

DESIGN AND COMPREHENSIVE PLANNING
OF AN ALASKAN OPTIMAL INTERMODAL
FREIGHT CONTAINER BASED SHELLFISH
SETTING AND PRE-NURSERY SEED
BOOSTING SYSTEM.

Provan Crump, Pro Aquaculture Solutions and Eric Wyatt, Blue Starr
Oyster Co.

Disclaimer

While the authors have taken care in the preparation of the information contained in this report and believe it to be accurate, they give no warranty, expressed or implied, as to the completeness of the information provided. The authors advise that interested parties should view the aquaculture opportunity of eastern oyster hatchery production according to their own particular circumstances and ultimately make the individual decisions that are in their own best interests.

Materials in this work are largely forward-looking and provide expectation or forecasts of future events, rather than relating strictly to historical or current facts. Forward-looking statements express an opinion of potential. Since many factors determine actual results, there are no guarantees that results similar to those projected will be achieved. All forward looking statements are based on information available at the time of the report's production. The authors assume no obligation to update after this time.

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

Introduction

Due to cold water conditions in Alaska and a limited growing season, extra-large sized oyster seed from hatcheries perform significantly better than smaller. Having larger seed can reduce the growth time to market size by many months. Smaller sized oyster seed performs well in the Pacific Northwest and demand for these sizes drives the production goals of hatcheries in WA and HI, which are the seed sources for AK. For decades, Alaskan farmers have attempted to source 3mm and larger seed, but have had limited access. Another factor for Alaskan farmers is having larger seed available at the perfect time of year to optimize the limited growing season. This proposal focuses on the need to deliver significant quantities of locally conditioned, large sized oyster seed to instate nurseries at the optimal time.

Development of a solution to this issue is a direct continuation of the oyster hatchery work that has been ongoing at the OceansAlaska facility in Ketchikan. Container based pre-nurseries can be configured to several sizes and capabilities, however all are based on the cultivation of micro-algae for feeding oyster seed (or other juvenile shellfish), water filtration and heating of seawater. All components of such a system can be consolidated, for shipping cost savings, into one of the shipping containers used as a structure, prior to barge shipping to Alaska. Container based systems can be deployed regionally, as needed, and can be matched to local organizational and labor capabilities. Detailed plans and standardized operating procedures can be slightly modified, as needed, for each different locations and organizational needs. OceansAlaska will contract with Pro Aquaculture Solutions of Prince Rupert and Blue Starr Oyster Co. of Tokean to complete all steps of the proposal. Both companies have a strong history of working with OceansAlaska on hatchery solutions and have intimate knowledge of conditions in Alaska. In person delivery of results of the project will be presented to the Metlakatla High School science program as part of an ongoing outreach program. Site evaluations will be conducted on Prince of Wales Island and Metlakatla. The container based prenursery/setting facility detailed below consists of 4 of 40-foot-high cube containers. The containers will be insulated and walled with doors and partitions where needed by affordable containers. The plan would be to have the containers prepared and then moved to a freight forwarder to have all the equipment loaded in them for shipping to the site in Alaska. The containers will retain structural integrity which allows them to be shipped in a normal manner. Two of the containers will be for algae production, one for setting/nursery production and the last for filtration and heating (see appendix 1. for detailed design drawings).

Production Plan

Strategy

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

The strategy is to have the facility operate from January to May to produce +4mm screened seed. The algae production utilizes 48 of 500L continuous harvest algae bags. Full production of algae extends from January to May. The facility will filter and heat saltwater to optimize growth rates and will utilize ready to set pacific oyster larvae from a certified shellfish hatchery. Larvae are set using epinephrine and placed into the Weller tanks to raise to 1mm. When the oyster seed reaches 1mm screen they are moved to the bottle system to rear until they are +4mm screened. At this point they are ready to go to a FLUPSY. The aim is to produce at least 2.7 million +4mm screened oyster seed by end of May/early June. This will optimize further growth in the FLUPSY with the aim of having most of the oyster seed to plus 12mm screen size by September of the same year. The advantage of this plan is the reduction the production time to market size. Multiple nursery runs could be conducted to double overall production if required.



Farm ready large Pacific oyster seed

Specifications

Facility: Containerized Setting and Prenursery

The containerized setting and prenursery facility is made up of 4 x 40ft high cube shipping containers that have been insulated and lined. Standard doors are framed inside of the original entrance, behind the container doors. All equipment for the facility will be loaded into the containers in Washington state then subsequently shipped to the Alaskan location for fit out. The containers will be outfitted to serve the different areas of oyster seed production.

- One container will be outfitted for water filtration, water heating, water storage and maintenance/storage area.
- Two containers will be configured for micro-algae production. One will have the algae lab and 19 x 500L continuous harvest algae bags. Another will have 29 x 500L algae bags.
- One additional container will be outfitted for oyster seed production, with 3 Weller tank systems (and a total of 9 Weller bins) and a 60 bottle upwell system.

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

All the containers are temperature controlled using heat pump mini-split systems. Figure 1. Shows the layout of the 4 containers. For full plans see Appendix 1.

Water Intake System

The intake system will be made up of a dual line system to enable lines to fallow to decrease the effects of fouling on the lines. The intakes are screened to 5mm to reduce large particles reaching the pump.

Pumping, Filtration, Water Heating and Heat Recapture

One container, “Mechanical”, is utilized for filtration, water heating and heat recapture. The container is temperature controlled to decrease heat loss after the water is heated for nursery production. The main water pump is situated on a floating dock; this reduced the effects of the suction head changes with tidal range. The saltwater is pumped to the “Mechanical” container via HPDE butt fused piping. The pumped water then goes through a primary 25um drum filter. The drum filter has a reservoir split in half. One side goes through secondary filtration for nursery/algae use and the other side goes to the source side (pulling heat out of) of the heat pump used for heating water. The nursery/algae water goes through secondary filtration 10um, 5um, 1um and UV. The water then goes through a heat exchanger that uses the heated effluent water from the nursery that is stored in an insulated sump to preheat the cold incoming water. The preheated water then goes to an on-demand reservoir. Water is circulated through the water heating heat pump in a loop back into the reservoir. A percentage of water directly after the heat pump is used for oyster seed production and algae production. The filtered and heated water system supplies contamination free heated water to optimally raise algae and oyster seed when conditions are too cold naturally (out of season rearing). This enables the nursery to have oyster seed ready when natural conditions become favorable for oyster growth.

