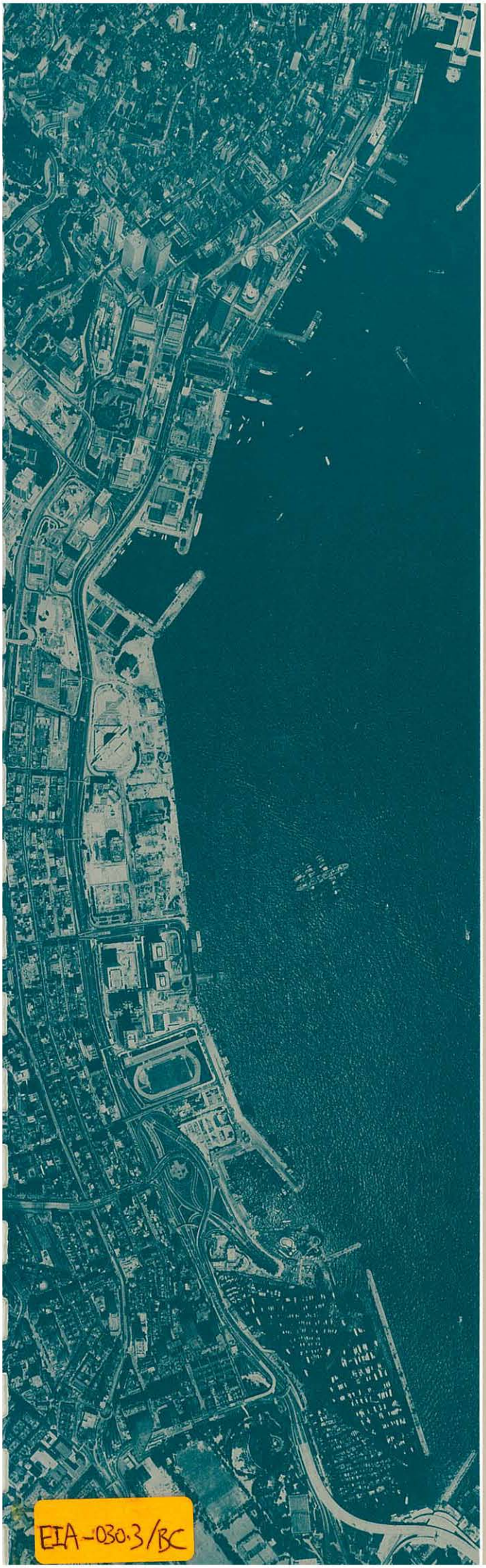

Hong Kong Government
Territory Development Department
Hong Kong Island and Islands
Development Office

Central and Wan Chai Reclamation Development

中環填海工程第二期

環境影響評估

執行摘要

(to) in EIP 2/HK/01/XIX

Maunsell Consultants Asia Ltd
in association with
MVA Asia Ltd
CES Consultants in Environmental Sciences (Asia) Ltd

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一九九四年十一月

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執行摘要

1. 引言

1.1 中環填海工程第二期包括興建約五公頃的填海用地及其有關的基本建設。基本設施將會在新的填海區及添馬艦海軍基地以東的現有土地上興建。填海範圍包括添馬艦海軍基地及在威爾斯大廈以北一片伸延出維多利亞港約六十米的土地（見圖一）。

1.2 填海工程預計並不需要大量的堆填物料，以下爲三項建議中的可行方案：

一） 使用海上填料填海
二） 將工地用作公眾傾卸場
三） 由承建商提供物料

1.3 使用海上填料填海，是泛指將填料從水路運往工地；當中包括了利用躉船將海沙或陸上採得的填料運往工地。

1.4 添馬艦海軍基地內的海床藏有一層受船隻維修活動污染的沉積物，本研究建議不挖走該處的沉積物，以避免產生棄置污泥及令污染物散播等問題。

1.5 預計填海工程約需二十四個月完成。在工地內將興建道路、一個行人路網絡及一條主要爲通往英軍碼頭而建的行人天橋。現時的海軍起卸用設施會在工程展開前被昂船洲的新建設施所取代。爲了使英軍碼頭可以繼續運作，需要在海堤上建設梯級及浮台碼頭以暫代現有之設施。現時位於添馬艦以東的所有建築物將會被拆卸及重建。因在重建後現時的英軍總部的四周將會被道路包圍，所以亦會爲該總部提供新的進路。

1.6 *雨水及污水排放系統*

擬建工程會影響共三個集水區；其中兩個屬市區性質，而其餘的一個則是包括山頂的集水區。在中區、西區及灣仔西污水總綱計劃的研究中指出其中一個集水區因區內的雨水渠及污水渠的互接而引致嚴重的污染量。渠務署已修正了其中一條主要的誤駁污水渠。爲減少污染物排放入在工地旁的維多利亞港，須要採取措施以改善目前的情況。擬建工程亦需要將其中兩條雨水排放管道伸延或遷移。

1.7 由擬建發展區所產生的污水將會輸往灣仔污水隔濾廠處理。該隔濾廠最後亦會被擬建之策略性污水處理計劃所取代，將來污水會經由深入地下的污水管道輸往南中國海排放。

2 水質

2.1 因添馬艦基地的內港令海水受到局部的包圍，所以預計填海工程並不會對進出維多利亞海的潮汐及附近水流的速度造成明顯的影響。爲收集有關的基線水質的資料，本研究在基地內及維多利亞港內分別設有六個及五個水質監測站。測量的資料包括鹽度、溫度、溶解氧、懸浮固體及含氧量的減少潛力。

2.2 在維多利亞港內量度得的鹽度及溶解氧均與海洋的很接近，只有近海堤的一個監測站所度得的鹽度及溶解氧較低，很可能是由於該處接近雨水的排放出口所致。而在基地內的鹽度則較港內的低，但亦因該處缺乏水流混和而使鹽度有地區性的變化。另外，在基地內度得的溶解氧亦具有相同的特性。在海港內的海水溫度亦屬正常，但在冷卻用水的排放口附近的水溫則較高。

2.3 在維多利亞港內的懸浮固體水平與現有環境保護署(環保署)的監測數據比較亦屬正常。除了近海堤位置外，所有監測站所度得的大腸桿菌數量均屬正常，可能是因爲在海堤附近的排放口及添馬艦本身令該處的大腸桿菌數量增加。而在基地內則錄得較低讀數，這可能由於該處海水與海港內的海水交流量很低所致。

