

Filling the Bay: Beneficial Reuse of Dredged Materials at the Oakland Middle Harbor Enhancement Area



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Introduction

Topic: Beneficial Reuse of Dredged Materials

Site: Oakland Middle Harbor Enhancement Area (MHEA)

Prime Contractor: Ahtna Design-Build, Inc. (Grading Portion)

Client: USACE San Francisco District

Presenter: Mr. Patrick Royce, Senior Construction Manager
Ahtna Design-Build, Inc.

Acknowledgments:

- Mr. Nicholas Malasavage, P.E., USACE San Francisco District
- Ms. Kara Romero, Ahtna Project Manager
- Gahagan & Bryant Associates, Inc.
- Winzler & Kelly, Merkel and Associates



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Oakland Middle Harbor Enhancement Area

- Built on the site of the former Oakland Naval Supply Depot - supply center for the Navy's Pacific Fleet from World War II.
- 38 shoreline acres built by the Port of Oakland; operated by the East Bay Regional Park District.
- The Port of Oakland and the U.S. Army Corps of Engineers are working on a project to restore shallow wildlife habitats to Middle Harbor.
- 180-acre MHEA intended to restore shallow water habitat and provide habitat enhancement.



Oakland Middle Harbor Enhancement Area (MHEA)

Oakland Port Deepening Challenges:

- Needed to deepen the inner and outer channels from 42' to 50' to allow for the larger container ships;
- Needed to find a disposal location for 12.8 million cyds. dredged materials;
- Intermittent federal funding for the deepening project;
- Technical Constraints: 1st project of its kind (allowing large-volume filling) in the San Francisco Bay Area.

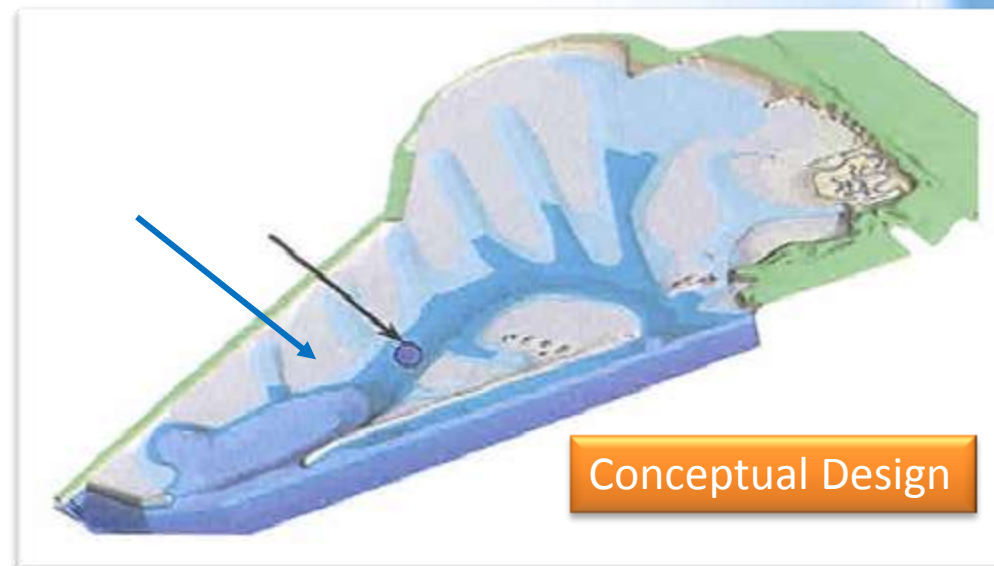
MHEA Project Objectives:

- Use 6 million cyds. of dredged material to convert a former U.S. Navy Fleet Industrial Supply Center adjacent to the inner and outer harbor into aquatic habitat for eel grass.
- Get permitting from agencies to create a 1st of its kind environmental enhancement area open to the bay waters.
- Final sculpting of ~400,000 cy of sediment.
- Relocate rock from jetty to bird islands.
- Open MHEA to full tidal circulation, construct marsh for educational purposes.



