



Civil Engineering Department
Geotechnical Engineering Office

**Agreement No. CE 52/94
West of Sulphur Channel
Marine Borrow Area**

Focused Environmental Impact Assessment

Executive Summary
December 1994

Scott Wilson Kirkpatrick
CONSULTING ENGINEERS

in association with

Aspinwall & Company
Hydraulics and Water Research Asia Ltd

EIA/023 2/10
EIA-0502/BC



Civil Engineering Department
Geotechnical Engineering Office

**Agreement No. CE 52/94
West of Sulphur Channel
Marine Borrow Area**

Focused Environmental Impact Assessment

Executive Summary
December 1994

Scott Wilson Kirkpatrick
CONSULTING ENGINEERS

in association with

Aspinwall & Company
Hydraulics and Water Research Asia Ltd

WEST OF SULPHUR CHANNEL MARINE BORROW AREA FOCUSED ENVIRONMENTAL ASSESSMENT EXECUTIVE SUMMARY

Introduction

1. A Focused Environmental Impact Assessment (EIA) has been undertaken for the proposed use of the West of Sulphur Channel Marine Borrow Area (WSC MBA) for the dredging of reclamation material, as awarded by the Civil Engineering Department (CED) under Agreement No. CE 52/94.
2. Investigations in the WSC area have indicated that if this area is added to the South Tsing Yi (STY) area to the north (Pits 1& 2), the utilisation of the overall sand resource can be optimised. The section of borrow area assessed for the purposes of this Study is referred to as WSC Pit 3. The locations of the pits are shown in Figure 1.

Scope of Assessment

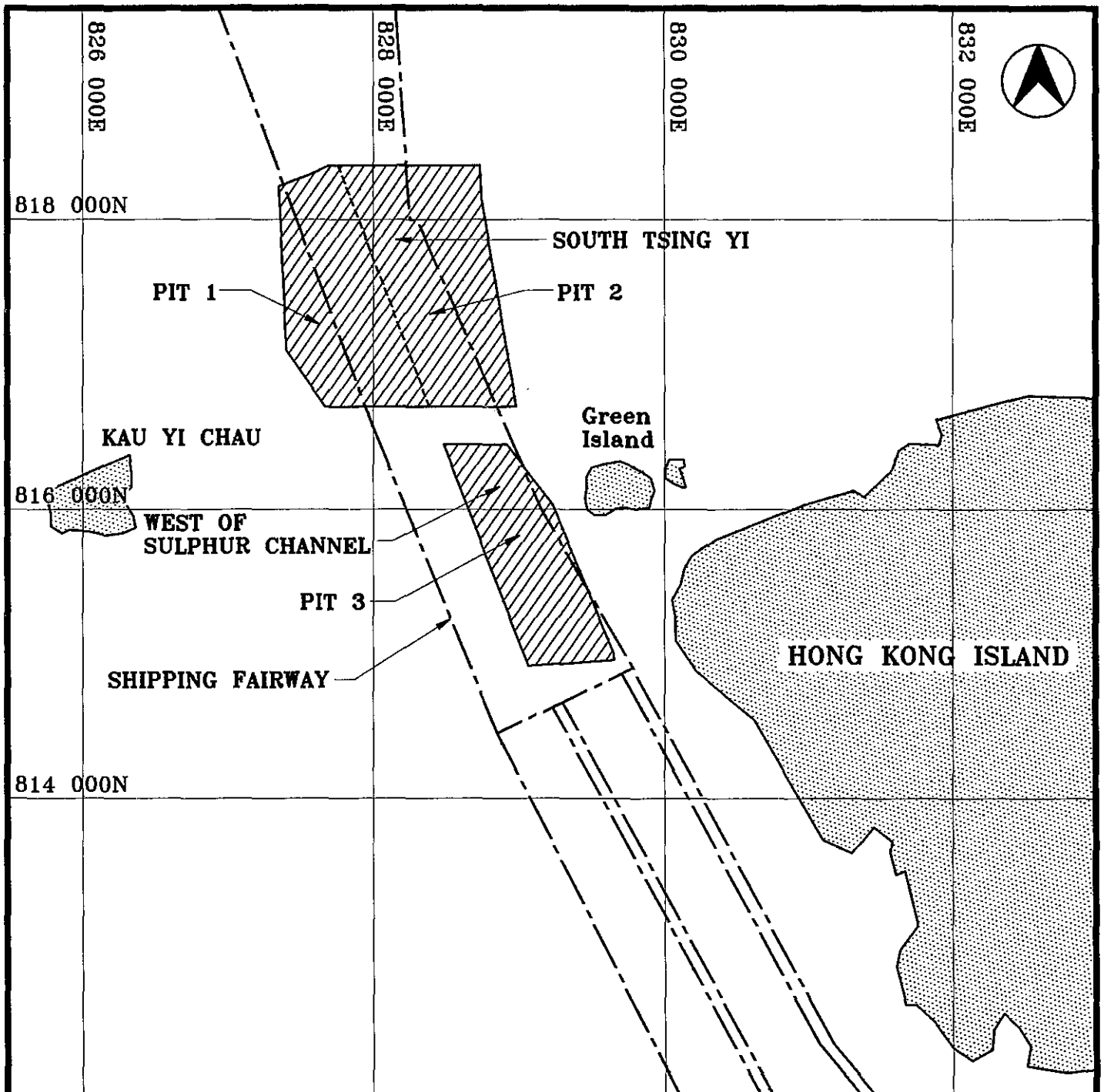
3. The primary purpose of the Focused EIA has been to assist in minimising pollution, environmental disturbance and nuisance from the proposed marine borrowing and all related activities in West of Sulphur Channel by providing information on the nature and extent of the potential environmental impacts, identification of the most appropriate dredging method and the recommendation of suitable mitigation measures.
4. A scoping exercise of environmental impacts associated with the works identified major potential impacts in relation to marine water quality and marine ecology, and intermediate impacts with respect to fisheries, mariculture zones and visual quality. Minor potential impacts were identified in relation to noise and air quality. Subsequent to the scoping exercise, key issues were assessed with respect to identified sensitive receivers.