2.4 建造新的海堤將須要挖掘海泥，因而會增加水中的懸浮固體。預計因工程而產生的懸浮固體爲0.002kgm^{-3}至0.01kgm^{-3}之間，這數值在該區水質因天然氣候而轉變的範圍(0.01kgm^{-3}至0.04kgm^{-3})之內。所以將不會對任何對污染感應強的地方帶來嚴重的影響。挖掘及棄置海泥會增加水中的生化需氧量，這亦可能間接令水中的溶解氧下降。但根據計算顯示，在最惡劣的情況(即最不利的氣候環境及最高挖泥速度)下，溶解氧會減少約1.02mgl^{-1}；使溶解氧減至4.6mgl^{-1}。爲紓緩這影響，建議使用低影響的挖泥方法；例如使用密封抓斗式挖泥機及限制最高的挖泥速度等。另外，爲保護在地工附近的水質，亦將會實施合適的監測計劃。上述兩項影響均屬暫時性質，如監測的結果顯示水質比預定的目標、行動及戒備水平差時，將會慮考暫時停止挖泥工程。

2.5 因挖泥而從沉積物中釋放出來的其他污染物應不會造成明顯的影響，因爲這類釋放所須的物理及化學條件極不可能發生。研究顧問亦認爲由於水流速度及水中的稀釋能力，所以因挖泥而令泥中養份釋出的影響亦不會很大。目前有很少根據可證明在香港的情況下，普通微量金屬會因挖泥而大量流失。

2.6 其他同期在該區進行的工程包括中環填海第一期、灣仔填海第一期及西區過海隧道；而本工程只屬整體發展計劃中的一小部份。在其他挖泥工程中進行的水

質監測顯示水質均在設定的水平之內，所以本研究總結因中環填海第二期挖泥工程所產生的水質污染，並不會使整體的累積影響超過水質標準。

2.7 長遠來說，在港府擬建及預計於2000年運作的污水處理計劃完成後，維多利亞港內的水質將會改善。這項污水處理計劃可將現時的污水排放及非法將污水接駁入雨水渠的情況消除。

2.8 有關基線及影響監測計劃的要求，將列明在「環境監測及審核手冊」之內。

3 產生的廢物

3.1 *海泥*

在現時海堤前地區的海底沉積物須要在施工前挖走。根據現時的法例及準則要求，曾抽取了沉積物的樣本以評估在海泥中污染物的濃度。在基地內設定了九個地點，在每個地點上抽取四個不同深度的樣本。在及後的化學分析研究中，發現在沉積物的上層含有很高的銅及鋅的濃度。但這些結果並不表示整個維多利亞港的海泥情況，因爲幾乎可以肯定污染物是來自基地內的船隻維修及油漆活動。因內港缺乏水流的進出，所以加劇了污染物的沉積。根據標準，幾乎所有的樣本均被列入最高污染度的級別。

3.2 爲減少受污染沉積物的釋放，所以研究建議保留在基地內的海泥在原地，並限制只在海堤範圍內挖泥。挖掘海堤底部約產生十萬一千立方米的海泥，其中的四萬四千立方米將需運往沙洲以東的受污染海泥傾卸場棄置。

3.3 *建築廢物*

拆卸添馬艦基地以東現有的建築物將會產生不少的廢物。爲減少因棄置可用的物料往別處的影響，在拆卸工程中產生的建築廢料，應盡量用作填海的填料。顧問公司相信在工地內並未曾經使用過石棉。

3.4 *受污染土地*

工地曾進行船隻維修活動超過七十年；在現有的兩個工場中，比較舊的一個被認定更可能受到污染。在兩個工場內進行的工序需使用燃油、溶劑、松脂、電池酸液、漆油、雙氧水、水銀及金屬碎屑等。雖然工場內並沒有石棉，但一個加建的有害物品倉庫曾經儲存乙炔、放射性及滅火物料等。大部份的有害物品均已清理，而且在倉庫區域並沒有發現嚴重污染的蹟象。

3.5 顧問公司認爲在工地內的土壤存著受污染的可能。有鑑於此，工程發展商需進行土壤污染評估；當中包括抽取底層土壤樣本化驗及分析土壤和地下水等，以

確定受污染的程度及確認是否有需要實施合適的緩解措施。這項評估須要在任何發展工程展開之前完成。

4 空氣質素

4.1 在空氣污染管制條例內的空氣質素指標制訂了有關各類污染物在一小時、八小時、廿四小時及全年平均值的可接受水平。與本研究相關的空氣污染物包括一氧化碳、二氧化氮、總懸浮粒子及可吸入懸浮粒子等。據環保署於一九九一年的監測資料指出，在離工地最近的監測站，所錄得二氧化氮及總浮粒子的全年平均值，並沒有超過標準水平；亦沒有超過廿四小時的空氣質素指標水平。顧問公司在工地附近及威爾斯軍營內確認了二十二個對空氣污染感應強的地方。

4.2 *施工階段*

研究指出在施工期間的空氣污染主要來自地盤平整、拆卸、挖掘、風蝕、車輛行走及搬移物料等工序。如前文所述，提供填堆物料的三個方案有使用海上填料填海、將工地用作公眾傾卸場或由承建商提供物料。後兩項方案皆可將物料從水路運往工地。就空氣污染而言，除了因運輸車輛的數量和分佈外，後兩項方案所產生的影響程度大致上相同；如物料利用躉船運輸，則預期的影響將可望減少。據電腦模擬結果顯示，如沒有緩解措施，大部份的感應強的地方會受到嚴重的影響。模擬分析亦指出使用陸上採得的填料會比由水路將海沙運往工地產生多超過二倍的總懸浮粒子。

4.3 利用控制車輛速度、在工地及填料上灑水等緩解措施，可有效地減低總懸浮粒子的水平。如使用海上填料填海，在所有的感應強地方均可符合空氣質素指標水平。但如用陸上填料，就算執行了上述措施，在低風速的情況下，預計亦會八個地點超出了空氣質素指標水平。因此本研究建議使用海上填料填海。

4.4 在施工前應進行基線測量，藉以建立現時的空氣質素水平。而在施工期間，會在最接近工地範圍的監測站進行總懸浮粒子的測量。

4.5 *運作階段*

在填海工程完成後，可能會帶來的是在新建道路上的交通污染。本研究中使用了CALINE4電腦散佈模擬來預計二氧化氮、一氧化碳及可吸入的懸浮粒子等的濃度。研究指出可吸入的懸浮粒子的二十四小時的平均濃度並未超過空氣質素指標。但在交通最繁忙的時候，在統一中心及遠東金融中心的一小時平均二氧化氮濃度將會超過空氣質素指標水平。雖然如此，因該兩幢大廈均設有空氣調節，而抽風口設在平台的高度，所以預期道路交通並不會造成不可接受的影響。因爲所有的評估是基於最惡劣的情況，所以實際上發生的可能性很低。此外，要有效地紓減來自車輛產生的污染，只可以透過減低個別車輛的排放、盡量利用公共交通工具及合適的交通管理。