Oakland Middle Harbor Enhancement Area (MHEA)

- **Project Scope:** 180 acres of fully functional aquatic sub-tidal and inner tidal habitat
- **Project Status:** Construction underway, project completion scheduled for 2017
- **Project Partners:**
USACE, Port of Oakland, U.S. Fish and Wildlife, California Department of Fish and Game, Bay Conservation and Development Commission & Water Quality Control Board



2012: PHASE 1

- Earthmoving
- Sustainable Design
- Wetland Enhancement
- Redistribution of approximately 400,000 cubic yards of previously placed dredged materials

2016: PHASE 2

- Earthmoving
- Sustainable Design
- Wetland Enhancement
- Placement of small rip rap for slope stability
- Placement of large rip rap for erosion control at the sheet pile wall
- Redistribution of approximately 250,000 cubic yards of previously placed dredged materials
- Creation of 5-acre marsh, bird islands and ditch blocks, and incidental related work



Construction Challenges to Grading/Filling

Preconstruction conditions

- Existing grades between -12 and 0 ft MLLW in fill areas
- Shallow or no draft in dredging areas (-2 to +6 ft MLLW)
- Site open to full tidal range, ferry wakes, etc.

Sub-tidal elevations

- Existing grades between -14 and 0 ft MLLW in fill areas
- Final grade ranging from -18 to +2 feet MLLW
- Rip rap structures for bird islands to +8 feet MLLW
- Ditch blocks along the existing sheet pile wall to reduce erosion
- Small rip rap placed to protect underwater slopes in deeper areas

Efficient and accurate control of fill thickness

- Mitigate risk of mud waves
- Measure and control material placement
- Finish grade elevation critical to future habitat development

Construction cost risks

- Measurement and payment structure
- Site preparation to overcome technical constraints
- Production rates and required equipment



Low water challenges

This is the 1st permitted action in decades to allow large-volume dredging/filling of the San Francisco Bay.

Phase 1: 2012

Key Points:

- Approximately 400,000 CY of dredging
- Controlled placement of dredge material into 7 fill areas.
- Grading tolerance of +/- 1 foot



2012– MHEA

Project Strategies and Innovations:

- Fabrication of the “Pecos”, later renamed the “Fred”
- Real-time grade control via RTK linked grade roller modified DredgePack software
- Fill placed in 2 ft lifts and routinely achieved grading tolerance of +/- 1 foot
- Typical production rates were 300 to 650 CY/hr depending on water depth.
- Work completed on-time (Sept 2012) and on budget.



MHEA Grading – Did it work?



May 2013 (8 months later)

Photographs courtesy of CDI



Area 7

Aerial View of MHEA

1993



Prior to any work performed

Early
2016



After the initial grading and settlement period

Photo courtesy of Port of Oakland/USACE San Francisco District

2016: Phase 2

- Grade the island to their final grade
- Dredge out the turning basin to -18 feet MLLW
- Dredge out the main channel for increase water exchange
- Install bird roosting islands from +5 to +8 feet MLLW
- Install ditch blocks to slow erosion along sheet pile wall
- Creation of the 5 acre marsh area