Dredging Details

5. The WSC Pit 3 is located in one of the busiest fairways in Hong Kong Harbour. The material to be dredged consists of alluvial sand, marine sand, and marine silt and clay. The total volume of material to be dredged is around 9 million cubic metres of sand and 4.1 million cubic metres of silt and clay. It is anticipated that dredging of the area under study will occur over a 6 month period.
6. Trailer suction hopper dredgers (TSHD) will be used for dredging. The assessment has been based on a worst case dredging scenario which involves one TSHD dredging marine sand in WSC Pit 3 and another TSHD simultaneously dredging alluvial sand in STY Pit 2. It has also been assumed that dredging within the East of Lamma Channel Marine Borrow Area, and that required for the Green Island Reclamation (Part) Public Dump (GIRPD) are concurrent with the works.
7. The Marine Department imposed the condition that two dredgers could work concurrently in either two of the pits in the area, but only one dredger will be permitted to dredge in the fairway at any one time (for which a Traffic Separation Scheme is in force). As such, it would be impractical to have two dredging contractors working concurrently in the area.

Extent of Impacts

8. Potentially the major impacts associated with the works relate to the physical removal of the seabed and associated loss of ecological habitat, and the suspension of material into the water column with the associated impacts on ecological communities, commercial fisheries in open waters, and mariculture zones. As no overflow from the dredger is permitted in the dredging of overburden mud, the impacts on the environment arising from mud dredging will be minimised.



0 500 1000 1500 2000 Metres



**WEST OF SULPHUR CHANNEL MARINE
BORROW AREA
FOCUSED ENVIRONMENTAL IMPACT
ASSESSMENT
EXECUTIVE SUMMARY**

Figure No. 1

Site Locations of STY Pits 1 & 2
and WSC Pit 3 Showing
Shipping Fairway

Marine Water Quality and Sediments

9. The fundamental impact that may be expected to result from dredging in WSC Pit 3 will be elevated levels of fine inert material suspended in the water column. These suspended solids will arise from the overflow dredging method using a TSHD and will be greatest when marine sand is being dredged. Greatest impacts may also be expected during the wet season spring tide.
10. The only sensitive receiver predicted to be affected beyond acceptable limits is the Water Supplies Department flushing water intake at Kennedy Town. It is recommended that a silt screen be installed around the intake to mitigate the effects of the plume to acceptable levels.

