(An) Alternative Approach to Decommissioning and Risk Management of a Historical Cooling Pond and Phosphogypsum Stacks

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The Nutrien Fort Saskatchewan Nitrogen Operations facility has been in operation for over 40 years. The facility produces nitrogen-based fertilizers (ammonia and urea) and the neighboring Sherritt facility historically produced phosphate fertilizer from 1965 until 1991. Phosphogypsum produced as a byproduct of the production process was stored in large gypsum stacks on the plant site. Nutrien inherited the gypsum stacks and associated phosphate cooling ponds in 1996 when they acquired ammonia and urea production facilities from Sherritt International.

Groundwater quality concerns related to the gypsum stacks and former phosphate cooling pond prompted the decommissioning of the pond along with recontouring of the gypsum stack. Groundwater with elevated sulphate and ammonia have the potential to migrate off site and, without the mitigations that are in place, to the North Saskatchewan River. Nutrien proposed a plan to fill the former pond with phosphogypsum, recontour the pond and gypsum stack, and cap the area using a phytocapping approach.

Stantec prepared a Risk Management Plan (RMP) to support the decommissioning plan and demonstrate protection of potential receptors from exposure to soil and groundwater impacts through site management and current and planned mitigation measures. There were numerous challenges to the decommissioning, in addition to the unconventional capping approach, including a neighboring metals tailings pond, underground infrastructure, surface water management and groundwater and surface water collection systems that had to be considered. The RMP is supported by a three-dimensional conceptual site model (3-D CSM) to demonstrate the mitigation strategies and facilitate stakeholder engagement with respect to the challenges and mitigations.

Nutrien completed the decommissioning of the Phos Pond, including backfilling and grading over the summer and fall of 2022. The final grade was designed to manage surface water runoff and avoid ponding on the cap as well as to incorporate a toe ditch to capture shallow groundwater flow and a groundwater collection pond to reduce the impacts from the neighboring metals tailings pond. Planting and the establishment of the phytocap was completed in the spring and summer of 2023. Approximately 26,000 hybrid poplar were planted over the 17-hectare area.

Decommissioning is intended to reduce groundwater mounding, reduce horizontal and vertical groundwater flow, reduce the potential for off-site migration of impacts as well as to improve the overall aesthetics of the area. Other benefits of the phytocap include carbon capture and creation of wildlife habitat. The RMP includes ongoing monitoring to verify environmental outcomes including reduced infiltration, reduced groundwater mounding and potential for offsite migration of impacts, stabilization of cover materials, and the effectiveness of the groundwater recovery system.

This presentation will provide a brief history of the site and 3-D CSM, the challenges with decommissioning, the unique approach taken by Nutrien, the risk management plan and the preliminary results of the monitoring program. The focus will be on how the alternative capping approach supports the RMP and the advantages with respect to groundwater management and other environmental outcomes when compared to traditional capping methods.

Dylan King

Dylan is a professional hydrogeologist with 20 years of experience, including Phase II ESAs, groundwater supply evaluations, environmental impact assessments, Environmental Protection and Enhancement Act (EPEA) approval compliance monitoring programs, groundwater database management, and groundwater remediation. Dylan has managed large, complex groundwater monitoring programs at oil and gas, petrochemical and fertilizer production facilities, and appreciates the technical and logistical challenges that such projects present. Dylan has a passion for developing 3D conceptual site models for integration and interpretation of hydrostratigraphy and soil/groundwater analytical results to identify potential risks to human and/or ecological receptors and to develop remediation or risk management approaches to meet client needs while achieving desired environmental outcomes.