Managing Leachable Arsenic for Sustainable On-Site Soil Retention

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Background/Objectives. A former rail yard site was required to be developed into a new public transport hub. The site hosted rail platforms within which was 4,500 m^3 of soil with elevated concentrations of arsenic, lead and copper, resulting from historical rail operations. Statistically, the concentrations of these chemical substances did not exceed Tier 1 human health soil screening criteria for commercial/industrial land use, however, the concentrations significantly exceeded waste soil classification criteria and, notably, arsenic was significantly leachable in a portion of the soil material. Levelling of the site was required for re-development and thus the platforms and soil within such structures had to be removed from the site. Due to the significant exceedance of the waste soil classification criteria, the cost to remove the soil via the traditional dig and dump approach was calculated to be in excess of $2 million AUD and would require a minimum of 650 truck movements between the site and the licensed waste disposal facility. Retention of the leachable fraction of soil material would present a potential long term risk to beneficial uses of groundwater. Noting the economic and environmental constraints of the project, an alternative and more sustainable approach was developed which involved cut and fill balancing of on-site soil materials coupled with selective treatment of leachable material to enable on-site retention of such material while mitigating long-term risks to groundwater.

Approach/Activities. The balance of cut and fill included the removal and on-site storage of the impacted soil material followed by the removal of underlying clean natural material beneath the former platform footprint, thus creating a 'void'. Approximately 2,000 m^3 of clean soil was removed from the site and re-used at a non-sensitive site (e.g., new infrastructure projects requiring fill). The leachable soils were isolated and treated on site using the proprietary immobilization agent RemBind®. Bench-scale trials involved treating the soil with RemBind® at an additional rate of 10% and then analyzing soil leachates using US EPA Methods 1311 and 1320.

Results/Lessons Learned. Bench-scale tests showed that a RemBind® addition rate of 10% resulted in a 96% reduction in leachable arsenic compared to untreated control soil. Field leachability tests post-treatment were in agreement with the bench-scale tests, indicating the very successful binding of the leachable arsenic to a level that was satisfactory for the mitigation of long-term leaching of arsenic from the soil material to groundwater beneath and surrounding the site. All impacted soil material was returned to the void under Level 1 geotechnical compaction supervision, creating a new development platform for the transport hub. The sustainable approach saved the Government ~$1.3 million AUD and avoided over 650 truck movements as well as the associated carbon footprint.