Marine Ecology

11. It is likely that the removal of seabed habitat will result in the loss of a relatively undisturbed macrobenthic community in the vicinity of WSC Pit 3. Eventual backfilling of WSC Pit 3 with uncontaminated marine silt and clay from other borrow areas in Hong Kong waters will initiate and enhance recolonisation by the macrobenthos, and it is recommended that such action be considered following the completion of works in WSC Pit 3.
12. The actual capacity of benthic organisms to sustain an increased sedimentation rate is dependent on the rate of deposition, species tolerance, stage of life-cycle (egg, larva, juvenile, adult) and other environmental stress factors (e.g. presence of toxins, water flow and temperature). Little is known, however, about the absolute tolerance thresholds of most Hong Kong organisms. Sedimentation impacts may last for a relatively short or longer period of time depending on the extent, duration and rate of dredging, as well as environmental factors related to the hydrological regime. Many benthic communities in Hong Kong are located on soft muds and sands which are frequently disturbed by storms which create high suspended sediment loads in the water column. As such, macrobenthic invertebrates are unlikely to be adversely affected by sediment suspension and resettlement. The main impact will relate to direct habitat loss in the WSC Pit 3 area.
13. Corals are also highly variable in their tolerance of sediment concentrations. Some of the most common coral species in Hong Kong are easily damaged and killed by sedimentation. Potential impacts on the local coral community, in the case of dredging WSC Pit 3, are therefore likely to be restricted to impacts from both increased suspended solids levels and increased sedimentation of the seabed, rather than a direct loss of habitat.
14. Of the areas in the East Lamma Channel which are predicted to experience high rates of sediment deposition only the coral range on the northern coastline of Lamma Island (Pat Kok) and Luk Chau have dense populations of soft corals of medium conservation value. As approximately 50% of these corals are found growing from vertical or sub-vertical substrate these corals would not be susceptible to sediment accumulation. The remainder of the corals are growing on the lower lying seabed, however they would not be at risk of complete burial even if continuous deposition of sediment occurs as the rates predicted. Although of high risk of mortality from deposition, the corals in the range adjacent to the west of Hong Kong Island are of low density and low conservation value. It is likely that much of the coral community in this area has already been damaged or destroyed as a result of the amount of shipping and other activities occurring within the East Lamma Channel.

Marine Fisheries

15. The main direct impact of dredging will be the loss of feeding grounds for fish species dependent on the benthic fauna, but this is expected to be limited in extent and its duration will depend on the recolonisation of the borrow area following the cessation of dredging.
16. Commercial fishing in the vicinity of WSC Pit 3 will be affected for the duration of the works due to restricted access for fishing boats as well as the aversion of fish species to the dredging zone and the associated dredging plume. Suspended sediments in the water column will have variable effects on the commercial fish and invertebrate population depending on a host of species-specific and environmental factors. Vulnerability of fisheries will be greater with respect to Fry collection areas close to the Lamma shoreline.
17. Mariculture zones (MCZs) are potentially more vulnerable to sediment impacts than open water fisheries. Evaluation of sedimentation impacts on the Lo Tik Wan, Sok Kwu Wan and Yung Shue Wan MCZs has shown that suspended sediment levels are well within the guideline level of 80 mg/l

adopted by the Agriculture & Fisheries Department for water quality within MCZs. Total sediment deposition rates in the vicinity of Lo Tik Wan MCZ have been estimated to be between 5 and 20 cm, however, deposited sediments are unlikely to have adverse effects on the MCZs as fish cages are suspended above the seabed.

Air Quality

18. The only conceivable impact on air quality is emissions from sea vessels associated with the marine borrowing. However, even in the most adverse meteorological conditions it is unlikely that emissions from two TSHDs operating in the marine borrow area would have any measurable effect. As such, it is considered that no significant cumulative air quality impacts would be associated with the works.

Noise

19. Assuming one TSHD operating in WSC Pit 3 at any one time, the noise level at the nearest sensitive receiver has been calculated at 37 dB (A). Additional TSHDs working in one of the STY Pits, or at the East Lamma Channel Marine Borrow Area would not contribute significantly to this noise level. No special mitigation measures are therefore considered necessary beyond good work practices and ensuring that dredging vessels remain within the eastern boundary of WSC Pit 3, particularly at night.