4.6 *氣味影響*

現時並沒有關於氣味的空氣質素指標，而對氣味的量度亦很主觀。預期有味的氣體會從污水系統的泵房中溢出；然而這些氣味可以使用活性碳過濾器來緩解。在泵房內安裝過濾器將由渠務署負責。

5 噪音

5.1 在對噪音感應強的地方將會受到來自建築工程、交通及直升機升降等噪音影響。本研究中將會就每種噪音來源，根據有關的法定步驟及指引進行分析。

5.2 除了在星期日、假期及平日的晚上七時至翌日上午七時外，從機動設備發出的噪音是沒有限制的；但一般情況下都會採用75分貝作爲非法定的標準。由交通及直升機發出的噪音並沒有法例管制，但在香港規劃標準及準則中有最高限制的建議。

5.3 *施工階段*

被確認的十個對噪音感應強的地方，相前均受到超過70分貝的交通噪音影響。在本噪音評估中，已包括所有三個可行的堆填方案。計算顯示，如不考慮工地對噪音的擋隔及使用海上物料堆填，在威爾斯大廈的建築噪音水平達87分貝。在設計緩解措施時，必須嚴格依從現行噪音管制條例及附例中的需求；如建築活動需在晚間進行，則須領取建築噪音許可証。建議的緩解措施包括在固定的機械加設消音器或屏障、在工地四周架設高度合適的屏障及管理在工地上行駛的車輛。此外，亦須進行定期的噪音監測。

5.4 *交通噪音*

在道路交通的噪音評估結果顯示，在擬建發展附近的建築物外牆的噪音水平，大部份都超過70分貝。預料未來的交通流量(及噪音水平)會較現時爲低，所以將來的交通不會造成額外的噪音影響。

5.5 *直升機噪音*

評估直升機噪音的研究指出，在某些接近擬建的直升機坪的感應強的地方所受到的最高噪音可能超過香港規劃標準及準則的水平。但是已遷移的直升機坪在中介及最後階段將不會增加在感應強的地方的的噪音水平(見圖二)。可以採用的緩解措施十分有限，主要是靠改變直升機坪的運作。

5.6 除部份的威爾斯軍營外，所有對噪音感應強的地方均已裝置窗戶玻璃及空氣調節，所以預期不會受到任何噪音影響。而將來的建築發展則必須要在設計中附加對噪音的緩解措施。

6 總結

6.1 *水質*

預期擬建的填海工程不會影響潮汐的水流活動，而整體的水質亦會維持在可接受的水平之上。在工程中所產生的污水將會經由灣仔西污水隔濾廠及污水排水口擴散器，排入維多利亞港內。而這排放對港內水質亦只會造成局部的影響。而污水最後會被輸往策略性污水處理計劃內的深入地下的污水渠，再排出大海。

6.2 興建新的海堤將須挖取海泥，這會局部地增加水中的懸浮固體。但使用合適的採挖方法及工序預期將可限制懸浮固體的濃度只比本底水平高約$0.002kgm^{-3}$至$0.01kgm^{-3}$；使累積的懸浮固體在$0.01kgm^{-3}$至$0.04kgm^{-3}$之間，這數值在該區水質因天然氣候而轉變的範圍之內。預計的溶解氧會因爲生化需氧量的增加而會減少$1.02mgl^{-1}$至$4.6mgl^{-1}$，這仍是可以接受的。在挖泥工程期間會進行水質的監測及審核，以證實研究結果及監管工程，藉以減少對水質造成的影響。如監測的結果顯示水質比預定的目標、行動及戒備水平差時，將會慮考暫時停止挖泥工程。

6.3 *廢物的產生*

拆卸現有建築物、海堤及一般建築活動均會產生廢物。本研究建議所有在拆卸工序中產生而合適的建築廢料，均作填海之用，以避免因處理該類廢物而造成的其他環境問題。

6.4 在因建造海堤而挖掘的海泥中，大約百份之四十四只可以棄置在沙洲以東的受污染海泥卸泥場內。挖泥工程的影響將會透過表現規定和環境監測及審核計劃來控制。

6.5 *空氣質素*

在對污染感應強的地方，於施工期間會受到高塵埃水平影響。因爲本研究建議使用適當的消減塵埃技術及將填料從水路運輸，加上在感應強的地方已設有空氣調節，所以實際上並不會構成嚴重的空氣質素影響。另一方面，由將來交通帶來的二氧化氮及可吸入的懸浮粒子水平，亦會符會空氣質素指標內的規定。

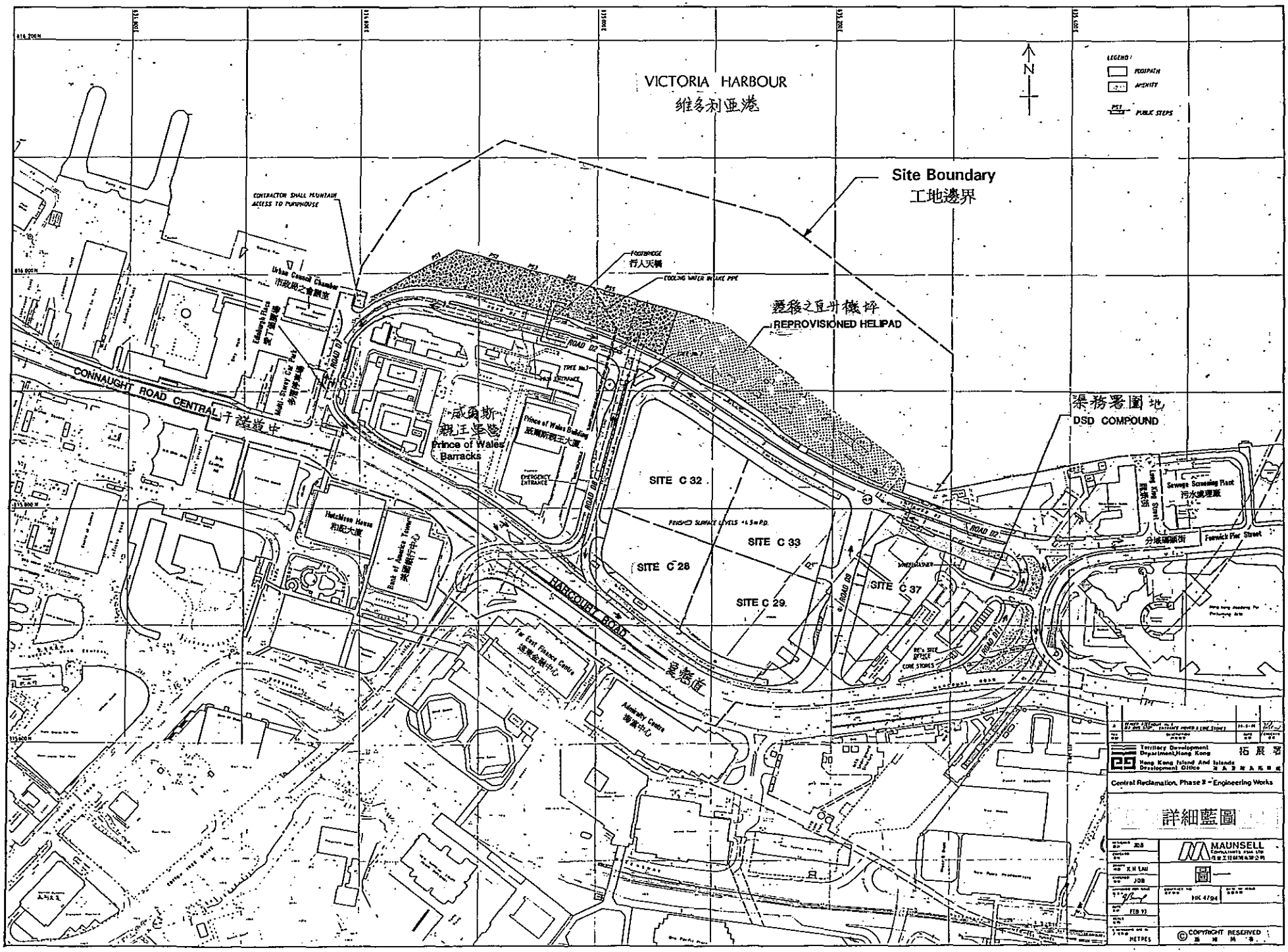
6.6 如在污水系統的泵房內裝置活性碳過濾器，在該處所引致的氣味影響預算會符合環保署的要求。

