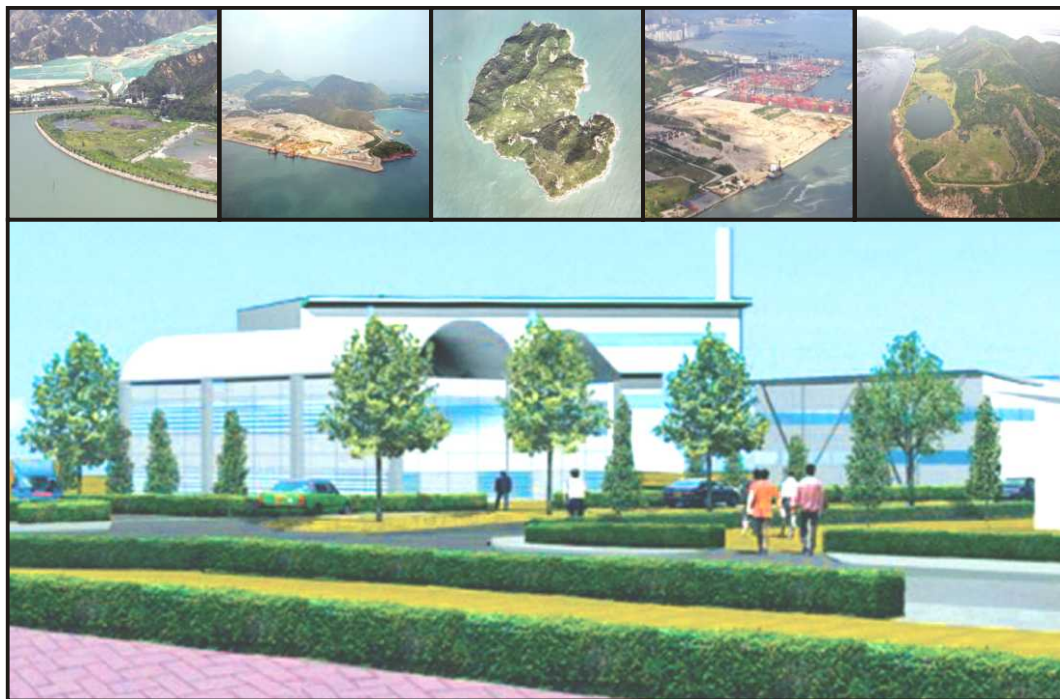


**Environmental Protection Department
Government of Hong Kong
Special Administrative Region**

Tender Ref. SW 03-124

**Site Search for Integrated Waste Management Facilities
in Hong Kong for Municipal Solid Waste**



Final Site Search Report

January 2008

Prepared by:

Camp Dresser & McKee International Inc.

Environmental Protection Department

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Chapter 1 Introduction

1.1 Background

In April 2002, the Government of the Hong Kong Special Administrative Region (HKSAR) invited Expressions of Interest (EOI) from local and international waste management industry to submit proposals on waste treatment technologies for the development of Integrated Waste Management Facilities (IWMF). The IWMF is to be constructed to handle the unavoidable portion of municipal solid waste (MSW) in Hong Kong.

At the same time, the Environmental Protection Department (EPD) commissioned a consultancy study, “Review of Integrated Waste Management Technologies”, to assess the proposals and analyze their relevance and appropriateness to the future waste management needs of Hong Kong.

To enhance the transparency and maintain a balanced view, an Advisory Group (AG) was set up by the Government, which is chaired by the Permanent Secretary (Environment) and comprised non-official members from professional bodies, academia, green groups and business sectors, to assist and advise the Government on selecting the most suitable waste treatment technologies.

At the end of the EOI evaluation process, a shortlist of the waste treatment technologies was drawn up and it formed the basis for the preparation of several Strategy Options for the development of IWMF in Hong Kong. Finally, the AG recommended that the IWMF should adopt a multi-technology approach so that the most suitable technologies could be used to deal with various waste streams of the MSW.

In 2004, EPD commissioned Camp Dresser & McKee International Inc. (CDM) under Tender Ref. SW 03-124 to conduct a study on site search exercise for the IWMF development,

The Government promulgated ‘A Policy Framework for the Management of Municipal Solid Waste (2005 – 2014)’ (The Policy Framework) in December 2005. Various waste management initiatives and targets, including the development of the IWMF, are set out in the Policy Framework. The Advisory Council on the Environment (ACE), in response to the Policy Framework, held an open forum in January 2006 to discuss and exchange views with stakeholders and the public. The ACE also sent a delegation to the Netherlands and Germany in March 2006 to acquire more information on and understanding of overseas experience and technologies on MSW management and treatment. In July 2006, the suitable treatment technologies to be adopted for the IWMF and their respective capacity requirements for the site search purpose were discussed at an ACE Waste Management Sub-committee meeting. The above would serve as a background for the site search exercise for the development of the IWMF in Hong Kong.

1.2 Objectives

The aim of this Study is to identify potential sites for further consideration and detailed studies, including detailed Environmental Impact Assessment (EIA), at a later stage. This study, thus, is carried out through a qualitative evaluation of various potential sites instead of a quantitative assessment. The present study is designed to identify sites which would

have insurmountable impacts, as well as to identify constraints for the short-listed potential sites for separate studies at a subsequent stage which would include detailed and quantitative assessments.

1.3 Scope

Under this Study, the site assessment would be carried out in two stages. The first stage involves ranking the list of potential sites based on a set of pre-determined criteria, whereas the second stage would carry out a more detailed assessment on the sites so as to recommend a short list of potential site(s) for further consideration and more detailed study. The Stage 1 Assessment has aimed at identifying the potential site(s) which is (are) likely to have insurmountable impacts, in particular the environmental ones. In the Stage 2 Assessment, a sensitivity analysis of the evaluation weighting and scoring system adopted in Stage 1 is conducted, and the assessment of the sites in terms of non-environmental criteria is reviewed taking into account conceptual layout plan of the IWMF at the potential sites. By eliminating site(s) with obvious constraints, the outcome of this site selection assessment would be a short list of potential sites recommended for further detailed study.

The purpose of this report is to present the process and findings of both Stages 1 and 2 assessments.

1.4 Structure of the Report

The Site Selection Report is structured as follows:

- Chapter 1 – describes the background, objectives, scope and structure of this Report;
- Chapter 2 – describes the background and identification of potential sites;
- Chapter 3 – outlines the approach and methodology of conducting Stage 1 Assessment;
- Chapter 4 – presents the environmental evaluation;
- Chapter 5 – summarises the assessment on engineering / technical aspect;
- Chapter 6 – presents the evaluation on social aspect;
- Chapter 7 – summarises the economical assessment;
- Chapter 8 – describes the assessment on consumer and user aspect;
- Chapter 9 – presents the overall outcomes of the Stage 1 Assessments;
- Chapter 10 – outlines the approach and methodology of Stage 2 Analysis and Review;
- Chapter 11 – presents the findings of the Sensitivity Analysis;
- Chapter 12 – presents the Stage 1 Review;
- Chapter 13 – provides an outline of the ‘Short-listed’ sites; and

Chapter 14 - summarises the findings and recommendations of the site selection.

It is noted that Chapters 3 – 9 cover the Stage 1 Assessment, whereas Chapters 10 – 13 relate to the Stage 2 Review.

Chapter 2 Identification of Potential Sites

2.1 Background

In accordance with the recommendations of the AG, the IWMF will adopt the following waste treatment technologies such that the most suitable technology could be applied to deal with different waste streams of MSW –

- ❑ Biological Treatment - including composting and anaerobic digestion which would treat biodegradable materials such as food waste from commercial and industrial establishments;
- ❑ Mechanical-Biological Treatment (MBT) - comprising mechanical and biological processes which recover recyclable materials and treat biodegradable fraction from mixed waste; and
- ❑ Thermal Treatment (TT) - incinerating the unavoidable mixed waste not handled by biological treatment or MBT and recovering the energy contained.

Among the above treatment technologies, state-of-the-art thermal technology with waste-to-energy opportunity would play a key role in the overall IWMF strategy, treating the main stream of MSW. As for the biological treatment, given its technological characteristics and the source of biodegradable waste, it would target on the stream of source-separated biodegradable waste from commercial and industrial establishments.

While MBT would also have a role to play in the overall IWMF strategy, its operation occupies a large area and the product outlets are uncertain. In this connection, the ACE considered MBT unlikely suitable to Hong Kong but mechanical sorting and recycling more viable. The implementation of the latter would, nevertheless, hinge on the provision of a collection system for recyclables and related infrastructures which are not yet available. Therefore, whether and how waste treatment technologies of this kind should be applied would require further studies. Possibly as AG recognized, it may be more suitable to initially aim at a small demonstration scale MBT operation subject to the future waste management framework and prevailing market conditions of the recovered materials.

In view of the above, instead of integrating the three technological components on a single site, it was considered more practicable to develop them under separate programmes, which together will form an integrated solution to our waste problem. In this connection, the planning of an Organic Waste Treatment Facility (OWTF) for source separated biodegradable waste from commercial and industrial sectors, which would not have much interface with other components of IWMF, is being pursued separately. It follows that the basic objective of the present IWMF site search is to identify potential sites for carrying out thermal treatment of the main MSW stream although consideration will also be given to carry out mechanical sorting and recycling or implement small demonstration-scale MBT at the same site subject to their compatibility and the prevailing waste management framework.

2.2 Identification of Potential Sites

The design capacity of the IWMF and hence its requirement on site area is one of the major bearings in identifying potential sites for the IWMF development. To conform with the waste management targets set out in the Policy Framework¹, the planning of IWMF would adopt a thermal treatment capacity of 3,000 tonnes per day (tpd) for the initial phase and the purpose of the present site search. Basically this would represent the volume of MSW requiring diversion from direct landfill disposal if the Policy Framework's target of reducing the total MSW disposed of at landfills to less than 25% by 2014 is to be met.

To form a list of potential sites for developing the IWMF, the initial step was to exclude areas where the intrinsic characteristics warrant the IWMF development not suitable. This was conducted with the consideration of various principles and criteria previously agreed by the AG (see Box 1).

Box 1. Areas not recommended by the Advisory Group on Waste Management Facilities (AG) for the development of the IWMF

- | |
|---|
| <ul style="list-style-type: none">• All areas for Residential and Commercial Use;• All 23 existing or potential Country Parks;• All existing or potential Marine Parks and Marine Reserves;• All Special Areas (outside Country Parks);• All Sites of Special Scientific Interest (SSSI) (including buffer areas);• All Restricted Areas (Wildlife);• The RAMSAR Site (including buffer area);• All Green Belt (GB) and Urban Fringe Parks;• All Conservation Areas (CA);• All Coastal Protection Areas (CPA);• All Water Gathering Grounds;• All Wetlands Areas;• All Fish Culture Zones;• All Proposed Fisheries Protection Areas;• All Gazetted Beaches;• All Declared Monuments, Graded Historical Buildings and Structures, Deemed Monuments and Archaeological Sites;• All Cemeteries, Burial Grounds or Grave zones;• All Fairways and Shipping Lanes and Port Areas; |
|---|

¹ The waste management targets set out in the Policy Framework are to -

- i) reduce the amount of MSW generated in Hong Kong by 1% per annum up to the year 2014, based on the 2003 levels;
- ii) increase the recovery rate of MSW to 45% by 2009 and 50% by 2014; and,
- iii) reduce the total MSW disposed of in landfills to less than 25% by 2014.

- All Airport and Restricted Areas around it (including the Military Airport);
- All Tunnels and Roads, existing and proposed Railways;
- All Other Major Infrastructure (including Castle Peak Firing Range);
- All Major Tourism Development Areas; and
- All Priority Sites for Enhanced Conservation promulgated under the New Nature Conservation Policy.

As regards developing IWMF in man-made caverns, construction cost for a large cavern space is relatively expensive, construction time is longer, and there is limited local and overseas experience in similar large scale cavern development (the largest cavern waste management facility in Hong Kong is the Island West Transfer Station under Mount Davies which has two caverns with a footprint of about 2,000 m² each, much smaller than 30,000 m² needed to house the major treatment components of IWMF), plus the safety risk associated with potential consequences of accidents in an enclosed space is very high. In the previous Feasibility Study of WEF, it is concluded that cavern sites are not suitable for accommodating the incinerator. This is consistent with the suggestion in one of the proceedings of the 26th Annual Seminar of the HKIE Geotechnical Division, which investigated the administrative and technical issues that need to be addressed to facilitate enhanced use of underground space and the potential for more use of caverns for infrastructure development in Hong Kong. According to the proceedings, rock cavern development is considered not suitable for incinerators. As such, cavern sites are not considered further in the present site search assessment.

Based on the basic site requirements of the IWMF, a review was conducted to form an initial list of potential sites by making references to –

- ❑ Sites occupied by the old incinerators;
- ❑ Shortlisted or selected sites of site search studies² for similar facilities or infrastructures; and
- ❑ Sites previously or currently used for waste treatment or disposals, including closed landfills.

The above has resulted in forming an initial list comprising 13 closed landfills and the following 21 sites:

- ❑ Outlying Islands –

² Studies to which references made include –

- Sludge Treatment and Disposal Strategy
- Extension of Existing Landfills and Identification of Potential New Waste Disposal Sites
- Feasibility Study of Waste-to-Energy Incineration Facilities
- Additional Study of Waste-to-Energy Facilities
- Centralized incineration Facility
- Study on Long-term Arrangement to Accommodate Inert C&D Material and Dredged Mud.

- Ex-Lamma Quarry, Lamma Island;
 - Shek Kwu Chau;
 - Siu Ho Wan; and
 - Ha Mei Wan, Lamma Island.
- ❑ Large Scale Artificial Islands for New Landfill Development –
- Eastern Waters;
 - Lamma South West;
 - North West Lantau;
 - South Cheung Chau;
 - South East Offshore; and
 - Tai Long Wan Offshore.
- ❑ Other Regions
- Ha Pak Nai;
 - NENT Landfill Extension B;
 - Nim Wan;
 - Pillar Point Valley;
 - Stonecutters Island;
 - Tseung Kwan O Area 137;
 - Tuen Mun Area 38;
 - Tuen Mun Port (near Black Point Headland);
 - WENT Landfill Extension A;
 - WENT Landfill Extension B (Covered Tsang Tsui West & Middle Ash Lagoon); and
 - Tsang Tsui Ash Lagoons (Middle Lagoon, adjacent to WENT Landfill Extension B).

The initial list of potential sites was then subject to further consideration of their site characteristics, latest development status and the dominant environmental conditions to form a site proposal.

All the 13 closed landfill sites were considered not suitable for the lack of large flat platforms, unstable foundations and commitment to other uses.

As for the large scale artificial islands intended for new landfill development, they would necessitate very long construction time and massive reclamations and hence, substantial water and marine ecological impacts.

For the remaining sites, commitments have made to reserve some of them to other developments (e.g. Siu Ho Wan for OWTF and Stonecutters Island for the Harbour Area Treatment Scheme). As a result, the site proposal was narrowed down to the following 8 potential sites -

- ❑ Ex-Lamma Quarry, Lamma Island;
- ❑ Ha Mei Wan, Lamma Island;
- ❑ Ha Pak Nai;
- ❑ Tuen Mun Port (near Black Point Headland);
- ❑ Shek Kwu Chau;
- ❑ Tsang Tsui Ash Lagoons;
- ❑ Tseung Kwan O Area 137; and
- ❑ Tuen Mun Area 38.

With the site proposal, the Planning Department was then approached to provide assistance and advice on drawing up a list of potential sites for the assessment purpose of the present Study. With due consideration of site availability, landuse, traffic, environmental, social and other relevant aspects, it was concluded that the Ha Pak Nai and Tuen Mun Port sites be dropped from further consideration.

The reasons for ruling out the Ha Pak Nai site are that it is located at the ecologically sensitive coastal area at Deep Bay and embraces numerous active fish ponds. The site is zoned as "Coastal Protection Area" on the relevant Outline Zoning Plan (OZP) and the proposed IWMF is not in line with the planning intention of the area. Moreover, it is located immediately next to the Ha Pak Nai Archaeological Site which is worthy of preservation.

As for Tuen Mun Port site, the site actually has not yet been formed as the plan under a previous study, 'The Feasibility Study of Waste-to-Energy Incineration Facilities', was to use part of the site formed through reclamation for the proposed Tuen Mun Port development project to build a waste treatment facility. As currently there is no programme to implement the Tuen Mun Port project and no reclamation has been carried out in that area, locating an IWMF on that site is therefore not possible. Moreover, the proposed site is very close to Lung Kwu Sheung Tan where a number of indigenous villages exist and that it is in close proximity to Lung Kwu Tan which has already been developed as a popular recreational spot. It is also close to the Sha Chau and Lung Kwu Chau Marine Park designated for the conservation of Chinese White Dolphins. All these factors have made the Tuen Mun Port site not suitable for IWMF development.

Having considered the above, the aforementioned two sites are not recommended for further consideration, and the following list of remaining potential sites was formed -

- S1 Tesung Kwan O Area 137;
- S2 Ex-Lamma Quarry, Lamma Island;
- S3 Ha Mei Wan, Lamma Island;
- S4 Shek Kwu Chau;
- S5 Tsang Tsui Ash Lagoons; and
- S6 Tuen Mun Area 38.

The above 6 potential sites, therefore, formed the basis of the assessment of the present study. **Figure 2-1** shows the locations of these 6 potential sites and a brief description of them is presented in the following sections.

2.2.1 Tseung Kwan O Area 137 (S1)

The proposed site for IWMF development is located at the southwest edge of Area 137 reclamation. **Figure 2-2** shows the location of the proposed site. The nearest developments include the SENT Landfill and the Tseung Kwan O Industrial Estate to the north of the proposed site. To the southwest, there is the Tathong Channel. The site has been previously studied for the development of Waste-to-Energy Facilities (WEF).

Siu Sai Wan and Chai Wan are the closest residential areas with dense population, which are about 2.4 km from the site. About 3 km to the north of the site, there is a major comprehensive development area for a MTR depot, a MTR station, and associated residential and commercial development (i.e. the Lohas Park) in Area 86. Other possible sensitive receivers in the vicinity include the Tung Lung Chau fish culture zone to the southeast of the site.

The site is primarily reserved for deep waterfront industries (DWI) and Potentially Hazardous Installation (PHI) uses. It is the only site in Hong Kong SAR which is currently available for PHI.

2.2.2 Ex-Lamma Quarry, Lamma Island (S2)

The proposed site is located at the ex-Lamma Quarry at the northeast side of the island. **Figure 2-3** shows the location of the site. In 1995, the site was granted to the then Civil Engineering Department, now the Civil Engineering and Development Department (CEDD) to undertake a 7 year rehabilitation contract. The area has been rehabilitated with landscaping and the rehabilitation works was completed in 2002.

