Remediation Gumbo: Blending Science, Engineering and Construction for Successful Project Delivery

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Background/Objectives. This paper explores the learnings from a science, engineering and construction perspective from the Port Nelson, Calwell Slipway Basin Sediment Remediation Project in New Zealand. This project addressed sediments heavily contaminated in tributyltin (TBT) and copper, from historic activities associated with ship maintenance on the 2500 t slipway.

Detailed sediment characterization identified that sediments were heavily contaminated with TBT, copper and other contaminants such as DDT, PAHs, PCBs and metals. However the primary contaminants of concern were TBT and copper. TBT concentrations in sediment were measured in excess of 16 mg/kg, with copper concentrations ranging up to 6000 mg/kg. The challenge that the Port faced was that the TBT and copper concentrations exceeded the limits set by their maintenance dredging consents (approvals) for sea disposal of dredge spoil. The basin had not been dredged since 1984, and the accumulated sediment was posing a navigation issue for the operation of the slipway. As such, the Port had to find a solution for the 50,000 m^3 (65,000 yd^3) of contaminated sediments.

Approach/Activities. A happy gumbo: comprising collaboration between scientists, engineers, contractors and regulators allowed the development of a well-tailored remediation solution. A robust and comprehensive approach was taken to the science, which included numerous bench trials, lab testing and a field based pilot trial. This approach delivered a sound basis for development of the engineering solution, and also provided confidence to the environmental assessment and approvals process.

The solution comprised dredging the contaminated sediments, and stabilizing with a blend of ordinary Portland cement and activated carbon. This material was then used in a reclamation to create an additional 5000 m^2 (1.2 acres) of additional land for the port, with a land capital value of NZD $1.7 M. Given the region's numerous active fault networks, stability during seismic activity was considered critical for the long term success of the project. Whilst a perimeter bund would have offered cost savings during the construction phase, the risk of failure and release of contaminated sediments during seismic activity was considered too great. Consequently, the reclamation area was formed using a homogeneous blend of stabilized sediments which greatly reduced the material's permeability and leachability. Removal, processing and placement of sediments was undertaken using a selection traditional land based plant and equipment as well as hopper barges and a dedicated floating pugmill which consisted of an excavator, vibrating grizzly, pugmill, cement storage silo and a longreach excavator. Following placement of the stabilized material, the reclamation area was armored using locally quarried rock in order to provide greater protection against weathering and erosion.

Results/Lessons Learned. A collaborative, and open approach was the key to success. Proactive and early engagement with community stakeholders and iwi (Maori tribes) was an important aspect for building community support for the project. The science (field investigations, bench blend trials, blend optimization, bench leach trials, laboratory testing, tank

tests for contaminant resuspension, TBT suspended solid proxy derivation) was communicated to support the rationale for the approach and also the consideration of alternative options, and also rationalize the monitoring conditions. Science was also used to support the approvals process – and achieve the impossible (disposal of toxic materials in the Coastal Marine Area, and undertake reclamation – both prohibited under regional plan rules and the New Zealand Coastal Policy Statement!).