

Maintenance Dredging in Portland Harbor

A photograph showing a large-scale dredging operation in a harbor. A large, rusted metal structure, likely a hopper or conveyor, is being lowered into the water by a crane. The water is blue, and the background shows a forested hillside. A white barge with blue structural elements and yellow safety gear is visible on the right side of the frame.

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Imagine the result

Discussion Outline



- Site Background
- Pre-Design Investigation
- Permitting
- Design Parameters
- Implementation
- Monitoring
- Conclusions

Site Background



- Bulk petroleum fuel terminal within Portland Harbor
- Has been in continuous operation for more than 100 years
- A recent infrastructure project increased capacity by 20% to approximately 63 million gallons
- Deeper ship berths (40 feet below Columbia River Datum (CRD)) were required to accommodate larger Double Eagle Class Ships
- Previous elevations of ship berths for were 38 feet below CRD

Pre-Design Investigation

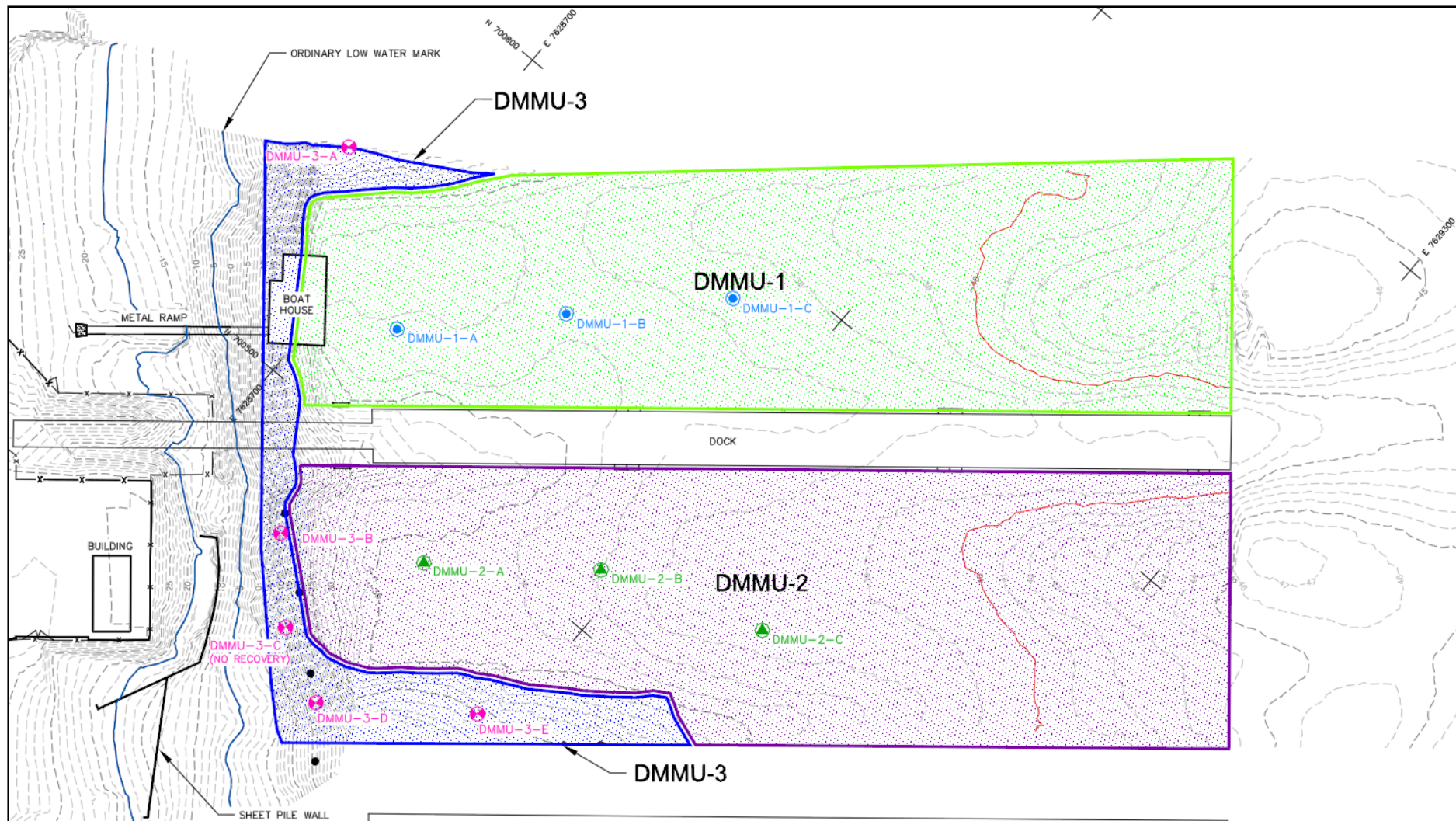


- *Northwest Regional Sediment Evaluation Framework (SEF)* developed by the United States Army Corps of Engineers (USACE) guided sampling efforts
- Characterize sediment within dredge prism (chemical and physical properties)
- Evaluate disposal options by comparing sediment chemistry to regulatory guidance
- Characterize post-dredging new surface material
- Evaluate stability of the dredge prism side-wall
- Characterize side-wall sediment chemistry that may slough into dredge prism

