Rapid Measurement of Petroleum Hydrocarbons during Site Remediation

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Background/Objectives. A petrochemical plant in southern Taiwan was shut down at the end of 2015. AECOM carried out detailed soil and groundwater assessment and high concentrations of total petroleum hydrocarbons (TPH) were found, mainly originating from lubricants and base oil. Site remediation activities officially started on 1 January 2017. Around 10 hectares of land requires remediation over a 3 to 4-year period.

According to the results of the site investigation, the remediation plan for the site will use a combination of biological treatment, soil washing, and thermal treatment. All of the contaminated soil will be excavated (down to several metres in some areas), and the appropriate remediation method will be chosen based on soil texture, contaminant levels and regulatory targets.
Biological treatment will be used for low TPH concentration soil. Soil washing and thermal treatment will used for high TPH concentration soil with sandy or silty textures, respectively.
A handheld infrared instrument for the rapid measurement of TPH in soil (RemScan®) is being employed as a screening tool to help classify and segregate soils for the different remediation methods.

Approach/Activities. The handheld infrared instrument was calibrated using representative soils form the remediation site. The instrument was then validated by scanning selected soils and then sending the scanned soils to an external laboratory for TPH (C_{10} to C_{36}) analysis using US EPA Method 3570:8015C.

After validation, the instrument was then used to segregate soils for the various remediation methods and to analyze samples before and after treatment.

Results/Lessons Learned. The calibration model is shown in Figure 1 below. The validation data is shown in Table 1 below. The results show an excellent correlation between RemScan and an external laboratory for both the calibration model and the validation samples.
Based on these results, the instrument is now being used as an integral art of the site remediation plan, saving many thousands of dollars in operational and laboratory costs.

Table 1: Validation of RemScan versus Laboratory for 4 Selected Site Samples

Sample Id	Lab (ALS) TPH (mg/kg)	RemScan TPH (mg/kg)*
S1	2,900	2,365
B-0.5m	4,570	4,410
B-5m	8,410	8,334
B-5.5m	42,100	41,648

*Average of 10 measurements with mixing between each measurement