The ex-Lamma Quarry is currently zoned as “Undetermined” on the draft Lamma Island OZP and occupies an area of over 34 ha.

The closest village is Luk Chau, locating to the northwest of the site. Besides, the site is in a prominent position facing Sok Kwu Wan where a mariculture zone locates.

2.2.3 Ha Mei Wan, Lamma Island (S3)

The proposed site, as shown on **Figure 2-4**, is situated at the west of Lamma Island. To the north of the site, there is the Hong Kong Electric Co. Ltd. (HEC) Lamma Power Station and its extension. The site has previously been proposed for WEF development. Reclamation will be required if the IWMF are to be housed at this site. Currently, no statutory or departmental plans cover this site.

2.2.4 Shek Kwu Chau (S4)

Shek Kwu Chau is an island located to the southwest of Cheung Chau and to the south of Lantau. The proposed site is to be formed by reclamation which acts as an extension to the southern side of the island, as shown on **Figure 2-5**. The site is currently not covered by any statutory plan. The island has been granted for use by the Society for the Aid and Rehabilitation of Drug Addicts (SARDA). The major development on this island is the Rehabilitation Centre by SARDA.

The planning intention for Shek Kwu Chau is mainly for landscape protection and conservation, with land allocated for Government, institutional and community (GI/C) uses as well as other specified uses. According to the South West New Territories Development Strategy Review – Recommended Development Strategy, Shek Kwu Chau is recommended for conservation, landscape protection and coastal protection uses.

2.2.5 Tsang Tsui Ash Lagoons (S5)

The Tsang Tsui Ash Lagoons are situated at the northwest New Territories. To the east of the site, there is the WENT Landfill, which is one of the three strategic landfills in the HKSAR, whereas the CLP Black Point Power Station is located to the west. There are berthing facilities at the WENT Landfill for vessels transporting waste from various refuse transfer stations.

The Ash Lagoons are divided by bunds into three ash lagoons, the East Lagoon, the Middle Lagoon and the West Lagoon. The Ash Lagoons were constructed in the mid to late 1980s along the former coastline near Nim Wan, for the purpose of storing pulverised fuel ash (PFA). The lagoons have been filled with the ash from CLP's Castle Peak Power Station since 1989. The total capacity of the lagoons is estimated to be approximately 7.5 Mm³. However, the lagoons are not yet full due to the periodic mining of ash from the site for commercial use. CLP began to use the Middle Lagoon as part of its 'water collection and conservation system' in November 1997. The lagoons are provided to CLP under two licences issued by Lands Department, with an expiry date of 30 June 2047. According to the conditions of the land licences, the Government has the right to take back the area with a 12-month advance notice. Under this Study, the Middle Lagoon is chosen as one of the potential sites for developing the IWMF, as shown on **Figure 2-6**. The East Lagoon was proposed for WEF development under the 'Additional Study to WEF'. EPD has recently commissioned a feasibility study for the WENT Landfill Extension. As the study is still ongoing, the extent of the landfill extension is not yet confirmed and subject to revision. The co-location of the Landfill extension and the IWMF should be addressed in subsequent studies if this site is selected for the development of IWMF.

Situating at the mouth of Deep Bay, the site is within the Deep Bay Water Control Zone (WCZ). The North Western WCZ is to immediate south of the site. A grout-filled geotextiles mattress has been incorporated into the outer seawall around the ash lagoons to reduce the permeability and thus, reducing the movement of PFA leachate to Deep Bay.

2.2.6 Tuen Mun Area 38 (S6)

The proposed site is reserved for the Centralised Incineration Facility (CIF), which was previously proposed for handling clinical wastes, animal carcasses and security wastes. Similar to the IWMF thermal treatment facility, the CIF was also proposed to employ thermal technology to treat waste. The site has an area of 5.75 ha. and is currently zoned as 'Other Specific Uses' – 'Specialised Industrial Area' under the Tuen Mun OZP. The location of the site is shown on **Figure 2-7**. The site is adjacent to the Eco-park.

The site falls within temporary Government Land Allocation GLA-TTM521 allocated to CEDD for a fill bank and associated sorting facilities up to 31.3.2009. If this site is selected for IWMF development, the project proponent needs to liaise with the affected allocatee/licensee to sort out the interfacing problem, if any, and release the site for implementation of the project.

Chapter 3 Approach and Methodology of Stage 1 Assessment

3.1 Introduction

This section presents the basic approach and methodology of the qualitative assessment of the 6 potential sites for IWWMF development. Accordingly to the *Final Working Paper on Site Search Methodology and Criteria*, the performance of each site option will be evaluated under 5 categories, which are:

- ❑ Environmental;
- ❑ Engineering / Technical;
- ❑ Economics;
- ❑ Social; and
- ❑ Consumer & User.

There are a total of 20 criteria under the above 5 categories to be considered when conducting the site selection. **Table 3-1** lists out these major siting criteria which are slightly modified from that contained in the “Final Working Paper on Site Search Methodology and Criteria” to avoid any double counting of the criteria.

Table 3-1 Major Siting Criteria

Major Criteria	Environmental	Technical/ Engineering	Economics	Social	Consumer & User
Air Quality	√				
Noise	√				
Visual and Landscape	√				
Ecology (Terrestrial) [#]	√				
Drainage, Water Quality, Marine Ecology & Fisheries [#]	√				
Land Use				√	
Land Ownership				√	
Traffic Impact				√	
Community Impacts					√
Ease of integration with existing or planned MSW infrastructure		√			
Site Access		√			
Constraints to Site Layout		√			

Utilities		√			
Construction Duration		√			
Construction Risk		√			
Operational Risk		√			
Capital Cost			√		
Operating Cost			√		
Opportunity Cost of Land			√		
Hazard to Life*	√				

Note: * This criterion is added as recommended by the EPD after the issue of the 'Final Working Paper on Site Search Methodology and Criteria'.

As discussed in the Waste Management Sub-Committee of the Advisory Council on the Environment (WMSC) Paper 7/06, the 4th evaluation criterion is 'ecology' and the 5th is 'drainage & water quality'. As ecology consists of terrestrial ecology and marine ecology & fisheries, and marine ecology & fisheries also relate to the drainage & water quality, the 4th criterion is revised to be 'terrestrial ecology' and the 5th to be 'drainage, water quality, marine ecology & fisheries'.

Since all the potential sites fall on government land, the ranking for the criterion of 'Land Ownership' will be the same for all sites. Hence, this criterion will not be further considered in the assessment.

3.2 General Approach

The potential sites would be assessed/evaluated using the criteria listed in **Table 3-1**. The assessment aims at identifying those sites, if any, with a concern that significant or insurmountable impacts would arise if the site(s) is (are) to be developed with the IWMF. Impact during both construction and operational phases would be considered. The methodologies of evaluation and site prioritisation to be adopted for individual criteria are detailed in Sections 3.4 to 3.8.

For consistency, a system of impact categorisation using either positive signs ("+"), neutrals (0), or negative signs ("−"), has been adopted. The category which a site option belongs to depends on the extent and acceptability of the impacts associated with the site option in terms of the relevant criteria. For impact which is considered to be unacceptable or insurmountable, a ranking of double negative ("−−") will be assigned. Such a rank is used as an indicator that the site is considered to be unacceptable for a particular criterion. Any site given this rank should be ruled out for consideration in the subsequent detailed feasibility and EIA studies.

Rather than to precisely quantify the impacts which may arise at each site option, this evaluation aims to assess qualitatively the potential impacts associated with each of the site options using the above criteria so as to rule them out from further studies. In other words, it is not the aim of the present study to confirm the acceptability of the potential sites in any aspects. As such, the methodology of evaluating the criteria will focus on how to differentiate the site options from one another in terms of their performances. For the site(s) recommended by the present study for further consideration, they should be subjected to

further detailed studies to ascertain their suitability and environmental acceptability conducted under a separate study at a later stage.

3.3 Information on Identified Sites

As various relevant studies have been conducted previously, the relevant information extracted from these studies would be adopted for the evaluation under this Study. This can avoid repeated assessment and would allow this site search exercise to be carried out in a more effective and efficient manner. Nevertheless, the extracted information would need to be checked and updated when further studies are carried out in future.

The evaluation/comparison of the identified site options, as listed in Section 3.1, will be carried out based on the information extracted from the following sources, whenever appropriate:

- ❑ Previous relevant studies;
- ❑ Information from government departments;
- ❑ Information from relevant websites; and
- ❑ Information from other publicly available sources known to the consultant.

The table below shows the respective relevant studies for each site option.

Table 3-2 Source of Information of Potential Site Options

Site	Previous Relevant Studies			
	Eco-park in Tuen Mun Area 38	HATS	WEF	STDSS
Tseung Kwan O Area 137			√	√ (Note 1)
Ex-Lamma Quarry, Lamma Island		√		√
Ha Mei Wan, Lamma Island			√	√
Shek Kwu Chau				√
Tsang Tsui Ash Lagoons			√	
Tuen Mun Area 38	√ (Note 2)			

HATS – Environmental and Engineering Feasibility Assessment Studies in Relation to the Way Forward of the Harbour Area Treatment Scheme

WEF – Feasibility Study of Waste-to-Energy Facilities / Additional Study of Waste-to-Energy Facilities

STDSS – Sludge Treatment and Disposal Strategy Study

Note 1: The site to be evaluated under this site search exercise is not exactly the same as (but adjacent to) the site investigated under the STDSS.

Note 2: The site options are in the vicinity of the sites investigated under previous studies and therefore, information from the respective previous studies is considered to be relevant.

In addition, other recent or on-going studies would be considered if they are found relevant.

3.4 Environmental

Six environmental criteria, which comprise air quality, noise impact, water quality, ecology, landscape and visual impact, and hazard to life, are considered in the assessment. The methodology of assessing the performance in terms of each criterion is summarised in the subsequent sections.

Other environmental impacts such as solid waste impact and cultural heritage impact have not been carried out in this assessment as there is no archaeological site within the 6 potential sites according to information from AMO's website and any potential solid waste impacts are anticipated to be of similar orders for all the sites and are not insurmountable. These aspects should be assessed in details in the subsequent EIA for the short-listed sites.

3.4.1 Air Quality Impact

Air quality impact is associated with the construction of all proposed solid waste treatment facilities and in particular, the operation of the thermal treatment facility. Construction activities such as excavation, site formation, concreting, and building constructions will generate mainly fugitive dust. Operation of facilities may likely create odour impact due to the handling and treatment of MSW. Thermal treatment facility would give rise to air pollutants such as RSP, NO_x, SO₂, CO and various other air pollutants.

The evaluation of air quality impact will be conducted with reference to Annexes 4 and 12 of the Technical Memorandum on Environmental Impact Assessment Process (TMEIAP). The evaluation process will consist of four stages:

- ❑ Identify the Air Sensitive Receivers (ASRs);
- ❑ Establish the existing baseline conditions of each site;
- ❑ Evaluate the key impacts on the ASRs; and
- ❑ Prioritise the sites.

Since the air quality impacts during the construction phase are only short-term but those during operational phase would be continuous far-reaching particularly for the IWMPF, the impact during operational phase will dominate. As a result, the site options will be ranked as follows based on the air quality impact during the operational phase:

- (+) Category 1 - No or negligible impacts, e.g. no ASRs within the zone of influence;
- (0) Category 2 - Impacts are acceptable with mitigation;
- (-) Category 3 - Impacts are acceptable with mitigation in general but the residual impact (i.e. remaining impact after the mitigation measures have been implemented) is of concern of particular groups of people; and

- (--) Category 4 - Impacts are unacceptable even with mitigation. This includes non-compliance with Air Quality Objectives (AQO) and odour standards arising from the accommodation of the IWMF.

3.4.2 Noise Impact

Noise impact may arise during both construction and operational phases of the IMWF development. Noise impact during construction phase associates with construction activities, including ground excavation, piling activities and site formation, with the use of various powered mechanical equipment. Operation noise impact may be caused by ventilation, operation mechanical equipment and vehicular traffic.

The evaluation of noise impact will be carried out by making reference to Annexes 5 and 13 of the TMEIAP. The following stages will be included in the evaluation:

- Identify the Noise Sensitive Receivers (NSRs);
- Establish the existing baseline conditions of the site options;
- Evaluate the key impacts on the baseline conditions; and
- Prioritise the sites.

The performance of each site in terms of noise impact will be ranked as follows:

- (+) Category 1 - No or negligible impacts, e.g. no NSRs within the zone of influence;
- (0) Category 2 - Impacts are acceptable with mitigation;
- (-) Category 3 - Impacts are acceptable with mitigation in general but the residual impact is of concern of particular groups of people; and
- (--) Category 4 - Impacts are unacceptable, e.g. non-compliance with noise criteria set in Annex 5 of TMEIAP as a result of the IWMF development.

The combined ranking of noise impact is shown on **Table 3-3**:

Table 3-3 Matrix of Combined Ranking of Noise Impacts

		Operational Phase			
		Category 1 (+)	Category 2 (0)	Category 3 (-)	Category 4 (--)
Construction Phase	Category 1 (+)	+	0	-	--
	Category 2 (0)	0	0	-	--
	Category 3 (-)	-	-	-	--
	Category 4 (--)	--	--	--	--

3.4.3 Visual and Landscape Impact

Visual impacts are affected by the sensitivity of a receiver and the magnitude of change due to the proposed development as perceived by the receiver, whereas landscape impacts are generally evaluated as a function of the magnitude of an impact and the sensitivity of the landscape resource or landscape character. Sensitivity of landscape is a measure of the ability of the landscape resource or character to accommodate change due to the proposed development without prejudice to its intrinsic landscape character.

The changes, due to the construction and operation of the IWMF, to the existing landscape and visual resources may be caused by the disturbance to existing vegetation, site formation, reclamation of land and introduction of building(s).

The evaluation will be conducted based on the broad principles outlined in Annexes 10 and 18 of the TMEIAP. The evaluation will include the following stages:

- ❑ Establish the existing baseline conditions of each site;
- ❑ Evaluate the key impacts on the baseline conditions; and
- ❑ Prioritise the sites.

The site options will be ranked as:

- (+) Category 1 - No or negligible impacts, e.g. the proposed development is in-keeping with the existing and/or planned developments in the area;
- (0) Category 2 - Impacts are acceptable with mitigation;
- (-) Category 3 - Impacts are acceptable with mitigation in general but the residual impact is of concern of particular groups of people; and
- (--) Category 4 - Impacts are unacceptable even with mitigation.

Table 3-4 shows the matrix of the combined ranking for landscape and visual impacts:

Table 3-4 Matrix of Combined Ranking of Landscape and Visual Impacts

		Landscape Impact			
		Category 1 (+)	Category 2 (0)	Category 3 (-)	Category 4 (--)
Visual Impact	Category 1 (+)	+	0	-	--
	Category 2 (0)	0	0	-	--
	Category 3 (-)	-	-	-	--
	Category 4 (--)	--	--	--	--

3.4.4 Terrestrial Ecology

Within the territory of the HKSAR, there are many designated areas which are protected for their scientific and ecological values. These areas include Country Parks, Special Areas, SSSI,

restricted areas and the Ramsar Site. Although initial site screening was conducted to exclude these areas from the development of IWMF, areas of high ecological values may be affected by the associated activities of the construction and operation of IWMF. Under this criterion, only the terrestrial ecological impact will be evaluated. For the marine ecological, including fishery, impacts, they will be assessed together with water quality impact.

With reference to Annexes 8 and 16 of the TMEIAP, the evaluation will be conducted following the sequence below:

- ❑ Conduct a desk-top baseline study;
- ❑ Identify and predict the potential ecological impacts;
- ❑ Evaluate the significance of the impacts identified; and
- ❑ Prioritise the sites.

The ecological performance of each site option will be ranked as:

- (+) Category 1 - No or negligible impacts, for instance, no loss of habitats / species;
- (0) Category 2 - Impacts are acceptable with mitigation measures implemented;
- (-) Category 3 - With impacts (with mitigation implemented) of low ecological value, for example, loss of species with low ecological interest; and
- (--) Category 4 - Impacts are unacceptable even with mitigation, e.g. loss of ecologically important species/habitat.

The combined ranking for terrestrial ecological impacts will be as follows:

Table 3-5 Matrix of Combined Terrestrial Ecological Impacts

		Operational Phase			
		Category 1 (+)	Category 2 (0)	Category 3 (-)	Category 4 (--)
Construction Phase	Category 1 (+)	+	0	-	--
	Category 2 (0)	0	0	-	--
	Category 3 (-)	-	-	-	--
	Category 4 (--)	--	--	--	--

3.4.5 Water Quality, Marine Ecology & Fisheries

Water quality impact associated with the development of IWMF is mainly from the site runoff or reclamation during the construction phase. In general, effluent discharged from the IWMF during operation phase can be minimized by proper design and practice to treat/reuse/recycle wastewater generated onsite. Besides, if water-cooling, rather than air-cooling, would be adopted for cooling the power generation system of the TT facility, the hot effluent discharged during the operation phase of the TT facility can be a main impact to water quality. Nevertheless, the quality of the downstream receiving water bodies and their

compliance with Water Quality Objectives (WQOs) should also be considered. The impacts on marine ecology and fishery should also be assessed wherever appropriate.

The evaluation will be conducted with reference to Annexes 6 and 14 of the TMEIAP. The stages of the evaluation will include:

- ❑ Establish the existing baseline conditions of each site;
- ❑ Evaluate the key impacts on the baseline conditions; and
- ❑ Prioritise the sites.

The categories of water quality performance will include:

- (+) Category 1 - No or negligible impacts;
- (0) Category 2 - Impacts are acceptable with mitigation;
- (-) Category 3 - Impacts are acceptable with mitigation in general but the residual impact is still of concern to certain degree; and
- (--) Category 4 - Impacts are unacceptable even with mitigation, e.g. causing the non-compliance to WQOs of the receiving water body, and the disruption of core habitat(s) of ecologically important species.

The combined ranking for water quality, marine ecological and fishery impacts will be as follows:

Table 3-6 Matrix of Combined Ranking of Water Quality, and Marine Ecology and Fishery Impact

		Operational Phase			
		Category 1 (+)	Category 2 (0)	Category 3 (-)	Category 4 (--)
Construction Phase	Category 1 (+)	+	0	-	--
	Category 2 (0)	0	0	-	--
	Category 3 (-)	-	-	-	--
	Category 4 (--)	--	--	--	--

3.4.6 Hazard to Life

In analysing the hazard to life due to the IWWMF development, 2 types of risks will be considered, which are:

- ❑ Risk arising from the normal operation of the IWWMF to individuals / human. In this case, it would mainly be the risks associated with the inhalation of emissions from the IWWMF, in particular the stack emission, to human;
- ❑ Risks associated with any accidental or other emergency events which may lead to injuries and/or fatalities;

- ❑ Hazards to IWMF's on-site population due to dangerous goods (DGs) storage facilities/PHI nearby; and
- ❑ Hazards to off-site population outside of the IWMF due to on-site manufacture, storage, use or transport of DGs, if any, at the IWMF.