Creating Islands in the Bay



Creating Marsh Area Berm



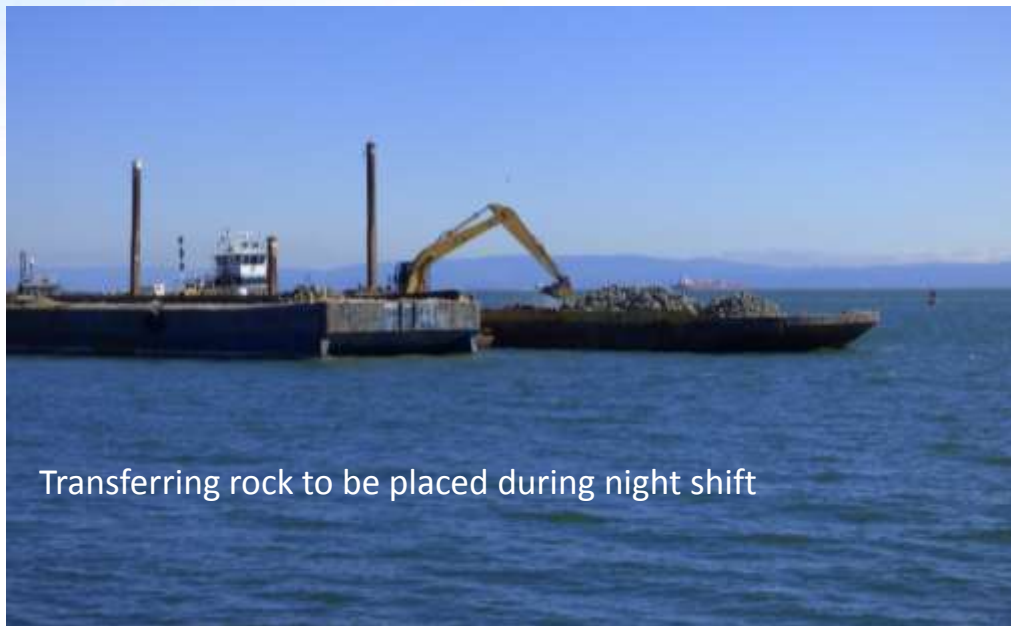
Project Photos



Excavator placing rip rap



Building Bird Islands



Transferring rock to be placed during night shift



Clearing cutter head of clay

Project Photos



Plume of good sand material being placed



Installing 2-3 ton rip rap ditch block inside middle harbor sheet pile wall



Begin degradation of East jetty



Night shift placing material at bird islands

Project Specialty Equipment

Dredge “Paul
Vincent”



Filling
Machine
“Fred”

Innovative Custom Filling Dredge



“Flintstone” wheels with RTK to measure depth and location of filling to give operator real time data to achieve grading profiles.

Final Grading Results

- 95 % of the areas are within the design grades
- Completed on time
- Completed on budget
- Achieved project objectives
- Hydrographic surveys in 2016, 2017, 2018 and 2019 are within +/- .02'

