THE UNIVERSITY OF MELBOURNE, FACULTY OF ENGINEERING

STRENGTH AND DEFORMATION PROPERTIES OF COODE ISLAND SELT

BY

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## DEVELOPMENT TECHNOLOGIES

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There are extensive deposits of soft marine clay along the coastal fringes of West Malaysia. Early development in the country was located in relatively firm grounds and foundation failures were relatively minor.

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However with the rapid progress in industralisation and infrastructure construction during the late 1960s and 1970s ,it was found that large civil engineering projects had to be constructed on the soft marine deposits. Some of these projects had major problems associated with differential settlements, embankment stability and the extent of surcharge duration necessary. The effects of some of these problems are experienced to this date. It was therefore necessary to understand the behaviour of such deposits inorder to reduce the effects of such problems.

The Coode Island Silt deposit of the Lower Yarra Delta is believed to behave similar to the soft marine clay of West Malaysia. The knowledge and experience gained in understanding the behavioural characteristic of the Coode Island Silt deposit could be applied to the problems encountered in Malaysia. The work undertaken in this thesis was aimed at developing such skills. TABLE OF CONTENTS:

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## 1. INTRODUCTION

The Coode Island Silt deposit is a silty clay formation making up part of the Yarra Delta. This Delta is believed to have been formed by the process of sedimentation and erosion associated with sea level changes during the Quaternary period. The Coode Island Silt,(CIS) is thought to have been formed in the final phase of this sedimentation process, which took place about 8000-9000 years ago.

The climate during this period was much warmer than the present and the sea level was some 3 meters higher than now and extended up the Yarra and Maribyrnong valleys to form a large embayment from North Melbourne and South Kensington through Fishermans Bend and Port Melbourne with a minor embayment reaching east of the basaltic hills at South Melbourne towards Albert Park.

After deposition of the Coode Island Silt, the sea slowly retreated to its present level and strandline. This silty clay delta is underlain by a very uneven terrain of Tertiary and Silurian rocks crossed by hills and depressions.

The properties of Coode Island Silt were extensively investigated during the early 1960's due to the proposed construction of the Lower Yarra Crossing. This material was tested in great detail by the Road Construction Authority (formally C.R.B.). Subsequently other independent workers have also investigated the shear strength and stress-strain characteristics at scattered locations. The response of a soil element to a particular test or engineering event will depend on the changes of effective stresses that it undergoes, and further this response will be inadequately represented by a few simplistic properties such as Undrained Shear Strength.These properties themselves may vary locally to a significant degree both laterally and vertically within the ground due to the microfabric of the material and its history of formation.

Certain key material properties need to be measured and their variability taken into due consideration. This variability has to be viewed against the cost of testing and the delay times involved in doing new tests for each new job site.

Because of the variation and uncertainty in the soil properties, a number of correlations have been established which when used judiciously form a valuable framework for the interpretation of test data. The empirical observations that many cohesive soils exhibit normalised behaviour is of major practical value, for it provides a very convenient format for presenting and evaluating the behavioural characteristics. With the exception of Anantasech(1984), very little attention has been devoted to the development of the normalised behaviour of the Coode Island Silt.

It is therefore the intention of this report to:-

- (i) Create a database holding selected strength and deformation data and index properties for the Coode Island Silt.
- (ii) To investigate any trends that are observed with this material.
- (iii)To investigate also the feasibility of data logging with the aid of micro computer.

This report will include data on the index properties, strength properties, consolidation parameters, field settlement behaviour and cone penetration data. Although detailed pressure meter data has not been included in this report, it will be discussed briefly. The borehole location and the occurrence of CIS is shown in Figure 1.1. and the typical cross-sections in Fig. 1.2.

The data for the properties mentioned in this report were collected from the Road Construction Authority, Coffey and Partners, Port of Melbourne Authority and from various publications as will be discussed in Chapter 2 and Chapter 3.