TERRITORY DEVELOPMENT
DEPARTMENT, HONG KONG

KAI TAK AIRPORT NORTH APRON DECOMMISSIONING

ENVIRONMENTAL IMPACT ASSESSMENT EXECUTIVE SUMMARY

(AMENDED VERSION)

JUNE 1998

MAUNSELL CONSULTANTS ASIA LTD
in association with
CES (ASIA) LTD

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1 INTRODUCTION

Closure of Kai Tak Airport will release land for redevelopment. The South East Kowloon Development at Kai Tak Airport Design and Decontamination and Site Preparation Project (CE 86/97) is the first of the South East Kowloon Development projects. Its aim is to provide groundwork for future residential, commercial and industrial developments and landscaping.

The study area (Figure 1.1) covers about 164 hectares, comprises Planning Areas 1 and 2 and the western part of Planning Area 4. The development is scheduled to commence in 1998 after closure of the airport and site preparation of most of the site will be completed by 2000. Key activities include:

- Decommissioning of airport related facilities
- Decontamination of the airport site
- Building and pavement demolition
- Site preparation

The potential environmental impacts arising from this proposed work have been assessed in the EIA report. The impact assessment includes noise, air quality, water quality, demolition waste, ecology and land contamination. The major conclusions and recommended mitigation measures are presented in the following sections.

The EIA was carried out based on information available at the time. Changes of project can affect the findings of the EIA. As all the environmental issues have been substantially addressed and resolved during the South East Kowloon Development Feasibility Study (SEKDFS), the study has adopted information and findings in the SEKDFS where relevant to the study.

The report has been prepared in accordance with the requirements in Annex 21 of the Technical Memorandum (TM) of the Environmental Impact Assessment Ordinance (EIAO). This covers relevant project information, relevant legislation, existing environmental conditions, assessment criteria and methods, assessment findings and proposed mitigation measures.

2 CONSTRUCTION NOISE

Noise will be generated by activities related to the decontamination, building demolition and removal of pavement throughout the project period. Due to the large study area, and depending on the extent of structural screening from off-site buildings, some sensitive receivers may be exposed to construction noise, as some works would take place relatively close to the site boundary.

The assessment has addressed construction noise impact on representative noise sensitive receivers resulting from each individual construction activity, and has also addressed cumulative noise impacts. Construction activities are predicted to cause small exceedance of the applicable day time non-statutory limits without mitigation in place. However, with the implementation of mitigation in the form of quieter plant, and due to the fact that representative noise sensitive receivers immediately adjacent to the site are generally designed with noise insulating features to alleviate existing traffic and aircraft noise, residual impacts were predicted to be acceptable.

3 AIR QUALITY

During the demolition stage of the airport, dust impacts will arise from the demolition of existing buildings, break-up of pavement, haul road emissions, open site erosion, as well as from operations of the temporary crushing plant and stockpiling area.

It was predicted that with 50% dust suppression by twice daily watering, exceedances of the total suspended particulates (TSP) 1-hour average guideline level and 24-hour average Air Quality Objectives would not be expected outside the demolition areas except some places near the boundary with To Kwa Wan area. Exceedances of the 1-hour average guideline level for TSP were predicted around the temporary crushing plant within 60 metres from the plant boundary. No sensitive temporary uses are located in close proximity to the crushing plant, adverse dust impacts at sensitive receivers are therefore not expected.

Potential emissions during the contamination remediation stage of the airport will be generated from the catalytic incinerator located at the southwestern side of the airport apron. Potential emissions include nitrogen dioxide emissions from fuel combustion and residual benzene emitted after the catalytic oxidation of the soil vapour extracted from the contaminated site.

The modelling results showed that exceedances of the Air Quality Objectives for nitrogen dioxide are not expected in the vicinity of the catalytic incinerator. Exceedances of the 1-hour average Health Protection Concentration Levels for benzene are predicted within 20 metres from the incinerator stack at the worst affected elevation. Since the closest existing sensitive receivers are located at more than 150 metres away from the incinerator, adverse air quality impacts on sensitive receivers from the operation of the catalytic incinerator are not expected.

Adverse air quality impacts at sensitive receivers due to benzene emissions from the excavation of contaminated soil would not be expected if the excavation rates are controlled. Buffer distances to mitigate air quality impact are proposed for the pilot tests of the remediation system (Figure 3.1).

The vapour from the biopile would be vented to the catalytic incinerator for treatment before release to the atmosphere.

4 WATER QUALITY

The main sensitive receiving water bodies include Kai Tak Nullah, Kai Tak Approach Channel and Kowloon Bay.

Construction wastewater containing elevated levels of suspended solids and /or silt are likely to be generated as a result of rainwater runoff, processing water such as that used for dust suppression, and water used in the mechanical workshop. Potential impacts would be associated with the discharge of these waters into surface water which could cause elevation of suspended solids. Domestic sewage from the workforce will also be generated.

Recommended mitigation measures include the provision of adequate construction site drainage and sewage treatment facilities and the adherence to the good practices outlined in ProPECC PN 1/94 *"Construction Site Drainage"*.

The release of contaminated groundwater during decontamination is of concern. The nature of contamination in groundwater mainly relates to total petroleum hydrocarbons. The proposed remedial measure ie Soil Vapour Extraction (SVE) System itself produces no wastewater. The biopile will be covered and stablised with heavy weights. Leachate will be disposed offsite for treatment at suitable treatment facilities. Perimeter trench to collect runoff has been specified in the tender.

Because of the tight programme, excavation of contaminated soil will be necessary for some areas. Excavation of contaminated soil would be scheduled in the dry season to prevent heavy rainfall causing site run-off. Measures would be incorporated to contain any leachate for disposal.

All effluent from the construction sites should comply with the Water Pollution Control Ordinance Technical Memorandum discharge standards and are subject to the control under licences.

5 SOLID WASTE

In the waste management section, waste types, generation rates and handling procedures have been evaluated for both construction and operation phases.

Waste streams will include construction waste, chemical waste and general municipal solid waste. It was estimated that a total of 983,000m^3 of construction material would be generated, of which 181,000m^3 (representing 18% of total waste generated) would be non-inert material and require off-site disposal at landfill. The remaining 802,000m^3 construction waste would be processed and re-used on site for road, rail and reclamation, etc.

Chemical wastes, including residual fuel, solvent, lube oil and free oil, would be generated from the decontamination and site clearance. All these wastes should be collected by licensed chemical waste contractors and be disposed of at Tsing Yi Chemical Waste Treatment Plant. In addition, surveys should be carried out to confirm the presence of Asbestos Containing Material (ACM), so that appropriate removal and handling procedures for ACM can be determined.

6 ECOLOGICAL ASSESSMENT

The area is highly urbanised, supporting a dense population and industrial activities. Much of the existing land area was reclaimed. Sparse vegetation, comprising amenity planting or grassed areas is present. The study area does not cover any area of nature conservation value.

The assessment indicated that the ecological impact arising from the proposed project is anticipated to be either beneficial or of minimal adversity, thus no mitigation measures are considered necessary.

Migrant birds occasionally stop on the runway at Kai Tak, but only as a resting point during adverse weather conditions. Other such habitats are available elsewhere in Hong Kong and will also be provided by the proposed SEKD Metropolitan Park.

7 LAND CONTAMINATION

Review of the KTA site history was conducted. The contaminative land uses at the site include fuel storage and aircraft maintenance workshops. Historical leakage from the hydrant fuel system has been recorded at the airport apron.

A range of potentially contaminative land uses in the vicinity of KTA have also been identified. However, no evidence of migration of external contamination sources into KTA could be found.