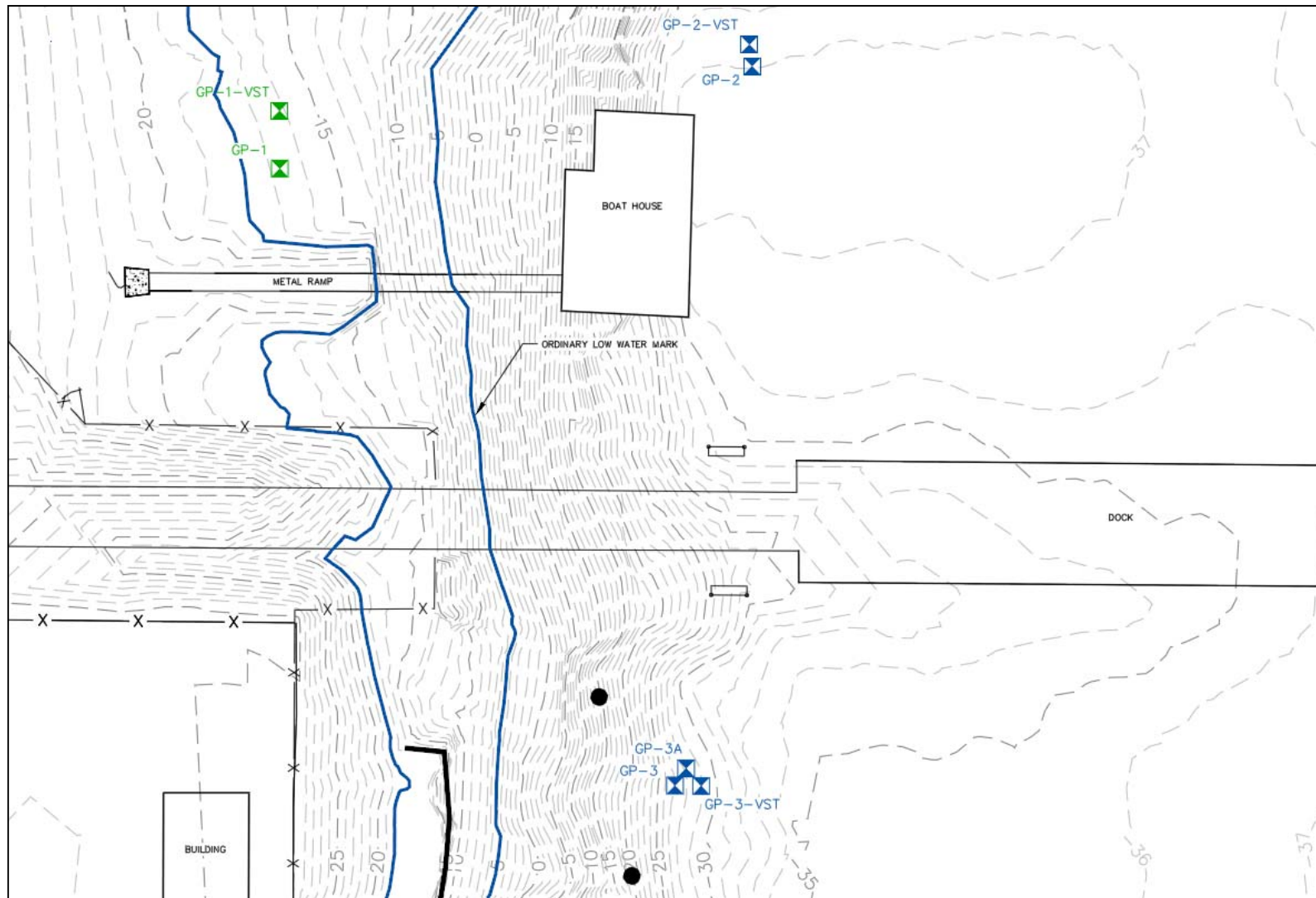
Pre-Design Sampling

- The proposed maintenance dredging area was subdivided into three Dredge Material Management Units (DMMU)
 - DMMU-1 (North berth)
 - DMMU-2 (South berth)
 - DMMU-3 (slopes surrounding DMMU-1 and DMMU-2)
- Sediment vibracore samples were collected to characterize dredge material for disposal, new surface material after dredging, and sediment with the potential to slough into the dredge prism
- Vane shear testing and standard penetration testing (SPT) were performed at one upland location (GP-1) and two in-water locations (GP-2 and GP-3) to assess riverbank stability and sediment sloughing potential around the perimeter of the DMMUs