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL
FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED
BOOSTING SYSTEM.

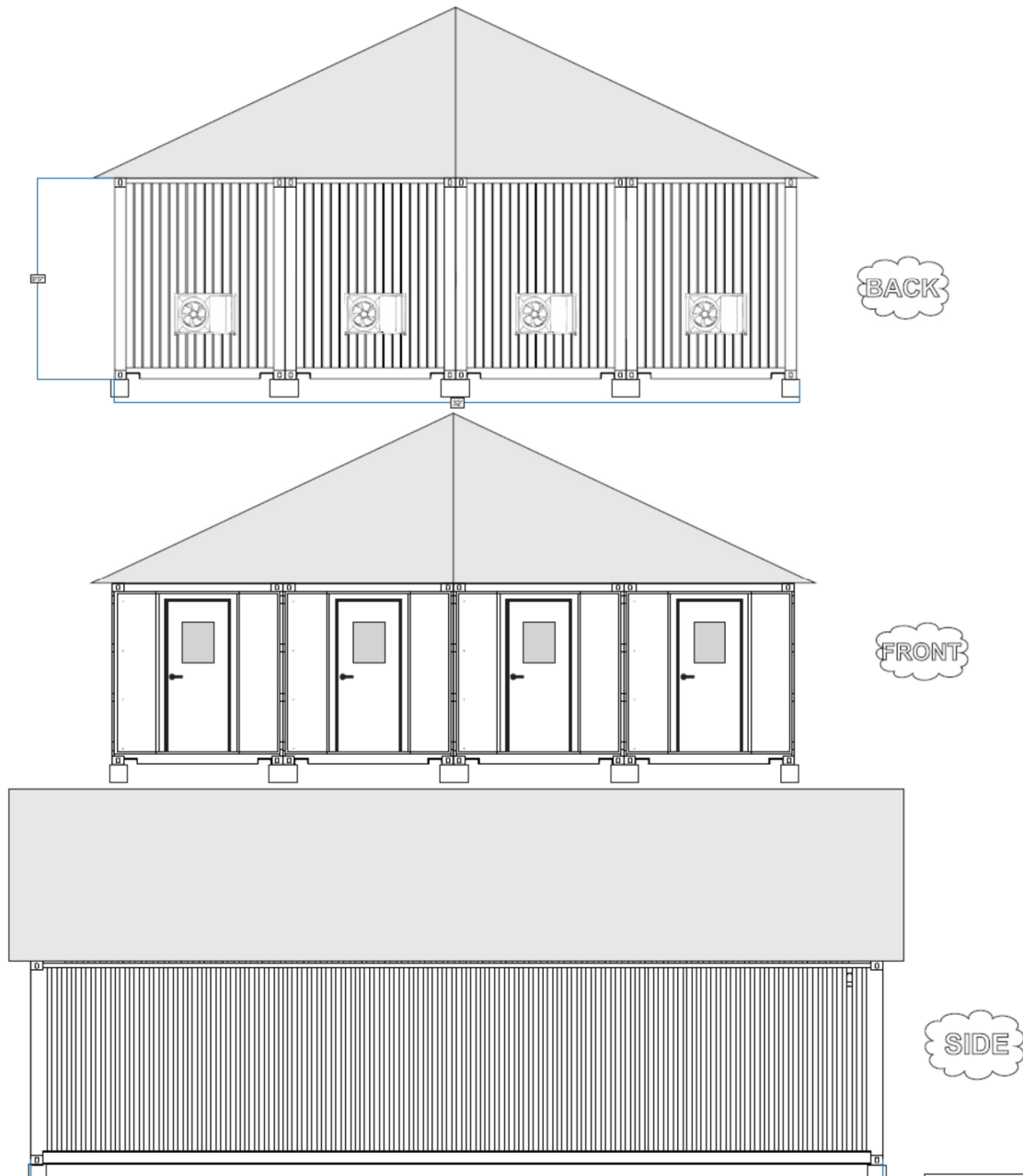


Figure 1. Layout of the 4 containers system.