Environmental site investigation within the existing KTA area has been undertaken to ascertain the nature, scale and extent of possible ground contamination resulting from known leaks of aviation fuels. The site investigation consisted of two phases:

Phase 1 of the investigation characterized soil gas conditions in 195 existing boreholes to assess indirectly the likely subsurface soil contamination levels. The survey established the extent of the aviation fuel contamination and identified some "hot spots" coinciding approximately with the locations of historical leaks of aviation fuel and also with other sources. Elevated levels of methane and anaerobic conditions were found in some areas. Phase 2 assessment included thex installation of 77 groundwater wells and the collection of soil and groundwater samples for chemical analysis to confirm the extent and nature of contamination so as to formulate feasible and site-specific remediation options.

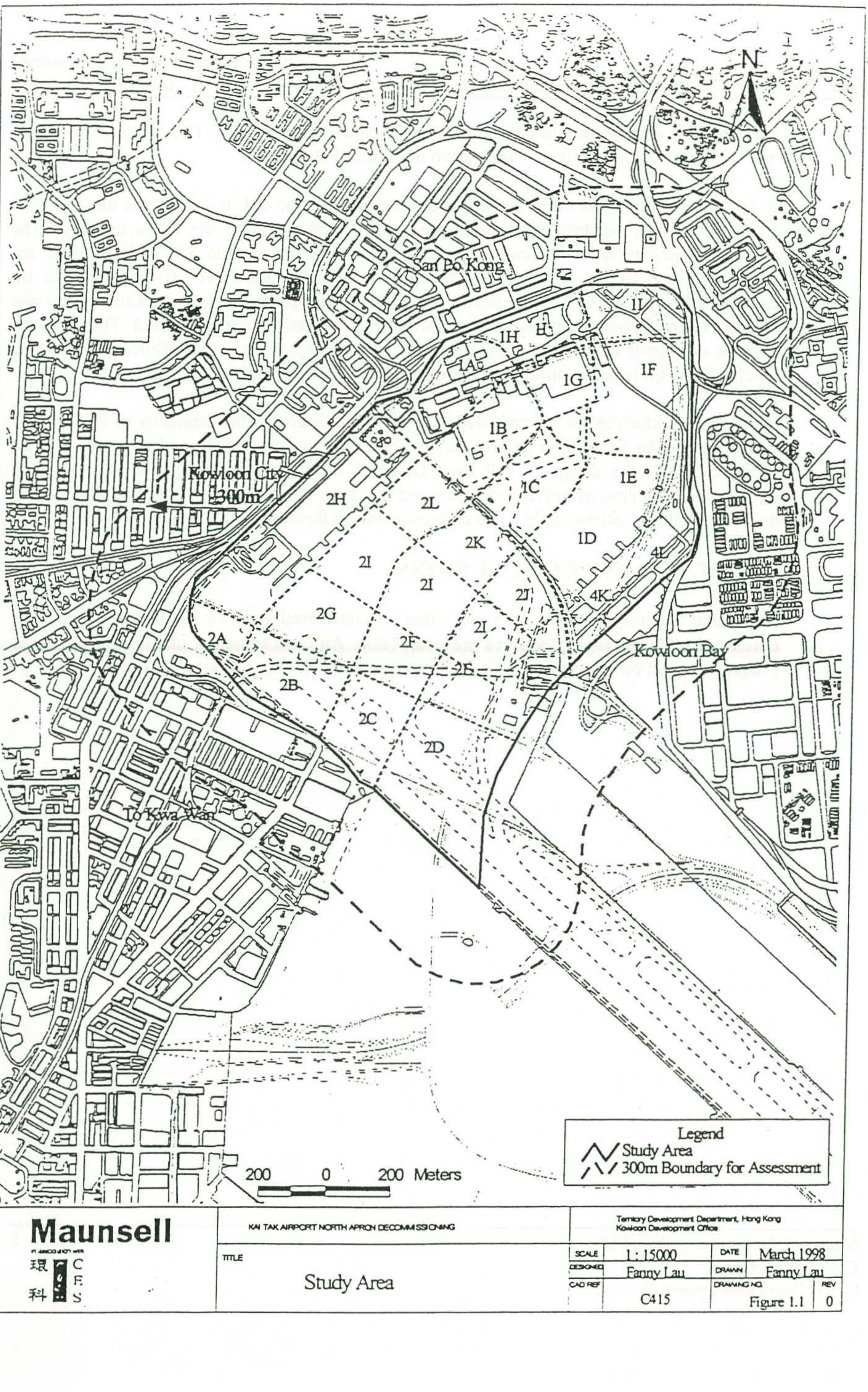
Results from Phase 2 indicated that remediation would be required at three areas: one at the OCTF site, one at HACTL building and one at the south side of the Northern Airport Apron. The key contaminants of concern in the soil are Total Petroleum Hydrocarbon (TPH) and benzene, toluene, ethylbenzene and xylenes (BTEX) which exceeded the relevant standards, warranting remediation. Methane in explosive concentrations possibly resulting from petroleum product was found in three areas. The environmental risk assessment modelling results indicated that the estimated risks in ground water were all within the acceptable risk levels. Even so, it was recommended that remediation should include key parameters if later investigation (after closure of the airport) identifies that groundwater clean-up is required. The contaminated areas and remediation system layout are shown in Figures 7.1 and 7.2.

A decontamination technology screening process was carried out to identify the most suitable technique for remediating the subject site, with consideration of site characteristics. The principal recommended technologies are soil vapour extraction (SVE)/bioventing for unsaturated soil and air sparging (AS) for saturated soil/ groundwater. These techniques are considered to produce the least health and safety risks to the workers on site. Mitigation measures of environmental impact during the remediation process were proposed. These include the use of vapour emission treatment system, oil interceptor and noise silencers. For some localised hot spots, excavation and treatment on a "biopile" system was proposed.

Pilot tests are scheduled to be conducted in July 1998 to determine the feasibility of Soil Vapour extraction and Air Sparging in different areas of the contaminated areas, and to gather data for optimisation of the design. "Fall back Options" in terms of free product recovery and excavation/ biopiling of heavily contaminated areas are planned in case that SVE/AS system does not perform satisfactorily. The decontamination flowchart is shown in Figure 7.3.

8 SUMMARY AND CONCLUSIONS

In general, environmental impacts can either be considered small or can be mitigated to an extent where impacts on receivers are acceptable. An environmental monitoring and audit programme will be required for noise, air quality, water quality and land contamination.



Maunsell	KAI TAK AIRPORT NORTH APRON DECOMMISSIONING	Territory Development Department, Hong Kong Kowloon Development Office			
環科 CES	TITLE Study Area	SCALE 1 : 15000	DATE March 1998		
		DESIGNED Fanny Lau	DRAWN Fanny Lau		
		CAD REF C415	DRAWING NO. Figure 1.1	REV 0	