As the first type of risks mentioned above (i.e. health risk of air emission) would be covered in the evaluation of air quality impact, it would not be included in the assessment of hazard to life. Only the remaining types of risks would be discussed under this criterion.

The factors affecting the level of risks associated with accidents as a result of the IWMF operation include:

- ❑ The occurrence frequency of accidents.
- ❑ Number of people in the vicinity of the IWMF, including the operational staff.

The categories of hazard to life performance will include:

- (+) Category 1 – No or negligible hazard;
- (0) Category 2 – Relatively low level of hazard;
- (-) Category 3 – Relatively medium but acceptable level of hazard; and
- (--) Category 4 – Relatively high and unacceptable level of hazard.

3.5 Engineering / Technical

The performance of the site options in engineering / technical aspect will be evaluated against 7 criteria as follows:

- ❑ Ease of integration with existing or planned MSW infrastructure;
- ❑ Site access;
- ❑ Constraints to site layout;
- ❑ Utilities;
- ❑ Construction duration;
- ❑ Construction risk; and
- ❑ Operational risk.

3.5.1 Ease of integration with existing or planned MSW infrastructure

This criterion focuses on whether the IWMF at the proposed site can be easily integrated with the existing and/or planned infrastructures for handling MSW, for instance, whether the proposed site is close to the upstream refuse transfer stations (RTSs) and the downstream landfills.

Under this criterion, the performance of individual site is evaluated against:

- ❑ Proximity to the Waste Sources. The sites will be evaluated based on their proximities to the RTSs, from which the refuse will be transferred to the IWMF for treatment. From an operational point of view, close distance to the waste sources would mean a shorter transfer distance and hence, a lower transportation cost of waste and higher operational efficiency. Also, the arrangement of refuse transfer would be less complicated. A higher score will therefore be given to a site within close proximity to these waste sources.
- ❑ Proximity of the Residual Disposal Facilities. The sites will be evaluated in terms of their proximity to the residual disposal landfills. A site within close proximity to a landfill will imply a shorter transportation distance, and thus, cheaper cost for residue disposal and higher operational efficiency.
- ❑ Impact on Existing Contracts. Site options will be evaluated based on the degree to which the accommodation of the IWMF at these sites would impact on the existing waste disposal and operation contracts of the RTSs. The impact extent of these contracts will be determined by the proximity to the existing transport routes and disposal locations. A site in close proximity to waste sources or residual disposal facilities would have a shorter refuse transfer distance and hence, any changes to the existing RTS contract may be offset by the reduced refuse transport distance.

The categories of site performance in terms of the ease of integration with MSW infrastructure will include:

- (+) Category 1 – Negligible or insignificant impacts, for instance, landfills /RTSs are within close proximity to the site option and insignificant impact to the existing refuse transport contracts;
- (0) Category 2 – Moderate impacts , no landfills / RTSs are in the vicinity of the site but within a relative short distance, similar travel distance to the current route of refuse transfer route, and moderate impact to the existing refuse transport contracts;
- (-) Category 3 – Substantial adverse impacts, for example, landfills and / or RTSs are relatively distant from the site and extensive changes to the existing refuse transfer contracts are required.

3.5.2 Site access

Access to the IWMF site can be either land- or marine-based. If only one type of access is feasible, there will be no contingency plan with the alternative means of transportation. Nevertheless, the RTSs can be used as a buffer in emergency cases or special circumstances if the access to the site is affected.

The following factors should be considered when evaluating the accessibility of a site:

- ❑ The available mode(s) of transport, that is, land or sea or both;
- ❑ The remoteness of the site; and
- ❑ The relative location of the site, for example, whether the site is in a relatively central position which would affect the distance travel for waste/residue transport.

The categories of site performance in terms of site access are:

- (+) Category 1 – Relatively good accessibility;
- (0) Category 2 – Relatively moderate accessibility; and
- (-) Category 3 – Relatively poor accessibility.

3.5.3 Constraints to site layout

The site layout of the IWMF will be constrained by factors including

- ❑ Site shape and dimensions; and
- ❑ Terrain and topography.

The categories of site performance in terms of site layout constraints are:

- (+) Category 1 – Insignificant constraints, e.g. a site with a large piece of flat land and of good surface condition;
- (0) Category 2 – Moderate constraints, e.g. constraints can be mitigated with effective layout design; and
- (-) Category 3 – Significant constraints, e.g. a site with small area and in odd shape.

3.5.4 Utilities

Utilities, including water and power supplies, are necessary for both construction and operational phases of the IWMF development. In evaluating the site performance in terms of utilities, the following aspects will be considered:

- ❑ Proximity to energy and water supplies;
- ❑ Capacity of energy and water supplies; and
- ❑ Ease of power grid connection.

The categories of performance in terms of site access are:

- (+) Category 1 – Small-scale utility provision, for instance, within close proximity to a water supply network or a power station/existing power grid;

- (0) Category 2 – Medium-scale utility provision, for example, the site at some distance to existing water supply network or existing power grid; and
- (-) Category 3 – Large-scale utility provision, e.g. a submarine water supply pipeline or a submarine power cable needs to be installed.

The combined ranking for utility provision will be as follows:

Table 3-7 Matrix of Combined Ranking of Utility Provision

		Power Supply		
		Category 1 (+)	Category 2 (0)	Category 3 (-)
Water Supply	Category 1 (+)	+	0	-
	Category 2 (0)	0	0	-
	Category 3 (-)	-	-	-

3.5.5 Construction Duration

The construction duration can vary greatly with the site selected for the IWMF development. While the time required for installing the equipment of the IWMF is common for all site options, the time for civil works can be very different among various sites, depending on the types of civil works involved.

Factors affecting the construction period associated with the civil works involved for IWMF development include:

- ❑ Types of civil works involved, e.g. reclamation;
- ❑ Complexity and difficulties of the works;
- ❑ Accessibility of the site; and
- ❑ Possibility of utilizing existing facilities which can minimise the duration of the civil works.

For example, site options involving reclamation would require much longer construction durations.

Besides, the need of substantial provision of ancillary facilities, including utilities and marine berthing facilities, will also increase the duration of the construction works.

The categories of site performance in terms of site access are:

- (+) Category 1 – Relatively short construction duration;
- (0) Category 2 – Moderate construction duration; and
- (-) Category 3 – Relatively long construction duration.

3.5.6 Construction risk

The risk associated with the engineering aspect consists of construction risk and operational risk, which may occur at different stages of the IWMF developments.

For the construction risk, the type of construction involved would be a determining factor for the level of risk associated with a particular site option. For example, a site option requiring massive reclamation would have a higher construction risk than that involving conventional surface construction only.

The categories of site performance in terms of construction risk are:

- (+) Category 1 – Relatively low level of risk, e.g. conventional surface construction;
- (0) Category 2 – Medium level of risk, e.g. reclamation works involved; and
- (-) Category 3 – Relatively high level of risk, e.g. massive reclamation works is required.

3.5.7 Operational risk

Although the system design of the IWMF should be in general the same regardless of the site locations, the risk associated with the operation of the IWMF would vary with the site location.

The following factors will be considered in evaluating the level of operational risk associated with individual sites:

- ❑ The reliability of the operation mode, which largely depends on the accessibility of the site; and
- ❑ Consequence of accidental incidents.

The categories of performance in terms of operational risk are:

- (+) Category 1 – Relatively low level of operational risk;
- (0) Category 2 – Medium level of operational risk; and
- (-) Category 3 – Relatively high level of operational risk.

3.6 Social

The performance of the site options will be evaluated against two social criteria, which are:

- ❑ Land Use; and
- ❑ Traffic Impact.

3.6.1 Land Use

Three factors will be considered in assessing the site performance in terms of land use, which are:

- ❑ On-site use displacement;
- ❑ Compatibility with surrounding land uses; and
- ❑ Compatibility with land use designation and zoning.

Performance of each site will be assessed with reference to the current planning intention reflected/shown on the statutory OZPs, non-statutory departmental plans, the relevant planning documents and other development proposals if any.

Site options do not require on-site use displacement, compatible with the surrounding land uses and land use designation and zoning will score a higher rank.

The categories of site performance in terms of land use are:

- (+) Category 1 – Negligible or insignificant impact on land use, e.g. compatible with planning intention and surrounding land use and no on-site use displacement is required;
- (0) Category 2 – Acceptable impact on land use; and
- (-) Category 3 – Significant impact on land use, e.g. entirely incompatible with planning intention and with strong competition with other potential uses for the area.

3.6.2 Traffic Impact

The traffic impacts comprise impacts on both land-and marine-based traffic. Since any traffic impact generated during the construction are only temporary in nature and the scale is anticipated to be in a local extent and within an acceptable level, the evaluation will focus on the traffic impact during the operational phase of the IWWMF development.

The traffic associated with the operation of the IWWMF will mainly arise from the waste / residue delivery to and from the IWWMF site. The materials can be transferred either via marine vessels or via road, depending on the location of the IWWMF site, the designated landfill and the associated RTSs.

The impacts on traffic will be assessed taking into account the following:

- ❑ Current traffic conditions;
- ❑ Addition or reduction in traffic associated with refuse (and other materials) transfer; and
- ❑ Future transfer route of refuse / ash.

Based on the traffic volume, traffic condition, and safety and transit length for both refuse and ash delivery via land and/or marine, the traffic impact arising from the transfer routes associated with the site options will be ranked as:

- (+) Category 1 – Positive impacts, e.g. similar transfer routes but shorter or pass through less busy water;
- (0) Category 2 – No or negligible impacts, e.g. the transfer routes are similar to the current transport route of refuse to the WENT Landfill;
- (-) Category 3 – Impacts are acceptable; and
- (--) Category 4 – Unacceptable impacts.

3.7 Economics

In the financial aspect, the performance of the site options will be evaluated against 3 criteria:

- ❑ Capital cost;
- ❑ Operating cost; and
- ❑ Opportunity cost of land.

3.7.1 Capital cost

Although the installation cost of equipment for treatment facilities of the IWMF should be common for all site options, the following are critical factors that cause large construction cost variation among various sites:

- ❑ Reclamation cost;
- ❑ Provision cost of associated utilities; and.
- ❑ Provision cost of marine berthing facilities.

Options requiring reclamation would have a much higher construction cost than those surface sites on which the IWMF can be constructed recently. In addition, the need of providing a submarine water supply pipeline and/or power cable will increase the construction cost. On the other hand, a site locating adjacent to a landfill or other uses with existing berthing facilities would have a saving in construction cost as the existing berthing facilities can be utilised.

As such, the ranking of the site options in terms of capital cost would be as follows:

- (+) Category 1 – Relatively low construction cost, e.g. no reclamation works or submarine pipeline installation are required, and existing facilities can be utilised;
- (0) Category 2 – Moderate construction cost;

- (-) Category 3 – Relatively high construction cost, e.g. site options with reclamation.

3.7.2 Operating cost

While the cost of operating the IWMF itself should be relatively equal for various site options, the transportation cost can vary greatly among individual sites. Hence, the operational cost among the various site options would be differentiated based on the transportation cost associated with the delivery of waste / residue to and from the sites.

The categories of performance in terms of operating cost are:

- (+) Category 1 – Relatively low operating cost;
- (0) Category 2 – Moderate operating cost; and
- (-) Category 3 – Relatively high operating cost.

3.7.3 Opportunity cost of land

Opportunity cost refers to the potential benefit that would be obtained if the site is selected for uses other than IWMF development. The assessment is based on the revenue that could be generated if the site is used for the other development and is on economics aspect only. For example, if a site is a prime site for major residential development, developing the IWMF will make such a development not possible. The opportunity cost, in this case, will be the loss in revenue by selling this parcel of land. The existing uses and the planning intention of the site are the major factors in determining the opportunity cost of the individual sites.

The performance in terms of opportunity cost of land will be ranked as:

- (+) Category 1 - No or negligible opportunity cost, for example, no planned uses;
- (0) Category 2 – The opportunity cost of land is acceptable; and
- (-) Category 3 – High opportunity cost, for example, land earmarked for sale and / or with planned uses with high revenue anticipated such as for commercial development.

3.8 Consumer & User

The performance of the site options will be evaluated against one criterion in the aspect of consumer and user, which is:

- Community Impacts.

3.8.1 Community Impacts

This aspect involves the community within the society, which would be affected by the IWMF development.

The impacts on the community can be classified into two sub-categories:

- ❑ Territory Wide Cultural / Social Impacts on the HKSAR; and
- ❑ Local Cultural / Social Impacts on people and communities.

The following factors should be considered in assessing the community impact arising from the development of the IWMF:

- ❑ No. of population in the vicinity of the site; and
- ❑ Nature of host community.

The categories of performance in terms of community impacts are:

- (+) Category 1 – Positive impact, e.g. facility welcomed by the community;
- (0) Category 2 – No or insignificant impact; and;
- (-) Category 3 – Moderate Impact; and
- (--) Category 4 – Unacceptable adverse impact.

The combined ranking of the site options are presented below:

Table 3-8 Matrix of Combined Ranking of Community Impact

		Territory			
		Category 1 (+)	Category 2 (0)	Category 3 (-)	Category 4 (--)
Local	Category 1 (+)	+	0	-	--
	Category 2 (0)	0	0	-	--
	Category 3 (-)	-	-	-	--
	Category 4 (--)	--	--	--	--

3.9 Evaluation Weightings and Scoring

A two-tier categorisation of site selection criteria would be adopted. This consists of 5 'Categories' which are further sub-divided into a number of "Criteria". Both the Categories and Criteria bear different degrees of importance in terms of the overall site selection evaluation process and have then been assigned different weightings based on professional judgement.

Table 3-9 shows the respective weightings of the categories and criteria.

Table 3-9 Weighting of Individual Siting Criteria

Category	Weighting (%)	Criteria	Weighting (% of Category)
Environmental	50	Air Quality	40
		Noise Impact	10
		Visual and Landscape Impact	10
		Ecology	10
		Water Quality & Marine Ecology and Fishery	15
		Hazard to Life	15
Engineering / Technical	10	Ease of Integration	30
		Site Access	20
		Constraints to Site Layout	10
		Utilities	10
		Construction Duration	10
		Construction Risk	10
		Operational Risk	10
Economics	10	Capital Cost	30
		Operating Cost	40
		Opportunity Cost of Land	30
Social	10	Land Use	70
		Traffic Impact	30
Consumer & User	20	Community Impacts	100

The following table shows the scoring system for the ranking.

Table 3-10 Scoring System

Rank	Score
+	3
0	2
-	1
--	0

It should be noted that for any site option having a Score of "0" or a ranking of "--", such a site should not be recommended to take forward for detailed feasibility and EIA studies.

The weighting system proposed under this Study is only intended for carrying out a qualitative assessment, rather than for quantifying the performance of the site options. Nevertheless, the weightings assigned to the respective category of criteria have taken into account the nature of the project, the characteristics of the sites, the purposes of the present Study and the overwhelming concerns in the site selection stage. As such, a heavier weighting (50%) was given to the category of “environment” where the environment of Hong Kong, particularly the air quality is commonly regarded as the major concern. Likewise, the category - “consumer & user” was given with a heavier weighting (20%) than the rest categories (10%) to reflect the importance of considering the community desires in the site selection stage. In the category “economics”, the criterion “operating cost” was assigned more weighting than “capital cost” and “opportunity cost” as IWMF would have a service life of 25 years or longer. In respect of the category - “social”, the emphasis was on the criterion - “land use” instead of “traffic impact” as the latter is manageable through proper operation planning and logistic management.

To cater for possible shift of focus and concerns on the different categories of criteria, a sensitive analysis testing the influence of changing weightings will be carried out in Stage 2 Assessment of this Study. It should be noted that the performance of each site in respect of each category of criteria should be studied and assessed in details in the subsequent stage should they be adopted for further consideration.

Chapter 4 Environmental Evaluation

4.1 Air Quality Impact

4.1.1 Air Sensitive Receivers

For the purpose of evaluating air quality impact during the construction phase, a zone of influence of 500m of the construction site boundary will be adopted. The same impact zone also applies to the odour impact.

Given the size and capacity of the TT facility, a zone of impact of 5km from the stack emission is proposed for the operational phase. Such an impact zone extent has been adopted in '*Sludge Treatment Facility – Feasibility Study*'. This zone of impact is chosen solely for the purpose of initial screening, and do not represent the extent of impact zone to be adopted for further studies. A larger impact zone may need to be used for the subsequent detailed quantitative assessment.

Table 4-1 shows the summary of ASRs for the potential sites.

Figures 4-1 - 4-5 show the ASRs for each of the potential sites. The detailed list of the ASRs for each of the potential sites during the construction and operational phases are shown in **Appendix A**.

