

## APPENDIX I

### DREDGING RESEARCH LTD

SUSPENDED SEDIMENT DATA COLLECTION  
DRAFT REPORT ON INITIAL SURVEY AT SOUTH CHEUNG CHAU (JUNE 1993)

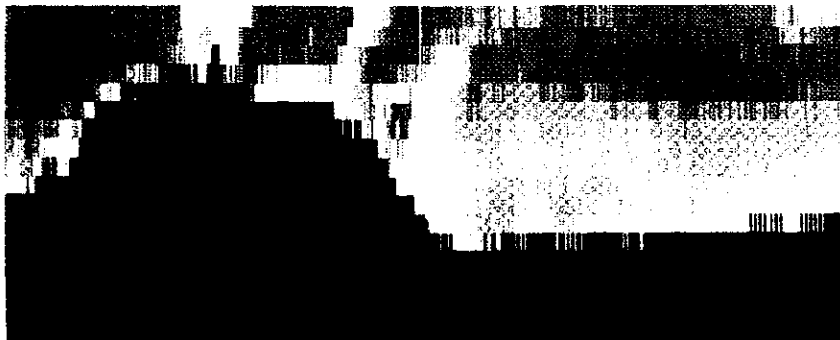
Introduction

Discussion and Summary of Conclusions

DREDGING RESEARCH LIMITED



**STUDY AND MEASUREMENT OF  
DREDGED MATERIALS  
FILL MANAGEMENT STUDY**



**SUSPENDED SEDIMENT DATA COLLECTION**

**DRAFT REPORT ON INITIAL SURVEY AT  
SOUTH CHEUNG CHAU (JUNE 1993)**

NOVEMBER 1993

GEOTECHNICAL ENGINEERING OFFICE  
CIVIL ENGINEERING DEPARTMENT  
HONG KONG



AGREEMENT CE 2/93  
STUDY AND MEASUREMENT OF DREDGED MATERIALS

DRAFT REPORT ON INITIAL SURVEY AT  
SOUTH CHEUNG CHAU MARINE DISPOSAL AREA

1. INTRODUCTION
- 1.1 The work described in this report was carried out as a part of The Study and Measurement of Dredged Materials under Agreement CE 2/93. The Study comprises two main elements:
  - A. The development of the Acoustic Doppler Current Profiler (ADCP) as a tool for the measurement of suspended solids in the water column;
  - B. Field measurements of suspended sediment intended to establish the effects of the extensive dredging and dredging material disposal operations which are now in progress.
- 1.2 Element A is essentially a research project during which field experiments and desk studies are being undertaken in order to establish a sound theoretical and practical basis for the use of ADCPs for measuring suspended solids. This part of the Study, whilst at an advanced stage, is still in progress. Much of the knowledge and experience gained since the commencement of the Study has yet to be fully reported and, even now, field methods and data interpretation procedures are still being refined.
- 1.3 The second part of the Study is still at an early stage. There are two types of field measurement involved:
  1. Territorial Suspended Sediment Surveys: Very large surveys covering the greater part of the territorial waters which are intended to gather data at a coarse scale concerning the overall suspended sediment regime in Hong Kong .
  2. Focused Surveys: detailed surveys during which specific areas are investigated.
- 1.4 At the time of preparation of this report, initial focused surveys had been undertaken at the South Cheung Chau and East Ninepins marine disposal areas in June 1993 and the First Territorial Suspended Sediment Survey had been undertaken in August 1993 during a period of spring tides. This Draft Report presents the results of the Initial Survey at South Cheung Chau. The survey was undertaken between the 6th and 9th June 1993 in order to identify and make a preliminary quantification of the sediment transport processes, if any, which act to remove sediment from the area or to redistribute it within the area.
- 1.5 The survey was undertaken jointly with Ravensrodd Consultants Ltd. (RCL) who have been retained by the Geotechnical Engineering Office to assist with the Mud Management Studies. The equipment used during the survey was deployed and operated by the Term Geophysics Contractor, Electronic and Geophysical Services Ltd. (EGS). This Draft Report presents the results of that part of the survey which relied on the use of the Acoustic Doppler Current Profiler (ADCP) to identify sediment movement in the main body of the water column. Measurements of dissolved oxygen which were obtained during this survey will be described in the Final Report.

