1 and Comment A.3 above. It should be noted that based on the configuration, and updated information provided, the rafts will not be on the bottom even at extreme low tide. In fact, there will be at least 3.0 feet under the rafts (taking the 54-inch draft of the raft into consideration) at the most extreme low tides. This buffer depth will allow for typical movement sediment. The only structures that would actually interact with the bottom substrate are the pilings. As mentioned in BE page 22, there will be minor levels of accretion based on the added pilings; the log boom will protect the shoreline from erosion, not exacerbate it. Given the location of the structure offshore, there is no interaction with surf smelt or sand lance spawning habitats.

4. *The structures are described as being at the -7 to -13 (MLLW) tidal level (p.8 ENVIRON). If there is a minus tide greater than -1 this will begin placing the structures onto the sediments of Spencer Cove, scouring the sediments (the 6' structure below the rafts). When elevated above the sediments the increase energy from accelerated tidal flow due to the blocking will also disrupt the sediments. Finally, wave action will also create hydraulic pressures beneath the structures preventing growth to take hold.*

   Response: Please see the response to Comment A.1 and Comment A.2 above.

5. *Related to point 3, the structures beneath the rafts will also act as a block to any migrating species of fish, whether Pacific herring or salmon.*

   Response: Based on the new calculations presented above, there would be a 3-ft clearance even at the most extreme low tide (-4.46 ft MLLW). Therefore, the rafts would not be a migration barrier to any

species. Fish that cannot swim under the rafts would be able to go around on either side. As discussed on BE page 25, aquatic species generally migrate along, or adjacent to, shoreline habitat. Because the proposed floating nursery system is 270 feet from the shoreline, it does not project from the shoreline and will not interact with intertidal habitat directly. However, there is potential for interaction with the proposed system and fish. It has been noted by many authors (Weitkamp et al. 1981, Thom et al. 1988, Ward et al. 1994) that nearshore structures present few risks to migrating juvenile Pacific salmon, and may even improve the potential opportunities for foraging. In contrast, behavioral changes of aquatic organisms in relation to overwater structures that extend from the shoreline have been observed (Able et al. 1998, Nightingale and Simenstad 2001). As the rafts will be positioned significantly offshore, away from nearshore shallows where juvenile salmonid migrations are typically observed, there is little potential interaction with migratory behavior patterns of juvenile salmonids, and no adverse impact is expected. Although the rafts will result in shading, they will be positioned offshore, in deeper water than would be utilized significantly by juvenile salmonids or forage fish.

6. *Also related to point 3, it is noted the rafts/log booms will be 15' from the oyster tract boundary. Recorded surveys from the area either exclude this portion of the tidelands (Manke) or noted upland area monuments as being in a slide area and not where they should be and did not include the tideland boundary (Harstine Island Association and Toebbe Clam Farm). As Taylor Shellfish has noted many times, oyster tract boundaries are notoriously inaccurate. Flexibility to move the structure waterward or into deeper water cannot be known without an accurate survey.*

   Response: As noted in the comment, the proposed project is entirely located on tidelands owned by Seattle Shellfish, as surveyed by Holman & Associates (1990). Note that the area has been stable and there has been no slide on the existing property, so all surveyed lines should be representative of the current boundaries. Given the level of clearance between the bottom of the nursery rafts and the subtidal floor even at extreme low tide (3 feet of clearance), there is no need to move the proposed project into deeper water.

7. *As described, the log booms will be attached to the galvanized steel pilings with metal collars. No damping material is noted which will result in the resonating of tubes as the logs rise and fall in the waves. These sounds will adversely impact both the residential area as well as wildlife above and below the water.*

   Response: Please see the response to Comment A.7 above.

8. *ENVIRON describes the blocking of light from these structures as having little impact. This structure is 360' of a double log boom with six 24'by 40' raft/underwater extensions. This area covered takes up far more surface area than any dock and adds to it the underwater structures which will also block light. How enough light is able to pass through the structures as presented is impossible to determine. The galvanized steel tubes will only add to the blocking of light, redirecting little into the shade. While the percentage of space this structure takes up in relation to Spencer Cove overall is small, and even smaller if you want to compare it to all of Puget Sound, the fact is this structure blocks a substantial amount of light which will have an adverse impact on this subtidal area.*

   Response: It should be noted that ENVIRON did not state that the shading effects generated by the proposed floating nursery system would have little impact. Based on review of effects from overwater structures, it was concluded that shading was the most significant factor of this project, and had implications for the physical habitat condition pathway (i.e., migration corridor and potential behavioral changes), water quality pathway (i.e., potential decreased in water temperature), and biological condition pathway (i.e., benthic faunal community indicator and vegetation community indicator). Each of these pathways was discussed in BE section 13, and the results of that discussion appear on BE Table 6 where each indicator mentioned above was identified as a "potential adverse effect". This potential effect is discussed in more detail in response to Comment A.1. and Comment A.2., above.