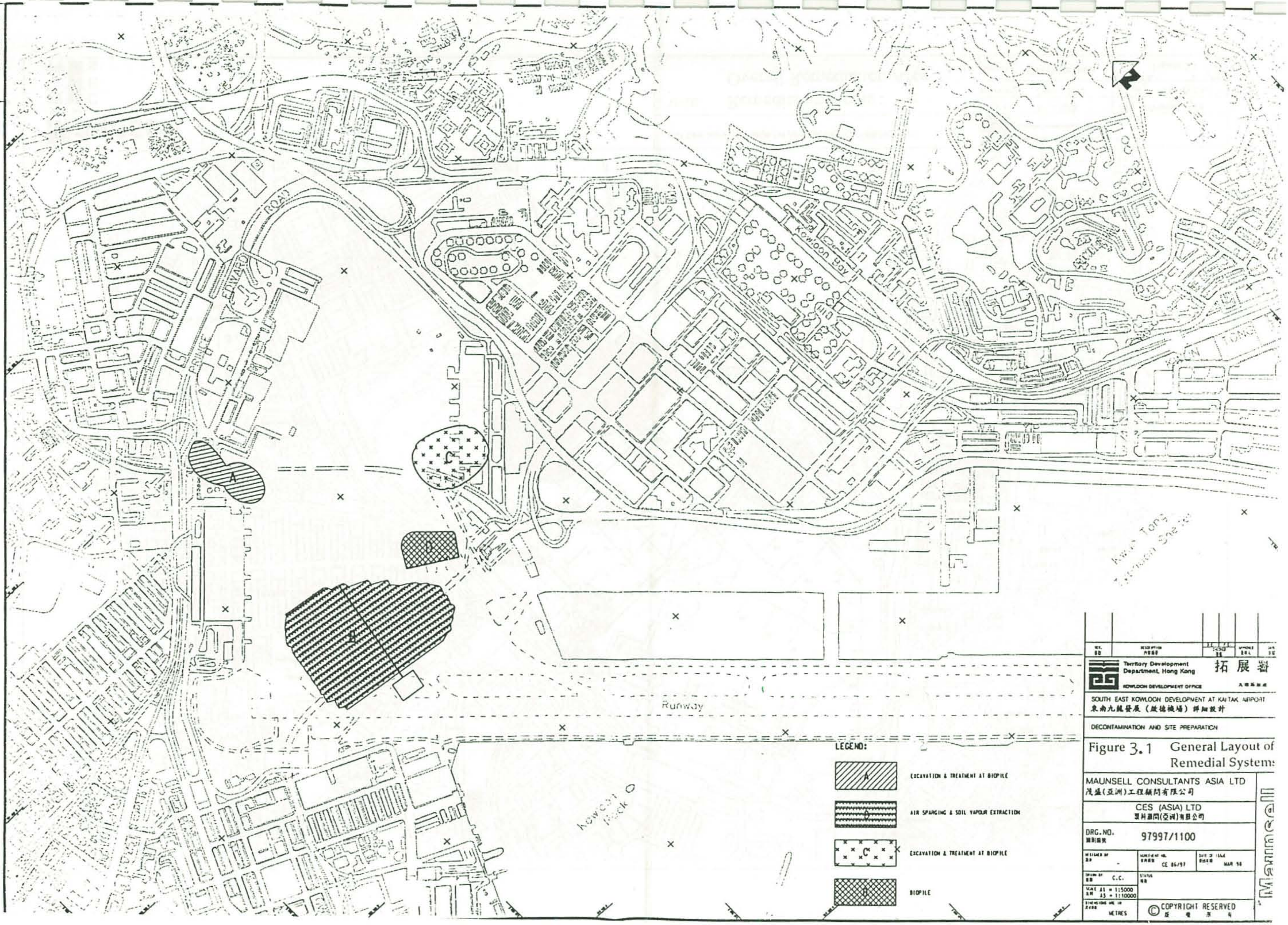
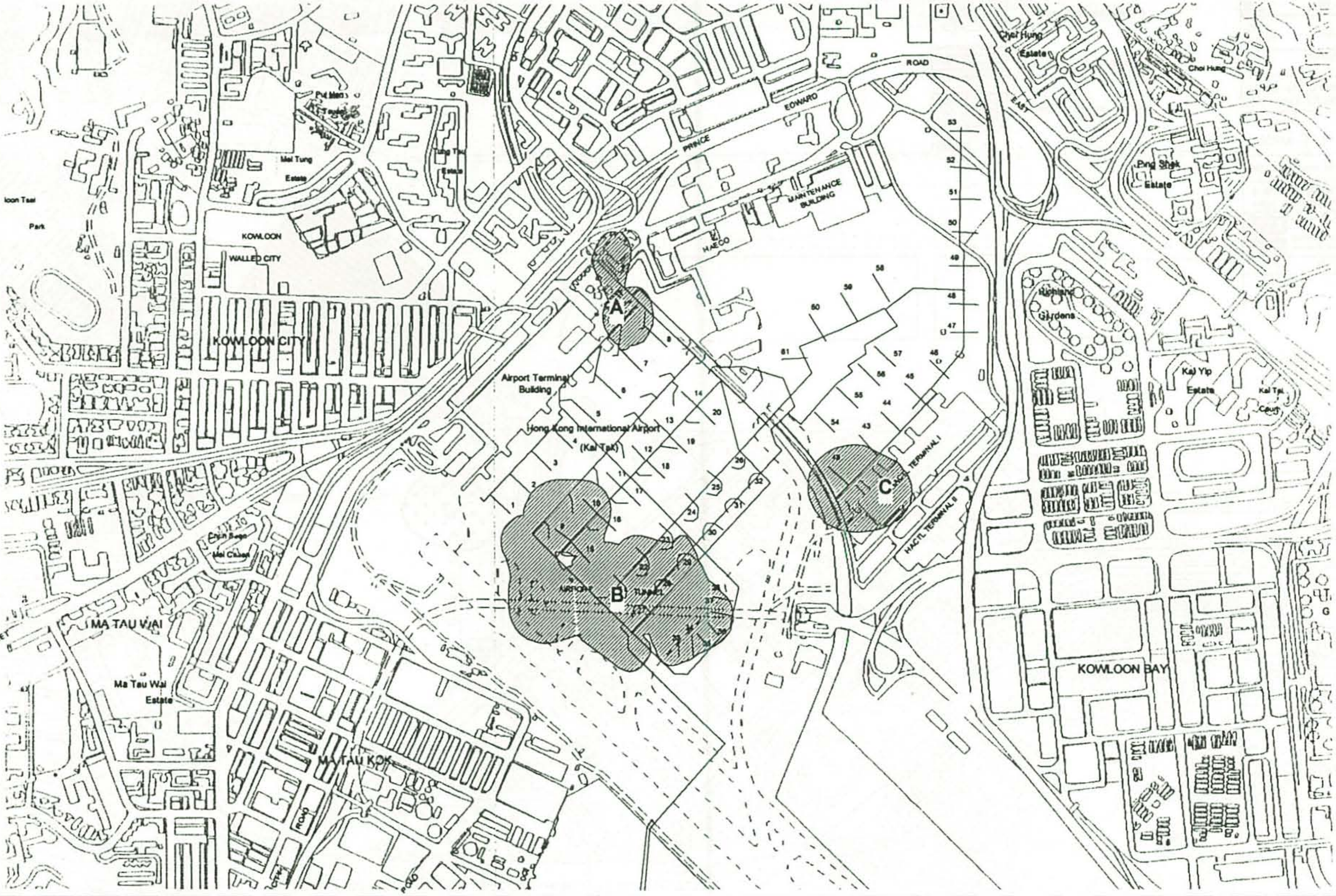


