

Integrated Study on the Distribution of Groundwater Contamination Flow Path at a Waste Disposal Site in Malaysia

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Most of the waste disposal site in Malaysia can be categorized as open dump sites which are usually without proper liner, treatment facilities and final capping. Most of these landfills are poorly managed and as a consequence leachate will easily migrated to the surrounding area through soils, subsurface geological strata and finally contaminate the groundwater system. This study had demonstrated the use of integrated techniques in determining the distribution of groundwater contamination flow path to the surrounding area in a selected waste disposal site in Malaysia. This study deals with field survey, sampling and laboratory test. Field survey involves geophysical investigation and groundwater flow study. In this study, electrical resistivity imaging (ERI) and colloidal boroscope system (CBS) were carried out to detect the groundwater contamination flow path at a waste disposal site. In addition, groundwater was sampled at every existing borehole as well as surface water within the study area in order to understand the scenario of the leachate plume distribution. The samples were analyse for their heavy metals content and stable isotope concentration.

Groundwater contamination at the Taiping waste disposal can be visually detected through ERI technique. In general, the contours of resistivity results show the existence of inhomogeneous strata in the area. It is quite clear that low resistivity anomalies exist at certain location in this study area is due to leachate plume movement. The result of the study confirms that the occurrence of groundwater contamination can be detected up to 25 m in-depth. The ERI technique had successfully delineated pollution layers. Thus, this method is an effective tool in detecting contaminated groundwater zones or layers in the study area. With support from the colloidal borescope data, the movement direction of leachate plume can be determined. Generally, the flow pattern of the pollutant species dominantly towards to the southeast of the study area that is follow the flow direction of groundwater. Based on the geochemical analysis, higher anomaly pollutant species were detected at the boreholes which is located at the southeast of the study area, indicates that the contaminant dominantly migrated through this borehole. However, the migration of leachate plume in the study area is still localized and not disperses in a wide area. This correlates well with low resistivity zone (<10 ohm-m) from the ERI images. The interconnection between groundwater and surface water can be observed in the study area based on stable isotope data. The tritium content in groundwater samples indicated that most probably water of modern groundwater. This integrated study was conducted in order to get more reliable and conclusive results. These findings will help Local Authorities to take some immediate action to improve the existing waste disposal site for instances improving the leachate treatment facility and upgrading the infrastructure inside the waste disposal site.