Characterization Sampling



Geotechnical Sampling



Pre-Design Investigation Results

- Sediment analytical samples were evaluated against the SEF criteria and Oregon Department of Environmental Quality (DEQ) Northwest Region (NWR) Clean Fill screening levels.
 - Data screening confirmed that dredge material was suitable for upland landfill disposal
 - New surface material did not exceed SEF screening levels
- Evaluation of geotechnical sampling results:
 - The bank west of the dock was stable for pre- and post-dredge conditions
 - Dredge cuts no steeper than a horizontal to vertical ratio of 2:1 would be relatively stable

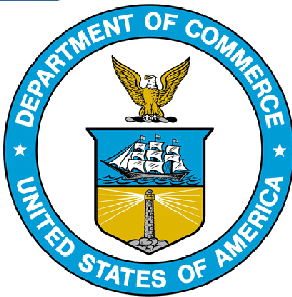
Permitting



**US Army Corps
of Engineers®**



State of Oregon
Department of
Environmental
Quality



**Bureau of
Development
Services**
FROM CONCEPT
TO CONSTRUCTION

- Permitting requirements included input from these state and federal agencies:
 - USACE (Department of the Army Joint Permit)
 - Oregon Department of State Lands (DSL; Department of the Army Joint Permit)
 - National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS; Biological Opinion)
 - US Fish and Wildlife (USFWS)
 - Oregon Department of Fish and Wildlife (ODFW)
 - DEQ (Section 401 Water Quality Certification)
 - City of Portland Bureau of Development Services (BDS; Land Use Compatibility Statement)

Design Parameters



- Estimates of dredge volumes and production rates
- Dredge type specifications
- Analysis of riverbank soil stability and dredge prism side slopes
- Decant water mass balance and water management
- Sediment disposal
- Construction monitoring requirements

Details of Design

- Dredging design was based on the use of a 16 CY barge mounted environmental bucket
 - Production rates were estimated to be approximately 125 CY/hr
- Dredge horizontal to vertical slope of 2:1 along shoreline and no dredging in the toe of slope along the shoreline
- Overdredge allowance of 1 foot
- Dredge material dewatered in bin barge and barged to transload facility, solidified and trucked to landfill
- Decant water discharged to City of Portland sanitary sewer pending analysis
- In-situ volume of dredge material = 26,700 CY
- Decant water volume = 1,000,000 gal
- Stabilized dredge material weight = 37,600 tons

Implementation



- Hickey Marine Enterprises (HME) performed maintenance dredging activities between September 8 and October 13, 2011
- Dredging activities occurred during active terminal conditions
- Dredge material was transported by barge to a transload facility in The Dalles, OR and then trucked to Wasco County landfill for disposal
- Target depth of 40 feet below CRD was achieved

Summary of Dredging Activities

Dredge Material Management Unit	Relative Location	Dredging Dates	Minimum Dredge Elevation	Volume Dredged
DMMU-1 (88,450 sf)	Downstream Slip	9/8, 9/13-9/16, 9/19, 9/28-9/30, 10/13	-40 ft CRD	13,559 CY
DMMU-2 (77,221 sf)	Upstream Slip	9/20, 9/22-9/23, 9/27, 10/3-10/5, 10/10-10/11	-40 ft CRD	12,393 CY
Total Volume Dredged				25,952 CY