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

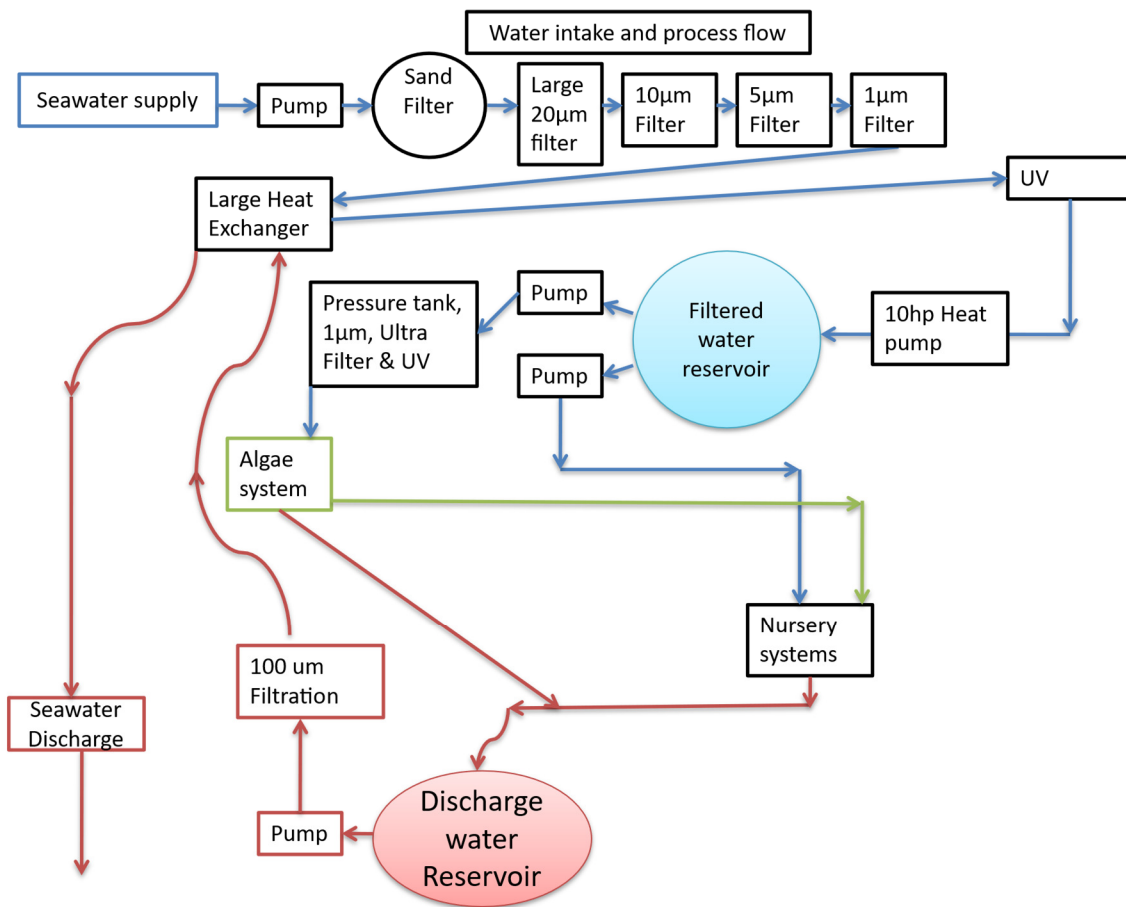


Figure 2. Water flow through the facility

Algae Production

The algae production will utilize 2 of the containers. One will have an algae lab and 19 x 500L algae bags, the second will have 29 x 500L algae bags. The containers are temperature controlled using heat pump split systems for optimal algae growth. Lighting for algae production is installed on the walls of the container. Algae production water is ultra filtered to 0.03µm to make sure there is no contamination reaching the bag system.

Clean starter cultures are ordered from the national micro-algae repository at the beginning of the season and ramped up in the

Algae lab in early January. A library of algae species will be maintained ensuring back up if anything crashes. The 48 x 500L algae bag system allows for continuous inputs of nutrients and water and harvest of algae at a predictable rate. The total number of bags in the system is ramped up by starting new bags and then back stating bags from these. This allows for rapid ramp up to full production. Algae bag production is at full production by February. Five bags per week are replaced to make sure algae production is maintained. The highest algae use will occur when the oyster seed is in the bottle system. This occurs in April/May, so it is important to ensure full algae production is maintained during this time.

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL
FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED
BOOSTING SYSTEM.

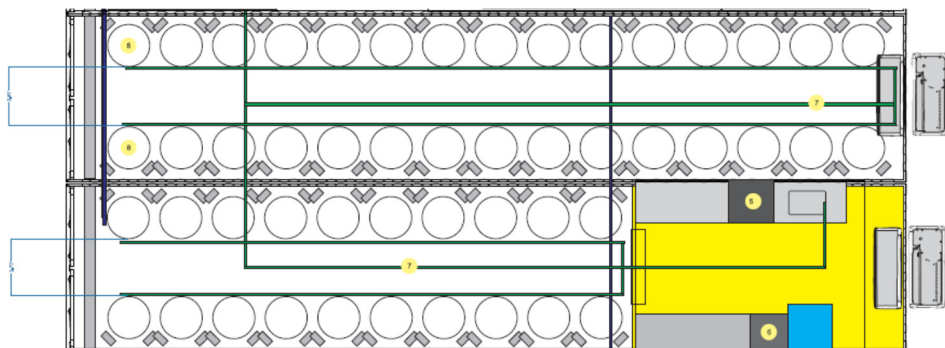


Figure 3. Algae Production containers with Lab. Top View



Micro-algae bag system

Nursery Setting Eyed Larvae to 1mm Oyster Seed

The nursery container has 2 x 3 bin Weller tanks and a 60-bottle upwelling system. The container is supplied with filtered heated saltwater. The algae harvest is automatically fed to the nursery systems. The container is temperature controlled by a heat pump split system. Eyed oyster Larvae are ordered from Hawaiian Shellfish to arrive in early February. 18 million larvae

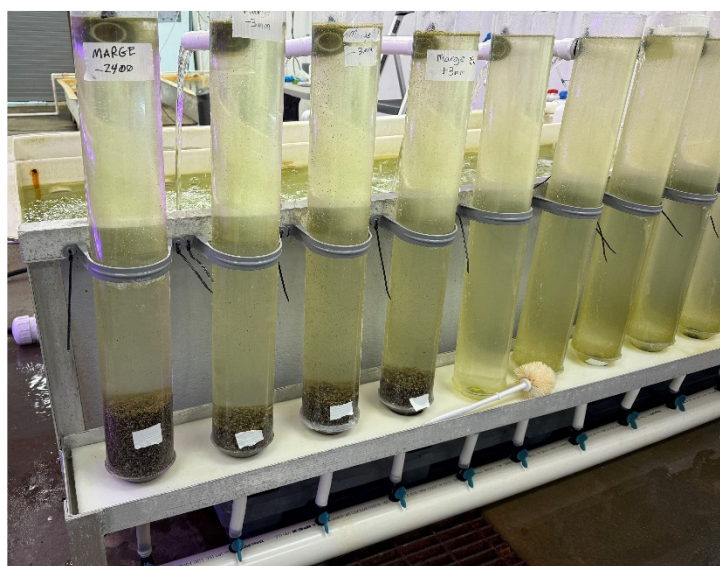
DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

are required for production needs. The eyed oyster larvae are epinephrine treated and stocked to the downwell tanks at 2 million per bin. The Weller tanks are fed continuous inputs of algae and water providing optimum environment for oyster larvae settlement. Setting bins are cleaned daily by draining the downwelling tanks and rinsing the setting larvae gently with a saltwater hose. Tanks are sprayed out with a freshwater hose and are always refilled promptly and are set with a feeding of 200k cells per ml. Five to seven days post settlement; the direction of the water flow through the setting bins is reversed from downwelling to upwelling through the bins. Upwelling bins are allowed to carry on growing for about seven more days and maintained with flow through inputs of water and algae.

Tanks and bins continue to be cleaned daily and feeding is maintained at 200k cells per ml. About 14 days post settlement, the oyster seed is screened on a 500 μ m screen and transferred to clean upwelling bins at a stocking density of 500/ml per bin. Water and algae inputs into upwelling tanks are increased to keep pace with seed growth and food consumption. After one week of growth in upwellers, the previously 500 μ m screened seed is graded on a 1 mm screen and transferred to the bottle system.

Bottle System

The bottle system is in the nursery container. The bottles work by upwelling the oyster seed in a fluidized state. This allows for even feed and oxygen levels. Bottles are a very space efficient way to rear large numbers of oyster seed. The seed in the bottle system are screened weekly to separate sizes allowing for more homogenized growth. The oyster seed grows in a bell curve, so the oyster seed will reach +4mm over a period. It is recommended that as seed reached +4mm they are shipped to the FLUPSY. This opens up room and more algae availability for feeding the remaining oyster seed.