Table 4-1 Air Sensitive Receivers for Potential Sites

Site	Construction Phase			Operational Phase		
	ASR Reference No.	ASR	Nearest Distance (m)	ASR Reference No.	ASR	Nearest Distance (m)
Tseung Kwan O Area 137	Nil	Nil	Nil	TKO-A1	Office at SENT Landfill	1080
				TKO-A2	Tin Hau Temple at Po Toi O	1710
				TKO-A3	Tseung Kwan O Industrial Estate	1350
				TKO-A4 & A5	Siu Sai Wan*	2000
				TKO-A6	Cape Collinson Correctional Institution	2500
				TKO-A7	TKO Sewage Treatment Plant	2950
				TKO-A8, A10, A11 & A13	Chai Wan*	3000
				TKO-A9 & A12	Hang Fa Chuen*	3500
				TKO-A14	MTR Tseung Kwan O Depot	3500
				TKO-A15	Lei Yue Mun*	4250
				TKO-A16	Shau Kei Wan*	4800
				TKO-A17	MTR Station and Lohas Park*	3100
				TKO-A18	Tiu Ken Leng	3990
	ELQ-A1 & A2	Luk Chau Village	240	ELQ-A1, A2 & A7	Luk Chau Village	240
Ex-Lamma Quarry, Lamma Island				ELQ-A3	Cement Works near Picnic Bay (or potential residential development within the Comprehensive Development Area (CDA))	800

Ha Mei Wan, Lamma Island					ELQ-A4 & A6	Sok Kwu Wan	640
					ELQ-A5	Lamma Island Youth Hostel	640
					ELQ-A8	Lo So Shing	920
					ELQ-A17	Mo Tat Wan	1160
					ELQ-A9	Lamma Power Station	1880
					ELQ-A19	Tai Wai San Tsuen & Tai Wai Kau Tsuen	1840
					ELQ-A20 & A14	Yung Shue Wan	2200
					ELQ-A16	Pak Kok San Tsuen & Pak Kok Kau Tsuen	3080
					ELQ-A10 – A13 & A15	Other domestic premises, G/IC at Lamma Island	2200
					ELQ-A18	Lei Tung Estate (Ap Lei Chau)*	3210
					ELO-A24	South Horizons (Ap Lei Chau)*	2990
					ELQ-A21	Wah Fu*	3550
					ELQ-A22	Aberdeen*	3730
					ELQ-A23	Wong Chuk Hang	4500
	HMW-A1	Lamma Power Station	200		HMW-A1	Lamma Power Station	200
					HMW-A4	Lamma Island Youth Hostel	1880
					HMW-A5	Lo So Shing	1960
					HMW-A6	Cement Works near Picnic Bay	1880
					HMW-A2 & A9	Sok Kwu Wan	2640
					HMW-A3, A7, A8, A10 – A14	Other domestic premises, G/IC at Lamma Island	1640

Shek Kwu Chau					HWM-A15	Pak Kok San Tsuen & Pak Kok Kau Tsuen	3000
					HMW-A16	Mo Tat Wan	3800
					HMW-A17	Tai Wan San Tsuen & Tai Wan Kau Tsuen	1760
					HWM-A18	Yung Shue Wan	1840
Shek Kwu Chau	SKC-A1	Shek Kwu Chau Treatment and Rehabilitation Centre		140	SKC-A1	Shek Kwu Chau Treatment and Rehabilitation Centre	140
					SKC-A2, A4, A9 & A12	Domestic premises and G/IC at Chi Ma Wan	2530
					SKC-A3, A5, A6 – A8, A10, A11, A13 & A14	Domestic premises and G/IC at Cheung Chau	3330
Tsang Tsui Ash Lagoons	TTSL-A1	Tsang Kok Village		500	TTSL-A1	Tsang Kok Village	500
	TTSL-A2	Planned WENT Landfill Extension		400	TTSL-A2	Planned WENT Landfill Extension	400
	TTSL-A3	Temple at Tsang Tsui		450	TTSL-A3	Temple at Tsang Tsui	450
	TTSL-A4	Proposed Sludge Treatment Facility		500	TTSL-A4	Proposed Sludge Treatment Facility	500
					TTSL-A5	CLP Black Point Power Station	1150
					TTSL-A8, A9 & A12	Domestic premises and G/IC at Sheung Pak Nai & Ha Pak Nai	2150
					TTSL-A6	Domestic premises at Lung Kwu Tan	2000
					TTSL-A7	Temple at Pak Long	3250
					TTSL-A10	Castle Peak Power Station	4600
					TTSL-A11	Office at NENT Landfill	1250
					TTSL-A13	Leung King Estate	4040
					TTSL-A14	Tsing Shan Monastery	4750

Tuen Mun Area 38	TM-A1	Fill Bank	1	TM-A1	Fill Bank	1
	TM-A2	Eco-park	100	TM-A2	Eco-park	100
	TM-A3	Proposed 'Holiday Camp'	120	TM-A3	Proposed 'Holiday Camp'	120
	TM-A4	Pilot C&D Material Recycling Facility	210	TM-A4	Pilot C&D Material Recycling Facility	210
	TM-A5	Proposed Permanent Aviation Fuel Facility	460	TM-A5	Proposed Permanent Aviation Fuel Facility	460
				TM-A6, A7 & A9	G/IC at Pillar Point	650
				TM-A8	Shiu Wing Steel Mill	700
				TM-A11	Cement Works near Eco-park	820
				TM-A10	Castle Peak Power Station	1000
				TM-A13	Domestic premises at Lung Kwu Tan	1650
				TM-A16	Melody Garden *	2750
				TM-A19	Butterfly Estate *	3050
				TM-A12, A14, A15, A18, A22, A24, A28, A30, A31 - A32	Tuen Mun (South) *	1350
				TM-A17	Temple at Pak Long	2600
				TM-A21, A25 - A27	Tuen Mun Kau Hui	3500
				TM-A23	Tuen Mun (North)	4250
				TM-A29	CLP Black Point Power Station	4900
				TM-A33	Leung King Estate	4950
				TM-A20	Tsing Shan Monastery	3900

Note: * Major Population Cluster

4.1.2 Baseline Conditions

Below presents the major emission sources for each site option.

Tseung Kwan O Area 137

The emission sources in the vicinity include TKO Industrial Estate, SENT Landfill and vehicular emission in the area. Nevertheless, with the prevailing wind direction to be north-easterly and the site is located at the eastern side of the territory, the air quality of the area is considered to be moderate.

Ex-Lamma Quarry

In general, the existing air quality in Lamma Island is relatively good. The major emission sources in the area are the cement works to the southwest of the quarry and the HEC Lamma Power Station. As there is no major road network on Lamma Island, no air quality impact is related to vehicular emissions.

HEC operates an air quality monitoring station at Pak Kok San Tsuen in Lamma Island to assess the ambient level of NO₂ and SO₂ in the vicinity of Lamma Power Station and its extension. The monitoring results in 2005 show that there is no exceedance of AQO for both NO₂ and SO₂.

Ha Mei Wan

Locating to the south of the extension of the HEC Lamma Power Station, the Power Station and the cement works to the southwest of the Ex-Lamma quarry are the major contributing emission sources. The ambient air quality is anticipated to be low to moderate.

Shek Kwu Chau

There is no major development on the island, except the Rehabilitation Centre run by SARDA. In such a rural environment, the ambient air quality is considered to be relatively good.

Tsang Tsui Ash Lagoons

The major existing emission sources in the area include the CLP Black Point and Castle Peak Power Station, the WENT Landfill and the vehicular emission. The proposed Sludge Treatment Facility (STF) and the WENT Landfill Extension would be the planned emission sources.

Owing to its close proximity to the two power stations and the Pearl River Delta, the background air quality of the area is relatively low.

Tuen Mun Area 38

There are several major emission sources in the vicinity, including the Castle Peak Power Station, EcoPark, steel mill, cement works, fill bank, and vehicular emission in Lung Mun Road.

Tuen Mun Area 38 has a relatively low ambient air quality due to the existence of relatively abundant emission sources in the area.

4.1.3 Impacts during Construction Phase

During the construction phase, the air quality mainly relates to the elevated dust levels.

There is no ASR in close proximity to the site at Tseung Kwan O Area 137. A positive (+) rank is therefore given.

For the remaining sites, the elevated dust level associated with the construction works can be mitigated by effective and practicable measures including appropriate dust suppression measures, for instance, frequent water spraying and control of vehicle speeds, and good on-site management. No significant impact on the ASRs is predicted. As such, neutral (0) ranks are assigned to these site options.

4.1.4 Impacts during Operational Phase

During the operational phase of the IWMF, the air quality impacts are mainly associated with stack emissions and odour.

EPD has previously commissioned a study called '*Feasibility Study on Waste-to-Energy (WEF) Facilities*', and a study entitled '*Additional Study on Waste-to-Energy Facilities*' which investigated development of WEF in the context of the Territory's municipal waste management, and assessed the suitability of 5 potential sites in accommodating the WEF and the priority. Another study, '*Sludge Treatment and Disposal Strategy Study*' (STDSS), was also conducted, in which a systematic evaluation and assessment of the pre-identified sites for housing a STF for the implementation of the Site Specific Feasibility of Sludge Disposal Plan and Sludge Management Strategy.

Since the WEF are basically equivalent to the TT facility of the IWMF, findings of the WEF study and the Additional Study of WEF, would be very useful when assessing the impact on air quality due to the IWMF development. In addition, the findings of the STDSS should be considered as the STF is of a similar nature and a comparable scale as the TT facility of the IWMF. The findings of these studies serve as useful references in the evaluation of potential impact on air quality due to TT operation of the IWMF. Further quantitative assessments on air quality impact are recommended at a later stage for the selected site(s).

Since neither the WEF studies nor the STDSS covers sites in the vicinity of Tuen Mun Area 38, the evaluation of air quality impact for the site at Tuen Mun Area 38 would be made with reference to the air quality assessment from other studies, for example, the EIA on Eco-Park, wherever appropriate.

Findings of the studies of WEF showed that the impact on air quality due to the proposed WEF operation for sites at Tseung Kwan O Area 137, Ha Mei Wan and Tsang Tsui Ash Lagoons would be acceptable in terms of meeting the AQOs with effective mitigation measures including the state-of-the-art pollution control technologies and a range of odour control measures. The STDSS results also indicate that the risk levels of the non-criteria pollutants, including both carcinogenic (e.g. dioxins and furans) and non-carcinogenic, are acceptable. The impacts associated with the various site options are therefore differentiated by considering factors such as numbers of receptors, the proximity to receptors within the dispersion area and the proximities to other emission sources.

Tseung Kwan O Area 137 site is located in an airshed on the eastern side of the Hong Kong territory. As the prevailing winds in Hong Kong are north-easterly for about 70% of the year, there is a potential that the densely populated areas located downwind of the site may experience deterioration in air quality if the IWMF are to be developed at this site. It is estimated that there are about 368,000 residents living within a 5 km air quality impact zone, with most of the ASRs found in Tseung Kwan O, Lei Yue Mun, Tiu Ken Leng, Siu Sai Wan, Chai Wan, Heng Fa Chuen and Shau Kai Wan, which are at the prevailing downwind side. Even with the implementation of state-of-the-art mitigation measures, it is anticipated that the residual impact would still be a concern to certain groups of people including the residents in the downwind population clusters at the east of Hong Kong Island and Tseung Kwan O. As such, a negative (-) rank was assigned to this site.

According to the Hong Kong Planning Standards and Guidelines, the Tsang Tsui Ash Lagoons site is at the edge of a confined airshed area. Besides, the planned WENT Landfill extension, the Black Point Power Station, the Castle Peak Power Station, and the proposed STF will have cumulative impacts on the air quality of the area. However, there are very few ASRs within its dispersion area, the only ASR with more population is Leung King Estate which is located at the edge of the 5 km zone and is shielded by a mountain ridge. Neutral (0) rank is therefore given to this site option.

For the Ha Mei Wan site, there are some 5,000 people living on the island, and about 224,000 residents living in Wah Fu, Aberdeen, and Ap Lei Chau and Wong Chuk Hang in the vicinity. The IWMF development there will have cumulative impact on the air quality of the area due to the adjacent HEC Lamma Power Station and its extension. As a result, a negative (-) is assigned to this site.

According to the STDSS results, the impact on air quality due to the STF development at ex-Lamma Quarry and Shek Kwu Chau sites would be acceptable with effective mitigation measures in terms of compliance with both AQOs and standards for non-criteria pollutants, including both carcinogenic and non-carcinogenic ones. However, since the ex-Lamma quarry site is facing Sok Kwu Wan and relatively close to the Luk Chau village (the nearest ASR) and the CDA to the west of the site, the residual impact may still be a concern to the ASRs. Besides the 5,000 people living on the island, there are about 224,000 residents living in Wah Fu, Aberdeen, Ap Lei Chau and Wong Chuk Hang in the vicinity, the cumulative impact of the emissions from the IWMF and the Power Plant would be a concern to the residents in Lamma Island and the Southern District of Hong Kong. Hence, this site is assigned with a negative (-) rank.

Taking into account the relatively good background air quality at Shek Kwu Chau and the fewer ASRs (which are located more than 2.5 km away from the site, except the Shek Kwu Chau Treatment and Rehabilitation Centre which houses about 200 people), any residual

impact is anticipated to be relatively low or negligible. The only major ASRs are in Cheung Chau but they are not located in the prevailing downwind direction, and there are no other emission sources in the nearby areas. Thus, a positive (+) rank is given to the Shek Kwu Chau site.

The Tuen Mun Area 38 site was previously earmarked for the development of CIF, which is a facility with similar nature as but of a much smaller scale than the TT facility of the IWMF. According to the findings of the CIF Study, the impact on air quality and odour due to the CIF operation is acceptable in terms of meeting both the AQOs and other standards for non-criteria pollutants, with appropriate mitigation measures. Compared to the other site options, the site is relatively close to major residential / population clusters, for example, the Melody Garden and Butterfly Estate, which are approximately 2.7 km and 3.1 km away from the site. In fact, within the 5 km impact zone there are over 300,000 population. Adverse cumulative air quality impact from the IWMF and several major local emission sources like the Black Point Power Station, Castle Peak Power Station, Shiu Wing Steel Mill, Green Island Cement is anticipated. There is a prevailing public concern on the air quality in Tuen Mun that with more new developments the general air quality in the area would deteriorate further. These developments include the Eco-park and the planned Permanent Aviation Fuel Facility (PAFF). However, EIAs for both the Eco-park and the PAFF suggest that the existing air quality, including odour, would not be adversely affected by the development with proper mitigation measures. It is also noted that CLP is currently conducting a project called 'Emission Control Project at Castle Peak Power Station 'B' Unit, with an aim to reducing the SO₂ and NO_x emission from the Power Station by up to 90% and 80% respectively.

It is noted that -

- ❑ The mitigated cumulative hourly NO₂ impact at the worst affected ASR (i.e. the planned 'Holiday Camp' which is about 120 m from Tuen Mun Area 38) with contributions from the Green Island Cement, Shiu Wing Steel Mill and Eco-park alone is very close to the limit of AQO. With the IWMF and possible future development in the operation of the industrial facilities in the area, it is very likely that the AQO in term of NO₂ at this ASR would be exceeded. The possibility of having the IWMF at Tuen Mun Area 38 that could meet the AQOs is very slim.
- ❑ Apart from the NO_x criteria, the IWMF development may not be able to meet the heavy metal criteria in the Tuen Mun Area 38 and its vicinity. It has been estimated that the heavy metal emission from Eco-park alone plus the background could result in high annual cadmium level very close to the annual criterion at the 'Holiday Camp' site. Thus, it is very likely that with the possible future additional industrial operation and IWMF in this area, the heavy metal criteria at the ASRs would not be complied with.

The above results reveal that Tuen Mun Area 38 is not a favourable site for IWMF development as it is very likely that the air quality criteria at the ASRs could not be met. A double negative (--) rank is thus given to this site, and this site would not be considered in the subsequent detailed feasibility and EIA studies.

4.1.5 Site Ranking

Tables 4-2 summarises the ranking of each site.

Table 4-2 Ranking of Air Quality Impact for Potential Sites

Site	Construction Phase	Operational Phase	Combined Ranking
Tseung Kwan O Area 137	+	-	-
Ex-Lamma Quarry, Lamma Island	0	-	-
Ha Mei Wan, Lamma Island	0	-	-
Shek Kwu Chau	0	+	+
Tsang Tsui Ash Lagoons	0	0	0
Tuen Mun Area 38	0	--	--

The above is a qualitative comparison for the purpose of site short-listing and subject to subsequent modelling results at a later stage under a separate study. Further assessment with detailed modelling works will be necessary for ascertaining the magnitude of the impact, including cumulative impact, the types of mitigation measures required and the acceptability of any residual impact under a separate study at the subsequent stage.

4.2 Noise Quality Impact

4.2.1 Noise Sensitive Receivers

In accordance with Section 3 of Annex 13 of TMEIAP, the potential noise sensitive receivers (NSRs) include three major categories:

- ❑ Residential uses - all domestic premises including temporary housing;
- ❑ Institutional uses - educational institutions including kindergarten and nurseries, hospitals, medical clinics, homes for the aged, convalescent homes, places of public worship, libraries, courts of law, performing art centres, auditoria and amphitheatres; and
- ❑ Others - hostels and country parks.

A noise impact zone of 300 m will be adopted in this assessment, within which both existing and planned NSRs will be identified. The NSRs for each of the potential sites are presented in the following sub-sections.

Tseung Kwan O Area 137

Neither existing nor planned NSRs have been identified within 300 m of the potential site, as the nearest NSRs, which are the temple in Tei Tong Tsui and the village in Tung Lung Chau, are located 1.8 km to the south-east of the site.

There are no planned NSRs identified in the vicinity.

Ex-Lamma Quarry, Lamma Island

The nearest NSR, Luk Chau Tsuen, is located 240 m to the northwest of the site. The Sok Kwu Wan Tsuen, which is directly facing the site, is beyond the zone of impact with a distance of approximately 640 m away from the site.

According to the approved Lamma Island OZP No. S/I-LI/9, the area to the southwest of the site, that is, where the existing cement works are located, is zoned as CDA. In addition, the Planning and Development Study for Hong Kong Island South and Lamma Island identified three potential development areas, which are Pak Kok Tsuen, Yung Shue Wan East and Tai Wan San Tsuen West. However, the planned CDA and the three potential development areas are located beyond the 300 m zone of the impact for this site. Thus, there is no planned NSR in the vicinity. **Table 4-3** shows the information on the identified NSR. The location of NSR is presented in **Figure 4-6**.

Table 4-3 Noise Sensitive Receiver at Ex-Lamma Quarry Site

NSR		Land Use	Separation Distance (m)
Ref.	Description		
LQLAM-N1	Luk Chau Tsuen	Village	240

Ha Mei Wan, Lamma Island

With the nearest NSR, which is Kam Lo Hom, located more than 1.6 km away from the site, no existing and planned NSRs are identified within 300 m of the site.

Shek Kwu Chau

The Shek Kwu Chau Treatment and Rehabilitation Centre is the only NSR identified within the 300 m impact zone of this site. There is no planned NSR in the vicinity. **Table 4-4** shows the details of the NSR. **Figure 4-7** indicates the location of the NSR for Shek Kwu Chau site.

Table 4-4 Noise Sensitive Receiver at Shek Kwu Chau

NSR		Land Use	Separation Distance (m)
Ref.	Description		
SKC-N1	Shek Kwu Chau Treatment and Rehabilitation Centre	G/IC	135

Tsang Tsui Ash Lagoons

The nearest NSR is the village house at Tsang Kok, which is approximately 500 m from the site. Thus, there is no existing NSR within the zone of impact.

There is no planned NSR in the vicinity.

Tuen Mun Area 38

The nearest domestic premises / NSRs are those located at Lung Kwu Tan, which is about 1650 m from the site. Hence, there is no existing NSR identified within the impact zone for this site.

The only planned NSR is the 'holiday camp', as shown on **Table 4-5**. **Figure 4-8** shows the NSR location for the site.

Table 4-5 Noise Sensitive Receiver at Tuen Mun Area 38

NSR		Land Use	Separation Distance (m)
Ref.	Description		
TM38-N1	Holiday Camp	G/IC	120

4.2.2 Baseline Conditions

Information on the baseline conditions for individual site options are extracted from previous relevant studies. Should any further field / survey works be required, those works will be carried out in a subsequent detailed study for the sites short-listed.