Figure 3.1 General Layout of Remedial Systems



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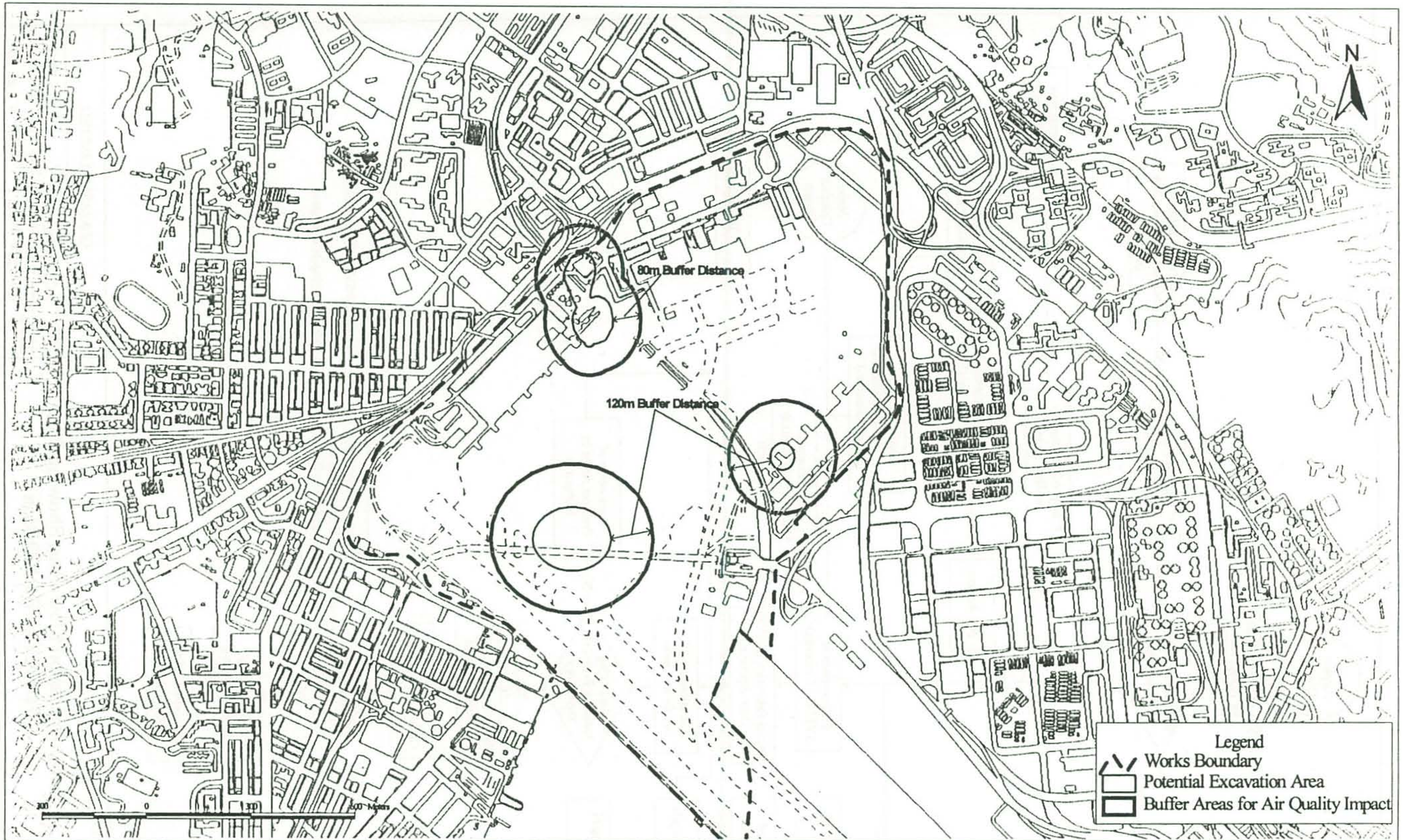
KAI TAK AIRPORT NORTH APRON DECOMMISSIONING

Territory Development Department, Hong Kong
Kowloon Development Office

TITLE **Remediation Areas : Overall Remediation Area**

SCALE	1 : 13000	DATE	March 1998
DESIGNED	Fanny Lau	DRAWN	Fanny Lau
CAD REF.	C415\exe_sum	DRAWING No.	Figure 7.1	REV 0



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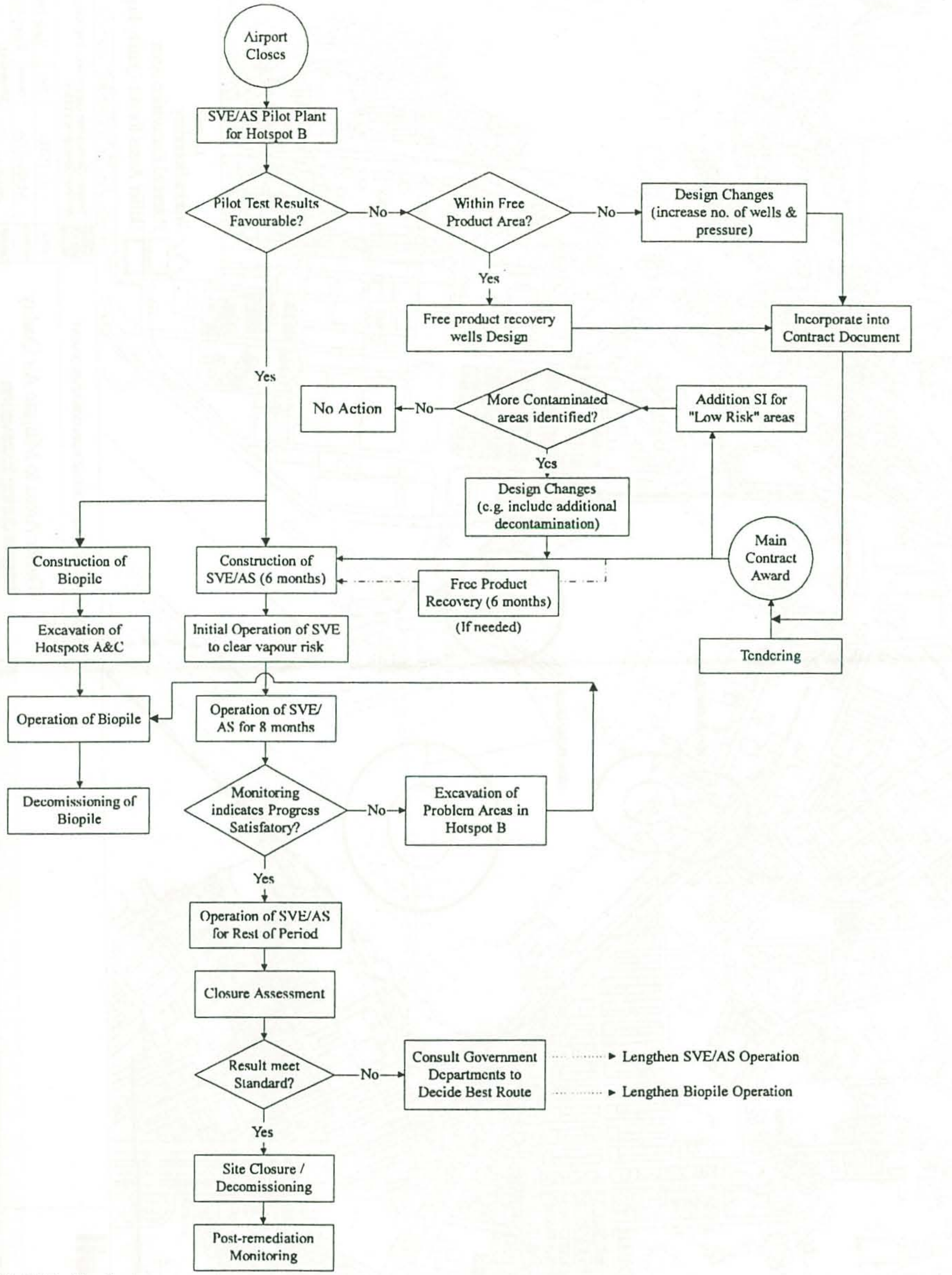
環 C E 科 S

FEASIBILITY STUDY FOR SOUTH EAST KOWLOON DEVELOPMENT	Territory Development Department, Hong Kong Kowloon Development Office				
TITLE Buffer Areas to Mitigate Air Quality Impact during Excavation	SCALE	1 : 15000	DATE	June 1998	
	DESIGNED	Matthew Ko	DRAWN	Fanny Lau	
	CAD REF	C415\exe_sum	DRAWING NO.	Figure 7.2	REV 0