Oyster seed upwelling bottle system

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

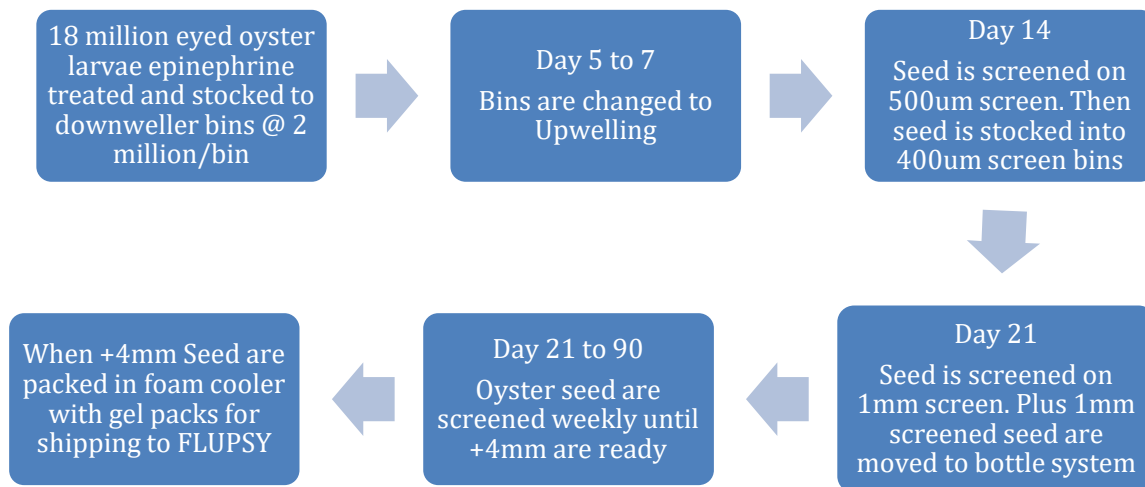


Figure 4. Production flow through the nursery

Back Up Power Supply

Due to potential intermittent power supply and the reliance on water for the health of the oyster seed a backup 40KW diesel generator is included in the design. This will ensure no halt in production due to electrical grid power outages.

Infrastructure Requirements

1. Electrical
 - The best would be mains electricity. The preferred power would be 440-volt 3 phase power to make all more efficient. If 3 phase is not available then a 3-phase converter can be used for certain equipment.
 - The total load for the facility is calculated to be 38.24 KW per hour at maximum load.
2. Freshwater
 - Hatcheries use large amounts of freshwater for cleaning purposes.
 - It is best to have mains freshwater, but if it is not available freshwater can be collected from the hatchery building and stored in water tanks.
 - If water collection is required, then an additional area would be required to winterize the system.
3. Sewage
 - It would be best to have a sewage connection, but there are other options if the site does not enable this.
4. Access to saltwater

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

- Having as short a run from the intake system to the hatchery alleviates many issues and can significantly reduce power usage.
- 5. Human resources
 - Having a location that is accessible for staff.

Production Plan

Production Timeline

The cycle starts with algae production ramp up in January. The algae production is held at full production until end of May/early June. In February oyster larvae arrive, and nursery production starts. The oyster seed is grown until it reaches +4mm screened. At this point the +4mm seed is shipped to the FLUPSY. When all oyster seeds are shipped the systems are shut down and deep cleaned then drained of all water. The facility is then dried out until production starts in the following January. (See figure 1.)

	No v	De c	Ja n	Fe b	Ma r	Ap r	Ma y	Ju n	Ju l	Au g	Se p	Oc t
Full Algae Production												
Nursery Production Run												
Dry Out												

* It is possible to do 2 nursery runs

Figure 5. Production timeline

Production Calculations

The hatchery production capacities are calculated from the aim of 2.7 million 4mm screened oyster seed. The highest feeding pressure comes from the 4mm oyster seed in the bottle system. This is what the water heating requirements, water usage requirements and production will be based on.

Algae Production

The hatchery will utilize a 48 x 500L continuous harvest algae bag system to produce the algae needs of the hatchery. The system uses ultra filtration for the incoming water to filter down to 0.03um. This provides high quality algae for the facility. The bag system allows for production of algae with low labor requirements.

Algae production is a key part of a hatchery successfully operating and defines the production capabilities.

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

	Tank Size (L)	Tanks	Harvest %	Total Algae Harvest (L)	Algae Cells/ml	Total Cells/day
500L Algae Bags	500	48	30%	7,200	4,000,000	2.88E+13

*The total algae cells available for feeding is 2.88+13 cells per day in 7,200 liters.

Figure 6. Algae production

Container Prenursery/Setting Facility Water Use

The water usage is calculated from the tank sizes and exchanges per day required for rearing the oyster seed.

Areas	Tank Size L	Amount	exchanges/day	water/day (L)
Seed Weller	3000.0	3	5	45,000
Bottle System	2000.0	1	40	80,000
Bags	500.0	48	0.30	7,200
Total water/day				132,200
LPM Max				91.8
GPM Max				24.3

Figure 7. Maximum water usage

This table provides the maximum water usage for the container based prenursery/setting system which is 91.8 LPM. This figure is used to size the intake system, primary and secondary filtration and the heating system for the hatchery.

Prenursery/Setting Facility Production Calculations

The production calculations are based off expected set rate, feeding ability and the stocking ability of the systems.

Setting (downwell)	Bins	Larvae/bin	Total Larvae to set	Set rate	Plus 500um Seed
	9	2,000,000	18,000,000	30%	5,400,000
* Setting to 500um seed takes around 2 weeks					
Bottles	Stocking at 1mm	Survival to 4mm	Harvest 4 mm	Seed/Bottle at 4mm	Total Bottles needed
	5,400,000	50%	2,700,000	45,000	60
* Each bottle can hold 45,000 4mm seed. 2.7million seed would take 60 bottles					

The 48 x 500L algae bag system teamed with the 60-bottle system can produce an estimated around 2.7 million +4mm screened oyster seed.

Figure 8. Production Calculations

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

Conclusion

The containerized prenursery/setting facility was designed around the production calculations that provided the water usage, filtration sizing and water heating requirements to produce the 2.7 million +4mm oyster seed. Appendix 1. Is the comprehensive design of the facility with all components required for the facility. The Business Plan document outlines the capital and operating cost for the facility.