- Safety Record: Zero Incidents for total 25,000 hours of work

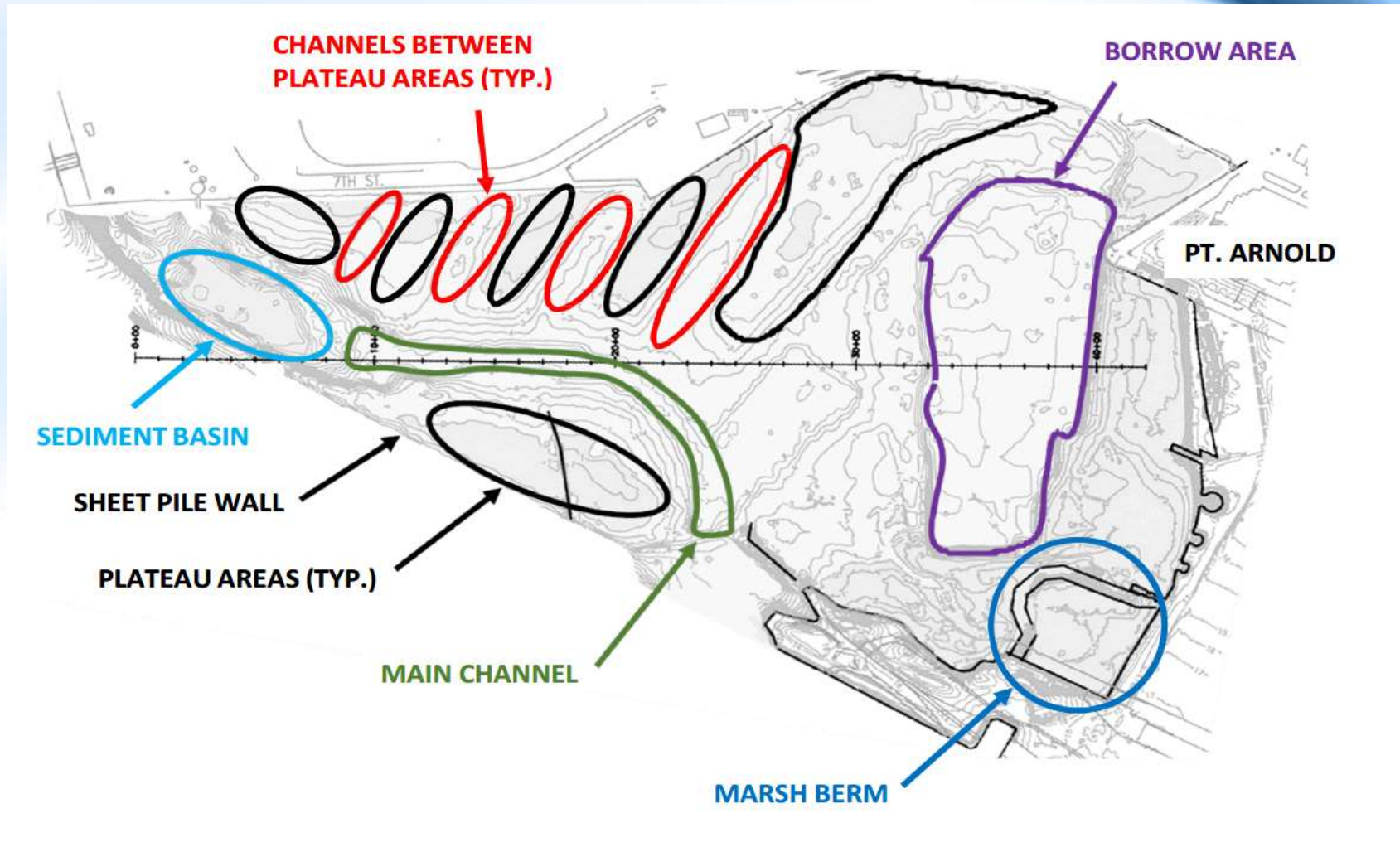


Middle bird islands complete



Birds enjoying their new islands

Primary Features of MHEA



Bathymetry changes over time 2016-2019

Sediment Basin:	Deepest area constructed	Designed to collect sediment	0.9' higher or 0.37' per year
Borrow Area:	Filled at the end of grading effort	Consolidated of fill first year	Shoaling now present
Main Channel:	Runs from Avian Island to Basin	Expected to collect sediment	On average, 0.5' of shoaling present
Marsh Berm/ Marsh Area:	Berm constructed to +5' to +7' MLLW	Average scour across berm of 1.1'	Scouring in marsh plain 0.6' (2.4' max)
Eastern Shoreline:	Shoreline near park area	Sandy beach type area	Net scour of material present
Plateaus and Secondary Channels:	Consolidation of materials across plateaus	Appearance of some channelization	Material migration towards eastern edge of plateaus (wind)
Avian Islands:	Hydrographic/ Lidar Surveys	Settlement of 2-3' for western islands	Settlement of 1-2' for eastern islands

