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Australian Success in Bioremediation Cluster Approach

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Background/Objectives. The onsite remediation of hydrocarbon impacted soils at urban sites in Australia is often difficult due to project constraints such as footprint available, time constraints to reopen sites and sensitive neighboring receptors. The Cluster approach was adopted in 2012 by Caltex Australia Petroleum (Caltex) for the Sydney basin when a feasibility study was commissioned to identify potential Hub and Cluster sites. The study investigated the potential to develop these sites, including assessing the suitability of the material.
The Caltex Cluster approach was based on locating a centralised bioremediation treatment hub within clusters of regeneration sites containing large volumes of hydrocarbon impacted soil thereby allowing the bioremediation and appropriate reuse of the soil rather than disposal to landfill.

Approach/Activities. The pilot facility treated a range of soil types that were contaminated by crude-oil based products such as petrol and diesel. Due to regulatory requirements the ex-situ bioremediation process was undertaken in covered stockpiles, which were vented to enhance aerobic microbial activity. All emissions generated during the remediation were treated by a filter system.
Over a 27 month period (October 2013 to January 2016) a total of 5,744 tonnes of hydrocarbon impacted soil was received, successfully treated and reused. The soil was received from 13 sites in NSW with material ranging in texture, chemistry and parent material.

Results/Lessons Learned. Mass balance calculations indicate there four distinct factors resulted in the total degradation of hydrocarbons: volatilisation into the extracted air, volatilisation from the stockpile surface, leaching, and microbial activity in the stockpile. Stockpiles contained an average of 1,066 kg hydrocarbon per stockpile when received at the pilot facility. This was reduced to an average of 67 kg hydrocarbon per stockpile when validated. The microbial degradation of hydrocarbons was determined to be the most significant factor for TPH remediation.

Once treatment was complete, the soil was tested before being reused in appropriate situations, such as for use as engineering fill, giving a second life to the soil. The availability of the facility negated the requirement for on-site remediation of hydrocarbon-impacted soils across NSW, a process which can create odour and vapour issues for local residents and businesses.
The Proof of Concept to Regulators has resulted to approval of a permanent Sustainable Soil Remediation Facility, which is now operational immediately adjacent to the pilot location. In addition, Caltex were awarded a gold medal for the project in the International 2016 Edison awards for the category of Reuse & Reclamation. These were announced in New York in April 2016.

The Cluster approach is applicable to numerous industries and as such, it is the intention of this paper to provide an introduction to all aspects of the Cluster bioremediation approach, including regulatory and approvals, research findings, the challenges and limitations of approach, through to a detailed analysis of the benefits/consequences.