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CTBT: SCIENCE AND TECHNOLOGY CONFERENCE

T2.2-O1

A RAPID AND NON-DESTRUCTIVE METHOD FOR DETERMINING IN-SITU UNIAXIAL COMPRESSIVE STRENGTH (UCS) OF ROCKS DURING ON-SITE INSPECTIONS (OSIs)

By

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INTRODUCTION

- The On-Site Inspection Action Plan (OSI-AP), CTBT/PTS/INF.1343 and Corr. 1, serves as a tool for furthering OSI capabilities towards the establishment of a balanced, coherent, and robust verification regime at entry into force (EIF) of the CTBT.

- OSI-AP overarching priorities include, among others:-
  - Further development and consolidation of *inspection activities* and *techniques;*
  - Continued development of OSI equipment list with a view to having a near final draft list ready for consideration and approval at 1st Session of CSP.

- In furtherance to OSI-AP priorities/objectives, experts meeting held in VIC from 7-9 March 2018

- Consider specific issues relating to ground based visual observation (GVOB) and position finding.

INTRODUCTION (cont'd)

- Petrography proposed as an initial period GVOB technique.
- Technique not recommended because:

  (i) intrusive (involving rock sample collection);

  (ii)destructive (rock cutting and thin section preparation); and

  (iii) expensive and time consuming (petrographic analysis of thin sections).
- Technique may not offer immediate results to allow other OSI activities and techniques e.g. CPT to be undertaken.
- Schmidt hammer test method proposed as an alternative to petrography technique

THE SCHMIDT HAMMER TEST METHOD

- Also know as Rebound Hammer test method; non-destructive test (NDT) method.
- Makes use of Schmidt hammer or rebound hammer device.
- Developed primarily for testing concrete structures; has established itself as a recognized testing instrument for in-situ rocks in the field
- Measures rebound number (N) which is converted to Uniaxial/Unconfined Compressive Strength (UCS) using calibration curves or Linear and exponential correlations.
- Preserves integrity of samples, relatively simple, economical and versatile compared to conventional crushing tests (including rock cutting and thin section preparations).

SCHMIDT HAMMER (REBOUND HAMMER) DEVICE

Operation and working of device described in ISO 1920-7, ASTM C805, ASTM 597, CSN EN 12504-2, and CSN EN 12504-4.

WHY UCS DETERMINATION USING SCHMIDT HAMMER TEST??

CASE STUDY OF SCHMIDT HAMMER TEST: THE STUDY AREA

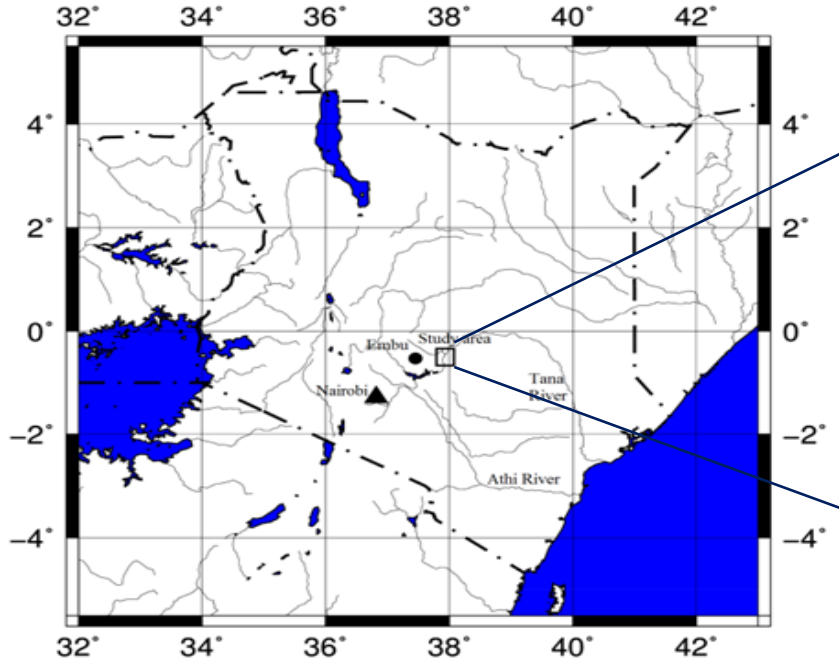
- Tests part of a multi-disciplinary study (ERT/I, MASW, Drilling, Geological mapping) at a proposed Karura HPP tunnel route, located about 200 km NE of Nairobi city in Kenya (Mulwa and Kuria, 2018)

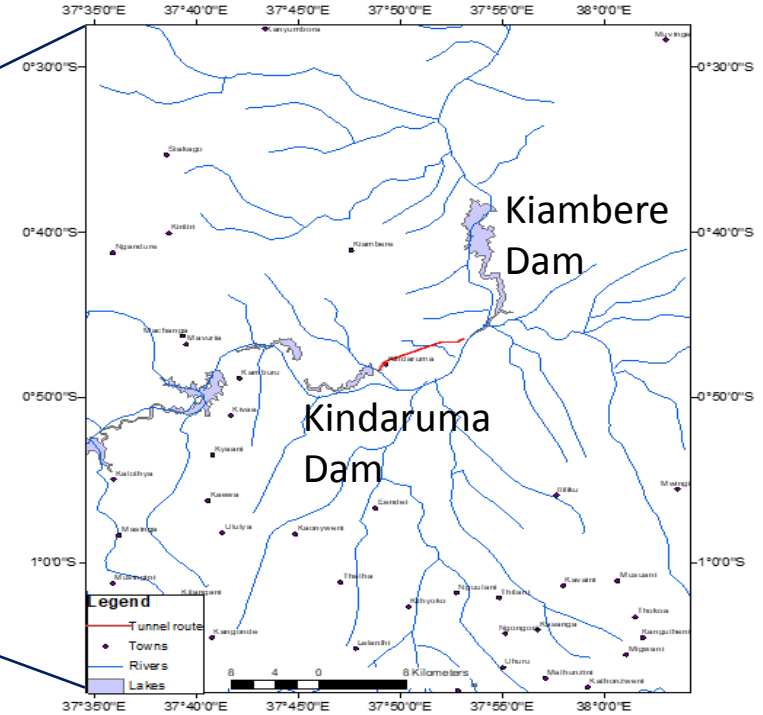
- Proposed Karura HPP tunnel route stretches over a distance of about 9km ENE from an existing Kindaruma HPP in upper Tana River.