Western Avian Roosting Island 2018

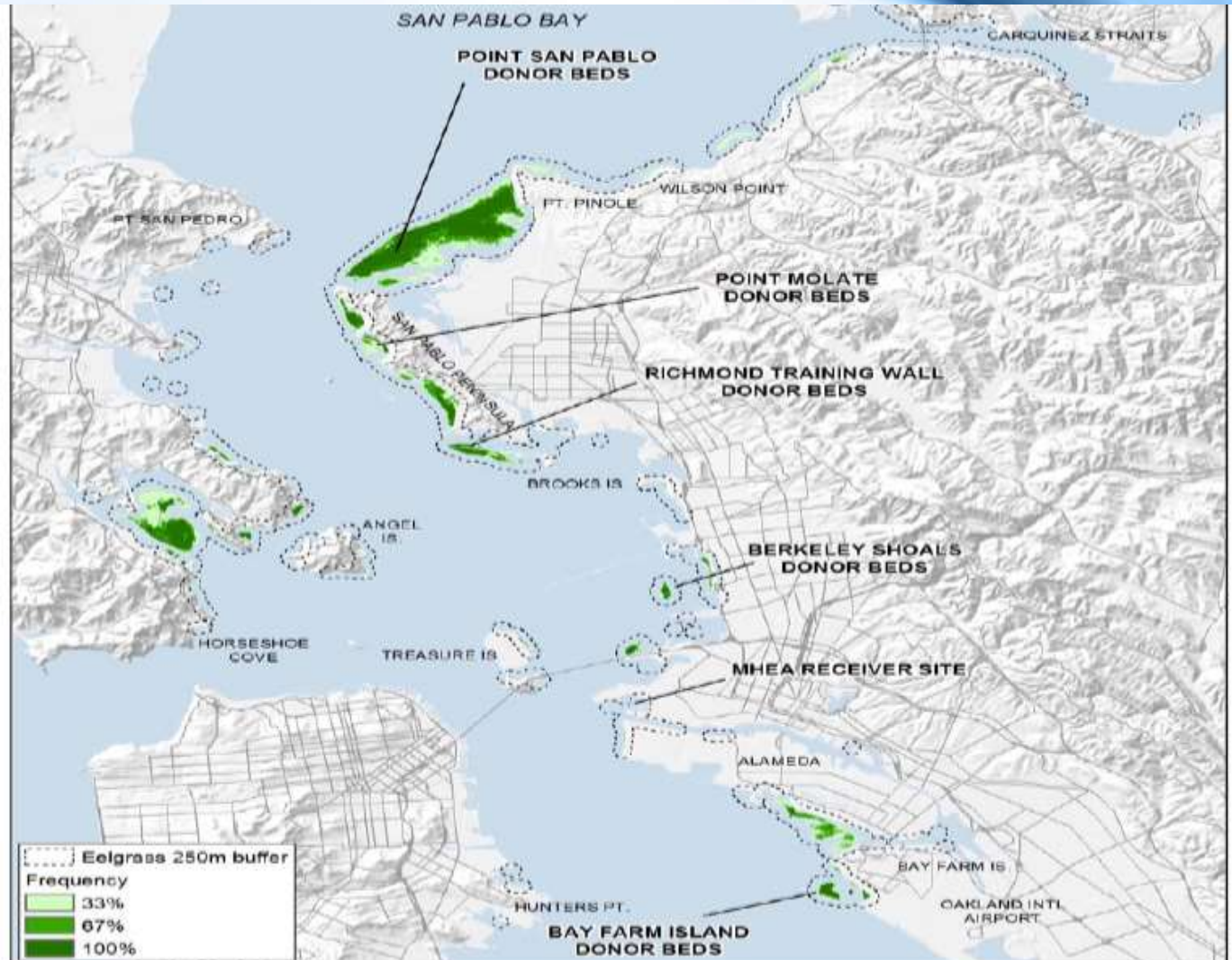


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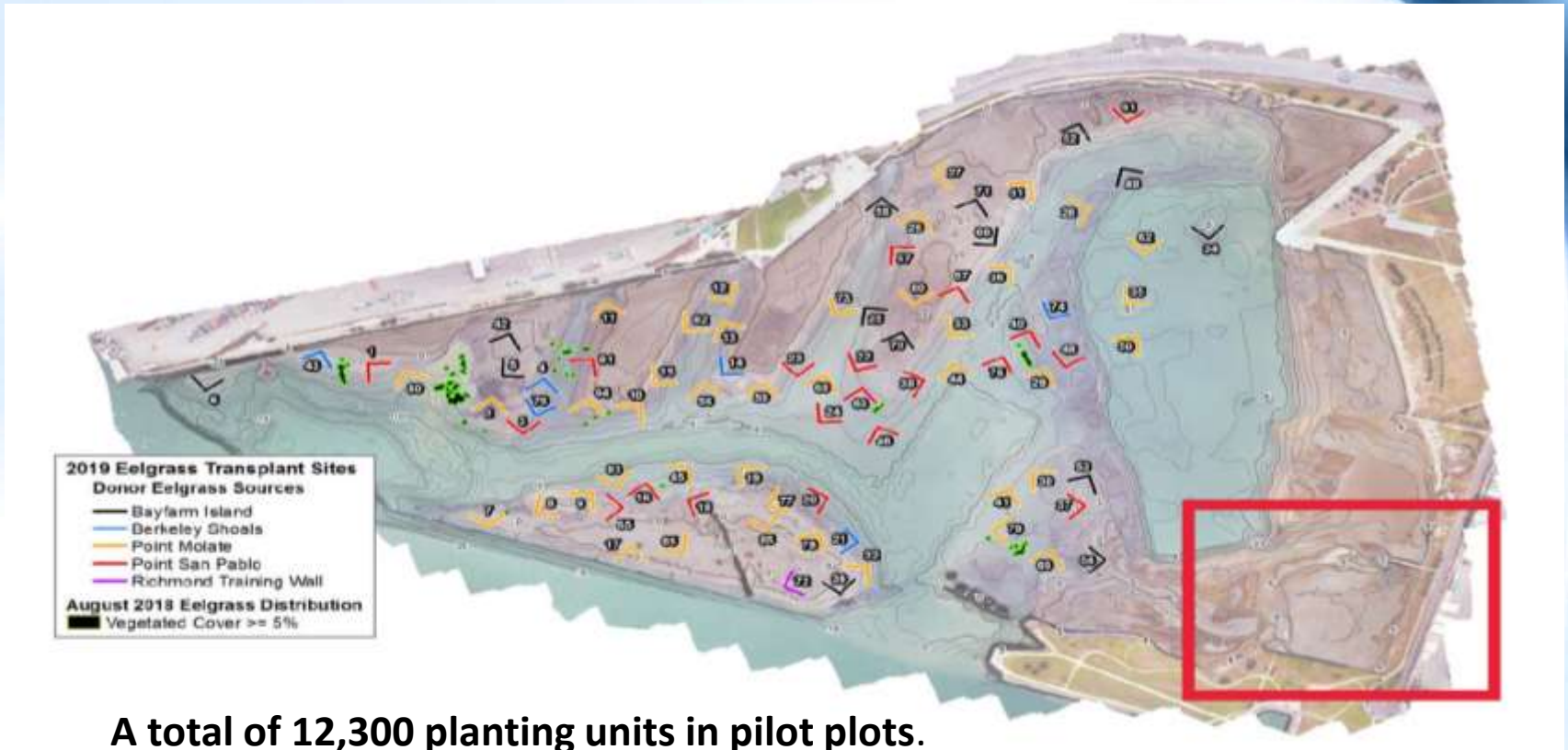
Eelgrass Donor Beds