Business Plan

Capital Costs

- The intermodal freight container-based shellfish setting and pre-nursery seed boosting system design is made up of 4 x 40ft High cube containers with all equipment required to operate the nursery facility.
- The intended use of the hatchery is to produce 2.7 million +4mm oyster seed during a 5-month season.
- The total capital cost of equipment for the hatchery is estimated to cost **\$716,740.67**

Table 1 Estimated Capital Costs Summarized

Area	Summery
Containers	\$85,000.00
Intake System	\$96,239.23
Primary Filtration	\$28,075.00
Water Delivery to Hatchery	\$10,800.00
Secondary Filtration	\$28,391.90
Water Heating	\$104,061.63
Alage Filtration	\$13,166.24
Algae Lab	\$38,641.00
Nursery (Setting Tanks)	\$92,911.16
Algae Production 50 x 500L Bags	\$85,515.53
Heat recapture	\$23,080.74
Maintence Area	\$7,500.00
Generator (300KW)	\$38,200.00
Sub Total	\$651,582.43
Tax	\$65,158.24
Total	\$716,740.67
25% Contingency	\$895,925.84

The estimated capital cost for the hatchery was calculated from a master equipment list with all components for the hatchery being priced from vendors.

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

Operating Costs

- The operating costs of the container-based shellfish setting and pre-nursery seed boosting system are based on experience in running commercial hatcheries.
- It is estimated 2 full-time aquaculture technicians, and 1 part time maintenance staff member would be required to operate the facility for the 5-month season. The total includes taxes and benefits.
- The water heating system for the hatchery is a heat pump system that uses electricity and is extremely energy efficient.
- Property taxes are based on estimated property value and the property tax rate on Prince of Wales Island.
- The estimated annual operating cost is **\$189,980.81**
- Summarized figures can be seen in Table 3.

Table 3. Summarized Annual Operating Costs

Area	Annual Cost
Labour (3 people)	\$122,850.00
Materials & Supplies	\$7,500.00
Power	\$48,514.17
Utilities	\$596.64
Property Tax	\$5,520.00
Payroll/Accounting	\$5,000.00
Total Costs	\$189,980.81

Revenue

- The facility production was designed around the volume of algae that can be produced in the 48 x 500L bag system.
- The other limiting factor is the short shellfish hatchery season (oyster farms want seed in May/June). This limits the amount of runs the facility can do. With careful planning, there is a potential to achieve 2 production runs per season.
- The facility is able to produce 2.7 million +4mm seed which is currently valued at **\$67,500**. See table 4.
- The main value of the +4mm Oyster seed is having a reliable supply of +4mm seed for on-growing to market size. If market oysters were sold for \$8/dozen and 75% of the +4mm seed grew to market size they would be worth \$1,320,000.
- The +4mm seed has a great potential to reduce the time it takes an oyster to be grow to market size which would be a major cost saving to farmers.

**DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL
FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED
BOOSTING SYSTEM.**

Table 4. Revenue From 4mm Seed Sales

Areas	Amounts
Algae Production Cells/Day	2.88E+13
Algae Cells / Bottle / Day	4.17E+11
Total Bottles	60
+4mm Seed / Bottle	45,000
Total Seed	2,700,000
+4mm seed Price Per Million	\$25,000.00
Total	\$67,500

Table 5. Planned Annual Production Timeline

	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Full Algae Production												
Nursery Production Run												
Dry Out												

* It is possible to do 2 nursery runs

Conclusion

The containerized setting and prenursery system offer the ability to set up the facility in remote locations with the containers being shipped with all the equipment required to set up the facility. The cost of the containers and equipment required is as accurate as possible. The capital costs consider the set-up of the facility in the location that is chosen. The operating costs are based on experience of the needs of a facility of this size. All calculations are conservative.

Other scenarios, such as harvesting 3mm screen seed if local temperature and wild algae conditions are conducive, or a variety of optional paths could increase overall production and reduce production costs. Improvements in downstream nursery systems, which are underway, would also increase the production potential of this facility.

Possible production costs of \$190,000 with a resulting potential revenue of \$67,500 (or even double that of \$150,000) show that operation of the facility (or any similar facility in Alaska) is not a highly profitable business. Shellfish hatcheries and nurseries are essential to the production of oysters, but operate on thin to negative margins.

Appendix 1.

Design And Comprehensive Planning
Of An Alaskan Optimized Intermodal
Freight Container Based Shellfish
Setting And Pre-nursery
Seed Boosting System.