Please see the response to Comment A.3 above in relation to the percentage of space that the proposed floating nursery system would occupy. The immediate effects of the project action were discussed accordingly in the BE. To consider effects from shading, it is appropriate to evaluate the size of the structure, and the likely influence that it will have on that exact area. When considering hydrology and sediment transport, it is, in contrast, necessary to consider the scope of the larger habitat and the overall influence of this structure in that habitat. It is not appropriate to consider longshore transport without an understanding of the percentage of area that this structure has in relation to the entire area of Spencer Cove.

9. *ENVIRON describes the separation of seed from sediment as using local water and a pump with a screen to catch the geoduck. How this will not result in a discharge of sediments into Spencer Cove is not detailed. We do not see any reference to impacts on water quality and Ecology's certification under the Clean Water Act.*

   Response: Please see the response to Comment A.4 and Comment A.5 above.

10. *It is stated this structure will have little impact on navigation. Recreational users will always seek calm waters. In any south wind Spencer Cove presents a prime location for calm waters. This structure will be an impact on anyone who has sought out these calm waters and will result in the restriction of recreation and navigation, both citizen rights under the Public Trust Doctrine.*

    Response: Please see the response to Comment A.10 above.

11. *The associated activities with this structure include mooring of boats. There is nothing to prevent this from becoming a small marina for Seattle Shellfish to use for its fleet of boats and barges.*

    Response: Given the understanding of the project design, there is no feasible way that this project could become a marina. Inclusion of mooring as a project activity allows Seattle Shellfish the opportunity to consolidate its mooring activities in Spencer Cove, which will reduce benthic impacts. However, mooring along the log boom will only be used for convenience of accessing the floating nursery pool. Boat traffic will not change within Spencer Cove because the floating nursery system would only change the location from the intertidal to the subtidal, not the amount of activity in the cove.

12. *The ENVIRON report on page 16 lacks an accurate description of what is present, noting that it will be provided in Appendix D. This was not included in the public notice information and is presumably still not submitted. Its significance in making decisions cannot be understated. Without knowing what the subtidal habitat is, how can a decision on what impacts will occur be made?*

    Response: It was not possible to submit the field analysis at the time of the original submittal as it had yet to be completed. The details of the field survey has been submitted to the ACOE in response to their comments to the BE. While specifics from that survey were not reported in the original submittal (i.e., enumeration of epibenthic and benthic infaunal organisms and location and relative abundance of macroalgae), the general trends were noted on BE page 16. It should also be noted that there is a general consensus of information that vegetation in Spencer Cove is primarily composed of *Ulva* and *Gracilaria*, while eelgrass is not known to occur closer than 1.8 miles from the proposed project area. Because the discussion of shading effects of the project focused on eelgrass studies, the effects reported in the BE were appropriately conservative. Please see the response to Comment B.2 for a more detailed discussion.

D. Mary Lou Peterson, neighbor, March 22, 2010

1. *[D]evelopment will diminish my property's views. Moreover, I have not received notice of how Seattle Shellfish or Mason County is planning to mitigate the substantial damage to my property's view (and its value) that will surely occur if this proposed change is approved.*

Response: The visual impacts from the proposed floating nursery represent an overall reduction, in terms of footprint, from the impacts of the intertidal nursery system previously in place. In addition, the proposed floating nursery system will allow the potential for consolidation of multiple moored watercraft into a single location, thus reducing the visual "footprint" of Seattle Shellfish's activities.

With regard to impacts on property values, the proposed floating nursery system will be located on an oyster tract that is owned by Seattle Shellfish. The language of the deed conveying this tract from the State makes clear that the use of the tidelands for commercial shellfish is intended. Indeed, the deed makes clear that if the tidelands are used for purposes inconsistent with shellfish production, ownership of the tidelands reverts back to the state. The deed transferring these tidelands is on file in the County records; adjacent property owners should therefore be on notice that shellfish farming activities are being undertaken on this property. Indeed, it appears that the commenter purchased her property well after Seattle Shellfish first put its intertidal seed nursery into operation. Finally, the commenter offers no support for her statement that the presence of the proposed seed nursery will result in a reduction in her property value.