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環科 CES

TITLE

Decontamination Flow-chart Showing Pilot Test & Fall Back Option

CES (ASIA) LIMITED			
PROJECT NO	C415\exe_sum	DATE	June 1998
DESIGNED	Maggie Wong	DRAWING NO	Figure 7.3

拓展署

啓德機場北停機坪遷拆

環境影響評估摘要

1998 年 6 月

茂盛(亞洲)工程顧問有限公司
聯同
環科顧問(亞洲)有限公司

1 前言

啓德機場關閉後，騰出之土地將需重新開發。其設計與去污及場地準備工程（CE 86/97）構成九龍東南部開發工程的第一部份，其目的在於爲將來的住宅、商業和工業開發及景觀設計提供基礎。

研究範圍（圖1.1）面積約爲164公頃，由第1和第2規劃區及第4規劃區的西部組成。該項目的開發計劃於1998年啓德機場關閉之後開始，而大部份場地平整將於2000年完成。主要工作包括:

- 機場相關設施的遷拆
- 機場場地的去污處理
- 建築物及路面之清拆
- 地盆開拓

對這項建議的工程可能產生的環境影響，已在一份環境影響評估報告中作了評估。影響評估包括噪音、空氣質量、水質、拆除的廢物、生態及土地污染等，以下各節闡述評估所得之主要結論和建議之緩解措施。

這環境影響評估利用現有的資料完成。將來工程的轉變可能會影響環境評估的結果。由於大部份的環境問題已在九龍東南部開發工程研究(SEKDFS)中解決，這個報告採用在SEKDFS中有關的資料和結果。

這報告是根據環境影響評估條例(EIAO)的技術備忘錄(TM)附件21的要求而製備的。報告內容包括與工程有關的資料、有關法例、現存的環境情況、評估的標準和方法，評估的結果和建議的緩解措施。

2 建築噪音

在整個工程進行之階段，場地去污、拆除建築物及拆除道路等工作均會產生噪音。基於研究區域遼闊，且場地外的結構屏蔽程度不同，及部份工程接近場地邊緣，故某些對噪音敏感的受體也許會受建築噪音的影響。

評估涉及到每一建築工程程序產生的噪音對代表性噪音敏感受體的影響，也包括到累計噪音的影響。據預測，建築工程產生的噪音，將略超過有關的非法定限制。然而，通過採用噪音低的建築器械，及由于場地附近的噪音敏感受體通常均採取有隔音設計，以減輕現有的交通和飛機噪音，所以，據預測，此等剩餘之噪音水平在可接受程度內。

3 空氣質量

清拆機場時，現有建築物及路面的拆卸及運輸車輛所引起的塵埃、地盆的侵蝕以及臨時壓碎機器和地盆內之堆土區，均會產生塵埃造成影響。

據預測，每天灑水兩次，可以抑制百分之五十灰塵，因此在拆除區之外，除土瓜灣某些地方，空氣之含塵量將不會超過總懸浮粒子（TSP）一個小時的平均水平指引及二十四小時的平均空氣質量標準（AQO）。據預測，在臨時壓碎機周圍六十米之內空氣含塵量將超過總懸浮粒子（TSP）的一個小時平均水平指引。但因壓碎機附近沒有易受空氣污染影響的受體，所以，不會造成負面的灰塵影響。

在機場場地去污階段，位於停機坪西南側的催化焚化爐，將會排放廢氣。潛在的廢氣排放，將包括燃料燃燒排放的二氧化氮，以及對污染場地的土壤進行催化氧化後排出的殘餘苯。

模擬的結果表示，在焚化爐附近，二氧化氮的水平不會高於空氣質量標準（AQO）。據預測，在焚化爐煙囪20米影響最大的高度之內，苯的水平將會高於保護健康濃度標準的一小時平均值。但由於最近的敏感受體位於焚化爐150多米之外，所以，操作催化焚化爐將不會對敏感受體的空氣質量產生不良影響。

若挖掘的速度受到控制，在挖掘污泥中所產生的苯對敏感受體的不良空氣影響，應該不會出現。去污處理系統的工程試驗所產生的空氣質量影響，我們建議採用緩沖距離(圖3.1)。

生物堆產生的氣體亦會經催化焚化爐處理過才排出大氣。

4 水質

主要易受水質影響的水體爲啓德機場明渠、啓德水道和九龍灣。

雨水、一般用水如防塵及機械車間之用水，將引致含懸浮固體/或沙泥高的廢水。將這些廢水排放至地表水，會令水中之懸浮固體濃度升高。施工隊伍也會排放生活廢水。

在場地去污階段，污染的地下水對施工之影響將值得關注 。污染的地下水含有過高之石油煙。由於在需要挖掘的土壤中，含水量相對較低，並且建議的去污程序中採用各類防範措施，故對地下水之影響將十分輕微。

推薦的緩解措施有：提供適當的建築工地排水系統及污水處理設施、遵循 ProPECC PN 1/94 "建築工地排水" 說明中的良好做法，以及遮蓋生物堆 (Biopile)。此外建築工地的排放物亦應符合水污染控制條例之技術備忘錄排放標準，並遵從執照條件進行。建議的除污措施，i.e. 土讓蒸氣抽取法(SVE)系統本身只產生微量的污水。生物堆將會被覆蓋。滲濾液將會被送往場外作處理。招標中會註明用邊周溝來收集徑流。

由於緊逼的時間限制，某些地區將需要作污泥挖掘加速工程。爲防止雨水引起污染場地內產生的滲水，污泥挖掘將會安排在乾燥季節內進行。而滲濾液將會被收集起來。

5 固體廢物

廢物管理部份，報告對建築和運作階段產生的廢物類型、產生率以及處理步驟作出了評估。

廢物將包括建築廢物、化學廢物及一般城市固體廢物。建築材料的總量估計有983,000立方米，其中181,000立方米（代表廢物總量的18%）爲非惰性材料，需要在工地之外堆填區棄置。剩餘的802,000立方米建築廢物將經過加工處理之後，在場地用於道路、鐵路和填海等。

去污和場地清理過程中將產生化學廢物，包括殘餘燃料、溶劑、潤滑油和游離油。所有這些廢物將由持牌化學廢物承辦商收集，在青衣化學廢物處理廠處理。此外，應進行檢查，以確定是否有含有石棉的物質存在，以便採取適當的清理程序。

6 生態評估

該地區城之都市化程度高，人口密集，工業活動頻繁。且多數現有土地爲填海造地，故現有植物甚少，祇有栽培植物或草地。研究的範圍亦不含具有自然保護價值的地區。

評估報告指出，建議的工程對生態有益，及極少負面影響，所以無須採取緩解措施。

在啓德機場的跑道上，偶爾有候鳥停留，不過，這只是在惡劣天氣的情況下，候鳥的一個歇腳點而已。在香港的其他地方，有類似的鳥類居停，建議的大都會公園將會提供此等停留點。

7 土地污染

報告對啓德機場的用地之記錄進行了研究。受污染之土地包括燃料儲存區和飛機保養工場。據記載，在航空停機坪曾經發生過漏油事件。

在啓德機場附近，亦有不同的污染土地使用者，然而，沒有發現外間污染滲入啓德機場範圍之跡象。

顧問公司在現有啓德機場內進行了環境場地勘察，以確定漏油對地面做成的污染性質、規模和程度。場地勘察分爲兩個階段:

調查的第一階段，包括查看現有195個鑽孔中的土壤氣體狀況，從而間接評估可能的地下土壤污染程度。調查確定了航空燃料的污染度，並界定了某些"熱點"，它們大約與漏油地點以及其他污染源吻合，在某些地區發現了甲烷濃度和厭氧程度較高。第二階段評估包括鑽探77個地下水井，收集土壤和地下水樣，進行化學分析，確認污染程度和污染特性，以便製訂切實可行的解決方案。