6.7 *噪音*

如使用陸路運輸填料，在某些感應強的地方的外牆噪音水平在施工期間會高達87分貝。但如由水路運輸填料往工地，包括用躉船載運海沙或陸上採得的填料，則噪音水平會降至84分貝。良好的窗戶玻璃及中央空氣調節將可減少大部份地方的噪音水平。此外，建議的緩解措施如在固定的機械加設消音器或屏障及在工地四周架設高度合適的屏障將可進一步減低建築中產生的噪音。研究亦指出，將來由車輛及直升機交通產生的噪音亦不會超出現時的水平；而新的建築物須將紓緩噪音的考慮加入在設計中。

6.8 *概論*

本研究顧問總結，因爲可以減少工地上車輛的往來及物料的運輸，所以從海路運送填料至工地將會比從陸路運送造成較少的空氣、水質及噪音影響。


VICTORIA HARBOUR
維多利亞港
Site Boundary
工地邊界
REPROVISIONED HELIPAD
臨務之直升機坪
DSD COMPOUND
渠務署園地
CONNAUGHT ROAD CENTRAL
干諾道中
HARCOURT ROAD
夏慤道
Prince of Wales Barracks
威爾斯親王兵營
SITE C 32
SITE C 33
SITE C 28
SITE C 29
SITE C 37
Sewage Screening Plant
污水處理廠
Territory Development Department, Hong Kong
Hong Kong Island And Islands Development Office
拓展署
Central Reclamation, Phase II - Engineering Works
詳細藍圖
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HK 4794
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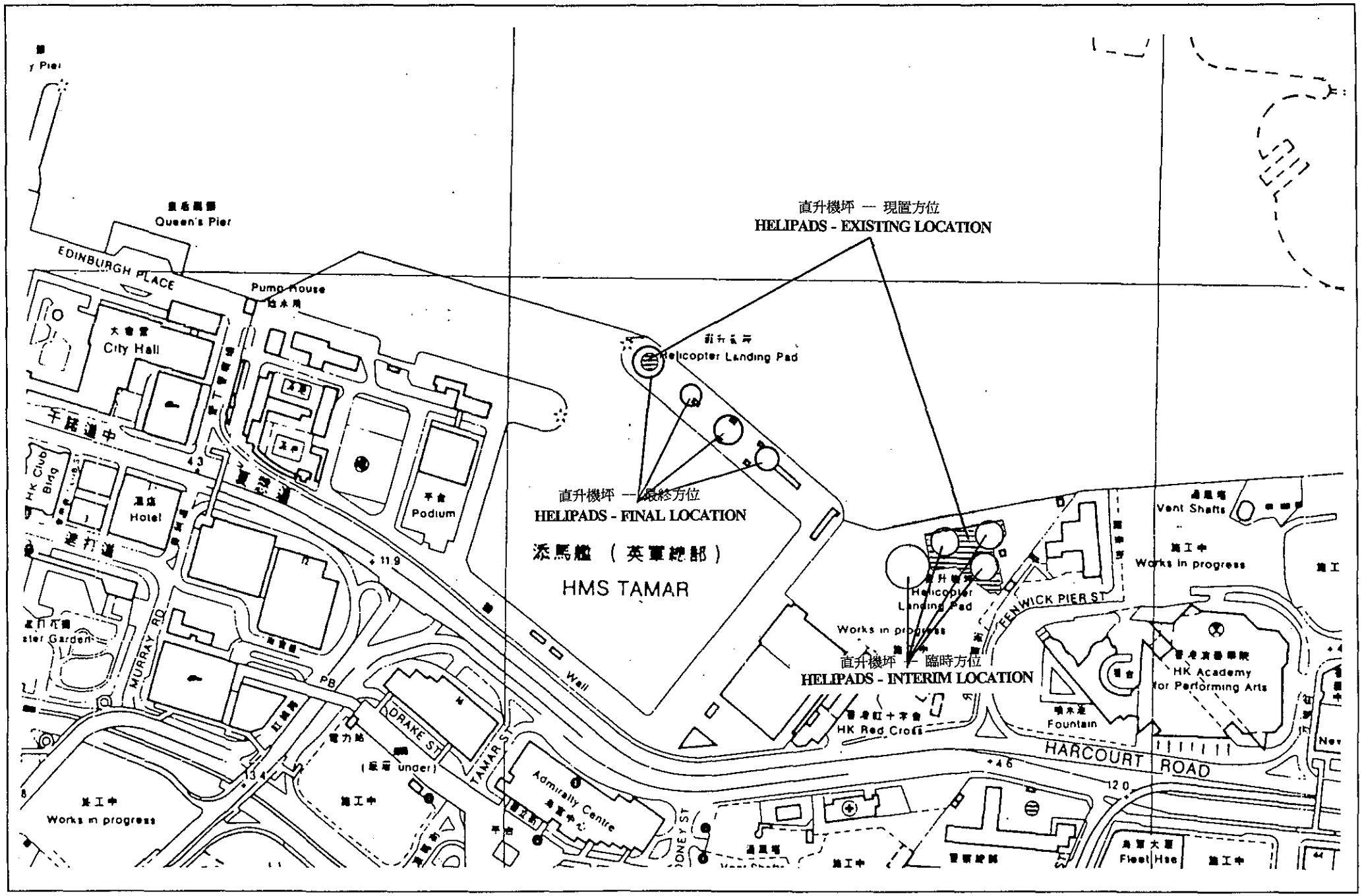
Queen's Pier
EDINBURGH PLACE
Pump House
City Hall
Helicopter Landing Pad
直升機坪 — 現置方位
HELIPADS - EXISTING LOCATION
直升機坪 — 最終方位
HELIPADS - FINAL LOCATION
添馬艦（英軍總部）
HMS TAMAR
Podium
Hotel
HK Club Bldg
MURRAY RD
DRAKE ST
TAMAR ST
Admiralty Centre
Wall
Helicopter Landing Pad
Works in progress
直升機坪 — 臨時方位
HELIPADS - INTERIM LOCATION
FENWICK PIER ST
Vent Shafts
Works in progress
HK Academy for Performing Arts
Fountain
HK Red Cross
HARCOURT ROAD
Fleet Hse
0 50 100 200 METRES