2. *This change would wreak very real and substantial financial damage to the property, and thus to me and my resources.*

Response: Please see response to comment D.1., above

3. *The nursery system will negatively impact navigation of recreational water craft (kayaks, rowboats, fishing boats) at high tides.*

Response: Please see response to comment A.10., above.

4. *The new system will pollute the area with extra noise, not regulated to conform to certain hours.*

Response: According to Mason County Code (9.36.040), the floating nursery system would be classified as a Class B Environmental Designation for Noise Abatement (EDNA), while any residential property would be classified as a Class A EDNA. Based on these classifications, the maximum permissible sound levels would be 57 dBA (MCC 9.36.060), not to be exceeded by more than:

a. 5 dBA for a total of 15 minutes in any one-hour period;

b. 10 dBA for a total of 5 minutes in any one-hour period; or

c. 15 dBA for a total of 1.5 minutes in any one-hour period.

Additionally, the following exemptions are listed in the County Code (9.36.080-9.36.100):

a. During the hours of 7 am and 10 pm, sounds created by the installation or repair of essential utility services.

b. Sounds originating from temporary construction sites as a result of construction activity.

c. Sounds created by warning devices not operating continuously for more than 5 minutes, or bells, chimes, and carillons.

d. Sounds created by watercraft; provided that such watercraft shall comply with Mason County Ord. 83-88 and Sections 9.36.160 through 9.36.180.

The maximum allowable noise limits for watercraft in Mason County at any hour of the day or night is 74 dBA when measured at the shoreline or anywhere within a receiving property. When measured at a distance of 50 feet from the closest point of the watercraft's hull, the maximum noise limits are:

a. 98 dBA for watercraft and engines manufactured before January 1, 1980;

b. 96 dBA for watercraft and engines manufactured after January 1, 1980; and

c. 94 dBA for watercraft and engines manufactured after January 1, 1984.

The principal source of noise generated from Seattle Shellfish nursery operations would be during the sorting of geoduck seed from the sand in the nursery trays. Pumps will be used to fill recovery bins (fish totes) in sorting the geoduck seed from the sediment (see response to Comment A.5 for this entire process). The totes that will be used in the sorting process hold approximately 235 gallons of water and the pump functions at 134 gallons/minute. Therefore, the pumps will operate only during the time necessary to fill the bins with water – approximately two minutes per bin.

The use of small boat motors would generate noise as well, but only when running; when boats are moored at the rafts the motors would be turned off. Because the seed will be suspended in rafts, Seattle Shellfish will have access to the rafts during normal working hours every day, and access will not be restricted by tidal stage. Thus, use of the raft system will alleviate the need for pump operations outside of normal working hours, as occasionally occurred in prior intertidal nursery operations. Use of the raft system also moves the noise source further away from shore from previous operations and the subject's property by several hundred feet. These measures greatly diminish audible noise such that the noise generated will comply with criteria of the county.

5. *The new system will add light pollution to what is currently a scenic area in its natural setting.*

Response: Lighting provided will meet the minimum required to meet US Coast Guard requirements. Please also see response to Comment A.10 above.

6. *The new system will increase commercial watercraft to a residential neighborhood and it seems likely there would be noise from persons working on the project.*

Response: The proposed nursery system will not result in any increase in watercraft use, or any increase in number of employees, from the intertidal nursery system previously in use at the site. As such, noise from watercraft associated with Seattle Shellfish operations will not change over the current baseline. Noise from operations was discussed above in response D-4.

7. *The proposed system may attract more clam predators to the area. If the predators cannot access those clams, the predators may attack the clam beds of the local neighborhood.*

Response: There is no evidence that the project would attract increased clam predators to Spencer Cove. Crabs are benthic dwellers and will generally not have access to a suspended floating nursery structure. This differs from past operations, where pools were maintained on the substrate, providing some benthic habitat structure and seed source that may have been attractive to crabs, in spite of the fact that the pools were screened to prevent predation. The proposed operations will not increase the total biomass of geoduck seed nursed, but will move it further offshore in suspended trays inaccessible to crabs. Given these factors, it is difficult to envision how the presence of the proposed floating nursery would result in an increase in clam predators in the area.

