

## **Filling a Freshwater Lake: Sediment Remediation Considering Net Environmental Benefit for Multiple Stakeholder Goals**

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**Background/Objectives.** Sediment remedial actions began in June 2017 at Lora Lake, part of a Port of Seattle (Port) Model Toxics Control Act (MTCA) Cleanup Site managed by the Washington State Department of Ecology, and will be completed in October 2018. The site is located on Port-owned property within the secured area of the Sea-Tac Airport, in a U.S. Army Corps of Engineers (USACE)-managed mitigation area, and within the FEMA 100-year floodplain. The primary contaminant of concern (COC) identified in the lake sediments is dioxins/furans. Contamination is attributed to historical operations on an adjacent upland property and to residential neighborhoods that discharged stormwater to the lake from the 1940s to 1990s. The remedy for the site included placing 56,000 cubic yards of carbon-amended sand cap throughout the 3-acre man-made lake to fully fill and return the lake to its native condition as a palustrine scrub-shrub wetland. This remedial action was selected through a net environmental benefit approach that considered goals of multiple agencies and stakeholders including compliance with the U.S. Federal Aviation Administration rules for Runway Protection Zones, reduction of aircraft navigation dangers associated with bird strikes, limitation of disturbance to surrounding USACE-managed mitigation areas, and water quality improvements to downstream Miller Creek, a salmon-bearing stream with local government and community organization interest.

**Approach/Activities.** Selection of lake filling for wetland rehabilitation as the preferred cleanup remedy was atypical but appropriate for the site, because the remedy evaluation process was able to consider benefits and impacts to the surrounding ecosystem and airport. Lake filling and wetland construction were selected over dredging and capping alternatives due to risks with resuspension and migration of the contaminated sediments to Miller Creek during construction and long-term exacerbation of high temperature and low dissolved oxygen concentrations in water discharging to Miller Creek following remedy completion. Strategic coordination with state and federal agencies and municipalities regarding these short- and long-term impacts to areas outside the MTCA site led to stakeholder support for the proposed lake filling remedy. Improving water quality in downstream Miller Creek and reducing flight hazards to planes approaching the airport from bird strike risk associated with open water below the airport approach path helped facilitate project approval from the USACE. Nationwide Permits were granted for filling waters of the state, conducting construction within a wetland, and temporarily disturbing existing mitigation wetland areas. Design of the selected remedy incorporated hydrogeologic groundwater flow and engineering floodplain analyses to demonstrate to local agencies and the USACE that the rehabilitated wetland would not increase the FEMA base floodplain elevation in Miller Creek, or reduce the effective base flood storage within the floodplain.

**Results/Lessons Learned.** The construction and planting of the palustrine scrub-shrub wetland is expected to be completed in October 2018 and the project will move into the long-term monitoring phase. A number of challenges were successfully addressed during project design and construction. Lessons learned are applicable to other cleanup projects and include developing bidder qualification requirements that encourage multiple bids, while providing the owner with a process for selection of a contractor with appropriate qualifications and experience to perform the work in low-bid selection scenarios. The team learned from use of performance

versus prescriptive specifications for complicated tasks, which allowed the design team and contractor to work toward successful implementation of complex work sequences.