Esquimalt Graving Dock Waterlot Sediment Remediation Phase 1B Open-Water Dredging

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Introduction
Esquimalt Graving Dock (EGD)

- South Western tip of Vancouver Island, Esquimalt BC
- PWGSC owned and operated since 1927 (constructed 1921-1926)
- “open-access” multi-user facility
- Largest deep-sea shipbuilding and repair facility on Canada’s Pacific coast
- Accommodate “Panamax” size vessels
- Phase 1B Project – 9.7 Ha
Introduction
EGD Waterlot Remediation
Phase 1B – Open-Water Dredging

• 37 million dollar contract to Tervita via competitive tender
• FRPD – major marine subcontractor
• Project at a glance:
  • 150,000 m$^3$ open-water dredging, transportation, disposal
  • Structure demolition and reinstatement
  • Slope protection
  • Residual management cover
Administration & Contract Management

• **Major Submittals Prior to Mobilization**
  - Construction Work Plan
  - Environmental Protection Plan
  - Quality Control Plan
  - Health and Safety Plan
  - Complete construction schedule

• **Ongoing Submittals**
  - Daily/Weekly Reports
  - Daily Multi-Beam Hydrographic Survey
  - Weekly progress meetings
  - 300+ Request for Information
  - 300+ Advisories
  - Approximately 10 change orders
  - Monthly progress billing
  - Updated schedule
Structural Demolition, Reinstatement & Slope Protection

- Removal (Demolition) and Reinstatement of:
  - Timber dock fender system
  - Marina floats, breakwater structure
  - Various site floats
- Slope Protection
  - Slope filter layer
  - Slope armour layer
Operation of Active Drydock Facility

- Completion of zones to meet EGD operations EGD booking schedule
- Working without interrupting an active dry-dock facility
- Adapting to a changing schedule
- Ongoing coordination and communication with EGD operations
- Requirement to leave 50% of the South Jetty and North Landing Wharf for EGD operations use
Dredging by Sequence

- Sequential design to work zone by zone
- Work two marine derricks concurrently while maintaining the sequential order
- Adapt sequence as required to meet EGD operational requirements
- Comply with DFO permit and restrictions on particular zones
- CFSA Marina protection
Types of Dredging at EGD

- Land based excavators – 4,000 m³
- Mechanical dredging with a clamshell - 145,000 m³
- Diver assisted suction dredging for sensitive structures – 50 m³
Marine Derrick and Bucket Positioning

- Real Time Kinetic (RTK) Receivers
- Crane and Barge Positioning (Qinsy)
- Electronic depth control via line counters (first time for FRPD)
- Surface updated daily from multi-beam survey and continuous from derrick software
Water Quality Concerns and Mitigations

- Silt curtains (7m deep)
- Sealed material barges
- No passive dewatering
- Bucket cycle times varied as required
- Level cut environmental clamshell bucket (contractor choice)
- Contractor supplied environmental monitor QC
- Full time PWGSC water quality monitoring consultant QA
Barging Logistics

- Transporting contaminated soil
- Authorization by Victoria Harbour Master and Queens Harbour Master (Esquimalt)
- Inclement weather conditions (wind/waves/fog)
- Move to Plumper Bay mid way through the project
Water Resources
Transfer

- Water management:
  - 250m³ high turbidity water per barge
  - Lock block wall wrapped in filter cloth

- Challenges:
  - Debris
  - Sludge
  - Thixotropic material

- Solution
  - Gabion wall
  - Slurry and Vacuum Trailer
Water Resources

Treatment

- Water Barges:
  - 2 Identical equipment setups on similar barges

- Water Storage:
  - 500m³ on deck
  - 1,100m³ below deck

- Treatment:
  - Average throughput 20L/sec
Water Discharge:
- Requirement: 40mg/L suspended solids or less (20 NTU)
- Actual: 2 NTU Average
- Automated discharge and recirculation valves

QA/QC
- Discharge based on inline turbidity analyzer
- Regular laboratory verification
Offloading

- Offload Barge
  - 2 Excavators
  - Spill tray
  - Loader on dredgeate barge

- Challenges
  - High moisture content
  - Thixotropic material

- Response
  - Various amendments (wood pellets & cement)
  - Minimize agitation

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Offloading
Off-Load Facility and Trucks

• Loading trucks
  • 2 truck and pups at a time
  • Average of 110 trips per day

• Containment
  • Sealed end gates
  • Hog fuel
  • Wheel wash
  • Regular monitoring
  • Storm water control berms
Upland Transportation

- Route Planning
  - Lane closure permits
  - Trucking routes
  - Community communications
  - Monitoring

- Challenges
  - Craigflower Bridge closure (construction)
  - Lane closure restrictions
  - Stakeholder management

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Disposal Facility and Logistics

- Truck Traffic
  - Long turnaround times
  - Scale congestion
  - Road cleaning

- Solution
  - Dedicated scale (80% of daily traffic from EGD)
  - Expanded the receiving/dumping area
  - Installed a wheel wash and manual cleaning area
Residual Management Cover Placement

- Fraser River washed sand, loaded onto barges and shipped to site
- Place sand layer
  - 0.3m to 0.6m thick
  - 75,000m$^2$ foot print
  - With clamshell bucket on grid pattern
- Utilized bucket positioning to track progress
- Completed during January to early March (weather)
Conclusion
Esquimalt Graving Dock Waterlot
Sediment Remediation
Phase 1B Open-Water Dredging

- Project complete:
  - **Under** budget
  - **Ahead** of schedule (aggressive)
  - Minimal impact to operations and tenants of the Esquimalt Graving Dock
  - Successful environmental cleanup
- Questions??

Photo credits in this presentation to:
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