

# **PROJECT TITLE: INVESTIGATION OF SOIL MOISTURE CONTENT VARIATIONS IN URBAN VS. NATURAL ENVIRONMENTS: A CASE STUDY IN BUKIT BATOK, SINGAPORE**

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# ABSTRACT

This research investigates the variation of soil moisture content across different land cover types within the bukit batok area of singapore. As a soil laboratory technician, I observed that localized geological features and vegetation significantly influence water retention in tropical urban environments. Using the globe observer app and manual soil sampling techniques, I collected data from two distinct sites: a naturally vegetated area near the bukit batok nature park and a compacted urban soil site. The primary objective was to understand how urban development impacts the soil's ability to hold moisture compared to natural landscapes. Initial findings suggest that areas with higher organic matter and natural vegetation maintain more stable moisture levels, even during singapore's high-intensity rainfall events. This data contributes to understanding local geotechnical properties and urban environmental management.

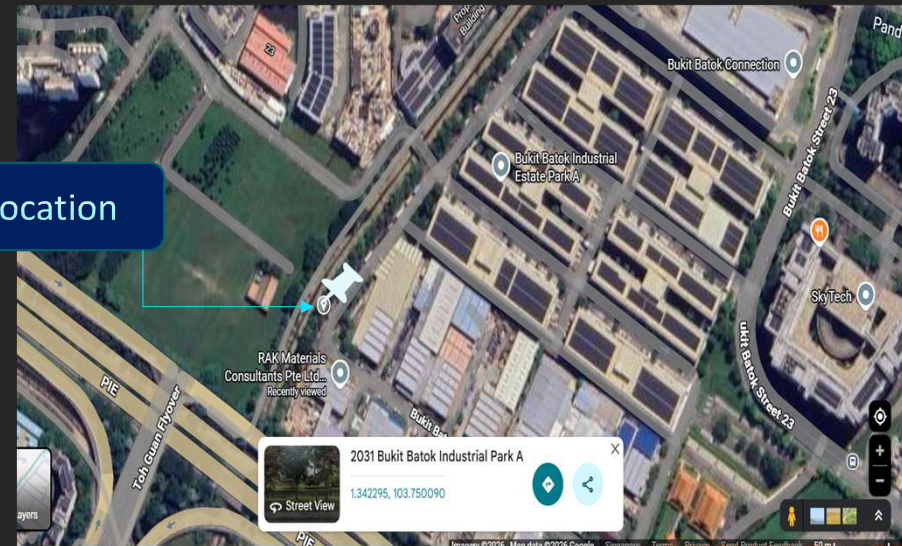
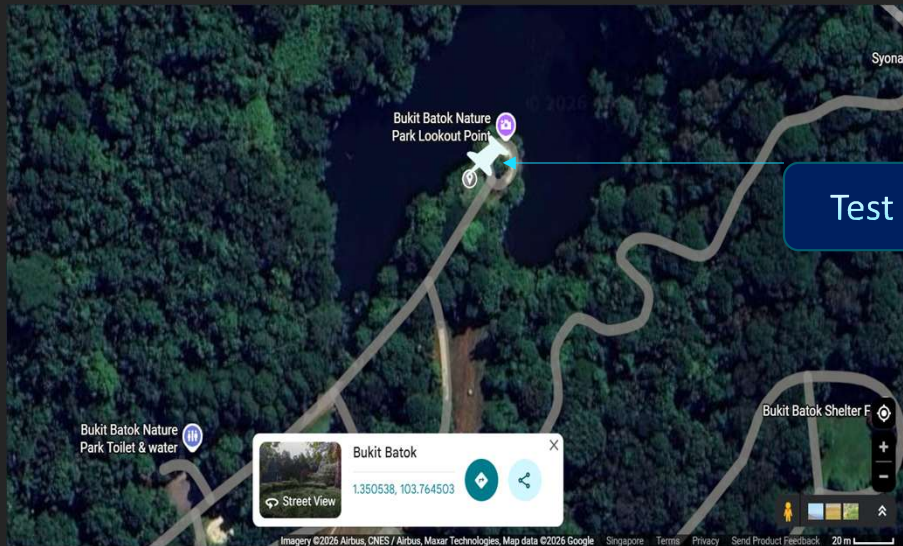