圖二　直升機坪位置

Hong Kong Government
Territory Development Department
Hong Kong Island and Islands
Development Office

Central and Wan Chai Reclamation Development

Central Reclamation, Phase II
Contract No. HK 4/94
Environmental Impact Assessment
Executive Summary

Maunsell Consultants Asia Ltd
in association with
MVA Asia Ltd
CES Consultants in Environmental Sciences (Asia) Ltd

Hong Kong Government
Territory Development Department
Hong Kong Island and
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CENTRAL RECLAMATION PHASE II

ENVIRONMENTAL IMPACT ASSESSMENT

EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 The Central Reclamation Phase II comprises approximately five hectares of new land reclamation and the construction of associated infrastructure. The infrastructure is to be built on both the newly reclaimed land and existing land to the east of Tamar Basin. The land formation will include the reclamation of Tamar Basin itself and also a strip of land to the north of the Prince of Wales Building, which will extend approximately 60m into Victoria Harbour (Figure 1).

1.2 A relatively small amount of fill material will be required for the formation of the reclamation, for which three proposed sources exist:

i) Use of marine based fill
ii) Operation as a public dump
iii) Use of contractor sourced material

1.3 The marine based fill will be fill materials delivered to the reclamation site by sea transport, which would include marine sand and land sourced materials delivered to the site by barge.

1.4 Tamar Basin contains a thin layer of contaminated sediments, resulting from ship maintenance activities. It is proposed to leave this in place, thus avoiding the potential problems of disposal and subsequent re-mobilisation of the contaminants.

1.5 Proposed completion of the development is scheduled for 24 months. Several new access roads are proposed for the site, and a network of pathways and a footbridge will cater for pedestrian needs, notably to access the British Forces ferry. Existing naval berthing facilities will be replaced by similar facilities on Stonecutters Island prior to commencement of the project. In order that British Forces ferries can continue to operate it will be necessary to reprovide suitable berthing facilities in the form of a pier or pontoon arrangement with access steps in the sea wall. All buildings on the site to the east of Tamar Basin will be demolished to allow for redevelopment. New access will be provided to the British Forces Headquarters since the proposed development will leave it surrounded by roads on all sides. Helicopter pads will be temporarily relocated during construction prior to permanent relocation at a new site.

1.6 *Drainage and Sewerage*

Three stormwater catchment areas will be affected by the proposed development. Two of these are wholly urban in nature and the third collects an element of runoff from the Peak. Survey results from the Central, Western and Wan Chai West Sewage Master Plan Study have identified significant pollution loads in one of the catchments, probably resulting from cross-connections between foul sewers and storm drains. A major expediant connection has since been rectified by the Drainage Services Department. Further steps to rectify this situation will be taken, in order to minimise contaminants being discharged into Victoria Harbour adjacent to the site. Two of the stormwater outfall pipes will require extension/relocation as a result of the proposed development.

1.7 Sewage generated from the development will be routed to the Wan Chai West Sewage Screening Plant. Eventually this plant will be phased out and the sewage will be conveyed to the deep trunk sewers forming the Strategic Sewage Disposal Scheme for ultimate discharge to the Lema Channel.

2 WATER QUALITY

2.1 Due to the enclosed nature of Tamar Basin the reclamation would have no measurable impact on tidal discharge through Victoria Harbour or on the magnitude of water movements in its vicinity. For the purpose of gathering baseline information, water quality observations were made at six stations within the basin and five stations in Victoria Harbour. Parameters measured included salinity, temperature, dissolved oxygen, suspended solids and oxidation-reduction potential.

2.2 Salinities measured in Victoria Harbour were all close to oceanic levels, except for the station nearest the sea wall, where decreased levels were probably attributable to nearby stormwater outfalls. These outfalls probably also accounted for the suppressed oxygen levels here, which were otherwise normal. Salinities within the basin were lower than in the Harbour, but also showed marked local variation due to poor mixing of the water. This was also the case for dissolved oxygen levels within Tamar Basin. Water temperatures in the Harbour were normal except where proximity to cooling water outfalls caused a slight increase.

2.3 Suspended solid levels for Victoria Harbour were also normal in comparison to existing Environmental Protection Department (EPD) monitoring data. Normal *E. Coli* concentrations were measured at all stations except for near the sea wall, where they were elevated due to the influence of nearby outfall pipes, and in Tamar Basin itself. The lower concentrations recorded inside the basin could be due to the low rate of water exchange with the Harbour.

2.4 Construction of the new sea wall will involve the dredging of soft marine mud and may therefore cause the release of suspended solids into the water column. The increases in suspended solid levels of between $0.002 kgm^{-3}$ and $0.01 kgm^{-3}$ are predicted to fall within the natural variation in concentration found in this area of between

0.01kgm^{-3} and 0.04kgm^{-3}. Therefore there is little evidence to suggest that any sensitive receivers would be adversely affected. Dredging and disposal activities also indirectly have the potential to reduce dissolved oxygen levels in the water column as a result of increased biological oxygen demand (BOD). However, calculations have demonstrated that the maximum predicted decrease in dissolved oxygen levels of 1.02mgl^{-1} would occur under most unfavourable weather conditions and assuming peak dredging rate. The resulting dissolved oxygen level in the water column would be about 4.6 mgl^{-1}. The impact can be mitigated by using low impact dredging methods, such as: water-tight sealed grab and restricted dredging rates. In addition a comprehensive monitoring programme will be implemented to safeguard the nearby water quality. Both of the above impacts are transient and of short duration. Should monitoring Target, Action and Trigger levels be exceeded, temporary cessation of dredging will be enforced.