- Run-of-river water (≅190 m^3/s) of discharge from the existing 3x24 (72) MW Kindaruma HPP, expected to serve Karura HPP.

- Karura HPP to further exploit residual head (≅ 40 m) between Kindaruma and Kiambere HPPs in the upper Tana River.

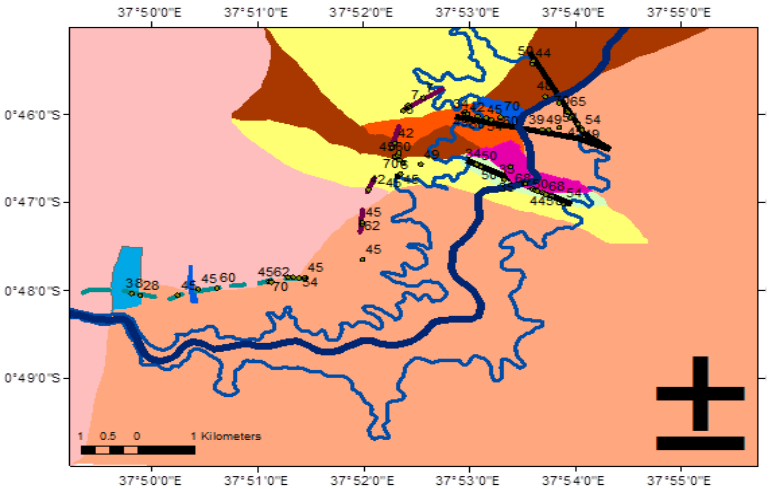
LOCATION OF THE STUDY AREA

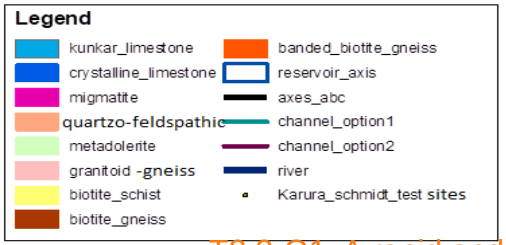


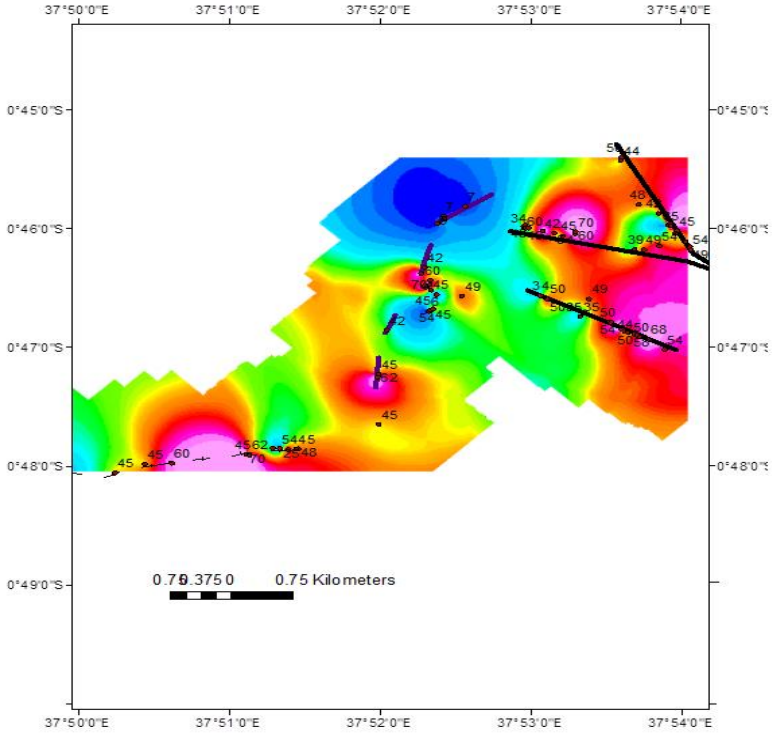


T2.2-O1: A rapid and non-destructive method for determining in-situ UCS of rocks during OSIs

CASE STUDY OF SCHMIDT HAMMER TEST: GEOLOGY AND UCS RESULTS







SUMMARY: SCHMIDT HAMMER TEST RESULTS

Rock Type	UCS (Mpa)
Biotite schist	7
Limestones (Crystalline and Kunkar)	28-38
Banded Biotite gneiss/Biotite gneiss	42-50
Granitoid gneiss	42-62
Qurtzo-Feldspathic gneiss	45-62
Granitoid gneiss - Qurtzo-Feldspathic gneiss contact zone	60-70
Meta-Dolerite and Migmatite	50-68

UCS values of rock outcrops in the study area governed by:-

- Rock type
- Degree of weathering
- Macro and micro fractures
- Foliation (Banding, Schistocity etc)

THANK YOU

ASANTE SANA