8. *If there are "leaks" in the system, there may be an unnaturally high population of goeyducks [sic] in the area.*

Response: The geoduck seed that will be stored on the floating nursery system is a valuable commercial commodity. Seattle Shellfish will take every precaution to ensure that geoduck seed is not released from the nursery system, as it is in their significant financial interest to ensure such leaks do not occur.

9. *If the system uses chemicals to keep the clam seed healthy, those chemicals will prevent my property from being "organic" through the leaching process.*

   Response: Seattle Shellfish does not propose to use any chemicals to keep the geoduck seed healthy.

10. *Possibly, the system will have such a high and dense population of clams that disease or other natural problems will develop. Any problems at this industrial site will mean problems for all the shoreline properties in the area.*

    Response: Geoduck seed are screened for recognized shellfish pathogens by a qualified shellfish pathologist certified by the American Fisheries Society prior to sale from the hatchery. Seed transfers are regulated and approved by the WDFW. At nursery sites, seed are maintained at densities within the trays that ensure health and vigorous growth is maintained. There is no evidence of geoduck seed maintained at Seattle Shellfish, or other nurseries for that matter, serving as a source of disease that has affected other natural shellfish stocks.

References

Albertson, S.L., J. Bos, G. Pelletier, and M. Roberts. 2007. Estuarine flow in the South Basin of Puget Sound and its effects on near-bottom dissolved oxygen. Washington State Department of Ecology, Environmental Assessment Program, Publication No. 07-03-033. Olympia, Washington.

Andersson, M.H., M. Berggren, D. Wilhelmsson, and M.C. Öhman. 2009. Epibenthic colonization of concrete and steel pilings in a cold-temperate embayment: a field experiment. Helgoland Marine Research. 63(3): 1438-3888.

Burdick, D.M. and F.T. Short. 1999. The effects of boat docks on eelgrass beds in coastal waters of Massachusetts. Environmental Management. 23(2): 231-40.

Delta In-channel Work Group. 2006. Demonstration project: Protection and enhancement of delta in-channel islands. Final Monitoring Report. CALFED Project #2001-E200 and Amendment Contract #01-N13-ERP Phase II.

Dowty, P., B. Reeves, H. Berry, S. Wyllie-Echeverria, T. Mumford, A. Sewell, P. Milos and R. Wright. 2005. Puget Sound submerged vegetation monitoring project: 2003-2004 monitoring report. Washington Department of Natural Resources/PSAMP, Olympia, Washington. 95 pp.

Ecology (Washington State Department of Ecology). 2010. Washington Coastal Atlas. Data Downloaded: February 18, 2010. Website: http://www.ecy.wa.gov/programs/sea/sma/atlas_home.html

European Commission. 2005. SEAFLOW – Pilot project for the exploitation of marine currents. Partners IT Power, Seacore, Gesamthochschule Kassel, and Jahnel-Kesterman. Contract JOR3-CT98-0202.

Gaeckle, J., P. Dowty, B. Reeves, H. Berry, S. Wyllie-Echeverria, and T. Mumford. 2008. Puget Sound Submerged Vegetation Monitoring Project 2006-2007 Monitoring Report. Puget Sound Assessment and Monitoring Program. Washington State Department of Natural Resources. Olympia, Washington. 95 pp.

Holman & Associates. 1990. Toebbe Clam farm survey. Job Number J90-51. June 26, 1990.

King County. 2001. Chapter 3: Features of Puget Sound region: Oceanography and physical processes. *In*: Reconnaissance assessment of the state of the nearshore ecosystem: Eastern shore of Central Puget Sound, including Vashon and Maury Islands (WRIAs 8 and 9). DE-AC06-76RLO 1830.

Kozloff, E.N. 1996. Seashore life of the Northern Pacific Coast: An illustrated guide to Northern California, Oregon, Washington, and British Columbia, fourth edition. University of Washington Press. Seattle, Washington. 370 pp.

Margheritini, L., L. Martinelli, A. Lamberti and P. Frigaard. 2006. Erosione indotta da onde e correnti di marea attorno a pali di grande diametro. Convegni di Idraulica e Construzioni Idrauliche, Rome, September 2006

May, R.W.P. and M. Escarameia. 2002. Local scour around structures in tidal flows. First International Conference on Scour Foundations, Texas A&M University.