2.5 The release, by dredging, of other pollutants from the sediments to the water column is not considered to pose an adverse impact. This is because the specific range of physico-chemical conditions required for such a release is considered very unlikely to occur. The Consultants also consider that the resuspension of nutrients into the water column is unlikely to cause adverse impacts due to dilution factors and water current velocities. There is little evidence of significant losses to the water column of any commonly occurring trace metals under Hong Kong conditions.

2.6 Other schemes, such as Central Reclamation Phase I, Wanchai Reclamation Phase I and the Western Harbour Crossing are currently under progress in Victoria Harbour. The proposed Central Reclamation Phase II is a very small part of the entire development scheme. Monitoring of the water quality parameters at the other dredging sites has demonstrated that they have remained within established limits. It can therefore be concluded that the additional contribution to cumulative impacts arising from Central Reclamation Phase II dredging works should not result in exceedance of water quality criteria.

2.7 In the long term it is expected that the water quality of Victoria Harbour will improve since proposed government sewage schemes will become operational around the year 2000. These schemes will eliminate the discharge of effluents and illegal waste water into stormwater drains, as is currently the case.

2.8 A proposed monitoring programme for the baseline and compliance monitoring requirement has been included in the Environmental Monitoring and Audit Manual.

3 WASTE ARISING

3.1 *Marine Mud*

The area in front of the existing sea wall will require the dredging of marine sediments prior to construction. In accordance with the existing statutory requirements and guidelines a sampling of sediments was carried out in order to assess the levels of any contamination. Four samples, taken at different depths, were taken from each of 9 sites within Tamar Basin. Subsequent chemical analysis detected significant copper and zinc levels in the upper sediment layers, these almost certainly result from the ship painting and maintenance activities carried out in the basin. The contaminant build up has been exacerbated by the lack of water flow in and out of the basin. Almost all of the samples fell into the highest class of contamination according to prescribed criteria.

3.2 It is proposed to leave the marine sediments of Tamar Basin *in-situ* and restrict dredging to the sea wall area in order to leave these contaminated sediments undisturbed. Dredging of the seawall base will generate approximately 101,000 m^3 of material, of which 44,000 m^3 will require disposal at the East Sha Chau contaminated mud disposal site.

3.3 *Construction Waste*

A considerable volume of waste material will arise from the demolition of existing buildings to the east of Tamar Basin. In order to reduce the environmental impact generated from disposal of the usable construction waste off-site, building debris arising from the demolition of the buildings should preferably be used as filling material within the reclamation. The Consultant believed that asbestos had not been previously used on the site.

3.4 *Contaminated Land*

The site has been used by vessels for over seventy years. Of the two existing workshops, one was substantially older and identified as having a higher potential for contamination. Processes carried out at both workshops used petroleum hydrocarbons, solvents, thinners, resins, battery acids, paints, hydrogen peroxide, mercury and finely divided metal wastes. Asbestos was not present, but a hazardous material storage area had been used to store acetylene, radioactive materials and fire fighting materials. Most of these materials had been removed and no evidence of significant contamination was detected for the hazardous material storage area.

3.5 It is the opinion of the Consultant that the potential exists for some land contamination to have occurred at the site. In view of this any future building project proponent will need to carry out a contamination assessment in the form of sub-surface sampling and analysis of soil and groundwater to determine the degree and extent of the possible contamination in order that suitable remedial action may be initiated if necessary. This work should be done prior to any building development construction activities taking place.

4 AIR QUALITY

4.1 The Air Pollution Control Ordinance (APCO) describes Air Quality Objectives (AQO) which stipulate acceptable average concentrations for a range of pollutants over 1 hour, 8 hours, 24 hours and annual periods. Pollutants relevant to this particular study include carbon monoxide (CO), nitrogen dioxide (NO_2), total suspended particulates (TSP) and respirable suspended particulates (RSP). Monitoring data produced by EPD in 1991 show that there were no exceedances of the annual average pollution concentrations for NO_2 and TSP at the monitoring station nearest to the proposed site. There were no exceedances for AQO levels for a set 24 hour period. The Consultants identified 22 buildings located around the site and within the Prince of Wales Barracks area which were considered sensitive to air quality impacts.

4.2 *Construction Phase*

It is considered likely that the main air quality impact during this phase will result from dust generation as a consequence of site preparation, demolition, excavation, wind erosion, vehicle movements and material transfer. As previously described, the three options for sourcing fill material are marine based fill, contractor sourced material and public dump material. The last two of these options could also be delivered to the site by sea. In terms of air quality impacts the last two of these options are broadly similar, if they were to be delivered to the site by land as opposed to by sea, though some differences may occur as a result of the frequency and distribution of delivery vehicles. Impacts would be decreased if sea delivery was utilised. Computer modelling revealed that severe air quality impacts would be suffered by most of the sensitive receivers if no mitigation measures were implemented. The modelling also revealed that the utilisation of land sourced fill material would result in over twice the levels of TSP generation that marine based fill delivered by sea would create.

4.3 Mitigation by means of traffic speed control, spraying of fill and watering of the site can substantially reduce TSP levels. This would allow total compliance with AQOs measured at all sensitive receivers for marine based fill. However, the utilisation of land based fill would still leave eight sensitive receivers exposed to TSP levels above the AQO for certain low wind speeds, despite mitigation. Therefore, marine based fill is recommended.

4.4 TSP monitoring should take place during the construction period with stations located as close as practicable to the site boundary. Prior to this a baseline monitoring study should also be carried out in order to establish existing air quality levels.

4.5 *Operational Phase*

Impacts following development may result from traffic pollution from the new road network. Pollutants NO_2, CO and RSP were investigated using the CALINE4 dispersion model. The study revealed that concentrations of RSP are not expected to exceed the 24 hour AQO criteria. However, in the worst case scenario the 1-hour concentrations for NO_2 during peak hour traffic would exceed their AQO at two of

the identified buildings, namely the Admiralty Centre and the Far East Finance Centre. Despite this it must be noted that both of these buildings are air-conditioned, with fresh air intakes at podium levels and therefore unacceptable air quality impact due to road traffic is not expected. Since all predicted impacts are based on a worst case scenario, they are only expected to occur very rarely in practice. Moreover, it is noted that mitigation of traffic sourced impacts can only take place as a result of decreasing individual vehicle emissions, increasing the use of public transport and traffic management.