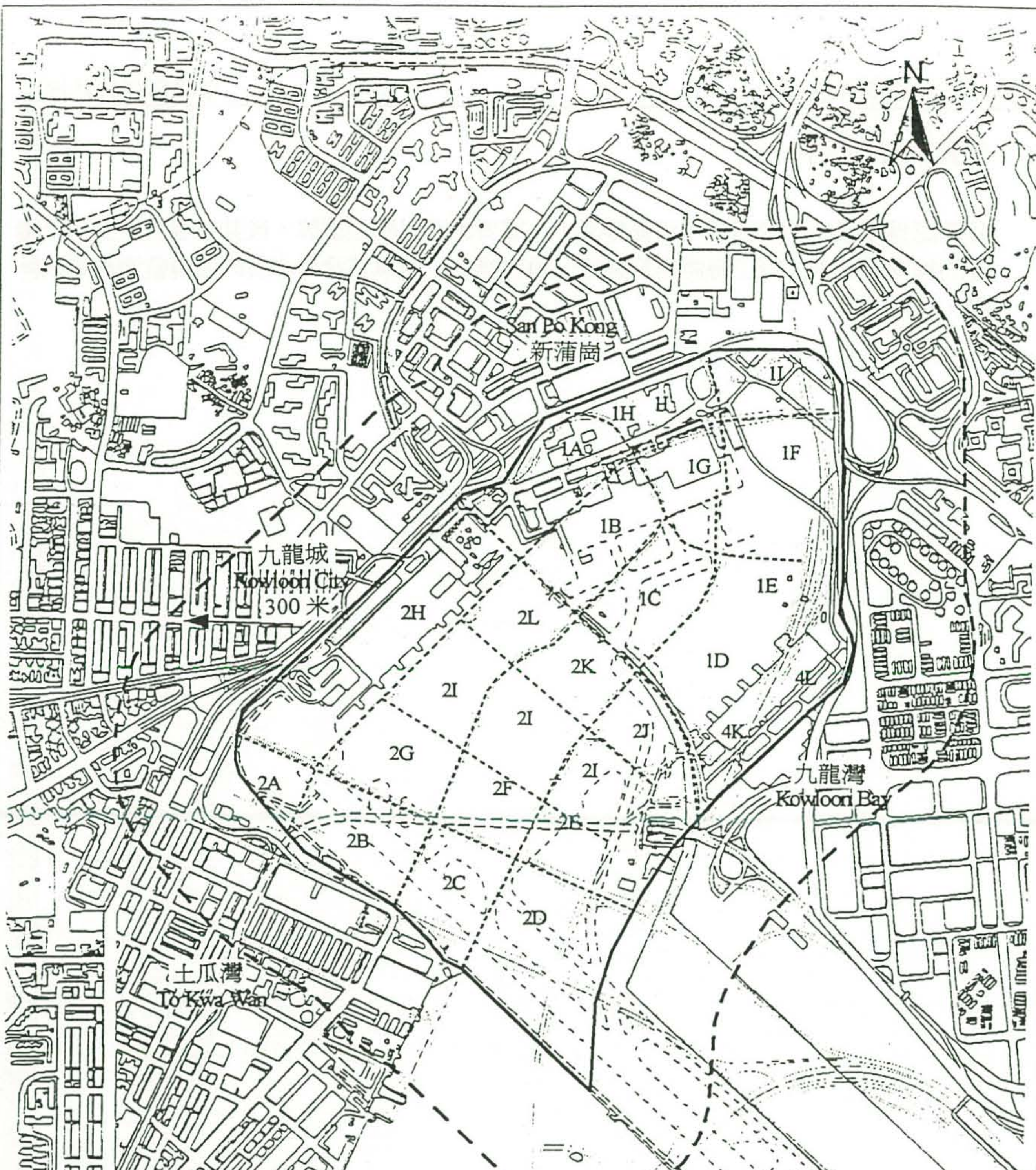
第二階段的研究結果顯示，在三個區域需要採取減少污染的措施：一個處於聯合油庫場地，一個處於香港空運貨站有限公司建築物邊及一個處於北停機坪的南側。土壤中主要的污染物爲總石油烴和苯、甲苯、乙苯及二甲苯，它們超過了相應的標準，需要採取減污措施。在三個地區發現的甲烷含量達到爆炸濃度，它們也許來自石油產品。環境風險評估的模擬結果顯示，地下水中估計的風險均在可接受的風險水平之內。即使如此，我們建議，如果最新調查（機場關閉之後）發現地下水需要清潔的話，減污措施中應包括主要的參數。圖7.1和7.2表示污染地區和減污措施的分佈圖。

我們根劇場地之特點，對去污技術進行了篩選，以甄別最適當的減污技術。推薦的主要技術係土壤蒸汽抽取法/對未飽和的土壤採用生物排氣法，對飽和土壤/地下水採用空氣分佈法。我們認爲，這些技術產生的環境危險、對施工人員的健康和安全影響最小。我們建議在減污過程中採用環境緩解措施，其中包括使用蒸汽排放處理系統、集油器及降噪器。對於污染熱點，我們建議在挖掘和處理採用"生物堆"系統。

工程試驗測試已安排在一九九八年七月進行，爲要決定在污染地區內不同地區進行土壤蒸氣抽取法(SVE)和空氣分佈法(AS)的可行性，和搜集資料可用於改良設計。假如SVE/AS系統表現未如理想，計劃會採用漂浮物回收和挖掘/生物堆置的"防備方案"。圖7.3表示有關的步驟。

8 總結和結束語

我們認爲建議中的工程對環境影響甚小，或者說可以經過緩解，後其影響將達到可以接受的程度。此外，施工時將需要進行一項對噪音、空氣質量和水質的環境監測和審核計劃。



Maunsell	啓德機場北停機坪遷拆	Territory Development Department, Hong Kong Kowloon Development Office			
環科 CES	TITLE 研究區	SCALE 1 : 15000	DATE March 1998		
		DESIGNED Fanny Lau	DRAWN Fanny Lau		
		CAD REF C415	DRAWING NO. 圖 1.1	REV 0	