Mumford, T.F. 2007. Kelp and eelgrass in Puget Sound. Washington Department of Natural Resources. Olympia, Washington.

Nightingale, B. and C. Simenstad. 2001. Overwater structures: Marine issues. Washington State Departments of Fish and Wildlife, Ecology, and Transportation. Olympia, Washington.

NMFS (National Marine Fisheries Service). 2005. POA-1985-285-N, Farragut Bay. Letter to Colonel Gallagher from Robert Macum. December 19, 2005.

Ratte, L. and E.O. Salo. 1985. Under-pier ecology of juvenile Pacific salmon in Commencement Bay, FRI-UW-8508. UW Fisheries Research Institute. Seattle, Washington.

Ricketts, E.F. and J. Calvin. 1968. Between Pacific tides, fourth edition. Revised by J.W. Hedpeth. Stanford University Press, Stanford, California. 614 pp.

Stick, K.C. and A. Lindquist. 2009. 2008 Washington State herring stock status report. Washington Department of Fish and Wildlife Fish Program. Seattle, Washington. FPA 09-05.

Stick, K. C. 2005. 2004 Washington State herring stock status report. Washington Department of Fish and Wildlife Fish Program. Seattle, Washington.

Thom, R.M., C.A. Simenstad, J.R. Cordell, and E.O Salo. 1988. Fisheries mitigation plan for expansion of moorage at Blaine Marina, FRI-UW-8817. Fish. Res. Inst. University of Washington. Seattle, Washington.

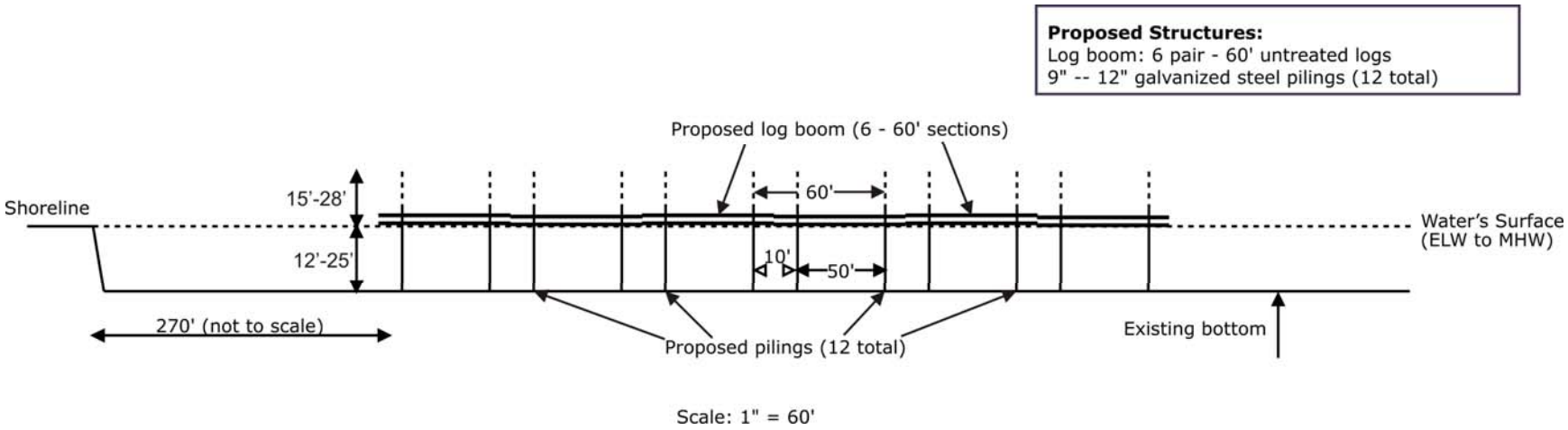
Vasquez, J.A. and B.W. Walsh. 2009. CFD simulation of local scour in complex piers under tidal flow. Water Engineering for a Sustainable Environment. International Association of Hydraulic Engineering & Research (IAHR). ISBN 978-94-90365-01-1.

Ward, D.L., A.A. Nigro, R.A. Farr and C.J. Knutsen. 1994. Influence of waterway development on migrational characteristics of juvenile salmonids in the Lower Willamette River, Oregon. North American Journal of Fisheries Management. 14: 362-371.