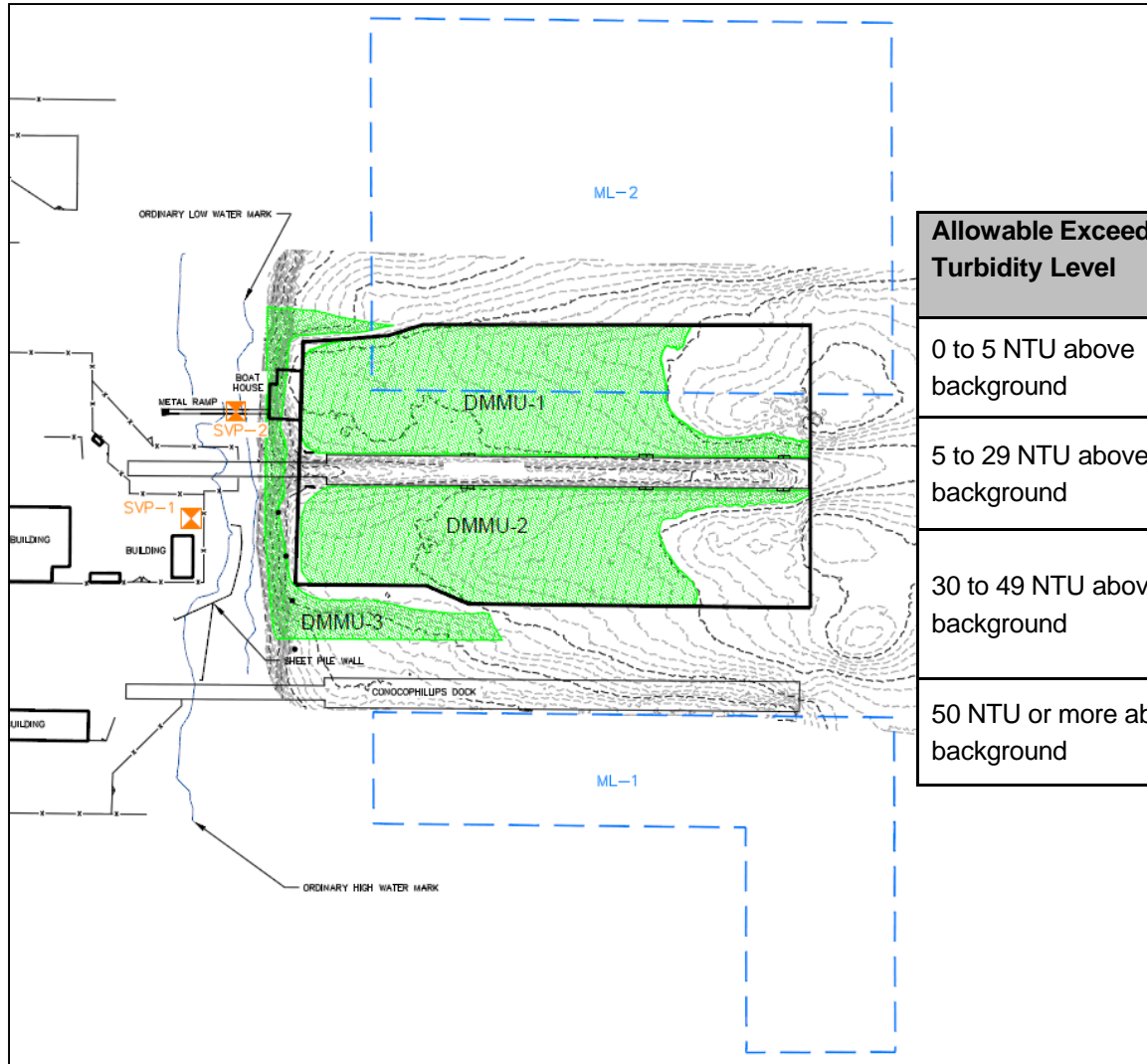


Environmental Monitoring Plan



- An Environmental Monitoring Plan was developed based on cumulative permit requirements
- Environmental monitoring included visual observations and water quality measurements
- Visual observations were made from the dock and the shoreline
- Background (upstream) and downstream water quality measurements were collected every 2 hours
- Measurements included turbidity, dissolved oxygen and pH

Environmental Monitoring Plan



Allowable Exceedance Turbidity Level	Action Required at 1 st Monitoring Interval	Action Required at 2 nd Monitoring Interval
0 to 5 NTU above background	Continue to monitor every 2 hours	Continue to monitor every 2 hours
5 to 29 NTU above background	Modify BMPs and continue to monitor every 2 hours	Stop work after 8 hours at 5-29 NTU above background
30 to 49 NTU above background	Modify BMPs and continue to monitor every 2 hours	Stop work after 2 confirmed hours at 30-49 NTU above background
50 NTU or more above background	Stop work	Stop work

Environmental Monitoring Plan

- Best management practices implemented:
 - Strict bucket control by an experienced equipment operator to minimize disturbance (i.e. not over or under filling bucket, reducing dredge cycle time)
 - Maintenance of floating sorbent boom and deployment of boom in the event of floating debris or sheen
 - Use of global positioning system software to control dredge cuts
 - Sequencing work activities to minimize the extent and duration of in-water disturbances

Conclusions



- Pre-design sampling results provided safe design parameters and allowed for disposal of dredge material in an upland landfill
- Dredging operations were completed safely and successfully
- Total dredge volume of 25,952 CY
- Requirements set forth in the Environmental Monitoring Plan and applicable permits were met throughout dredging activities

Imagine the result

THANK YOU

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