Tseung Kwan O Area 137

The noise climate of the site generally consists of aircraft noise and operational noise from the SENT Landfill. Other noise sources, including offshore marine activities (i.e. marine traffic in the Tathong Channel), and natural sound (e.g. waves breaking on the shoreline), also contribute to the background noise.

The baseline noise monitoring of the WEF Study suggested a noise level of 44 dB(A) for the night-time period at Tung Lung Chau.

Ex-Lamma Quarry, Lamma Island

The noise climate of the site is at a low level. The background noise level in the vicinity mainly comes from the cement works, natural sound variations and noise from the commercial restaurant activities in Sok Kwu Wan.

According to the STDSS, the lowest noise level of 44 dB(A) has been recorded at Luk Chau Tsuen and Sok Kwu Wan, which would represent the prevailing noise.

Ha Mei Wan, Lamma Island

The noise climate in this area mainly consists of aircraft noise, industrial noise from the power station and general community noise. Offshore marine activities are the other contributing noise sources.

According to the WEF Study, the prevailing noise level is 47 dB(A) during both the day and evening, and night-time periods, which is recorded at a village in Lamma Island located more than 1.5 km away from the site.

Shek Kwu Chau

Natural sound variations contribute to the background noise level in the vicinity. It is anticipated that the NSRs on the island are exposed to minimal external artificial noise.

The lowest noise level of 43 dB(A), representing the prevailing noise level, was recorded at the Shek Kwu Chau Treatment and Rehabilitation Centre, according to the monitoring result of STDSS.

Tsang Tsui Ash Lagoons

The background noise in the area include noise generated from the activities in the WENT Landfill and the CLP Black Point Power Station, and intermittent road traffic noise.

In the previous STDSS, a prevailing day-time noise level of 45 dB(A) was recorded at Pak Long Tsuen, which is located more than 3.3 km away from the site. According to the STDSS, owing to the isolated and rural nature of the site, substantial changes in night-time ambient noise levels are not anticipated.

Tuen Mun Area 38

The noise from traffic along Lung Mun Road and from the marine traffic at the waters off the area, as well as the industrial noise in the area are the major contributing noise sources, according to the EIA for the planned PAFF.

4.2.3 Impact Evaluation

4.2.3.1 Construction Phase

Since there are no NSRs within the 300 m zone of impact for the Tseung Kwan O site, Ha Mei Wan site and Tsang Tsui Ash Lagoons sites, no noise impact on the NSRs during the construction phase is anticipated for these site options.

According to the STDSS, construction noise level at the nearest NSR (i.e. Luk Chau Tsuen) for the Ex-Lamma Quarry site as a result of the proposed STF development would comply with the criteria (i.e. acceptable noise standards for day-time construction activities). Taking into account the fact that the TT facility of the IWMF are of the similar nature as the STF and Luk Chau Tsuen is separated from the site by a hill, it is predicted that any noise impact due to the construction of the IWMF should be insignificant.

The findings of STDSS also indicate that the construction noise level at the nearest NSR for Shek Kwu Chau site would be acceptable with the effective mitigation measures. As

mentioned above, since the STF and TT facilities of the IWMF are of similar nature, the construction noise impacts due to the two facilities are anticipated to be similar.

For the Tuen Mun Area 38 site, the only NSR is the proposed 'holiday camp'. The EIA on the Eco-Park suggests that the construction noise during the construction stage would be insignificant to the proposed 'holiday camp'. A similar result is predicted for the Tuen Mun Area 38 site as these 2 sites are adjacent to each other.

Moreover, the Tuen Mun Area 38 site is in the vicinity of an industrial area. Taking into account the relative position of the planned NSR, which is on the opposite side of Lung Mun Road, no significant noise impact during the construction phase is predicted.

4.2.3.2 Operational Phase

Similar to the case of construction noise impact, for sites at Tseung Kwan O Area 137, Ha Mei Wan and Tsang Tsui Ash Lagoons, no noise impact during the operational phase is anticipated as the nearest NSR is situated beyond the impact zone.

The STDSS suggests that, during the operational phase of the STF, the noise levels at the nearest NSRs are acceptable with mitigation measures for the ex-Lamma Quarry and Shek Kwu Chau sites. As the STF and the TT facilities are of similar nature, similar result is anticipated. The ex-Lamma Quarry site has a further advantage that since the Luk Chau Tsuen (the nearest NSR) is separated from the site by a hill, any noise impact to the NSR due to the IWMF operation at the site is predicted to be of a lesser extent or insignificant. As a result, a positive (+) rank is given to the ex-Lamma Quarry site, whereas the Shek Kwu Chau site is assigned with a neutral (0) rank.

For Tuen Mun Area 38 site, since the nearest planned NSR, the proposed 'holiday camp', is at a distance of some 120 m away, insignificant noise impact from the IWMF is anticipated. In addition, as marine transport is anticipated to be the major transport mode, additional noise impact arising from the heavy good vehicle traffic serving the IWMF travelling on Lung Mun Road is not expected. Thus, a positive (+) rank is assigned to this site. However, cumulative noise impact including that from the IWMF from this industrial area needs to be evaluated in subsequent study.

4.2.4 Site Ranking

Table 4-6 summarise the site ranking in terms of noise impact.

Table 4-6 Ranking of Noise Impact for Potential Sites

Site	Construction Phase	Operational Phase	Combined Ranking
Tseung Kwan O Area 137	+	+	+
Ex-Lamma Quarry, Lamma Island	+	+	+
Ha Mei Wan, Lamma Island	+	+	+
Shek Kwu Chau	0	0	0
Tsang Tsui Ash Lagoons	+	+	+
Tuen Mun Area 38	+	+	+

4.3 Landscape and Visual Impacts

The landscape and visual impact evaluation will be conducted based on the broad principles outlined in Annexes 10 and 18 of the TMEIAP.

4.3.1 Baseline Condition and Impact Evaluation

Depending on the cost or innovation invested impacts can be transformed from negative to attractive. In fact, there are successful cases in Osaka and Vienna that incinerators have been designed to be tourist attractions with appealing architectural features.

Tseung Kwan O Area 137

The TKO Area 137 (**Figure 4-9**) is located adjacent to the SENT Landfill and the TKO Industrial Estate. The existing quality of the landscape is low.

As this site is directly facing Siu Sai Wan, Chai Wan, and Heng Fa Chuen on the eastern side of Hong Kong Island as well as the Lohas Park of Tseung Kwan O, it would have significant visual effect on the substantial population residing in these areas. Taking into account the likely perception and aspiration of the community on the feature of IWMF with a tall stack, and the background natural hilly landscape feature of the site, there could be significant landscape and visual impacts. A negative (-) rank is therefore given to this site.

Ex-Lamma Quarry, Lamma Island

The ex-Lamma Quarry (**Figure 4-10**) is directly facing Sok Kwu Wan on Lamma Island. The site has been rehabilitated with landscaping at the end of 2002 under a quarry rehabilitation contract. The surrounding vicinity is naturally vegetated with grass, shrubs and trees. Since Lamma Island is popular among tourists and hikers and Sok Kwu Wan is one of the major tourist spot, it is of local importance and has a baseline of significant level of landscape and visual value. Any landscape and visual impacts arising from the IWMF development during either construction or operation phase can be moderate to significant. Owing to the temporary nature of potential impacts during the construction stage, it is anticipated that those impacts can be softened to an acceptable level by implementing appropriate mitigation measures.

As the site is directly facing Wah Fu, Aberdeen, Ap Lei Chau and Wong Chuk Hang on the southern side of Hong Kong Island, it would have significant visual effect on the substantial population residing in these areas. Taking into account the likely perception and aspiration of the community on the feature of IWMF with a tall stack, and the background natural hilly landscape feature of the site, there could be significant landscape and visual impacts. As a result, a negative (-) rank is assigned to this site.

Ha Mei Wan, Lamma Island

As mentioned above and shown in **Figure 4-11**, Lamma Island is a tourist attraction, it is of local importance and has a significant high baseline level of landscape and visual impact.

However, the site is already blighted by the existing HEC Lamma Power Station and its extension, which have little landscape. The major VSRs for this site are the many hikers who walk along trails from Yung Shue Wan to Sok Kwu Wan. Like the Ex-Lamma Quarry site, should the IWMF be built here, it would have significant visual impact on the substantial population residing in Wah Fu, Aberdeen, Ap Lei Chau and Wong Chuk Hang, and would likely arouse concern of these residents. As such, a negative (-) rank is given to this site.

Shek Kwu Chau

Shek Kwu Chau (**Figure 4-12**) is a sparsely inhabited island south of Lantau Island. The existing landscape of the island is pretty much undisturbed and has relatively high landscape baseline value.

The proposed site will be on reclaimed land. Landscape impacts during construction and operation on the existing landscape will be of limited extent, but there will be permanent changes to the natural coastline and potential disturbance to the vegetation nearby.

As the hill on the island obstructs views from the north and the east, the site would have limited VSRs. There are basically three VSRs: passengers from local ferries, residents of the drug addiction rehabilitation center, and passengers from the Macau Ferries. Since majority of the VSRs are relatively distant from the site, it is predicted that the landscape and visual impact would be acceptable with mitigation, so a neutral (0) rank is assigned to this site.

Tsang Tsui Ash Lagoons

The existing site of Tsang Tsui Ash Lagoons (**Figure 4-13**) has low landscape value. The surrounding landscape of the site is already blighted by the WENT Landfill and the CLP Black Point Power Station in the area.

The VSRs are limited to a few small village areas which are relatively distant from the site. The IWMF can blend with the WENT Landfill and the Black Point Power Station, as well as the planned WENT Landfill extension and the proposed STF. A positive (+) rank is therefore given.

Tuen Mun Area 38

As shown on **Figure 4-14**, this site is located in an industrial area. This site is newly reclaimed and bears minimal visual and landscape baseline value. The surrounding area is industrial in nature and includes a fill bank, a steel mill and a power station, and will soon include an aviation fuel facility. There are a lot of construction and operating industrial facilities in the area, hence, the construction and operation of the IWMF will blend into the neighbourhood. The existing landscape value of the area is therefore low and the landscape sensitivity of this site during construction and operation is relatively low. However, the site would be directly visible by residents of developments in West Tuen Mun, including Melody Garden and Richland Garden. The visual impact to these VSRs and the associated negative perception of them could be significant. Hence, it is assigned with a negative (-) rank.

4.3.2 Site Ranking

Based on the individual ranking for each potential site, the landscape and visual impact ranking is summarised in **Table 4-7** below.

Table 4-7 Ranking of Landscape and Visual Impacts for Potential Sites

Site	Landscape Ranking	Visual Ranking	Combined Ranking
Tseung Kwan O Area 137	-	-	-
Ex-Lamma Quarry, Lamma Island	-	-	-
Ha Mei Wan, Lamma Island	-	-	-
Shek Kwu Chau	0	0	0
Tsang Tsui Ash Lagoons	+	+	+
Tuen Mun Area 38	+	-	-

The above is only a qualitative comparison for the purpose of site short-listing. Subsequent detailed study which includes preparing detailed photomontages for the short-listed sites will be conducted to ascertain the acceptability of the IWMF development from the visual aspect.

4.4 Terrestrial Ecological Impacts

4.4.1 Baseline Conditions

A desktop study was conducted to assess the current terrestrial condition at the potential sites, with reference to the following materials:

- ❑ Sludge Treatment Facilities - Feasibility Study, Environmental Study Report (Draft), Metcalf & Eddy Ltd, 2006 (Herein called the STFFS - ESR);
- ❑ Additional Study of Waste-to-Energy Facilities, Site Selection Report (Final), MWH, September 2003 (Herein called the Additional WEF - SS Report);

- ❑ Sludge Treatment and Disposal Strategy Study, Site Specific Feasibility Study of Sludge Management Strategy (SMS) and Sludge Disposal Plan (SDP) – Volume 1 (Main Report), ERM, July 2000 (Herein called the STDSS – SSFS Report);
- ❑ GEO Information Note 07/2007 – Ecological Enhancement in Slope Works, GEO/CEDD, June 2007 (Herein called GEO Information Note 07/2007);
- ❑ Hong Kong Biodiversity, AFCD, Issue No. 6, March 2004 (Herein called HK Biodiversity – Issue No. 6);
- ❑ Information from AFCD's website; and
- ❑ Information from Hong Kong Outdoors's website.

The marine ecology and fishery baseline conditions will be discussed separately from the terrestrial ecological assessment but together with the assessment of water quality impact.

The baseline conditions were evaluated with reference to EIAO (Cap.499) and the associated TMEIAP Annex 8 and 16 along with other potentially relevant ordinances. Country parks (shown in **Figure 4-15**), plant and animal habitats, and SSSI (shown in **Figure 4-16**) are identified. None of the sites are directly located in Country parks or SSSI. The summary of the baseline evaluation is presented below.

Tseung Kwan O Area 137

The Additional WEF SS Report reported that there was no special terrestrial ecological value in respect of the existing Tseung Kwan O Area 137 site as it is a newly reclaimed area.

Ex-Lamma Quarry, Lamma Island

After the completion of the rehabilitation works since 2002, the area supports many grassland habitats for the Black-eared Kite, and three types of aquatic habitats have been formed in the quarry, as reported in the GEO Information Note 07/2007. The aquatic habitats included a 5 hectare man-made lake, four 30 m by 40 m sand traps and two 2 m by 3 m oval-shaped water ponds.

The man-made lake was constructed to look very natural and has shelving edges to support reed beds, which provide food for fresh water creatures. Water plants are included in the sand traps to provide food and resting places for small fishes and amphibians. The two water ponds provide habitats for small fresh water creatures found in the vicinity.

Ha Mei Wan, Lamma Island

As this site a new site to be formed by reclamation, it has no terrestrial ecological value.

Shek Kwu Chau

The site itself has no terrestrial ecological value since it is to be formed by reclamation. There are some faunal species of ecological interest on the existing island, including the Bogadek's Burrowing lizard, *Dibamus bogadeki*. Information shown on AFCD's website states that the Bogadek's Burrowing Lizard is endemic to Hong Kong. Previous records show that this species can only be found in Sunshine Island, Shek Kwu Chau and Hei Ling Chau. As there are only limited numbers of past records of this species, information on its biology and habitat needs is also limited.

Based on the information extracted from the website of Hong Kong Outdoors, two previously unknown species of snake were found on Shek Kwu Chau. In addition, it is the home to one third of Hong Kong's 230 butterfly species.

As advised by AFCD, two uncommon dragonfly species, *Cercion calamorum dyeri* and *C. melanotum* were also recorded on the island.

Tsang Tsui Ash Lagoons

According to the STFFS - ESR, the ash lagoons are of moderate ecological value, and the Middle and East Lagoons were found to support a moderate diversity of birds and mammals, including some species of conservation interest. The lagoons, however, are not considered as important habitats for most of the species of conservation interest recorded under the STFFS. The relatively low value of the lagoons is, in fact, a result of historical and current management practices. Extreme fluctuations in water-levels, together with the frequent dumping and removal of fly-ash from the lagoons, prevent the establishment of high value wetland habitats in the lagoons. Both the Additional WEF - SS Report and the STFFS - ESR reported that two bird species of conservation interest (Little Grebe and Little Ringed Plover) were using the site as a breeding ground. Although it was previously considered that the ash lagoons supported a locally rare dragonfly species, the Coastal Glider (*Macrodiplax cora*), this species was not recorded in the ecological survey conducted under the STFFS.

The STFFS - ESR also considered the secondary woodland habitat, which is mainly on the non-developed area on the opposite side of the Nim Wan Road, is of low-moderate ecological value, as it supported a moderately diverse vegetation community, and its ecological value could be increased if allowed to mature for further decades.

Tuen Mun Area 38

Similar to the Tseung Kwan O Area 137 site, this proposed site is located on a newly reclaimed land. Hence, there is no special ecological interest for this site as stated in the Additional WEF Study - SS Report.

According to the HK Biodiversity - Issue No. 6, Danaid butterflies are found at Siu Lang Shui Closed Landfill, which is on the opposite side of Lung Mun Road.

4.4.2 Potential Ecological Impacts

Based on the terrestrial ecological baseline evaluation as mentioned above, the potential ecological impact during construction and operation was assessed. Temporary and permanent impacts were considered.

Both the Tseung Kwan O Area 137 and Tuen Mun Area 38 sites are on reclaimed lands, and hence with no or little terrestrial ecological value. For the Tuen Mun Area 38 site, as it is in an industrial setting and is relatively far away and separated from Siu Lang Shui Closed Landfill by Lung Mun Road, no significant impact to the Siu Lang Shui Closed Landfill and the Danald butterflies is predicted. Hence, any impact on terrestrial ecology at these two sites is considered to be insignificant.

Since the Ha Mei Wan site is a new site to be formed by reclamation, it is anticipated that the construction and operation of the IWMF development at this site would not impose significant impact on terrestrial ecology.

For the Shek Kwu Chau site, it is also to be formed by reclamation. Although it is adjoining the island at the south western edge, it is intended that the terrestrial habitat of the island would not be encroached and the coastline would be preserved as far as possible should this site be considered. Nevertheless, special attention and mitigation will be required to ensure that there would be no impact on the fauna living on the other part of the island, in particular the endemic Bogadek's Burrowing Lizard.

For the ex-Lamma quarry site, as the existing habitats was formed since the rehabilitation of the quarry, such habitats should be able to be re-provided if suitable land and resources are available. No significant impact is therefore anticipated with mitigation.

For the Tsang Tsui Ash Lagoon site, the greatest direct potential impact is the loss of the Middle Ash Lagoon itself as a habitat. According to the Additional Study to WEF, if proper mitigation measures are implemented, there should be no residual impact on the bird species, which also use sites elsewhere as their habitats. The same is also anticipated under the STFFS. In the STFFS - ESR, it is concluded that the residual terrestrial ecological impacts resulting from the proposed STF would mainly be minor in scale. Previous records indicated that these two bird species would be present in the similar habitat nearby, as suggested in the STFFS - ESR. Hence the lost of site does not impose any significant adverse impact. Hence, it is considered that the impact would be acceptable through the implementation of proper mitigation measures.

4.4.3 Site Ranking

Based on the individual ranking for both construction and operational phases for each potential site, the terrestrial ecological ranking is summarised in **Table 4-8** below.