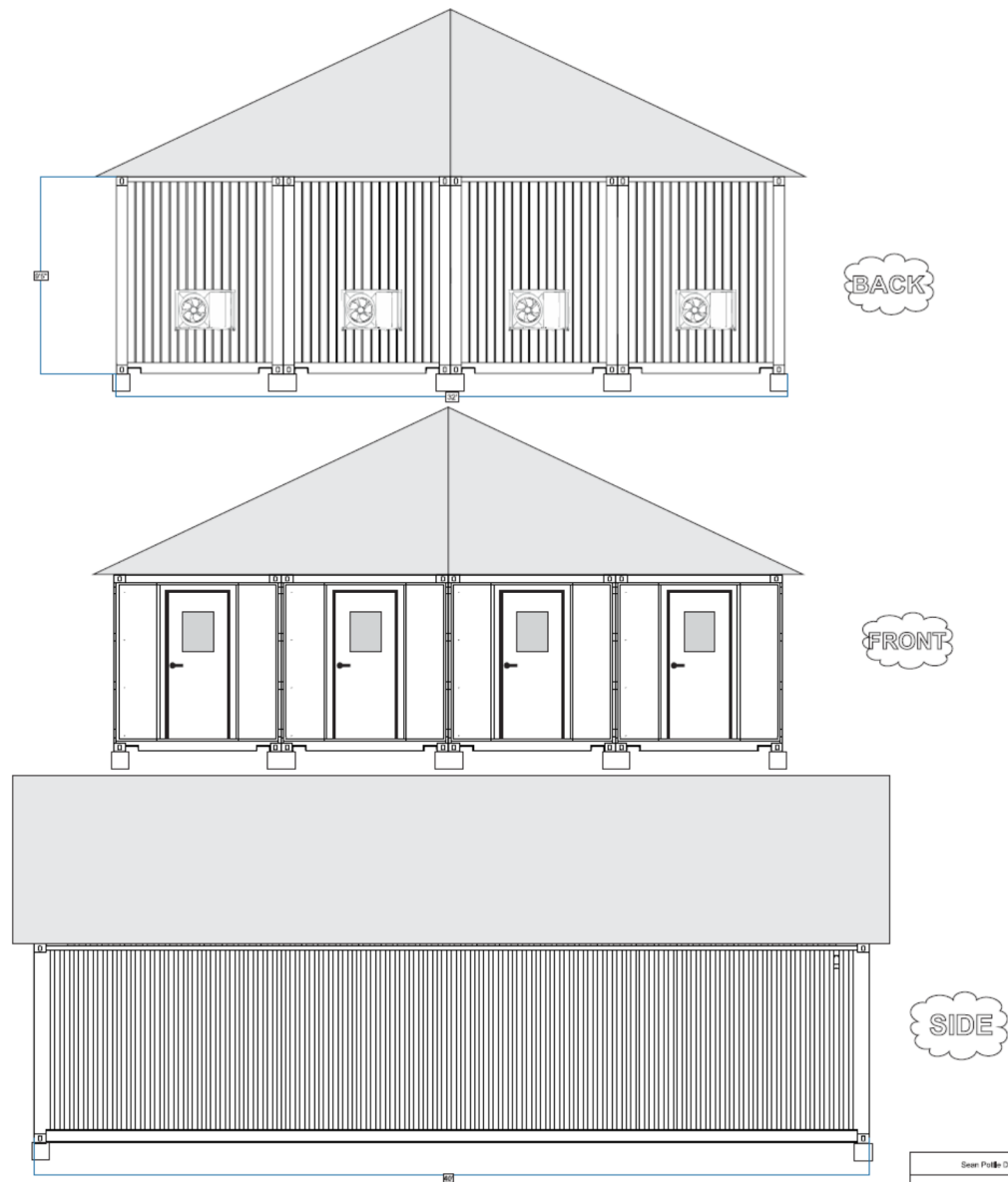
Sean Pottle Designs

Joint Innovation Project RFP#: 2023-02

April 4, 2025

REV: D-0011

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL
FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED
BOOSTING SYSTEM.



Design and comprehensive planning of an Alaskan optimized intermodal freight container based shellfish setting and pre-nursery seed boosting system.

Sean P. Designs	
Joint Innovation Project RFP# 2023-02	
Apr 4, 2025	REV: 0-0011

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

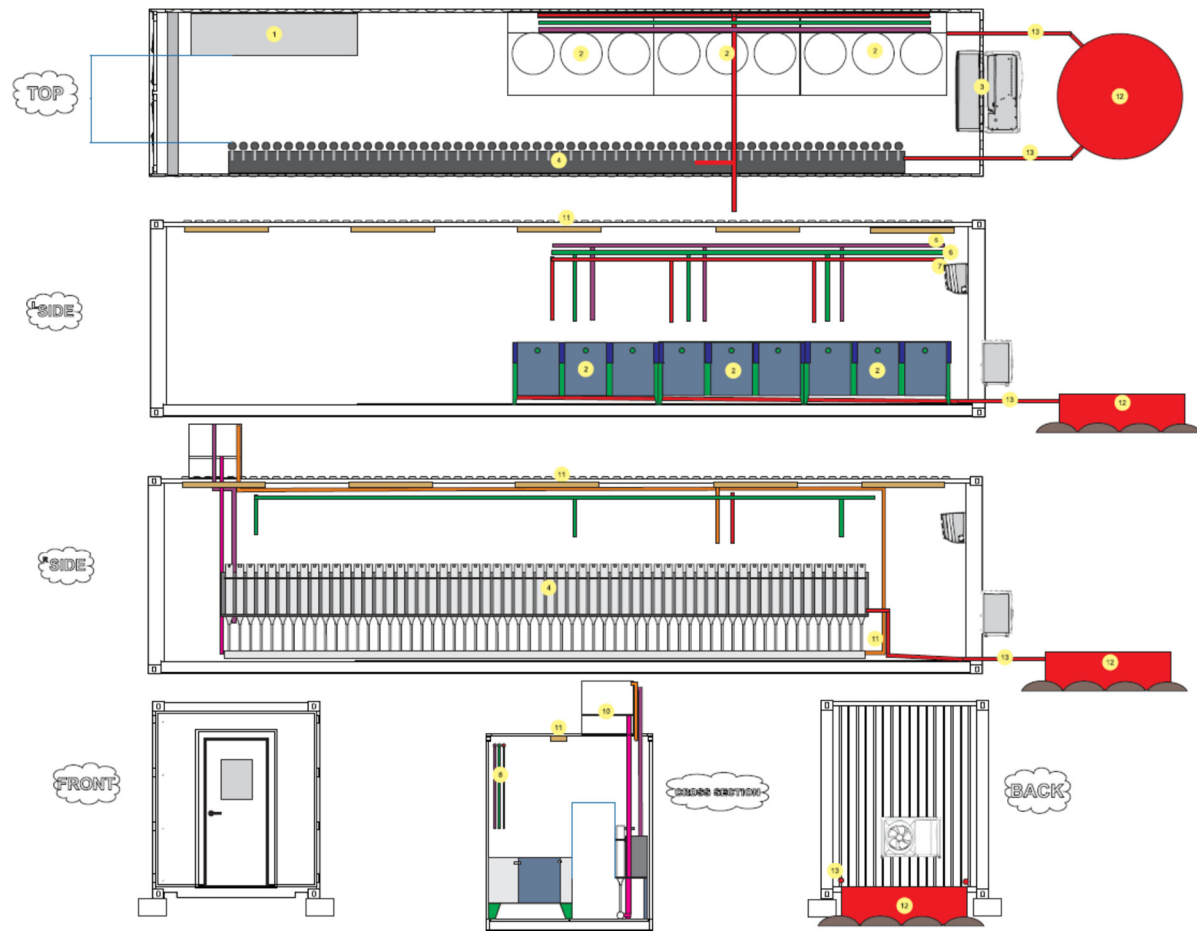


1	WORK BENCH	11	HEAT RECAPTURE HEAT EXCHANGER
2	ULTRA FILTRATION FOR ALGAE	12	500UM
3	SECONDARY FILTRATION TO LUM	13	100UM
4	PUMP	14	250UM
5	UV UNIT	15	200UM DRUM FILLER
6	RAW WATER LOOP FOR HEAT PUMP	16	FILTRATION
7	12000 BTU HEAT PUMP	17	UV UNIT
8	STORAGE SHELVES	18	LIGHTS
9	10 HP HEAT PUMP	19	SHELVING STORAGE
10	2000L STORAGE TANK	20	HEAT RECAPTURE FILTRATION

Design and comprehensive planning of an Alaskan optimized intermodal freight container based shellfish setting and pre-nursery seed boosting system.