4.6 *Odour Impact*

No statutory AQO exist for odour and measurements tend to be subjective. It is expected that malodorous gases will arise from the sewage system pumping station. These odours can be mitigated by means of activated carbon filters. The responsibility for this falls to the Drainage Services Department.

5 NOISE

5.1 Sensitive receivers will be affected by the noise generated from construction activities, traffic, and from helicopter movements. Impacts on the sensitive receivers were assessed for each of these sources, in accordance with statutory procedures and guidelines.

5.2 Noise from powered mechanical equipment is not restricted during the hours 0700-1900 except on Sundays and public holidays. However, a non-statutory limit of 75dB(A) is often adopted where practical. Traffic noise and helicopter noise nuisance are not provided for by legislation, though the Hong Kong Planning Standards and Guidelines (HKPSG) recommend maximum permissible limits.

5.3 *Construction Phase*

Ten noise sensitive receivers were identified which are currently subject to existing traffic noise of greater than 70 dB(A). The noise assessment took account of all three fill material source options. Calculations showed a maximum noise level of 87 dB(A) may be experienced by parts of the Prince of Wales Building during the construction phase, though this does not take into account the mitigating effects of site screening and the use of marine based fill material. For mitigation purposes the current Noise Control Ordinance and subsidiary regulations should be strictly complied with during the construction phase, and construction noise permits should be obtained if construction is continued outside day time hours. Mitigation should also include the muffling and screening of stationary plant, erecting screens of practical height around the site and management of on-site traffic movements. A regular schedule of monitoring should also be instigated.

5.4 *Traffic Noise*

Road traffic noise assessment indicated that most of the sensitive facades in the

vicinity of the proposed development were subject to external facade noise levels in excess of 70 dB(A). Predicted traffic flows (and hence noise levels) for the design years will be lower than existing levels. Therefore, future traffic noise would not cause any additional noise impacts.

5.5 *Helicopter Noise*

An assessment of helicopter noise indicated that maximum noise levels at some of the sensitive facades close to the proposed helipad sites may exceed HKPSG limits. However, the relocated helipads during the intermediate and final stages will not cause any additional impact on the receivers (Figure 2). Mitigation measures are limited, and would rely on changes to the helipad operations.

5.6 With the exception of part of the Prince of Wales Barracks all identified noise sensitive receivers possess quality glazing and central air conditioning such that they are less sensitive to any additional noise impacts, if any. Future buildings should incorporate noise mitigation measures into their design.

6 CONCLUSIONS

6.1 *Water Quality*

The planned reclamation is not predicted to affect tidal water movements, and overall water quality will remain within acceptable limits. Generated sewage will be discharged via the Wanchai West Screening Plant and then to the sewer outfall diffusers. The increased discharge into Victoria Harbour is only expected to affect water quality locally. Eventually sewage will be conveyed to the deep trunk sewers of the Strategic Sewage Disposal Scheme.

6.2 Construction of the new sea wall will require the dredging of marine mud which could locally increase the suspended solid concentrations in the water column. However, the employment of appropriate dredging practice is expected to restrict the increase in suspended solid concentrations to between 0.002kg m^{-3} and 0.01kg m^{-3} above background levels, and the resulting total concentrations are still expected to fall within 0.01kgm^{-3} and 0.04kgm^{-3}, which is the natural variation in concentration found in this area. The predicted decrease of dissolved oxygen by 1.02 mgl^{-1} to 4.6 mgl^{-1}, resulting from increased biological oxygen demand, is considered acceptable. A monitoring and audit programme will be carried out during the dredging works to confirm this and to control the works to minimise the water quality impacts. Should Target, Action and Trigger levels be exceeded, temporary cessation of dredging will be enforced.

6.3 *Waste Arising*

The demolition of existing buildings, the existing sea wall and general construction activities will all generate waste. It is recommended that all suitable construction waste arising from the demolition will be utilised on site in order to minimise further

environmental consequences resulting from off site disposal.

6.4 Approximately 44% of dredged material removed for sea wall construction will be suitable only for Contained Disposal at East Sha Chau. Dredging activities will be regulated by control performance specifications and a monitoring and audit programme.

6.5 *Air Quality*

Dust levels at some sensitive receivers will be high during the construction phase. In practice these impacts are not considered likely to cause adverse impact upon the sensitive receivers. This is because with dust suppression techniques, the use of fill delivered by sea and with existing good quality glazing and air-conditioning at sensitive receivers will all combine to mitigate the effects. Impacts resulting from NO_2 and RSP levels generated from future traffic levels will be within Air Quality Objectives.

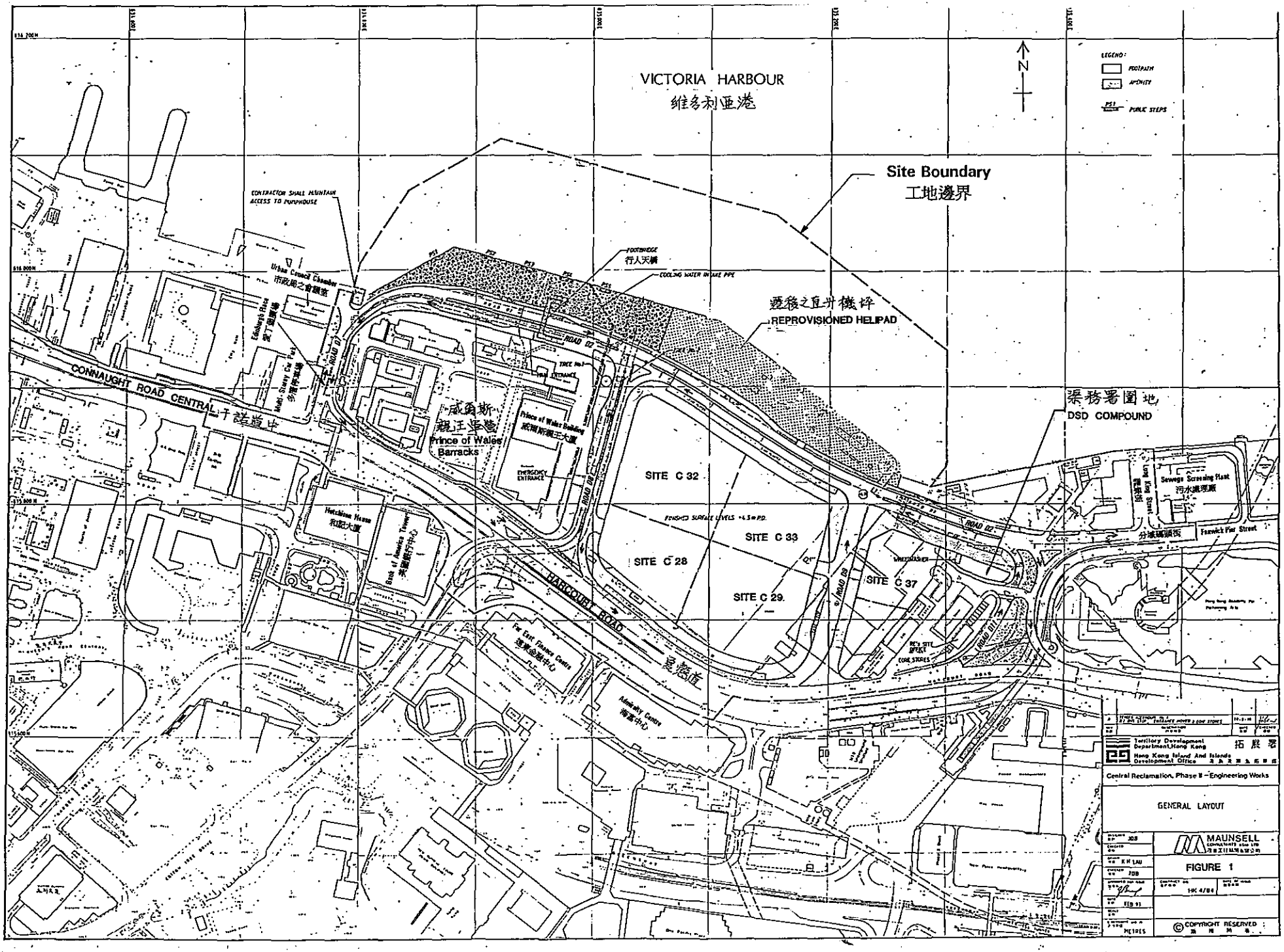
6.6 Potential odour impacts arising from the sewage system pumping station will meet current EPD requirements by means of activated carbon filters.