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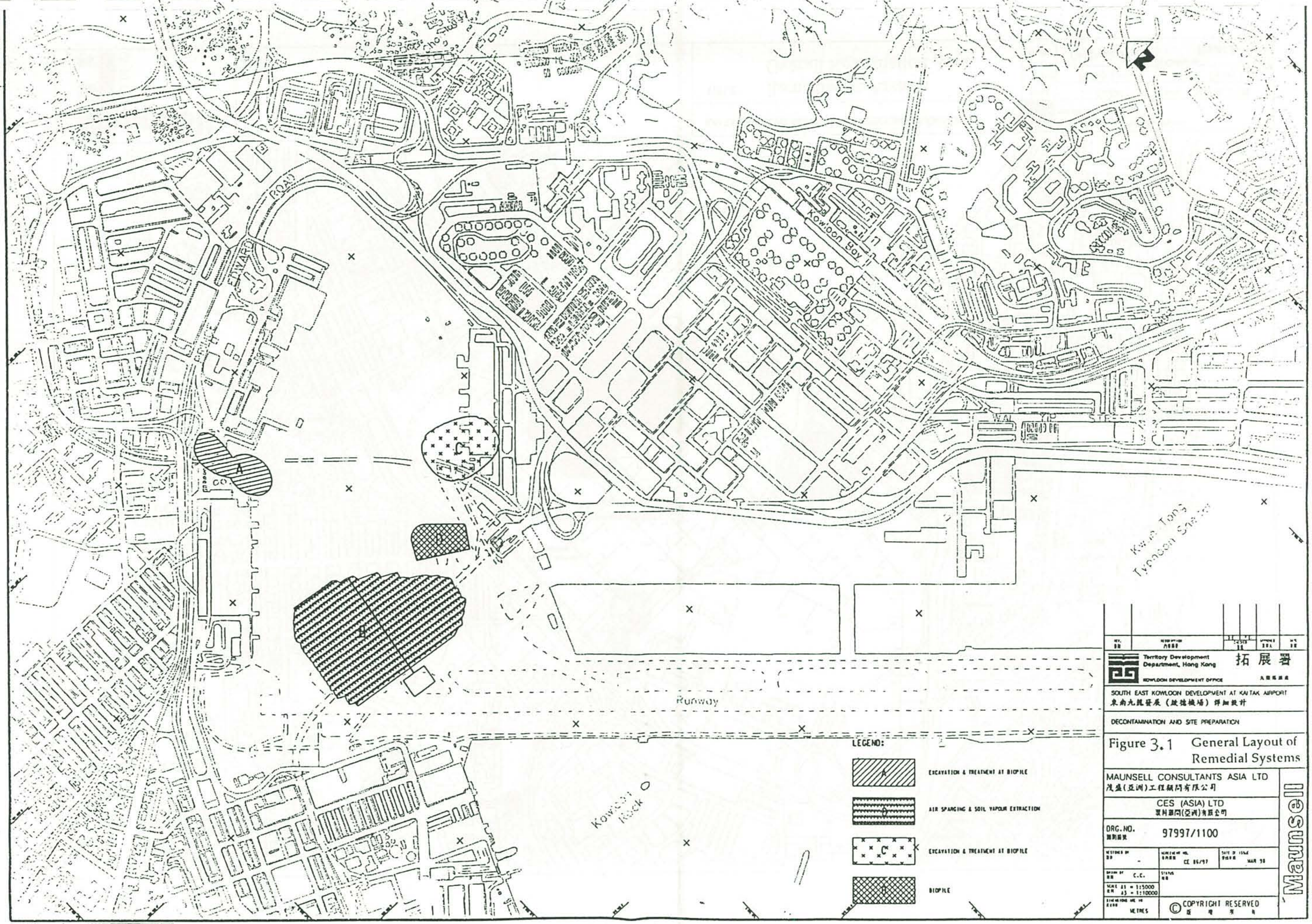