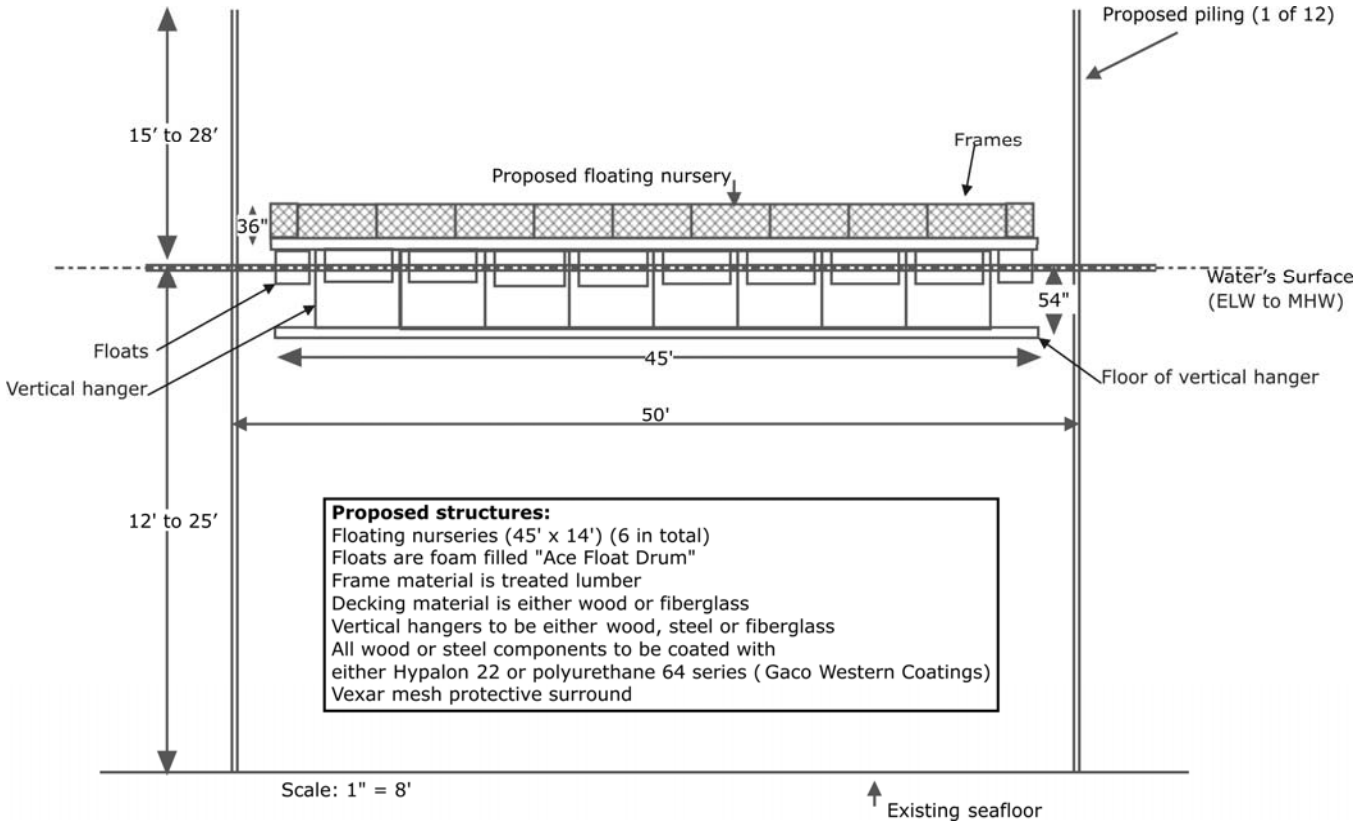
Weitkamp, D.E., E. Gullekson, and T.H. Schadt. 1981. Shilshole Bay fisheries resources, spring 1981. Report by Parametrix, Inc. to Port of Seattle. Seattle, Washington. 15 pages.

WRP. 1999. Design and construction of docks to minimize seagrass impacts. WRP Technical Note VN-RS-3.1.

