Thursday, April 28, 2016
Stream 6 - Resource Conservation
Location: Level A, Salon Joyce

8:30 am – 8:50 am

Utilization of Waste Materials, Non-Refined Materials and Renewable Energy in In-situ Remediation

Paul Favara and Jeff Gamlin
CH2M

The objective of the presentation is to describe how the utilization of waste and non-refined materials, along with renewable energy, can improve the sustainability of in-situ remediation.

Abstract

In the ramp-up to integrating sustainability into remediation, a key industry focus area has been to reduce the environmental footprint of treatment processes. In-situ treatment processes for chlorinated organics are considered inherently sustainable since they typically don't require continuous use of energy to provide effective treatment. However, a closer inspection of the burdens related to some remediation substrates shows there is room for improvement.

A solar/wind-powered subgrade biogeochemical reactor (SBGR) is a unique application of the enhanced reductive dechlorination (ERD) technology that has been developed to treat chlorinated volatile organic compounds (CVOCs) in soil and groundwater. In its simplest configuration, soil above a groundwater hot spot is excavated and backfilled with a mixture of locally available farm waste and non-refined material. A solar or wind-powered extraction well is placed near the backfilled area and extracts groundwater which is conveyed to a distribution network above the new backfill. The extracted water picks up organic carbon as it migrates through the rich organic material and carries it into the groundwater system. The extraction and reinfiltration of groundwater creates a recirculation system that provides for long-term organic carbon delivery and enhanced groundwater pore-volume movement that results in faster treatment times compared to typical "inject and drift" treatment approaches. A layer of abiotic treatment material, such as magnetite, can be placed on the bottom of the backfill to provide treatment of chlorinated organics in the groundwater that may be more amendable to abiotic treatment.

Application of the SBGR treatment technology has demonstrated to be more cost effective and lower environmental burden than traditional in-situ bioremediation approaches. The use of locally sourced waste material provides an opportunity to utilize waste in lieu of food-grade treatment media as an effective remediation substrate. A footprint comparison of different life cycle analysis impact categories shows the organic substrate in these systems have a much lower environmental footprint compared to traditional substrates used in bioremediation. The water footprint in SBGR treatment material is also substantially lower than traditional in-situ remediation delivery approaches since the contaminated groundwater is the source water for delivery of fresh organic substrate. The substrate also doesn't have the significant embedded water footprint associated with the production of food crops. The use of renewable energy to power groundwater recirculation allows this technology to be used off the grid in remote locations and also avoids the use of non-renewable energy.

This presentation will provide an overview of the SBGR treatment technology and focus on the environmental the environmental footprint and cost attributes of the technology. A comparison and contrast of treatment reagents used in the SBGR and traditional in-situ treatment ERD treatment projects will also be presented. CH2M was awarded the 2013 Environmental Business Journal Technology Merit Award in Remediation and the 2015 Network of Industrially Contaminated Lands in Europe Technology Award in 2015 for our work in advancing this sustainable technology.

9:00 am – 9:20 am

Sustainable Remediation of Peatland Following a Petroleum Hydrocarbon Spill

Sylvain Hains, Golder Associates Ltd.

This presentation will focus on the Sustainable Development (SD) actions taken in order to optimize site remediation and the quantifiable results that result. As such, different sustainable development indicators used will be explained, as well as the main issues of the project and of the different stakeholders. Finally, the sustainable development actions integrated into the remediation program will be described and their sustainable development (SD) performance will be presented.

Abstract

On August 17, 2004, a railway convoy from the Canadian National Railway (CN) derailed in the St-Joseph-de-la-Pointe-de-Lévy sector, located in the municipality of Lévis, Quebec. The convoy was transporting a total net volume of 6,440,107 litres of hydrocarbons, distributed in 68 tank cars. The total or partial contents of five tank cars spilled into the environment. The derailing occurred in the North-East extension of the peatland named Grande Plée Bleue. The spill occurred at the perimeter of the peatland, in an area where several ecological units converge, i.e., an ombrotrophic peatland containing ponds and wooded (bog and wooded bog), a lagg, a fen, and a forest.

The Grande Plée Bleue peatland is characterized by its large diversity of vegetation, but also by its network of more than 600 ponds. These ponds are precious feeding and reproduction areas for some 80 species of birds. This puts into perspective the importance of an intervention that takes into account the sensitivity and specifics of this wet environment. As well, this territory is used for recreational and tourism activities (interpretation trails, hunting, hiking, etc.).

Following the derailment and since the beginning of the development of the emergency plan, several SD indicators have been defined and served to establish the different actions carried out. The main indicators used included the following: the impact on the natural environment, biodiversity, groundwater, surface water, the health and safety of users and the public, the natural heritage, public use, production of greenhouse gases, energy consumption, and waste management. This integration of SD principles is to ensure that the impacts of the remediation actions do not exceed the impact caused by the presence of contamination in the environment.

This way, different stakeholders have been involved during the development of remediation measures, including emergency measures, among others: CN, the ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC), Environment Canada and the property owners adjacent to the site. Experts were also consulted, such as the groupe de recherche en écologie des tourbières de l'université Laval (Université Laval peatland ecology research group) and public interest groups were informed, such as the Société de conservation et de mise en valeur de la Grande Plée Bleue (Grande Plée Bleue conservation and improvement Society).

The remediation program has been optimized for each site area in order to minimize the ecological footprint of the remediation, and involves, among other things, controlling impacts on ground and surface water, the removal of one part of the peatland affected in the fen by excavation and the re-vegetation of this area as well as the in situ treatment through bioremediation of the affected peat in the bog and wooded bog.

9:30 am – 9:50 am

Improving the Sustainability of Clean-ups Through Conservation and Reuse of Treated Groundwater: A SuRF Initiative

Amanda McNally, AECOM

The objective of the presentation is to encourage more reuse of treated groundwater on site remediation projects worldwide.

Abstract

Reuse of treated groundwater is vital to augment worldwide water supplies. As the global population and the demand for water continues to increase, the challenge of supplying potable water becomes more prominent, requiring us to manage this natural resource in a sustainable manner. While it may seem intuitive to many of us in the remediation industry that groundwater conservation and reuse at remediation sites should be considered more frequently and evaluated more thoroughly than it has been to date, the concept remains a significant paradigm shift for many others. So, in 2012, the Sustainable Remediation Forum (SuRF) undertook an initiative to improve the sustainability of remedies by encouraging a greater focus on conservation and reuse of groundwater at clean-up sites. In 2014, SuRF's technical initiative team produced a document titled "Conservation and Reuse of Groundwater at Remediation Sites."

This presentation will provide an informative overview of SuRF's 2014 document, with the intent of encouraging efforts of water stewardship and reuse at remediation sites throughout the site remediation industry. Specifically, the presentation will inform on the industry impediments to conservation and reuse of treated groundwater, educate on how to overcome those impediments, profile some case study examples where reuse of treated groundwater from remediation sites has been successfully implemented, and highlight the next steps for us all to envision an increase in these practices, worldwide. To encourage a paradigm shift and inspire sustainable water stewardship in the remediation industry, this presentation is offered.