Monitoring and Audit Requirements

20. In addition to the Focused EIA, an Environmental Monitoring & Audit (EM&A) Manual has been prepared which specifies the objectives and responsibilities of monitoring and audit, together with protocols for undertaking these activities. Environmental performance requirements for the works are also specified, as are Action Plans for the implementation of control measures to alleviate adverse environmental impacts associated with the works.



土木工程署
土力工程處

合約編號 CE 52/94

西硫磺海峽挖海沙區 環境影響專題評估

簡要報告

一九九四年十二月

Scott Wilson Kirkpatrick
CONSULTING ENGINEERS

史偉高顧問工程師

聯同

雅博有限公司

水力水研(亞洲)有限公司



西硫磺海峽挖海沙區 環境影響專題評估 簡要報告

引言

1. 本環境影響專題評估乃根據土木工程署批出的合約編號CE52/94，就在硫磺海峽西挖海沙區進行挖掘填海材料的建議用途而作。
2. 據硫磺海峽以西地區調查顯示，如將該區拼合北面的南青衣一號和二號坑，可盡量擴大對整體海沙資源的利用。爲了進行本研究而接受評估的挖海沙區爲三號坑。各坑位置見圖一。

評估範圍

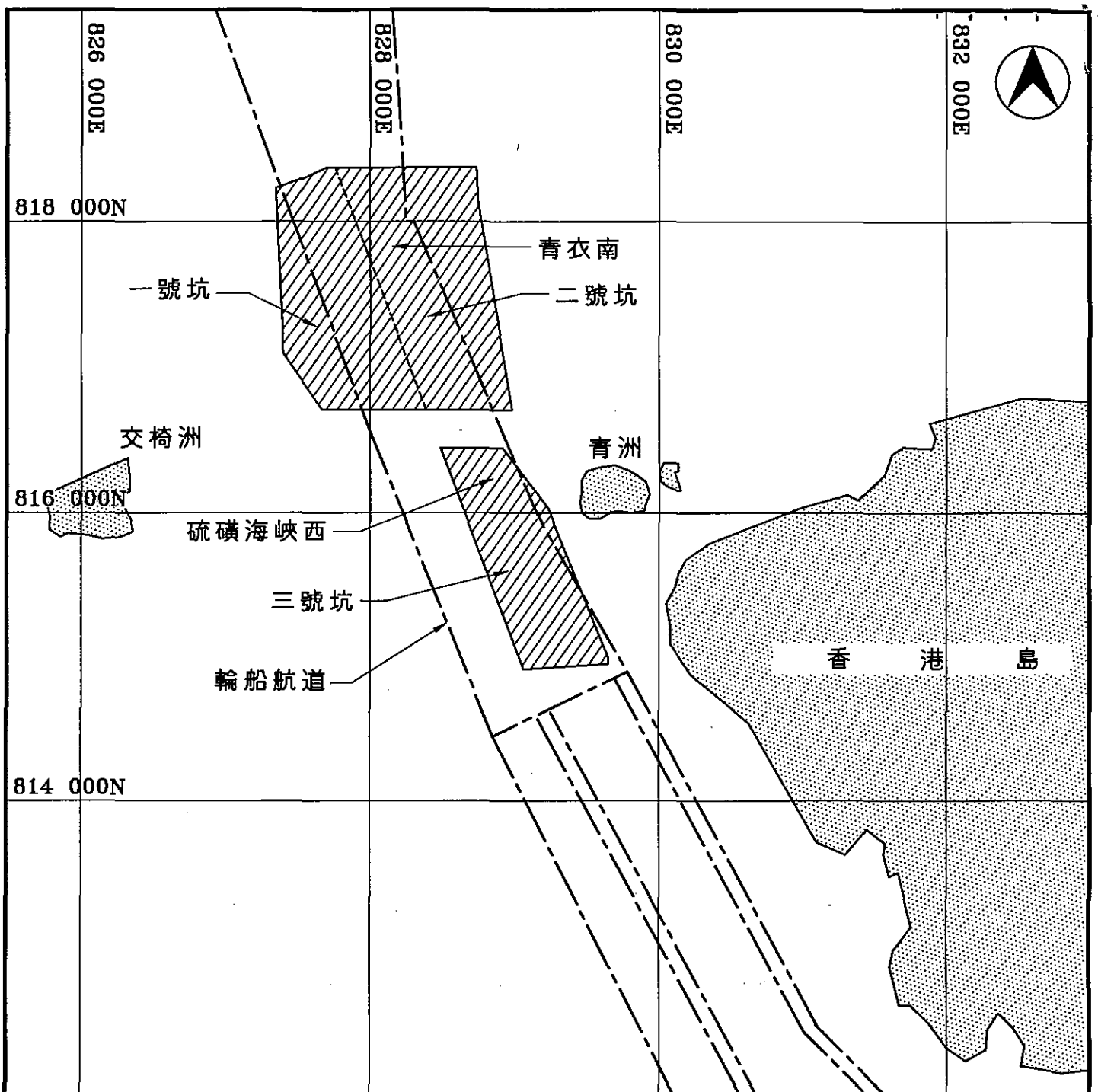
3. 環境影響專題評估的主要目的，在於提供有關潛在環境影響的性質和範圍的資料確定最適合的挖掘方法，以及建議適當的緩解措施，藉此協助盡量減少由於在硫磺海峽以西進行建議中的挖海沙及所有有關工程導致的污染、環境侵害和滋擾。
4. 根據與工程有關的環境影響範圍研究，工程對海洋水質及海洋生態將構成較大的潛在影響，而對捕魚業、海產養殖區及景觀等則有中級影響。此外，工程對噪音和空氣質素亦會有輕微的潛在影響。完成研究後，謹對已確認易受影響地方的有關主要問題進行評估。