Table 4-8 Ranking of Terrestrial Ecological Impacts for Potential Sites

Site	Construction Phase	Operational Phase	Ranking
Tseung Kwan O Area 137	+	+	+
Ex-Lamma Quarry, Lamma Island	0	0	0
Ha Mei Wan, Lamma Island	+	+	+
Shek Kwu Chau	-	0	-
Tsang Tsui Ash Lagoons	0	0	0
Tuen Mun Area 38	+	+	+

4.5 Water Quality, Marine Ecology and Fishery

4.5.1 Baseline Conditions

A desktop study was conducted to assess the baseline condition at the potential sites, based on the following reference materials:

- ❑ The STFFS – ESR;
- ❑ The Additional WEF - SS Report;
- ❑ The STDSS – SSFS Report;
- ❑ Environmental Impact Assessment for Development of an EcoPark in Tuen Mun Area 38, Final EIA Report, Scott Wilson, April 2005 (Herein called the EIA Report for EcoPark); and
- ❑ Information from AFCD's website.

Figures 4-17 and 4-18 shows the locations of Marine Parks and AFCD fishing areas respectively.

4.5.1.1 Tseung Kwan O Area 137

The site is located within the Eastern Buffer Water Control Zone (WCZ), as shown on **Figure 4-19**. To the west of the site, it is Lei Yue Mun.

The STDSS – SSFS Report identified the Fishing Control Zone (FCZ) on the northern shore of Tung Lung Chau is the main sensitive receiver. Besides, Finless Porpoise have been sighted off Tung Lung Chau based on the information from the AFCDs' website.

As advised by AFCD, there are coral found nearby.

Since the site is close to the Water Services Department's (WSD's) proposed desalination plant in Area 137, any adverse impact on the seawater quality near the intake of the desalination plant due to the IWMF development is undesirable.

4.5.1.2 Ex-Lamma Quarry, Lamma Island

The site falls within the Southern WCZ. To the east of the site, there is the East Lamma Channel.

Within the inner Sok Kwu Wan, which is to the southwest of the site, there are Fish Culture Zones (FCZs). According to the STDSS – SSFS Report, the FCZ in Sok Kwu Wan are considered to be an important part of fishing industry in Hong Kong. The water in the vicinity of Sok Kwu Wan has been identified as high production, containing abundant amounts of high commercial valued “Silver Shrimp” and being a nursery grounds for commercially important species. Other water sensitive receivers include the coral assemblages at Luk Chau and FCZ at Lo Tik Wan.

Locations of water sensitive receivers are presented in **Figure 4-20**.

The STDSS – SSFS Report also indicated that the waters off South Lamma are important habitats for Finless Porpoise.

4.5.1.3 Ha Mei Wan, Lamma Island

The site would fall within the Southern WCZ.

The nearest sensitive receiver is the cooling water intake from the Lamma Power Station, as shown on **Figure 4-20**. To the east and south of the site are two gazetted beaches at Lo So Shing and Hung Shing Yeh. In the STDSS – SSFS Report, it is suggested that these beaches are unlikely to support assemblages of high ecological values as they have been developed for recreational use. The subtidal hard surface assemblages on the west coast of Lamma were found to be of low ecological value, with the exception of the south coast of Lamma (Ha Mei Tsui).

AFCD advised that the waters off south Lamma particularly around Ha Mei Wan provide a core habitat for the Finless Porpoise. There is also a proposed Marine Park at south Lamma. According to the ‘Additional WEF – SS Report’, the fishing grounds in proximity to the site are rated as of high value in terms of their productivity, and the water around Ha Mei Wan are known spawning and nursery grounds.

4.5.1.4 Shek Kwu Chau

Similar to the sites at Lamma Island, the Shek Kwu Chau site falls within the Southern WCZ. Cheung Chau and Chi Ma Wan Peninsula is located to the northeast and north of the site respectively.

Information from the AFCD’s website indicates that waters around Shek Kwu Chau are patronized by the Chinese White Dolphin and the Finless Porpoise. The former has a lower sighting frequency than the latter in the subject area.

According to the STDSS – SSFS Report, there is a large, but not heavily utilised fishing zone around Shek Kwu Chau. In addition, the water surrounding the island is a spawning and nursery ground for a number of commercially important fish species.

In addition, there are soft and hard subtidal habitats found in the area but none of them are uncommon in Hong Kong, as stated in the STDSS – SSFS Report. Corals were generally

found in low numbers and in low densities with the exception to the coral, *Tubastrea sp.* This coral was found in high numbers. However, this coral is common within the Hong Kong's southern and eastern waters.

The STDSS – SSFS Report also indicated that with the steep coastline, which primarily comprised rocky habitats, no soft shore habitats were found on this Island. The survey conducted under the STDSS showed that no rare species were identified and no assemblages of particular ecological value were observed. Nevertheless, the assemblages that are present are the representative of relatively undisturbed habitats on the exposed shorelines in Hong Kong. Thus, the intertidal hard surface assemblages can be considered as of low to medium ecological value.

Figure 4-21 shows the locations of water sensitive receivers for this site.

4.5.1.5 Tsang Tsui Ash Lagoons

The site lies within the Deep Bay WCZ. Sensitive receivers near this site include areas of sea grass along the coast of Ha Pak Nai and mangroves in the Ha Pak Nai stream to the east of the site, as identified in the STDSS – SSFS Report. The sea grass areas are habitats for Horseshoe crabs and sensitive to changes in water quality. However, no horseshoe crab was found in the vicinity of the site during the ecological survey conducted under the STFFS.

4.5.1.6 Tuen Mun Area 38

The site falls within the North Western WCZ.

As described in the EIA Report on EcoPark, waters from the Pearl River carry very high loadings of suspended solids (SS) and nutrients to the North West WCZ. This cause a much higher SS and nutrients in this zone than the zones to the south and east of HKSAR.

The sensitive receivers in the vicinity of the site identified in the EIA Report on EcoPark include the industrial users (particularly Castle Peak Power Station and Shiu Wing Steel Mill) immediately to the west of the site. There is a specific requirement for the seawater intake for the Castle Peak Power Station that SS concentrations have to be maintained below a level of 150 mg/L within a 5 km radius of the intake. Two non-gazetted beaches, Lung Kwu Upper and Lower, and one gazetted beach, Butterfly Beach, are located more than 1.5 km away from the site.

As the site is close to the WSD's proposed desalination plant, any adverse water quality impact on the seawater quality near the intake of the proposed desalination plant due to the IWMF development is undesirable.

The site is also near to where the Chinese White Dolphins are frequently sighted in North Lantau, based on the information shown on AFCD's website.

Figure 4-22 shows the locations of water sensitive receivers for this site.

4.5.2 Impact Evaluation

4.5.2.1 Construction Phase

During the construction phase, impacts on water quality can be due to construction activities including reclamation, construction of submarine pipelines/cables, and washing down of materials (site runoff) to the receiving water bodies from the construction sites. Unlike the impact during the operational phase, the impact arising from the construction activities would not be long-term and would be in a local scale.

The site runoff from the construction site can be controlled with appropriate mitigation measures as recommended in ProPECC PN 1/94.

Due to the disturbance to marine sediments, impacts arising from reclamation (and construction of submarine pipelines/cables) can be more significant and in a larger extent. Thus, reclamation is considered to be the major factor contributing to any potential impact on water quality and marine ecology.

Owing to the need of reclamation, Ha Mei Wan and Shek Kwu Chau sites could have potential impact on water quality and marine ecology during the construction stage as a result of disturbance to marine sediment. While the former site is a core habitat for Finless Porpoise, the latter are waters used by both Chinese White Dolphins and Finless Porpoise. Both sites are spawning and nursery ground for various commercially important fish species. Any adverse impacts on those species as a result of affecting their habitats are undesirable. Although the impacts on water quality arising from the required reclamation are likely to be mitigated properly, it is anticipated that the residual impacts would still be of concerns to groups of people including the fishermen and environmentalists.

There is a seawall surrounding the site at Tsang Tsui Ash Lagoons to contain PFA. The inner face of the seawall is made up of filter layers laid underneath the armour stone to prevent leakage of PFA leachate from the lagoon to Deep Bay, and a wave wall on the seaward side protects the site from storms. The bottom layer is unlined, but has low permeability. As a result, subject to further study and careful mitigation measures during the construction stage, the potential impact on water quality is considered to be acceptable.

For the Tseung Kwan O Area 137, ex-Lamma Quarry and Tuen Mun Area 38 sites, since no reclamation is required for developing the IWMF, there will be limited disturbance to the marine sediments or impact on the Tathong Channel and Urmston Road respectively, provided that water pollution control measures are implemented during the construction of the IWMF and the berthing facility. Examples of those measures include the treatment of stormwater runoff, and bundling of chemicals and fuel storage areas. Therefore, impacts on the water quality during the construction phase are predicted to be acceptable with mitigation for these site options.

4.5.2.2 Operational Phase

In the WEF Study, it is proposed to use the air-cooling system, instead of one-through water cooling system due to environmental grounds. The same is also adopted in the Additional Study to WEF. Hence, the use of air-cooling system would be assumed for this Study and it would form the basis of the assessment.

During the operational phase, the impact on water quality as well as on marine ecology and fisheries can be due to the discharge of wastewater and surface runoff. The impact will be dependent upon the sensitivity of the water environment in the vicinity of each site option and the characteristics of the wastewaters generated and discharged.

Wastewater treatment and recycling will be employed and appropriate stormwater pollution control measures would be implemented. Thus, there would be no liquid discharges, except the surface runoff, from the site. As such, no significant impact on the surrounding waters, is anticipated, and any residual impacts should be insignificant for all potential site options. In addition, for the Tseung Kwan O Area 137 and Tuen Mun Area 38 sites, no adverse impact on the seawater quality near the intakes of the desalination facilities is predicted.

4.5.3 Site Ranking

Table 4-9 summarise the ranking of each site in terms of impact on water quality, marine ecology and fisheries.

Table 4-9 Ranking of Water Quality, Marine Ecology and Fisheries Impact for Potential Sites

Site	Construction Phase	Operational Phase	Combined Ranking
Tseung Kwan O Area 137	0	0	0
Ex-Lamma Quarry, Lamma Island	0	0	0
Ha Mei Wan, Lamma Island	-	0	-
Shek Kwu Chau	-	0	-
Tsang Tsui Ash Lagoons	0	0	0
Tuen Mun Area 38	0	0	0

If water cooling system is to be used for the thermal treatment of the IWMF, detailed water modelling would be necessary to ascertain the impact and to ensure any residual impact would not adversely affect the quality of the receiving water bodies. Marine ecology assessment should also be conducted for the shorted-listed sites under subsequent studies.

4.6 Hazard to Life

Since the same design of the IWMF treatment components will be adopted, the likelihood and magnitude of any incidents, for instance, explosion, fire, spillage, risks to the safety of employees and loss of plant equipment, are not site specific, and thereby, would be equal for all site options.

The potential accidental events include fire and explosion, microbiological hazards, the inadvertent receipt of hazardous or medical/clinical wastes, and the potential failure of the air pollution control system. With the use of Best Available Technology and proper planning, the risks to human associated with these potential events can be managed and minimized to an extremely low frequency of occurrence.

According to the WEF Study, the potential hazards to the public associated with a WEF, which resembles the IWMF, has found to be within an acceptable level.

Risk to human health has been discussed in the air quality impact section (Section 4.1), the results of which show that any impact due to the stack emission at all potential sites are within the acceptable level. Hence, such risk is not further considered under this criterion. As mentioned in Section 3.4.6, the assessment of the potential site options in term of hazard to life will focus on: i) the risk associated with accidents or other emergency events, ii) hazards to on-site population due to DGs storage or PHI nearby, and iii) hazards to off-site population arising from the DGs at the IWMF site.

The site at Shek Kwu Chau would have relatively fewer human receptors in the vicinity of the IWMF development. Taking into account that the anticipated extremely low frequency of accidents or other emergency events with the use of proper mitigation measures, the level of hazard to life for these site options is therefore considered to be negligible and positive (+) ranks are given.

The Tsang Tsui Ash Lagoons site would also have relatively fewer human receptors in the vicinity of the IWMF development. Although the site is close to the WENT Landfill and its proposed Extension, the potential impacts arising from the emission of landfill gas should be well mitigated as routinely done in operating the three strategic landfills. As a result, with the use of proper mitigation measures, the level of hazard to life for this site is considered to be negligible and a positive (+) rank is assigned to this site. Nevertheless, a landfill gas assessment should be conducted at subsequent studies, if this site is further considered.

Since Tseung Kwan O Area 137 is the only available PHI site in Hong Kong, there would be PHIs in close proximity to the IWMF development. Hence, the level of hazard to life associated with this site option is anticipated to be medium and a negative (-) rank is given.

Although the surrounding developments/facilities of the Tuen Mun Area 38 site include steel mill, power station, EcoPark and the proposed PAFF, the safe operation of these facilities are well-established locally or elsewhere. Hence, medium level of hazard to life is predicted for this site, and a negative (-) rank is given.

For the Ex-Lamma Quarry and Ha Mei Wan sites, there would be more human receptors in the vicinity of the IWMF development. While the former is close to the adjacent CDA site, the latter is adjacent to HEC Power Station. As such, both sites are anticipated to have medium level of hazard to life. Negative (-) ranks are therefore given to these two sites.

Table 4-10 summarises the ranking of each site in terms of hazard to life.

Table 4-10 Ranking of Hazard to Life for Potential Sites

Site	Hazard to Life
Tseung Kwan O Area 137	-
Ex-Lamma Quarry, Lamma Island	-
Ha Mei Wan, Lamma Island	-
Shek Kwu Chau	+
Tsang Tsui Ash Lagoons	+
Tuen Mun Area 38	-

4.7 Overall Environmental Performance

Table 4-11 shows the overall environmental performance of various site options.

Table 4-11 Ranking of Environmental Performance for Potential Sites

Site	Score						Rank
	Air Quality Impact	Noise Impact	Visual and Landscape Impact	Terrestrial Ecology	Water Quality, Marine Ecology & Fisheries Impact	Hazard to Life	
Tseung Kwan O Area 137	1	3	1	3	2	1	3
Ex-Lamma Quarry, Lamma Island	1	3	1	2	2	1	4
Ha Mei Wan, Lamma Island	1	3	1	3	1	1	5
Shek Kwu Chau	3	2	2	1	1	3	2
Tsang Tsui Ash Lagoons	2	3	3	2	2	3	1
Tuen Mun Area 38	0	3	1	3	2	1	6

4.8 Future Works

Since this study only provides a qualitative assessment with an aim to short-list the potential sites for further investigation, more detailed quantitative evaluation is proposed to be carried out under separate studies at a later stage, which include:

- ❑ Air quality modelling for both AQO pollutants and non-criteria pollutants, including toxic air pollutants;
- ❑ Quantitative noise evaluation;
- ❑ Water quality modelling, especially if water cooling system for the thermal treatment facility is adopted. Impacts associated with the construction and operation of the IWMF, with due regard to those project components which may cause major water quality concerns, such as any proposed reclamation, dredging for submarine pipeline installation and cooling water discharge, if any, on water sensitive receivers to be identified should be assessed and quantified through application of hydrodynamic and water quality models. The potential impact on the seawater quality near the intakes of the proposed desalination facilities at Tseung Kwan O Area 137 and Tuen Mun Area 38 should be assessed should these two sites are further considered;
- ❑ Field surveys to establish the baseline conditions, which are necessary for assessing the environmental acceptability of the sites from ecological, visual and landscape perspectives;
- ❑ Marine ecology surveys including dive surveys are required to identify and confirm the existence of any sensitive marine habitats / species, for example, coral at and in the vicinity of the project site. Impact evaluation should be based on updated ecological information and a marine ecology assessment should be conducted;
- ❑ Photomontages would be prepared to ascertain the acceptability of the IWMF development from the visual aspect;
- ❑ A detailed risk and hazard assessment should be undertaken to ascertain the possibility of fatalities at other existing / future developments; and
- ❑ A landfill gas hazard assessment should be conducted should the Tsang Tsui Ash Lagoons site is considered further.

The cumulative impacts generated by the existing / future developments on the adjacent environment should also be addressed in the detailed assessment. Effective and practicable mitigation measures should also be recommended if appropriate.

Full EIA should therefore be conducted on the site(s) which has(ve) been short-listed for further investigation under a subsequent study.

Chapter 5 Technical/Engineering Evaluation

5.1 Ease of integration

Currently, the MSW collected at RTSs will be transported to the WENT and NENT Landfill for disposal, with all RTSs with marine transport conveying refuse to the WENT Landfill. Thus, any site in close proximity to the WENT Landfill will integrate well with the existing MSW infrastructure.

The Tsang Tsui Ash Lagoons site is close to the WENT Landfill, the refuse transport route to the site would be almost the same as the current transport route of refuse, and the transportation systems are already in place. This site option can therefore integrate well with the existing MSW facilities as the additional transfer route would only be a short trip for transporting the ash from the site to the WENT for disposal. Also, the impacts on current RTS contracts will be minimal as the transport systems are already in place. As such, a (+) rank is assigned for this site option.

Although the Tuen Mun Area 38 site is not immediate adjacent to existing MSW facilities, they are relatively close to the WENT landfill as well as located along the existing marine transport route of the waste barges. The refuse transfer distance to the Tuen Mun Area 38 site is shorter than that to the WENT Landfill. The shortened travel distance could help to offset any modification / additional requirements of the current RTS contracts, for example, provision of ash transfer. Thus, extensive change to the existing refuse transfer arrangements / contracts are not anticipated. A neutral (0) rank is therefore given to this site option.

If the IWMF is sited at Tseung Kwan O Area 137, there will be extensive changes to the current refuse transport contracts for the new refuse transport arrangements and additional provision of ash transport. Although the destination of refuse transfer would be diverted from the western end to the south eastern end of the Hong Kong territory, the overall transfer distance may be similar to that of the current RTS contract. However, the transfer route of ash/refuse transfer to the WENT Landfill for disposal will be substantial as the ash will be needed to be transfer across the Hong Kong territory from the south eastern end to the western end. As a result, a negative (-) rank will be assigned to this site.

For the island site options, which are the 2 sites at Lamma Island (S2 and S3) and at Shek Kwu Chau, extensive changes to the current waste transport arrangement are predicted as they are quite distant from the WENT Landfill and marine transport of waste is the only possible mode of transport. If the IWMF are to be built at one of these sites, the current contract of MSW transport would need to be negotiated and revised. Further provision for the ash transport to the landfills would also need to be put in place. As a result, a negative (-) rank is assigned to these options.

Table 5-1 summarises the ranking of the potential sites in terms of their ease of integration with the existing and/or planned MSW infrastructures.