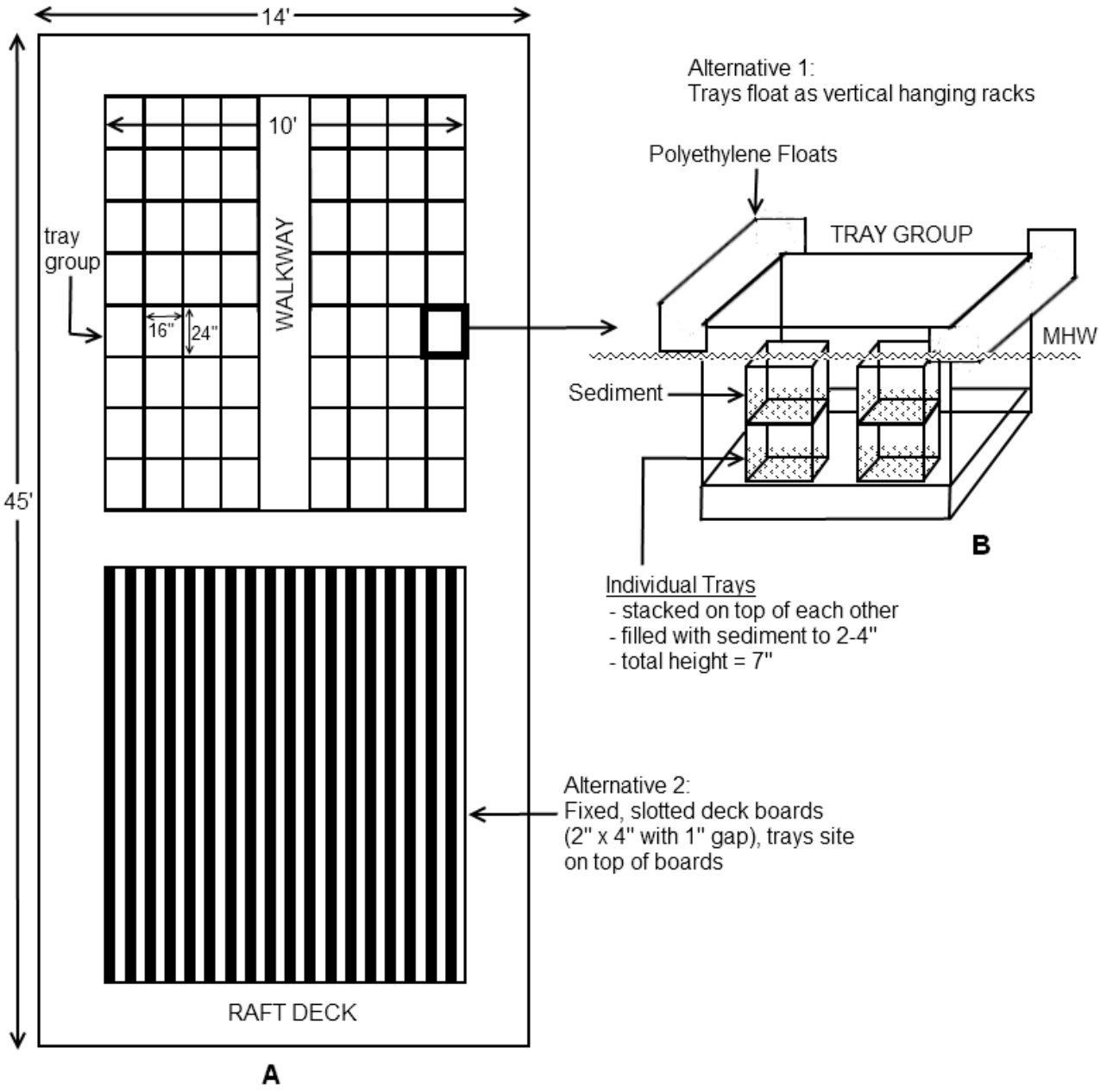
Project Drawings (BE Figures 2-4)



BE Figure 2. Profile view of the proposed log boom structure in Spencer Cove (Harstine Island), Case Inlet, south Puget Sound, Washington.
Source: C. Carlson 2010, Seattle Shellfish, LLC, modified by ENVIRON International Corporation
Note: The depth range provided is for the log boom structure only. The range is based on depth measurements from field survey and assumed height of steel piling (40'). Actual height of piling may vary depending on site conditions during pile driving.
ELW = extreme low water; MHW = mean high water



BE Figure 3. Profile view of the proposed floating nursery rafts in Spencer Cove (Harstine Island), Case Inlet, south Puget Sound, Washington.
Source: C. Carlson 2010, Seattle Shellfish, LLC, modified by ENVIRON International Corporation



BE Figure 4. Plan view (A) and individual tray group (B) perspective of the proposed floating nursery rafts and plastic trays in Spencer Cove (Harstine Island), Case Inlet, south Puget Sound, Washington.
Note: figure not to scale