挖掘詳情

5. 硫磺海峽以西三號坑位於香港海港內最繁忙的航道之一。挖掘材料將包括沖積沙、海沙、海洋淤泥和粘土，總挖掘量約爲九百萬立方米沙粒和四百一十萬立方米淤泥及粘土。該研究地點的挖掘工程預計爲期六個月。
6. 計劃中將使用自航耙吸式挖沙船進行採沙。本評估乃根據最壞的挖掘情況編制，即以一艘挖沙船在硫磺海峽以西三號坑挖掘海沙，再以另一艘挖沙船在南青衣二號坑挖掘沖積沙。此外，亦假設了在東博寮海峽挖海沙區的挖掘工程和青洲填海(部分)公眾傾卸泥區所需的挖掘工程與上述工程同時進行。
7. 海事處所施加的條件爲兩艘挖沙船可分別在該區兩個坑同時操作，但在同一時間內只准許一艘挖沙船在航道上挖泥(有關分道航行制現正生效)。因此，由兩家挖泥工程承辦商同時在該採沙區內工作是不可行的。

影響範圍

8. 工程可能帶來的主要影響，均與挖取現有海床和生態環境損失有關，以及增加水中懸浮固體對附近水域和海產養殖區的生態群和商業捕魚等的影響。由於在挖掘覆蓋泥層時挖沙船不能有任何滿溢，這類工程對環境的影響將盡量減低。



0 500 1000 1500 2000 米



硫磺海峡西挖海沙區
環境影響專題評估
簡要報告

圖一

青衣南一號及二號坑和
硫磺海峡三號坑場址位置
并顯示輪船航道

海洋水質及沉澱物

9. 在硫磺海峽以西三號坑進行挖泥的基本影響，將為懸浮於水柱內的細微惰性物體之水平有所上升。在以挖沙船進行溢流挖泥法時，懸浮固體水平會提高，於挖掘海沙時尤其嚴重。另外，在雨季春潮時預期亦有較大影響。
10. 預計唯一最易影響至超過可接受限度的地方，將為水務署在堅尼地城的沖廁水進水口。建議圍繞進水口安裝淤泥隔網，以緩解捲流的影響至可接受水平。