Table 5-1 Ranking of Ease of Integration with MSW Infrastructure for Potential Sites

Site	Ranking
Tseung Kwan O Area 137	-
Ex-Lamma Quarry, Lamma Island	-
Ha Mei Wan, Lamma Island	-
Shek Kwu Chau	-
Tsang Tsui Ash Lagoons	+
Tuen Mun Area 38	0

5.2 Site Access

Due to the relatively large volume of MSW involved, the marine access is the preferred major mode of transport for waste/residue delivery, similar to the current practice of MSW transport. Hence the evaluation of accessibility of potential sites would focus on the marine accessibility. However, if the site can also be accessed by road, it would add merit to the accessibility of the site as the MSW from the Northwest New Territories Refuse Transfer Station (NWNTRTS) and Shatin RTS can be transported to the IWMF directly by road.

Marine access was one of the preferred site requirements when identifying potential IWMF site. All of the 6 potential sites being assessed can be accessed by sea.

Lamma Island and Shek Kwu Chau are located to the south of the HKSAR. They are relatively close to the outlying island RTSs and the Island West RTS. The sites at these two islands are therefore considered to be moderately accessible.

For the remaining sites, that is, the Tseung Kwan O Area 137, Tsang Tsui Ash Lagoons and Tuen Mun Area 38 sites, they are accessible by both road and marine transport and are either relatively close to the WENT Landfill, the SENT Landfill or the Island East RTS. For the Tuen Mun Area 38 site, the current developments including the PAFF, Ecopark, steel mills and river trade terminal have occupied a large section of the existing waterfront area in Tuen Mun Area 38. There is limited space for the development of berthing facilities there and hence the transfer of waste to this site by marine vessels will be seriously constrained.

Table 5-2 summarises the ranking of the potential sites in terms of their site accesses.

Table 5-2 Ranking of Site Access for Potential Sites

Site	Ranking
Tseung Kwan O Area 137	+
Ex-Lamma Quarry, Lamma Island	0
Ha Mei Wan, Lamma Island	0
Shek Kwu Chau	0
Tsang Tsui Ash Lagoons	+
Tuen Mun Area 38	0

5.3 Constraints to site layout

The Tseung Kwan O Area 137 and Tuen Mun Area 38 sites are located on flat reclaimed land and they are delineated for development. This site is currently the only available site in Hong Kong designated for PHI such as oil depots, gas production plants, explosive depots and liquefied petroleum gas bottling and storage facilities. Due to stringent safety requirement, there is great difficulty in identifying other PHIs sites that could meet with Hong Kong's future PHI needs. Hence, should this site be taken for the development of IWMF, there will be no other available site to accommodate Hong Kong's future PHIs requirement. Hence the layout of the TKO site would be constrained and a negative (-) rank is given.

For the Tuen Mun Area 38 site which is relatively smaller than other sites. The site in question is currently reserved for another waste management facility and is only about 5.75 hectares, which is not enough to accommodate an IWMF of a capacity of 3,000 tpd of around 10 hectares. Even if developing the IWMF alone, additional land would need to be acquired from the nearby sites. However, other areas in Tuen Mun Area 38 have been planned for other land intensive facilities and permanent aviation fuel facility, etc. and there is no surplus land available. In addition, transfer of waste to this site by marine vessels will be constrained. This is because there is limited space for the development of berthing facilities along the waterfront in Tuen Mun Area 38 as the waterfront area has already been reserved to meet the operational requirements of the planned uses. A negative (-) rank is thus given to this site.

Tsang Tsui Ash Lagoons site also has a relatively large site area and constraints to the site layout are anticipated to be minimal. As such, a positive (+) rank is assigned.

The ex-Lamma Quarry site is on a relative large piece of land which is currently rehabilitated. Since the southeast side of the site is facing Sok Kwu Wan, which is a popular tourist attraction. Layout of the site needs to ensure that the impact in the landscape and visual aspect is minimised. Thus, a neutral (0) rank is given to this site.

For site options at Ha Mei Wan and Shek Kwu Chau, the sites will be formed by reclamation. Although the site can be formed to suit the preferred layout of the IWMF, the shape of the site and hence the layout would be constrained by the potential impact due to reclamation, for instance, the impact on marine environment. A neutral (0) rank is assigned to these two sites.

Table 5-3 summarises the ranking of the potential sites in terms of the constraints to the site layout.

Table 5-3 Ranking for Constraints to Site Layout for Potential Sites

Site	Ranking
Tseung Kwan O Area 137	-
Ex-Lamma Quarry, Lamma Island	0
Ha Mei Wan, Lamma Island	0
Shek Kwu Chau	0
Tsang Tsui Ash Lagoons	+
Tuen Mun Area 38	-

The evaluation above only provides a preliminary comparison of the potential constraints to the development of site layout for the potential sites. Detailed site layouts will be developed and assessed at a later stage under a separate study should the potential sites be short-listed for further consideration.

5.4 Utilities

There are existing water supply pipelines and CLP high voltage power lines in the vicinity of Tseung Kwan O Area 137 and Tuen Mun Area 38, the provision of water and power supply to these sites can be made by extending the existing water supply network and connection to the high voltage power line.

For the Shek Kwu Chau site, there is limited power supply but no water supply to the island. As such, substantive upgrade of the existing submarine power cable would be required. Regarding water supply, new submarine water pipeline or small scale water distribution plant would be required.

As the Ha Mei Ha site is located opposite to the HEC Lamma power station and its extension, power supply to the IWMF development can be provided by connecting to the nearby power station. Depending on the site detailed layout design, if the site is not connected by bridge structure to the power station, a submarine power cable and water supply pipeline may need to be constructed for power and water supply to the site.

For the ex-Lamma Quarry site, the power and water supply can be provided by extending the existing power and water supply system in Lamma Island.

Due to its relatively close proximity to the CLP Black Point Power Station, power supply to the Tsang Tsui Ash Lagoons site can be made by connecting to the power station. For water supply, expansive extension of the existing water supply network over a long distance needs to be made.

Table 5-4 summarises the present situation of the water and power supplies and the required type of utility provision of each site option.

Table 5-4 Type of Utility Provision Required for Potential Sites

Site	Existing Utility Facilities in the Vicinity		Type of New Provision Required	
	Water	Power	Water	Power
Tseung Kwan O Area 137	✓	✓	(2)	(2)
Ex-Lamma Quarry, Lamma Island	✓	✓	(2)	(2)
Ha Mei Wan, Lamma Island	✓	✓	(1) or (2)*	(1) or (3)*
Shek Kwu Chau	×	✓	(1)	(1)
Tsang Tsui Ash Lagoons	×	✓	(2)	(3)
Tuen Mun Area 38	✓	✓	(2)	(2)

Notes:

Types of New Provision:

(1) New submarine water supply pipeline / submarine power cable.

(2) Extension of existing water supply network / high voltage line.

(3) New water supply pipeline / power cable connection from the nearby Water Treatment Works/Power station.

* Depending on the detailed design of the site layout.

The ranking of the potential sites in terms of utility provisions are summarised in the following table.

Table 5-5 Ranking of Utility Provision for Potential Sites

Site	Water	Power	Combined
Tseung Kwan O Area 137	0	0	0
Ex-Lamma Quarry, Lamma Island	0	0	0
Ha Mei Wan, Lamma Island	-	+	-
Shek Kwu Chau	-	-	-
Tsang Tsui Ash Lagoons	0	+	0
Tuen Mun Area 38	0	0	0

5.5 Construction Duration

The IWMF development at Shek Kwu Chau site will involve reclamation works, installation of submarine water supply pipeline and power lines. Also, the site is quite remote. The construction sequence will involve: reclaiming the site first, bringing in the utility, and then constructing the IWMF. All of the materials, equipment and personnel/workers would need to be transported via marine access. Relatively long construction duration is therefore anticipated.

The Ha Mei Wan site will be in similar situation, reclamation works is needed but the submarine power line / water supply pipeline to be laid would be of shorter length if the reclaimed site for the IWMF is not physically connected to the Lamma Power Station. Hence, the duration of construction for this site would also be relatively long.

Accommodating the IWMF at the sites at Tseng Kwan O Area 137, ex-Lamma Quarry and Tuen Mun Area 38 would not involve reclamation works and installations of submarine pipelines / power lines. These site options would therefore have moderate construction durations.

The Tsang Tsui Ash Lagoon site also requires no reclamation or submarine pipelines installation works. This site has an advantage over the other sites as the marine berthing facilities at the adjacent WENT Landfill can be utilised. This can further shorten the construction duration. As such, moderate duration of construction would be anticipated.

Table 5-6 shows the major features affecting the construction duration and the anticipated construction duration for each site option.

Table 5-6 Anticipated Construction Duration for Potential Sites

Site	Reclamation Required	Substantial Utility Provision Required	Existing Facilities can be Utilised	Anticipated Construction Duration
Tseung Kwan O Area 137	×	×	×	Moderate
Ex-Lamma Quarry, Lamma Island	×	×	×	Moderate
Ha Mei Wan, Lamma Island	✓	✓	×	Long
Shek Kwu Chau	✓	✓	×	Long
Tsang Tsui Ash Lagoons	×	×	✓	Moderate
Tuen Mun Area 38	×	×	×	Moderate

Based on **Table 5-6**, the site options, in terms of construction duration, are ranked as follows:

Table 5-7 Ranking of Construction Duration for Potential Sites

Site	Ranking
Tseung Kwan O Area 137	0
Ex-Lamma Quarry, Lamma Island	0
Ha Mei Wan, Lamma Island	-
Shek Kwu Chau	-
Tsang Tsui Ash Lagoons	0
Tuen Mun Area 38	0

5.6 Construction Risk

None of the site options involve cavern construction.

For sites requiring reclamation, that is, those at Ha Mei Wan and Shek Kwu Chau, a neutral (0) rank will be given to represent the moderate level of construction risk.

The remaining sites at Tseung Kwan O Area 137, Ex-Lamma Quarry, and Tuen Mun Area 38, only involve surface construction. The levels of risk associated with the construction work at these sites are relatively low.

For the Tsang Tsui Ash Lagoons site, subject to further detailed study, some risk arises from the possible need to mitigate the large quantity of potentially contaminated ash for site formation and the difficulty associated with getting subsoil data beneath the lined lagoon for the foundation works. Thus, the level of risk associated with the construction works at this site is considered to be moderate.

Table 5-8 summarises the construction risk associated with various site options.

Table 5-8 Ranking of Construction Risk for Potential Sites

Site	Reclamation Required	Ranking
Tseung Kwan O Area 137	×	+
Ex-Lamma Quarry, Lamma Island	×	+
Ha Mei Wan, Lamma Island	✓	0
Shek Kwu Chau	✓	0
Tsang Tsui Ash Lagoons	×	0
Tuen Mun Area 38	×	+

5.7 Operational Risk

For the sites locating in ex-Lamma Quarry, Ha Mei Wan and Shek Kwu Chau (S2, S3 & S4), the refuse / ash transfer is solely dependent on the marine transportation. For the Shek Kwu Chau site, since there are less human receptors in the vicinity, the consequence of any accidental incidents associated with this site would be less severe. Hence, the level of operational risk for the Shek Kwu Chau site is considered to be medium, whereas the ex-Lamma Quarry and Ha Mei Wan sites would be relatively high.

The remaining sites, that is, S1, S5 and S6, can have both land and sea accesses. Nevertheless, the Tseung Kwan O Area 137 site would be located near other PHIs and the Tuen Mun Area 38 site would have nearby developments such as steel mill, power station and the planned PAFF, and both of the two sites have a number of human receptors in the vicinity. Hence, any accidental incident at these two sites could have more severe consequence and these two sites are anticipated to have relatively higher level of operational risk. The Tsang Tsui Ash Lagoon site is anticipated to have relatively lower level of operational risk as there would be less human receptors in the vicinity,

The operational risk associated with various site options are summarised in **Table 5-9**.

Table 5-9 Ranking of Operational Risk for Potential Sites

Site	Ranking
Tseung Kwan O Area 137	-
Ex-Lamma Quarry, Lamma Island	-
Ha Mei Wan, Lamma Island	-
Shek Kwu Chau	0
Tsang Tsui Ash Lagoons	+
Tuen Mun Area 38	-

5.8 Overall Engineering Performance

Table 5-10 shows the overall engineering performance of various site options.

Table 5-10 **Ranking of Engineering Performance for Potential Sites**

Site	Score								Rank
	Ease of Integration	Site Access	Constraints to Site Layout	Utilities	Construction Duration	Construction Risk	Operational Risk	Overall	
Tseung Kwan O Area 137	1	3	1	2	2	3	1	1.80	3
Ex-Lamma Quarry, Lamma Island	1	2	2	2	2	3	1	1.70	4
Ha Mei Wan, Lamma Island	1	2	2	1	1	2	1	1.40	6
Shek Kwu Chau	1	2	2	1	1	2	2	1.50	5
Tsang Tsui Ash Lagoons	3	3	3	2	2	2	3	2.70	1
Tuen Mun Area 38	2	2	1	2	2	3	1	1.90	2

Chapter 6 Social Evaluation

6.1 Land Use

The description of each site option is presented below.

6.1.1 Tseung Kwan O Area 137

As advised by District Lands Office/Sai Kung (DLO/SK), the site is presently occupied by the CEDD under 2 temporary Government Land Allocations for:

- (i) Fill bank and the subsequent decommissioning with an expiry date of December 2008; and
- (ii) Construction waste sorting facilities with expiry date of August 2010.

The fill bank and construction waste sorting facilities need to be relocated so as to vacate the site for IWMF development, should the construction of the IWMF commence before December 2008 and August 2010 respectively.

Moreover, according to the Review of Land Use in TKO Area 137 which has already been completed, the proposed IWMF has not been taken into account. It may require re-consideration and /or revision of the Review to consider locating the IWMF in TKO Area 137.

The IWMF development will be compatible with the future surrounding land uses as the majority of them would be industrial or warehousing uses. As the site is near to the WSD's proposed desalination plant in the area, this may have the synergic benefit of utilizing the electricity / energy generated from the IWMF for the desalination process.

However, it should be noted that the site is zoned "Other Specified Uses" annotated "Deep Water Front Industry" ("OU(DWI)") on the approved TKO OZP No. S/TKO/15, and it is reserved for PHI and deep waterfront industries (DWI) on the adopted TKO Outline Development Plan (ODP) No. D/TKO/2. Due to stringent safety requirements, there is great difficulty in identifying other PHIs sites that could meet Hong Kong's future need for PHIs. Hence, should this site be taken for the development of IWMF, there will be no other available site to accommodate Hong Kong's future PHIs requirement. Part of the site is earmarked for PHI uses on the Preferred Land Use Plan (PLUP) as in the Review of Land Use in TKO Area 137, which was endorsed by CPLD. Strong competition with PHI users, including an oil depot, a proposed gas production plant and LPG bottling and storage facilities, are expected as it is the only vacant site for PHI development in the HKSAR.

6.1.2 Ex-Lamma Quarry, Lamma Island

According to the Lamma Island OZP No. S/I-LI/9 gazetted on 15.6.2007, the site is zoned as "Undetermined (U)". The area to the south west of the quarry, that is, where the cement works is located, is zoned as CDA as shown in **Figure 6-1**. The planning intention of the CDA is for comprehensive low-rise, low density residential development with a maximum

domestic GFA of 12,000 sq. m, a maximum site coverage of 40% and a maximum building height of 3 storeys (9m).

According to the Planning and Development Study for Hong Kong Island South and Lamma Island, three potential development areas have been identified on the island, which are Pak Kok Tsuen, Yung Shue Wan East and Tai Wan San Tsuen West. However, it is considered that locating the IWMF at the Ex-Lamma quarry site is unlikely to significantly compromise the housing development potential at these areas as those potential development sites are distant from the quarry site and screened from the site by a mountain range.

In the local context, the proposed IWMF at ex-Lamma Quarry will be compatible with the existing cement works, which is to the southwest of the site. However, since the cement works is located in an area zoned as CDA, the IWMF development at the quarry site would not be in keeping with potential residential development within the CDA. In addition, according to the Planning and Development Study on Hong Kong Island South and Lamma Island, the quarry site has been identified to have a potential for development of temporary tourist and recreational activities. Housing the IWMF at the quarry may therefore constrain the potential land use of the rehabilitated quarry site. As such, a negative (-) rank is assigned for this site.

6.1.3 Ha Mei Wan, Lamma Island

The site is not covered by any statutory or departmental plan. The development of IWMF would be in keeping with the established HEC Power Station on the island. However, it would not be compatible with the Hung Shing Yeh Beach and Lo So Shing Beach which are located to the east and southeast of the site respectively. Hence, a neutral (0) rank is assigned to this site.

6.1.4 Shek Kwu Chau

The principal planning intention of the island is for coastal and landscape protection. It is not covered by any statutory plan. DLO/Islands advised that a small portion of the site encroaches onto the area with licence being granted to SARDA for rehabilitation of drug dependent persons. Besides, as there is no development on the island, except the SARDA, the IWMF development will compromise the harmony of the island to some extent, making it to score a negative (-) rank in terms of land use.

6.1.5 Tsang Tsui Ash Lagoons

The Tsang Tsui Ash Lagoons site is not covered by any statutory or non-statutory designations. The major land-use issue is that the site is currently provided to China Light & Power for their disposal of PFA originating from the Castle Peak Power Station till 30 June 2047. The lagoons are provided to CLP for their PFA disposal by means of two licences issued by Lands Department. The two licenced areas shall not be used for any purposes other than excavation and extraction of turfs, stones and materials for the construction of sea-walls and any other associated works and other building and non-building works as authorised by DLO in connection with the construction or operation of the PFA Lagoons.

According to the conditions of land licences, the Government has the right to take back the area with a 12-month advance notice, if the area is formed and landscaped to the Government's satisfaction. The development of the IWMF would be compatible with the adjacent WENT landfill and the Black Point Power Station, as well as the proposed WENT Landfill Extension and STF. As such, a neutral (0) rank is assigned to this site option.

6.1.6 Tuen Mun Area 38

According to the TM OZP No. S/TM/22, Tuen Mun Area 38 is currently zoned as "Other Specified Uses" and annotated "Special Industrial Area" (SIA).

The CIF is a column 1 use under the zoning of the SIA in the OZP. Planning intention of SIA is primarily for the provision of land for land-extensive and capital-intensive industries, as well as for other special industries. Although the IWMF are in a similar nature to the CIF (both employ thermal technologies to treat waste), and the development of IWMF will be in keeping with the planning intention of the already industrialised area and the surrounding land uses, application to Town Planning Board either under S16 or S12A Town Planning Ordinance may be required. The major concern is the site area is relatively small. The site in question is currently reserved for another waste management facility and is only about 5.75 ha, which is not enough to accommodate an IWMF of a capacity of 3,000 tpd of around 10 ha. Even if developing the IWMF alone, additional land would need to be acquired from the nearby sites. However, other areas in Tuen Mun Area 38 have been planned for other land intensive facilities including EcoPark, construction and demolition handling facilities and permanent aviation fuel facility, etc. and there is no surplus land available. In addition, transfer of waste to this site by marine vessels will be constrained. This is because there is limited space for the development of berthing facilities along the waterfront in Tuen Mun Area 38 as the waterfront area has already been reserved to meet the operational requirements of the planned uses. A negative (-) rank is therefore given.