## 5. DISCUSSION AND SUMMARY OF CONCLUSIONS

- 5.1 The survey has provided a very useful overview of the general distribution of sediment in the main body of the water column at the disposal area. The background conditions, as far as they can be recognised, appear to comprise a stratified water column in which the upper parts are characterised by sediment concentrations in the range 5 - 10 mg/l. These concentrations are coincident with reduced salinities and can be attributed to the Pearl River discharge. Below this surface layer, concentrations are very low, in the range 2 - 5 mg/l except very close to the seabed where they tend to rise again to between 5 and 10 mg/l.
- 5.2 Superimposed on this picture are the effects of the dumping operations and those of the apparent erosion of some of the previously-dumped materials which, in some instances, form prominent mounds. In the main part of the water column, elevated sediment concentrations appear to be localised to the immediate areas of the dumping operations. Concentrations diminish down-current which, during this survey, was in an ESE or SE direction. In the immediate vicinity of the dumping operations, concentrations were sometimes observed to slightly exceed 100 mg/l.
- 5.3 In contrast, there is evidence to suggest that over a very wide area, concentrations close to the seabed are elevated. This is likely to be, at least in part, a natural phenomenon but is also likely to be due to dumping. The relatively dense, near-bed suspensions that are inevitably formed as a result of dumping have the capability of flowing under gravitational forces in directions oblique to the tidal current and may actually flow against the current if the seabed slope is sufficient. Substantial areas of the near-bed water column might be expected to be affected in this manner and the results of the survey tend to confirm that this is indeed the case at South Cheung Chau.
- 5.4 There is strong evidence to suggest that one, and possibly three, of the spoil mounds formed in previously active dumping areas are being eroded by tidal currents. The northernmost mound was formed as result of barge-dumping operations and is located at E817500 N803700. It extended, at the time of the survey, to within about 4.5 metres of the sea surface. Elevated sediment concentrations near the top of the mound and in the area immediately down-current of the mound can be attributed with some confidence to erosion. It is understood that recent surveys have confirmed this erosion and more details will be provided in the Final Report.
- 5.5 The southern mound, centred at E817700 N801200, is much deeper and slightly elevated concentrations can only tentatively be attributed to erosion. Similarly, the eastern mound, at E820450 N802600 appears to be eroding slightly but the elevated concentrations could possibly be the result of an inaccurate dump. The possibility of erosion at South Cheung Chau, particularly during storms, was discussed in some detail in a recent GEO report (Evans, 1992).
- 5.6 Overall, the effects of the dumping at South Cheung Chau appear less dramatic than might be expected in view of the amount of materials which was being placed there in early June 1993. This conclusion is reinforced by the results of the first Territorial Suspended Sediment Survey which was undertaken in August 1993. These results are now being analysed and, in summary, show that South Cheung Chau is located between two areas where, during the ebb tide, significant sediment concentrations occur. To the west, the ebb tide carries a considerable amount of sediment around the western end of Lantau. Very high concentrations were recorded in the whole area around the Soko Islands which extended to a point about midway between the Sokos and South Cheung Chau at low tide. The vast majority of the sediment is thought to be derived from the Pearl River although it may be supplemented by some sediment from the work at the New Airport at Chek Lap Kok.
- 5.7 To the east, the Territorial Survey identified a second significant volume of sediment emerging with the ebb tide from the Western Harbour along the west side of Lamma. This is likely to be due to a combination of the Pearl River discharge and the effects of dredging works at the New Airport and in the various marine borrow areas between the airport and the northern end of Lamma.
- 5.8 The survey also showed that sediment derived from South Cheung Chau was identifiable, at low concentrations, for several kilometres to the east of the area before it passed out of Territorial Waters due south of the West Lamma Channel.