5 different donor beds were utilized to develop genetic diversity.

No more than 10% of eelgrass was taken from any 1 acre site at all harvest locations.



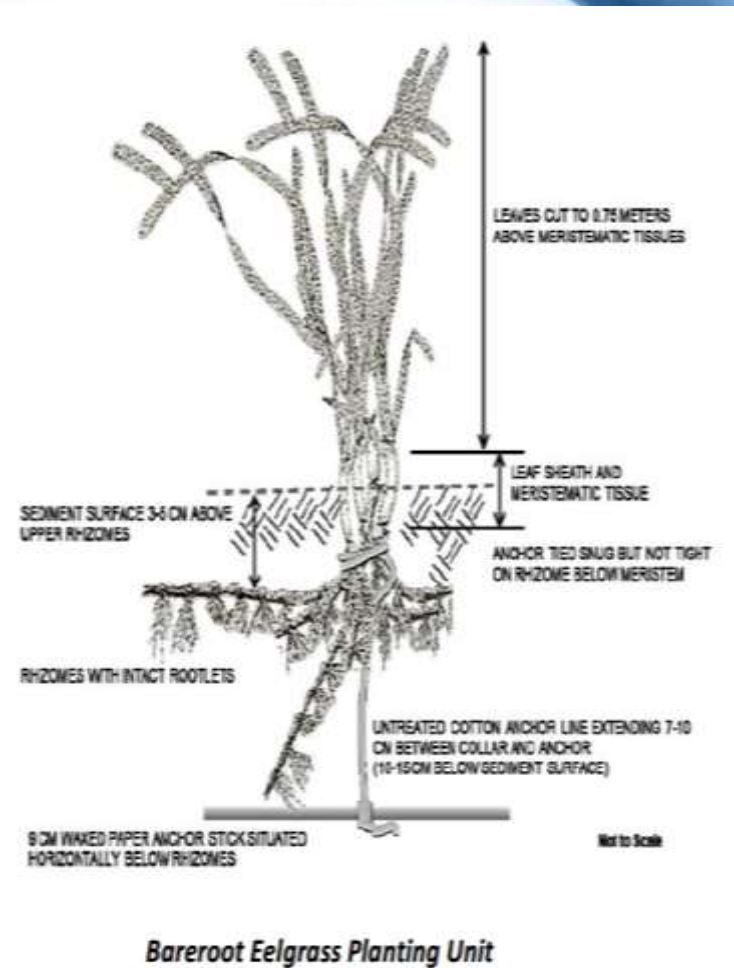
MHEA Eelgrass Planting Plan



A total of 12,300 planting units in pilot plots.

Eelgrass planting summary

1. Proceeded with 19 test plots in most challenging locations to test area durability and survival rates. (2017)
2. 10 of the 19 test plots remained and supported eelgrass. (2018)
3. This covered about 0.45 acres of the target area of 15+ acres.
4. Changes made to original planting plan and 82 additional plots were planted in 2019.
5. Estimated that the growth rate of the eelgrass will achieve target area (+15 acres) in 20 years after dredging commenced instead of the target 10 years.



Possible Future MHEA Activities

1. Marsh plain and marsh berm are not meeting the designed goals at present configuration. MHEA Technical Advisory Committee will be reviewing methods to achieve the original intended design.
2. Proceed with adaptive management of select features of the MHEA.
3. Possibly adding additional rip rap to avian islands to increase elevation.
4. Regrading of the eastern shoreline and beach area south of Point Arnold.
5. Periodic dredging to maintain core MHEA design template.

What the future will be for MHEA?

2019 to 2029: USACE performs monitoring, management and maintenance for 10 years. Report periodically to TAC on eelgrass and species monitoring and site management.

2029 and beyond: Port of Oakland assumes long-term site management and maintenance.



Thank you!
Questions?



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