Sean P. Designs
Joint Innovation Project RFP# 2023-02
Apr 4, 2025 REV: 0-0011

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.

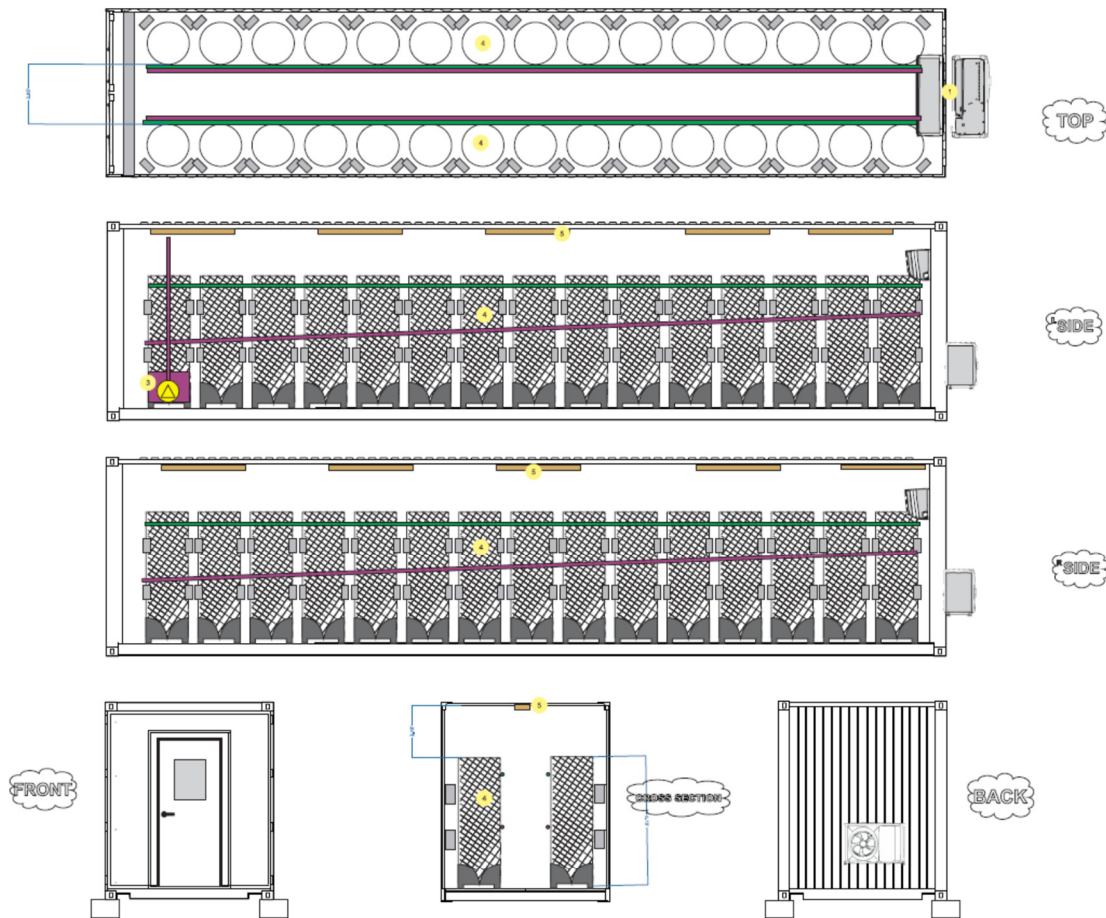


1	STORAGE SHELVING	11	LIGHTS
2	WELLER TANK SYSTEM	12	HEAT RECOVERY SUMP
3	12000 BTU HEAT PUMP	13	HEATED WATER TO SUMP
4	60 BOTTLE SYSTEM	14	
5	AIR	15	
6	SALTWATER	16	
7	ALGAE	17	
8	AERATION SALTWATER AND ALGAE LINES	18	
9	BOTTLE SYSTEM	19	
10	HEADER TANK	20	

Design and comprehensive planning of an Alaskan optimized intermodal freight container based shellfish setting and pre-nursery seed boosting system.

Sean P. H. Designs
Joint Innovation Project RFP# 2023-02
April 4, 2025
REV: 04011

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.



1	12000 BTU HEAT PUMP	11	
2	REAL TIME HARVEST RESERVOIR	12	
3	SEAWATER AND NUTRIENT LINE	13	
4	500L ALGAE BAG SYSTEM	14	
5	LIGHTS	15	
6		16	
7		17	
8		18	
9		19	
10		20	

Design and comprehensive planning of an Alaskan optimized intermodal freight container based shellfish setting and pre-nursery seed boosting system.