6.7 *Noise*

During construction a maximum level of 87 dB(A) would be experienced at the external facade by some sensitive receivers if land sourced fill material is used. However, this may be reduced to 84 dB(A) if the fill materials are delivered to the reclamation site by sea transport, which would include marine sand and land sourced materials delivered to the reclamation site by barge. Good quality glazing and central air conditioning will minimise the noise disturbance at most of the sensitive receivers. Moreover, further mitigation at source such as the use of muffling, screening of stationary plant and erecting screens of practical height will further attenuate the construction noise impact. Future vehicle and helicopter traffic noise should not exceed existing levels. New buildings may require inherent noise mitigation designs.

6.8 *General*

The Consultants conclude that the use of fill delivered by sea will cause less adverse environmental impacts in terms of air quality, water quality and noise nuisance than the land based fill material options due to the decrease in truck movements and material transfer.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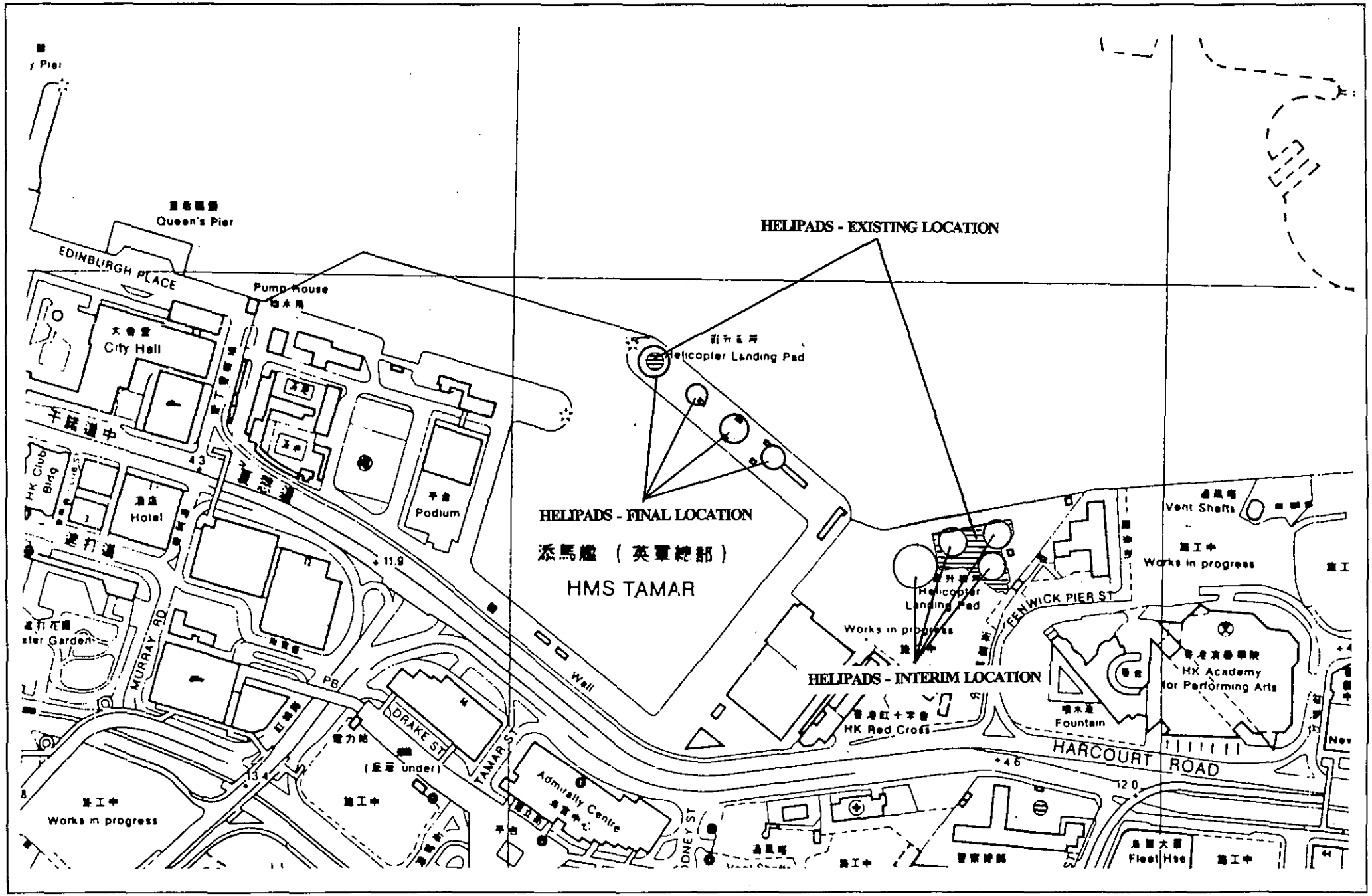

Figure 2 Locations of Helipads