# SOIL DESCRIPTION

1) LOCATION: BUKIT BATOK, SINGAPORE

2) COLOR AND TEXTURE: YELLOWISH BROWN SILTY CLAY

3) ENVIRONMENT: COMPARISON BETWEEN A NATURAL PARK AREA (FORESTED) AND A ROADSIDE/PAVED URBAN AREA



# METHOD AND MATERIAL

## TEST METHOD: BS 1377-2:1990 CLAUSE 3.2

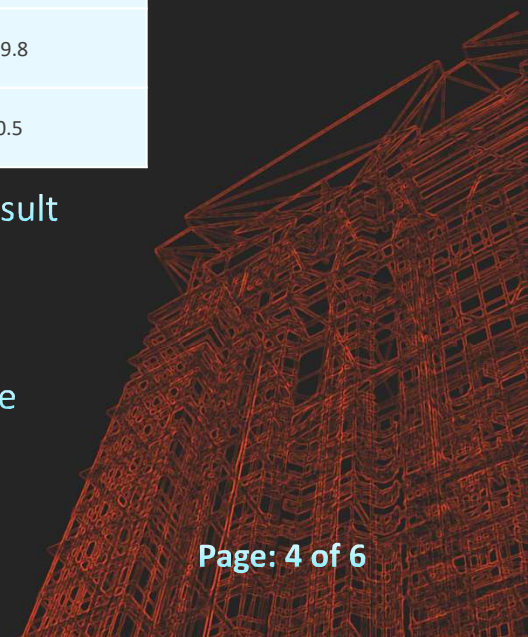
Mass of container, g	238.8
Mass of container + moist specimen, g	1574.4
Time in (oven)	26/1 - 5pm
Time out (oven)	27/1 - 9am
Mass of container + dry specimen, g	1222.6
Moisture Content, w, %	35.8

a natural park area (forested) test result

Mass of container, g	226.5
Mass of container + moist specimen, g	992.6
Time in (oven)	25/1 - 5pm
Time out (oven)	26/1 - 9am
Mass of container + dry specimen, g	919.8
Moisture Content, w, %	10.5

a roadside/paved urban area test result

**Remark:** The investigation revealed a significant disparity in soil moisture levels between the two sites. The natural park area (forested) showed a high moisture content of **35.8%**, whereas the roadside urban area recorded only **10.5%**.

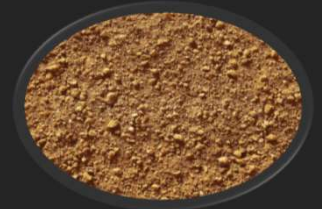


## DISCUSSION: IMPORTANCE OF SOIL MOISTURE CONTENT

Moisture content is a critical factor influencing the shear strength and bearing capacity of soil. In geotechnical engineering, excessive moisture can lead to an increase in pore water pressure, which reduces effective stress and may cause slope instability or foundation failure.

The high moisture content of **35.8%** at the Bukit Batok Nature Park reflects the healthy hydrological cycle of a forested ecosystem. The presence of natural vegetation and organic leaf litter acts as a protective layer, reducing evaporation and allowing higher water infiltration into the soil. From a geotechnical view, this represents a soil state with higher void spaces occupied by water, typical for well-structured residual soils in Singapore.

In contrast, the significantly lower moisture content of **10.5%** at the roadside site indicates the impact of urban development. Soil compaction from construction and the presence of impermeable surfaces (pavements/roads) severely limit rainwater infiltration. This dry state can lead to higher soil suction and changes in effective stress, which are critical factors to monitor for slope stability near urban infrastructures.



# CONCLUSION AND REQUESTING THE BADGES

This investigation proves that land cover in Bukit Batok significantly affects soil moisture levels. The high moisture at the natural park (**35.8%**) compared to the roadside (**10.5%**) demonstrates the vital role of natural vegetation in water retention and urban cooling. This data is crucial for geotechnical planning to manage soil stability and groundwater recharge in Singapore's urban areas.

## **I am a GLOBE Researcher:**

**Reason:** I completed a full scientific investigation by collecting original field data using GLOBE protocols and analyzing the results through a geotechnical engineering lens.

## **I Work with Satellite Data:**

**Reason:** I used the GLOBE Observer Land Cover tool to provide ground-truth observations that help validate NASA's satellite-based soil moisture models.

**References:** The GLOBE Program, Soil Moisture Protocol

## **I am a STEM Storyteller:**

**Reason:** I communicated my research findings to help my community understand the importance of soil health and urban hydrology.