Territory Development Department, Hong Kong 拓展署

KOWLOON DEVELOPMENT OFFICE

SOUTH EAST KOWLOON DEVELOPMENT AT KAI TAK AIRPORT
東南九龍發展（啟德機場）詳細設計

DECONTAMINATION AND SITE PREPARATION

Figure 3.1 General Layout of Remedial Systems

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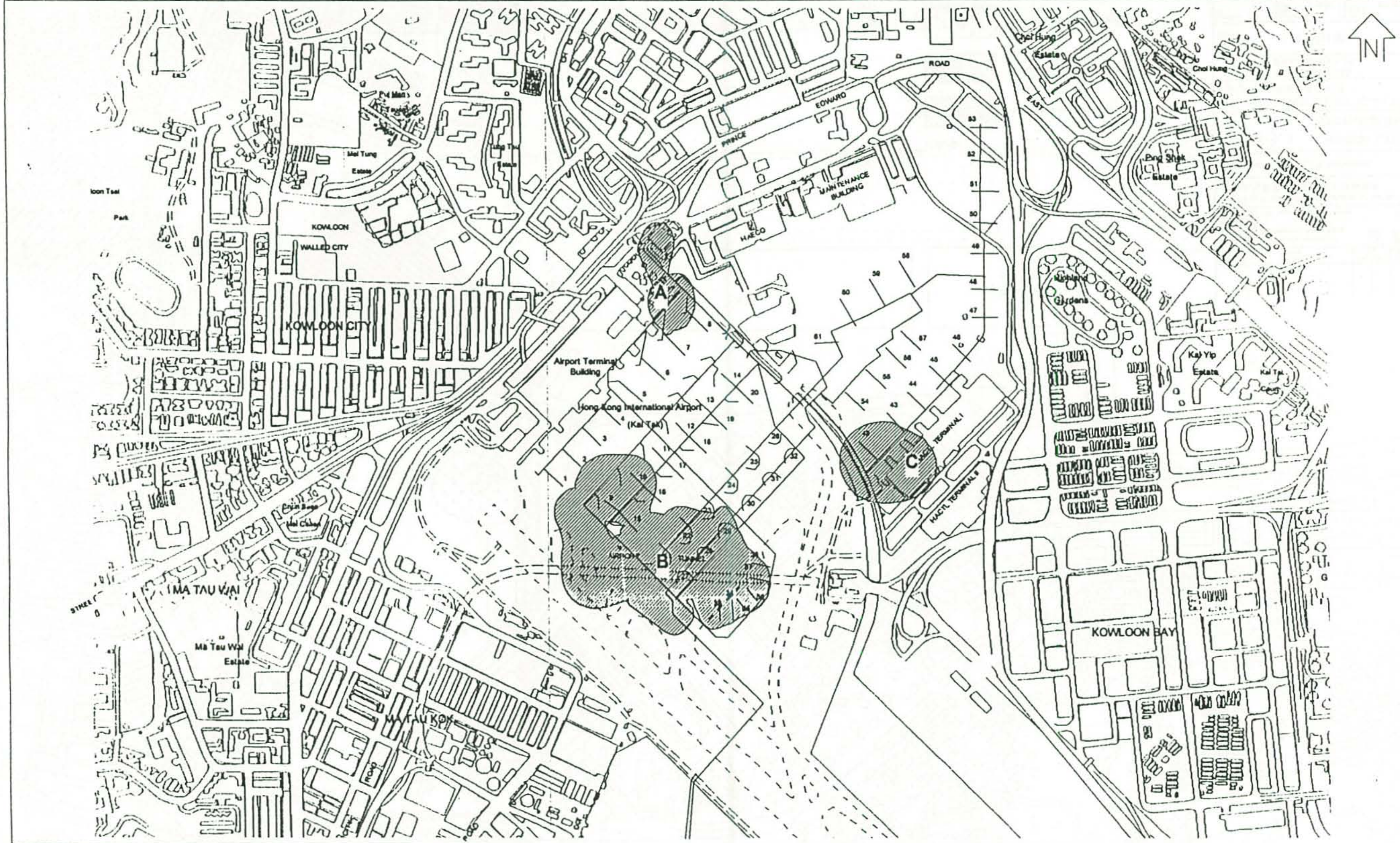
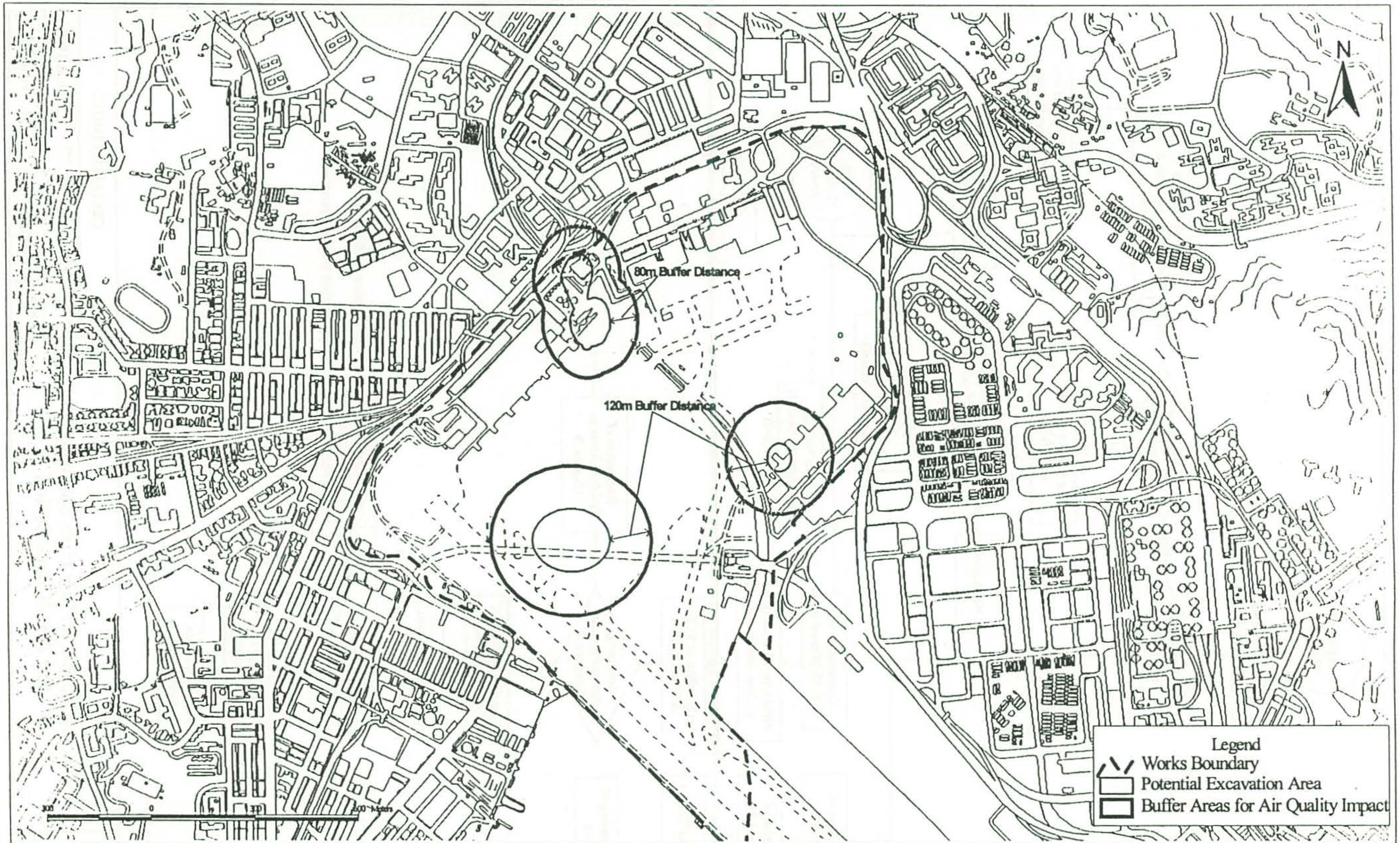
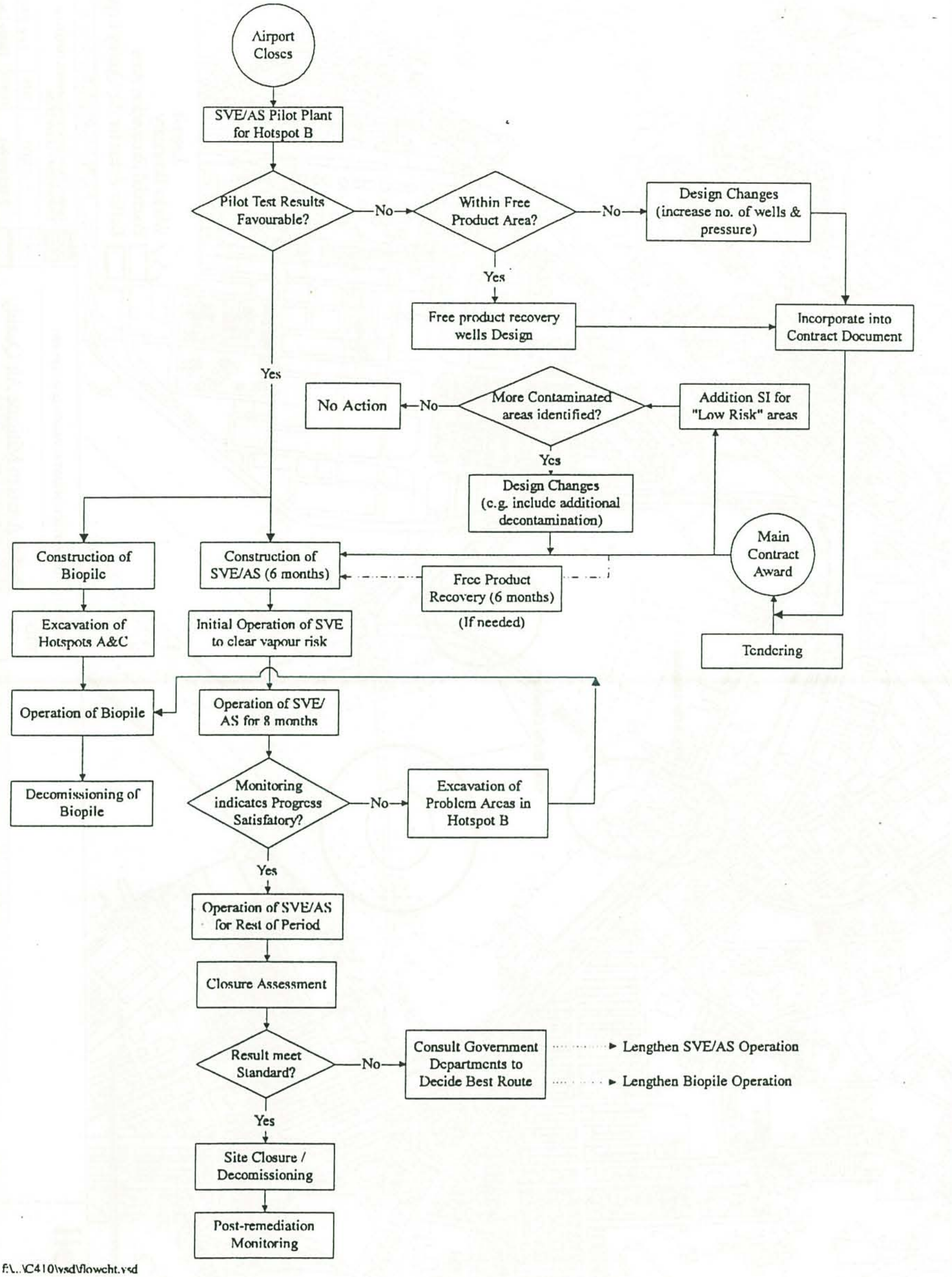


Maunsell 環科 CES	KAI TAK AIRPORT NORTH APRON DECOMMISSIONING		Territory Development Department, Hong Kong Kowloon Development Office			
	TITLE	Remediation Areas : Overall Remediation Area	SCALE	1 : 13000	DATE	March 1998
			DESIGNED	Fanny Lau	DRAWN	Fanny Lau
			CAD REF.	C415\exe_sum	DRAWING No	Figure 7.1 REV 0



Maunsell	FEASIBILITY STUDY FOR SOUTH EAST KOWLOON DEVELOPMENT	Territory Development Department, Hong Kong Kowloon Development Office			
環科 CES	TITLE Buffer Areas to Mitigate Air Quality Impact during Excavation	SCALE	1 : 15000	DATE	June 1998
		DESIGNED	Matthew Ko	DRAWN	Fanny Lau
		CAD REF	C415\exe_sum	DRAWING NO.	Figure 7.2 REV 0



環科 CES

TITLE

Decontamination Flow-chart Showing Pilot Test & Fall Back Option

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PROJECT NO	C415\exe_sum	DATE	June 1998
DESIGNED	Maggie Wong	DRAWING NO	Figure 7.3