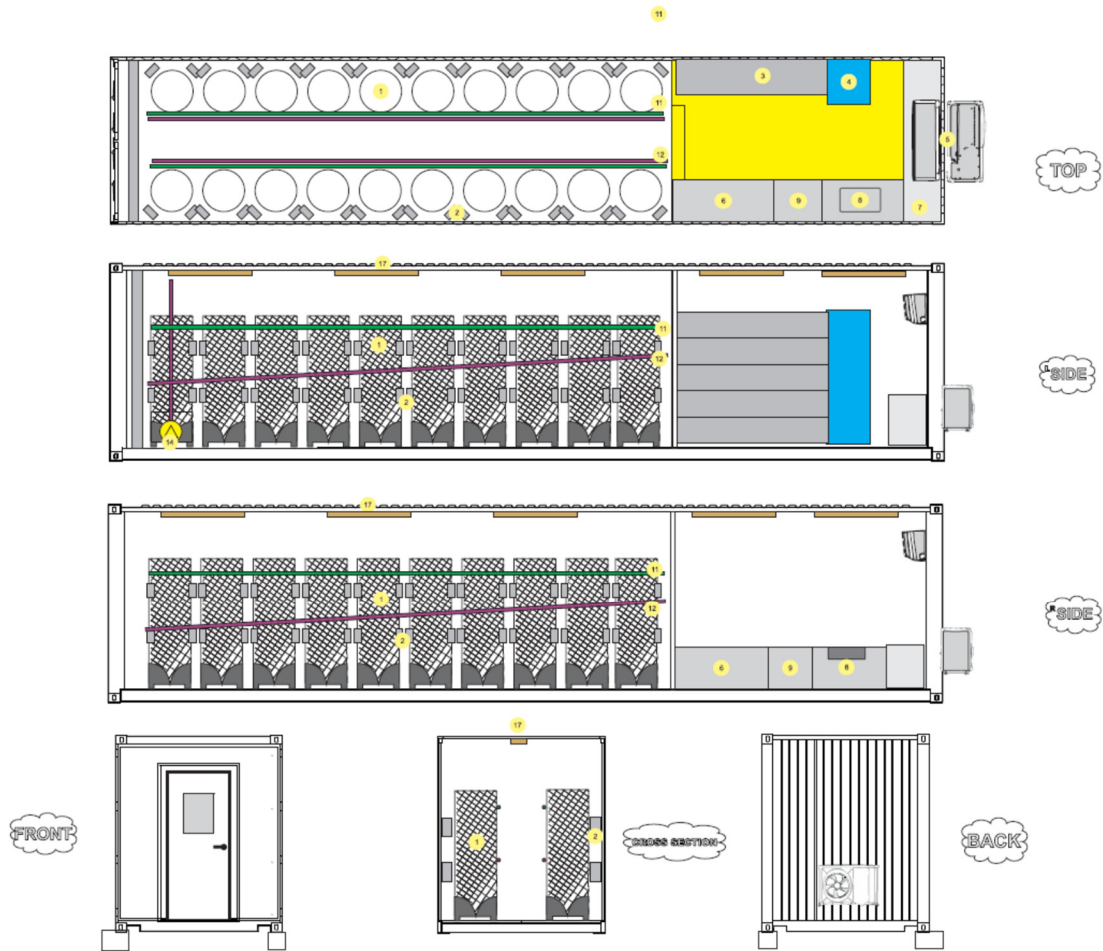
See Profile Design

Joint Inspection Project RFP# 2023402

April 4, 2025

REV: D-0011

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.



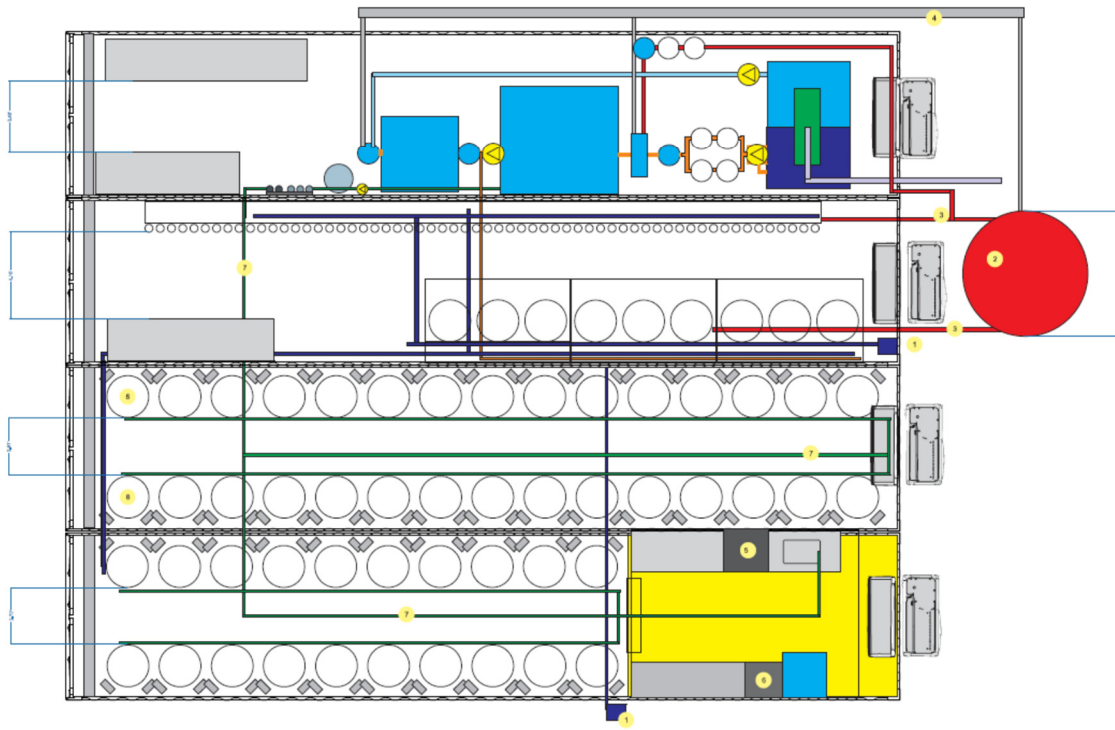
1	5000 ALGAE BAG	11	INLET WATER AND NUTRIENT LINE
2	LED FLOOD LIGHTS	12	HARVEST LINE
3	FLASK SHELVES	13	REAL-TIME ALGAE HARVEST RESERVOIR
4	FRIDGE	14	SEAWATER AND NUTRIENT LINE
5	12000 BTU HEAT PUMP	15	500L ALGAE BAG SYSTEM
6	BENCH	16	50W LED FLOOD LIGHT
7	TEMPERATURE CONTROLS	17	LIGHTS
8	SINK	18	
9	AUTOClave	19	
10	BENCH	20	

Design and comprehensive planning of an Alaskan optimized intermodal freight container based shellfish setting and pre-nursery seed boosting system.

Sean P. Designs
Joint Innovation Project RFP# 2023-02
Apr 14, 2025

REV: 04011

DESIGN AND COMPREHENSIVE PLANNING OF AN ALASKAN OPTIMAL INTERMODAL FREIGHT CONTAINER BASED SHELLFISH SETTING AND PRE-NURSERY SEED BOOSTING SYSTEM.



1	AERATION SYSTEM	11
2	HEAT RECOVERY SUMP	12
3	HEATED WATER TO SUMP	13
4	EFFLUENT WATER	14
5	AUTOCLAVE	15
6	TRANSFER CHAMBER	16
7	ULTA FILTERED WATER	17
8	ALGAE HARVEST CONTAINER	18
9		19
10		20

Design and comprehensive planning of an Alaskan optimized intermodal freight container based shellfish setting and pre-nursery seed boosting system.

Sear, P. & S. Design
Joint Innovation Project RFP# 2023-02
April 4, 2025
REV: 04/01/21