

**Groundwater Flow Characterisation
and
Quality
around Selected Waste Dumpsites
in
Lagos, Nigeria**

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**SCHOOL OF POSTGRADUATE STUDIES
UNIVERSITY OF LAGOS
CERTIFICATION**

This is to certify that this thesis:

**Groundwater Flow Characterisation and Quality around
Selected Waste Dumpsites in Lagos Nigeria**

Submitted to the School of Postgraduate Studies, University of Lagos
for the Award of the
DEGREE OF DOCTOR OF PHILOSOPHY (Ph.D)
is a Record of Original Essay Carried out by

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DEDICATION

To

The Almighty God, My Glory and the Lifter of My Head

To

My Mother, Mrs. Olusola Adegun

My Jewel of Inestimable Value, My Pillar and Source of Inspiration

and

The Memory of My Late Father, Mr. Felix Babajide Adegun

(You will Forever Live on in My Heart)

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ABSTRACT

Dumpsites in Lagos constitute a major source and risk of groundwater quality impairment in the environments where they are located. This is because the waste management practices at these dumpsites allows rainwater to infiltrate the waste matrix and combine with interstitial water released during the process of waste degradation, to produce leachate, which may eventually contaminate groundwater resources around the dumpsites. In achieving the aim of this study which is to assess the possible linkage between the groundwater flow pattern, leachate and the quality of groundwater around the dumpsites, three dumpsites were selected. These are the Abule-Egba, Solous 1 and Solous 2 Dumpsites.

In line with the objectives of this research, the study characterised groundwater flow pattern around the dumpsites through 2-Dimensional numerical groundwater flow modelling using processing MODFLOW (Pmwin version 5.3). The leachates generated at the dumpsites were characterised and their contamination potential were assessed using the Leachate Pollution Index. Furthermore, the variation, spatial pattern, and degree of groundwater contamination around the dumpsites were assessed through Principal Component Analysis, the inverse distance weighting method of spatial interpolation and Groundwater Contamination Index.

The results of the groundwater flow modelling revealed a predominantly horizontal and multidirectional flow pattern at Abule-Egba and Solous Dumpsites vicinities respectively. The assessment of the contamination potential of the leachates generated at the dumpsites through the Leachate Pollution Index revealed a low contamination potential, while the results of the groundwater quality assessment showed that a combination of waste disposal activities and lithogenic interactions groundwater with the aquifer and underlying geology were responsible for

the variation and mostly minimal level of groundwater contamination recorded around the dumpsites.

The higher mean concentration of parameters such as Electrical Conductivity, Total Dissolved Solids and Chloride downgradient of Abule-Egba Dumpsite is attributed to the predominantly horizontal groundwater flow pattern, while the multidirectional flow pattern around Solous Dumpsites implies the potential for leachate to migrate in different directions.

The study therefore advocates a number of measures to reduce the risk of groundwater contamination around current and future dumpsites locations in Lagos. The study recommends amongst others that detailed hydrogeological and groundwater flow characterisation be conducted before the location and commencement of waste disposal activities at future dumpsites in Lagos.