海洋生態

11. 海床環境的消失，將會導致失去在硫磺海峽以西三號坑附近一個相對地未受到干擾的大海底群落。工程人員最終以香港水域內其他挖海沙區的未受污染海洋淤泥和粘土重新充填三號坑，將可吸引和幫助海底生物重新遷居於此。建議考慮在完成硫磺海峽以西三號坑工程後採取此等行動。
12. 海底生物對增加了的沉澱物比例的實際容忍能力，將視乎沉降物比率、動植物種類的容忍程度、所處生命週期(卵、幼虫、幼年或成長期)，以及其他環境壓力因素(例如毒素的存在、水流和溫度等)而定。然而，對於大部分香港生物的絕對忍受界限所知甚少。沉澱影響的時間或較長或較短，須視乎挖掘範圍、為時長短和速度以及與水文形勢有關的環境因素。香港很多海底群落均位於軟泥和沙面，經常受到風暴影響，在水柱中形成大量懸浮沉澱物體。因此，大型海底棲生的無脊椎動物不大可能因沉澱物的懸浮和重新沉澱而受到不利影響。主要影響將與硫磺海峽以西三號坑一帶的生態環境直接受到損害有關。
13. 珊瑚對於忍受沉澱物濃度的能力也有很大差異。部分香港最常見的珊瑚品種，很容易因沉澱物的關係而受到損害或死亡。因此，以硫磺海峽以西三號坑挖泥的情況來說，對當地珊瑚群落的潛在影響可能只限於增加了的懸浮固體水平以及海床的沉澱物增加，而非對生態的直接損害。
14. 東博寮海峽預期將沉降大量沉澱物的地區中，只有南丫島北部海岸線(白角)和鹿洲才擁有稠密和具有中等保存價值之軟珊瑚。由於這些珊瑚中約有百分之五十從垂直或半垂直基質生長，這些珊瑚不會對沉澱物的積聚感到敏感。其餘珊瑚生長於較深的海床，不過即使按照預計比率持續沉降沉澱物，也不會有被完全覆蓋的危險。香港島以西附近的珊瑚雖然因沉降而死亡的機會較高，但其密度和保存價值都較低。該區的大部分珊瑚群，由於船隻往返以及東博寮海峽內其他活動的關係，很可能已被破壞或損害。

海洋捕魚

15. 挖掘工程的主要直接影響，將為依賴海底生物的各种魚類失去覓食場所。然而，估計其影響有限，而受影響的期限亦視乎終止挖掘工程後在該挖海沙區的重新移殖程度而定。

16. 工程期間，由於限制漁船駛入和挖沙區對魚類的排斥，以及有關的挖掘捲流等，在硫磺海峽以西三號坑附近的商業捕魚將備受影響。水柱中的懸浮沉澱物，對於商業魚類和無脊椎動物的數量將有不同的影響，視乎各種具體動植物種類和環境因素而定。在接近南丫島海岸線魚苗收集區，對捕魚業的影響會較大。
17. 對於海產養殖區而言，沉澱物的潛在影響較諸其在公開水域捕魚的影響為大。根據蘆荻灣、索罟灣和榕樹灣海產養殖區的沉澱影響評估結果顯示，懸浮沉澱物水平極為符合漁農處的每公升八十毫克的海產養殖區水質指標水平。蘆荻灣海產養殖區的整體沉澱物沉降比率估計約為五至二十厘米之間，不過，由於魚籠懸浮於海床之上，沉降沉澱物不大可能對該海產養殖區有不良影響。

空氣質素

18. 唯一可能對空氣質素有所影響的為與挖海沙區內工作有關船舶所排放的氣體。不過，即使在最惡劣的天氣情況下，在該挖海沙區運作的兩艘自航耙吸式挖沙船排放的氣體，仍不會有任何可測量的效應。因此，有關工程應該不會涉及任何重大的空氣質素累積影響。

噪音

19. 假設任何一刻只有一艘自航耙吸式挖沙船在硫磺海峽以西三號坑操作，最接近易受影響的地方之噪音水平經計算為三十七分貝(A)。在南青衣其中一個挖沙坑或者東博寮海峽挖海沙區操作的另一艘挖沙船，亦不會對該噪音水平有重大影響。因此，除良好的工作慣例及確保挖沙船在硫磺海峽以西三號坑東面範圍內作業外(特別是在晚上)，並沒有需要特別的緩解措施。

監察及評審規定

20. 除環境影響專題評估外，還制訂了一份環境監察及評審手冊，列明監察及評審的目的和責任，以及進行這些活動的有關草案。此外，手冊亦列明對工程的環保工作要求以及行動計劃，藉此實施管制措施以減輕與工程有關而不利環境的影響。