Table 6-1 summarises the land status and ranking of the sites.

Table 6-1 Land Status of Potential Sites

Site	Constraint/Alternative Landuse	Ranking
Tseung Kwan O Area 137	<ul style="list-style-type: none"> Zoned OU (Deep Water Front Industry) and designated for PHI Use. Strong competition with PHI users. 	-
Ex-Lamma Quarry, Lamma Island	<ul style="list-style-type: none"> Zoned as "U". Constrained the potential land use of the remaining portion of the rehabilitated quarry. 	-
Ha Mei Wan, Lamma Island	<ul style="list-style-type: none"> Not covered by any statutory or departmental plan. 	0
Shek Kwu Chau	<ul style="list-style-type: none"> Designated for landscape and coastal protection 	-
Tsang Tsui Ash Lagoons	<ul style="list-style-type: none"> Provided to CLP for their PFA disposal until 2047. 	0

Tuen Mun Area 38	<ul style="list-style-type: none"> Designated for “OU”, and annotated “SIA”, with CIF being a column 1 use under the SIA. 	-
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6.2 Traffic Impacts

In assessing the potential traffic impact arising from the IWMF development, only the major mode of transport would be considered.

Currently, marine transport is the major transport mode for MSW transfer. MSW from the RTSs are transferred to the WENT Landfill by marine vessels, except the Sha Tin RTS from which the refuse is transported to the NENT Landfill by road and the NWNTRTS to the WENT Landfill, as shown on **Figure 6-2**. Hence, marine transport is also considered to be the major mode of refuse / ash transport for the IWMF development at the potential sites.

For the Tsang Tsui Ash Lagoons site, all vessel transits must pass through the Western Harbour, which is adjacent to Kellet Bank and the Western Anchorages, the Ma Wan Channel and the Urmston Road / North Lantau areas, same as the current refuse transit route to the WENT Landfill. These areas are susceptible to relatively high safety risk for both ocean-going vessels and smaller crafts. However, the navigation within the Ma Wan Channel has been improved under the control of the local traffic control station of Marine Department, in particular the safety of large vessels navigating the turn in the presence of small vessels. In addition, the waste to be treated at the IWMF would be simply diverted from those currently going to the WENT Landfill. Hence, impact on the marine traffic would be negligible, compared to the current situation.

For the Tuen Mun Area 38 site, since it is located along the current marine transfer route of waste to the WENT Landfill, the vessel transfer of waste to the IWMF would be similar to that, except that the transit length would be shorter. Similar to the Tsang Tsui Ash Lagoons, the waste to be treated at the IWMF at Tuen Mun Area 38 would be simply diverted from those currently going to the WENT Landfill. Hence the marine traffic impact for this site is anticipated to be minimal.

Lamma Island is in a relatively central position in the territory of Hong Kong. Hence, there would be less aggregate refuse transfer vessel transit kilometres than the existing refuses transfer operations to WENT. Although the waste from the North Lantau RTS must pass through the busy Western Harbour and the Ma Wan Channel areas, waste from other RTSs would not need to transit this busy area. In addition, the risks associated with transit southwest of Green Island are very low. Any increase in refuse transit is not predicted to have any impact on the traffic in West Lamma Channel. The refuse transit vessel from the Island East RTS may transit south around Hong Kong Island, or through the Central Harbour area. Due to the reduction in transit required to pass through the busy Western Harbour, Ma Wan and North Lantau/Urmston Road areas, positive impact is predicted for the sites at Lamma Island (i.e. S2 and S3).

Locating to the west of Lamma Island, Shek Kwu Chau is also relatively central located. The aggregate refuse vessel transfer kilometres associated with the IWMF at Shek Kwu Chau would also be less than the existing operation of refuse transit to the WENT Landfill, and less refuse transit need to pass through the Ma Wan Channel and Western Harbour. As such, positive impact is anticipated for this site.

The Tseung Kwan O Area 137 site is situated at the extreme east of Hong Kong harbour and opposite to the Island East RTS. Waste from the RTSs does not need to transit the busy Western Harbour and Ma Wan Channel areas, except the waste from the North Lantau RTS. Besides, the aggregate transit lengths for the refuse vessels would be shortened. It would be advantageous for the refuse transfer vessels passing through the Central Harbour area due to the shortened distance and sheltered waters of the harbour, although the vessels can transit via south of Hong Kong Island. Waste from the Island East RTS will transit directly across the Tathong Channel to the IWMF site. Improvement to the current situation is thus anticipated.

The transport of residual ash (bottom ash and fly ash) from the IWMF to the WENT Landfill needs to be addressed although the traffic volume should be much smaller than that for the compacted refuse. It is noted that by the time the IWMF is commissioned, the SENT Landfill and its extension may be nearly filled up. The long term disposal site for incineration ash will likely be the WENT Landfill. The Tsang Tsui Ash Lagoons site has the advantage of situating right next to a landfill to allow convenient short distance land transport for ash disposal. For the Tuen Mun Area 38 site, it can access the WENT Landfill through both road and sea transport, and both the land and marine transit routes are relatively short. Therefore traffic impact arising from ash transport for the above two sites should be positive. Residual ash from the Tseung Kwan O Area 137 site to the WENT Landfill can be transported by both road and sea. However, both means of transport would involve relatively long transfer routes, from the eastern end to the northwest of the territory. As a result, a negative impact is anticipated for this site. For the remaining three sites, as they are quite centrally located in the territory, ash transport to the WENT Landfill follow essentially the existing refuse transfer route for Lamma Island and Cheung Chau, so the three island sites should have insignificant traffic impact. Considering the fact that the traffic volume and hence traffic frequency and traffic impact for refuse transport are dominant over those for the corresponding ash transport, the combined rankings for refuse and ash transport follow those assigned to refuse transport as follows.

A summary of the ranking in terms of traffic impact of each site is presented in **Table 6-2**.

Table 6-2 Ranking of Traffic Impact for Potential Sites

Site	Traffic Impact (Marine)			Rank
	Refuse Transfer	Ash Transfer	Combined	
Tseung Kwan O Area 137	Positive	Negative	Positive	+
Ex-Lamma Quarry, Lamma Island	Positive	Insignificant	Positive	+
Ha Mei Wan, Lamma Island	Positive	Insignificant	Positive	+
Shek Kwu Chau	Positive	Insignificant	Positive	+
Tsang Tsui Ash Lagoons	Insignificant	Positive	Insignificant	0
Tuen Mun Area 38	Insignificant	Positive	Insignificant	0

6.3 Overall Social Performance

The overall social performance of various site options is summarised in **Table 6-3**.

Table 6-3 Ranking of Social Performance for Potential Sites

Site	Score			Rank
	Land Use	Traffic Impact	Overall	
Tseung Kwan O Area 137	1	3	1.60	3
Ex-Lamma Quarry, Lamma Island	1	3	1.60	3
Ha Mei Wan, Lamma Island	2	3	2.30	1
Shek Kwu Chau	1	3	1.60	3
Tsang Tsui Ash Lagoons	2	2	2.00	2
Tuen Mun Area 38	1	2	1.30	6

6.4 Future Works

Since this study only provides a qualitative assessment for the potential sites. For further investigation, a detailed traffic impact assessment should be carried out under a subsequent detailed study, in which the cumulative impacts generated by existing / future developments should also be covered.

Chapter 7 Economical Evaluation

7.1 Capital Cost

The Ha Mei Wan and Shek Kwu Chau sites would incur a relatively high capital costs due to the need of reclamation. In addition, submarine pipelines will likely need to be installed for these two sites for utility provision. Negative (-) ranks are given to these site options.

For the site at Tsang Tsui Ash Lagoons, no reclamation is required. The existing marine berthing facilities at WENT Landfill can be utilised for the IWMF. As a result, a relatively low capital cost is anticipated for this site. Positive (+) ranks is assigned for this site.

For the remaining Tseung Kwan O Area 137, ex-Lamma quarry and Tuen Mun Area 38 sites, as reclamation and substantial utility provision are not required, moderate capital costs are predicted.

Table 7-1 summarises the capital cost of various site options.

Table 7-1 Anticipated Capital Cost of Potential Sites

Site	Reclamation Required	Substantial Utility Provision Required	Existing Facilities can be Utilised	Capital Cost
Tseung Kwan O Area 137	×	×	×	Moderate
Ex-Lamma Quarry, Lamma Island	×	×	×	Moderate
Ha Mei Wan, Lamma Island	✓	✓	×	High
Shek Kwu Chau	✓	✓	×	High
Tsang Tsui Ash Lagoons	×	×	✓	Low
Tuen Mun Area 38	×	×	×	Moderate

The ranking of each site in terms of capital cost is summarised in **Table 7-2**.

Table 7-2 Ranking of Capital Cost for Potential Sites

Site	Ranking
Tseung Kwan O Area 137	0
Ex-Lamma Quarry, Lamma Island	0
Ha Mei Wan, Lamma Island	-
Shek Kwu Chau	-
Tsang Tsui Ash Lagoons	+
Tuen Mun Area 38	0

The above evaluation only considers the major factors / construction works which would affect the capital cost associated with each site for the purpose of comparison. A more detailed cost estimate, which includes the natural terrain hazards assessment and the associated mitigation measures would be conducted should a site be proceeded to further consideration.

7.2 Operational Cost

As mentioned in Section 3, given the same operation modes at the various potential IWMF sites, the operating cost among various site options can be differentiated by comparing the transportation cost of refuse/residue transfer. As the refuse /ash transport is dominated by marine transit and the amount of the refuse is many times that of the residues as discussed in Section 6.2, thus, the operating cost associated with refuse / residue transport for the various sites can be differentiated by comparing the refuse transit lengths associated with each site.

The Tsang Tsui Ash Lagoons and Tuen Mun Area 38 sites would have aggregate transit lengths similar to the current refuse transfer to the WENT Landfill, resulting in a moderate operating cost. For the sites at Tseung Kwan O Area 137, Lamma Island and Shek Kwu Chau, a lower operating cost is anticipated due to the shortened transit length.

Table 7-3 summarises the anticipated relative operating cost for each site.

Table 7-3 Anticipated Relative Operating Cost for Refuse Transfer for Potential Sites

Site	Relative Aggregate Transit Length	Operating Cost associated with Refuse Transport
Tseung Kwan O Area 137	Short	Low
Ex-Lamma Quarry, Lamma Island	Short	Low
Ha Mei Wan, Lamma Island	Short	Low
Shek Kwu Chau	Short	Low
Tsang Tsui Ash Lagoons	Moderate	Moderate
Tuen Mun Area 38	Moderate	Moderate

Since the transportation cost for refuse and ash is only one of the components of the operating cost for the IWMF (which differs from various sites), the operating cost for various sites would be in similar order as the remaining cost components, including power supply,

water, pollution control, consumables, materials, labor, and equipment maintenance, are basically the same for all the sites. As such, the total operating costs of all sites are considered to be moderate.

The ranking of each site in terms of operating cost is summarised in **Table 7-4**.

Table 7-4 Ranking of Operating Cost for Potential Sites

Site	Ranking
Tseung Kwan O Area 137	0
Ex-Lamma Quarry, Lamma Island	0
Ha Mei Wan, Lamma Island	0
Shek Kwu Chau	0
Tsang Tsui Ash Lagoons	0
Tuen Mun Area 38	0

7.3 Opportunity Cost of Land

Table 7-5 shows the current zoning and/or planning intention of the various sites.

Table 7-5 Land Status of Potential Sites

Site	Constraint/Alternative Landuse
Tseung Kwan O Area 137	<ul style="list-style-type: none"> • Zoned OU (Deep Water Front Industry) and designated for PHI Use. • Strong competition with PHI users.
Ex-Lamma Quarry, Lamma Island	<ul style="list-style-type: none"> • Zoned as “U”. • Constrained the potential land use of the remaining portion of the rehabilitated quarry.
Ha Mei Wan, Lamma Island	<ul style="list-style-type: none"> • Not covered by any statutory or departmental plan.
Shek Kwu Chau	<ul style="list-style-type: none"> • Designated for landscape and coastal protection.
Tsang Tsui Ash Lagoons	<ul style="list-style-type: none"> • Provided to CLP for their PFA disposal until 2047.
Tuen Mun Area 38	<ul style="list-style-type: none"> • Designated for “OU” and annotated “SIA”, with CIF being a column 1 use under the SIA.

As none of the sites have been earmarked for sale or commercial development, accommodating the IWMF at any of these site options would not have high opportunity cost.

For the sites at Tseung Kwan O Area 137 and Tuen Mun Area 38, since the sites are designated for industrial uses, the opportunity cost would be the revenue generated from the competing land use. As such, a moderate opportunity cost for these sites are anticipated.

The Tsang Tsui Ash Lagoons site is currently occupied by CLP under a land licence, the opportunity cost of IWMF development at this site is thus predicted to be moderate.

The site at ex-Lamma quarry site is currently zoned as “U” with no definite land use has been determined. However, the quarry site has been identified to have a potential for development of temporary tourist and recreational activities according to the Planning and Development Study on Hong Kong Island South and Lamma Island. Hence, moderate opportunity cost of land is predicted and a neutral (0) is given.

For the remaining sites, as there are no planned uses at these sites, low or negligible opportunity cost is anticipated.

Table 7-6 shows the ranking in terms of opportunity cost of each site.

Table 7-6 Ranking of Opportunity Cost of Land for Potential Sites

Site	Ranking
Tseung Kwan O Area 137	0
Ex-Lamma Quarry, Lamma Island	0
Ha Mei Wan, Lamma Island	+
Shek Kwu Chau	+
Tsang Tsui Ash Lagoons	0
Tuen Mun Area 38	0

7.4 Overall Economics Performance

The overall economics performance of various site options is summarised in **Table 7-7**.

Table 7-7 Ranking of Economics Performance for Potential Sites

Site	Score				Rank
	Capital Cost	Operating Cost	Opportunity Cost	Overall	
Tseung Kwan O Area 137	2	2	2	2.00	2
Ex-Lamma Quarry, Lamma Island	2	2	2	2.00	2
Ha Mei Wan, Lamma Island	1	2	3	2.00	2
Shek Kwu Chau	1	2	3	2.00	2
Tsang Tsui Ash Lagoons	3	2	2	2.30	1
Tuen Mun Area 38	2	2	2	2.00	2

Chapter 8 Consumer & User

8.1 Community Impacts

8.1.1 Territory Wide Cultural / Social Impacts

In the territory wide context, the impacts relate to the greenhouse gas assessment, implications for climatic change, prolongation of landfill capacity and the harnessing of a renewable energy resource.

Regardless of the site location, the IWMF development in Hong Kong will benefit the territory by bringing a number of merits to the community as a whole, which include conservation of landfill capacity and the provision of a long-term sound means of MSW management and disposal, power generation with a renewable energy source and reduction in greenhouse gas emissions. However, there are public views that the IWMF should be developed at remote location(s) far away from major population cluster. As such, remote sites with low population in the vicinity, including Shek Kwu Chau and Tsang Tsui Ash Lagoons, are assigned with higher ranks. Positive (+) ranks are therefore given to these site options. For the remaining sites, neutral (0) ranks are assigned.

8.1.2 Local Cultural / Social Impacts

The cultural and social impact due to the IWMF development in a local context have been identified in previous evaluation, taking into account the characteristics of the prevailing environment, the sites of cultural interest and archaeological interest, existing land use, areas of recreation or nature conservation value. Examples of those impacts include the social disruption and loss of amenity to sensitive receivers in close proximity to local populations. The severity of those impacts associated with each site will be defined qualitatively for the purpose of scoring. As these criteria evaluate the IWMF in terms of long term impacts, these criteria would be related to the operational phase only.

As Tseung Kwan O Area 137 is planned for industrial uses, with the implementation of appropriate effective mitigation measures, the IWMF development is likely to blend with the surrounding environment. However, strong objections from the Sai Kung District Council and residents in TKO to the IWMF development in TKO Area 137 are anticipated in view of the possible/potential environmental nuisance. A negative (-) rank is therefore given to this site.

For the Tuen Mun Area 38 site, which is also planned for industrial uses, Tuen Mun District Council and the community have been expressing grave concern about the increasing co-location of dangerous and obnoxious facilities in the district. They also requested the Administration to stop treating Tuen Mun as a dumping ground by injecting additional obnoxious uses on it. There may be concerns that the proposal of housing the IWMF in Tuen Mun would pose risk to the nearby area and adversely affect the environment. Strong local objection against the proposal of locating the IWMF in Tuen Mun is therefore anticipated. If the IWMF are to be located at this site, adequate consultation should be undertaken to address the local concerns. The site option is thus assigned with a negative (-) rank.

For Ha Mei Wan site, impact on the local community is anticipated as the site is in close proximity to a recreation area. The IWMF development will also contribute to the cumulative impact due to the HEC Power Station. Hence, a negative (-) rank is given to this site.

For the ex-Lamma Quarry site, objections to the IWMF development are anticipated as the site is in proximity to a number of indigenous villages and seafood restaurants. Although there may be the potential to develop the IWMF as a new tourist attraction in Sok Kwu Wan and would bring advantage to the community, the perception of the IWMF being an unwanted neighbour would still require considerable efforts and time to change. As a result, a negative (-) rank is assigned to this site.

The vicinity of Tsang Tsui Ash Lagoons should have a low archaeological potential. With the implementation of appropriate mitigation measures, the village houses, temple and the bird species in the vicinity would not be affected significantly. Impact on the locals is anticipated to be insignificant. In respect of the perception of the local community, whilst the site is in fact distant (and separated by the mountain ridge of Castle Peak) from the major population cluster at Tuen Mun Town, it is administratively located in Tuen Mun District that the general objection of Tuen Mun residents to unwanted facilities still prevails. As such, a neutral (0) rank is given.

For the Shek Kwu Chau site, since reclamation would be required for the IWMF development, there may be objection from some public members. However, due to its relatively remote location and away from major population clusters, developing the IWMF at this site would have a relatively minimum impact to the locals. As such, a neutral (0) rank is given.

8.1.3 Site Ranking

Table 8-1 summarises the local cultural and social impacts and ranking of the sites.

Table 8-1 Ranking of Community Impacts for Potential Sites

Site	Territory Impacts	Local Impacts	Ranking
Tseung Kwan O Area 137	0	-	-
Ex-Lamma Quarry, Lamma Island	0	-	-
Ha Mei Wan, Lamma Island	0	-	-
Shek Kwu Chau	+	0	0
Tsang Tsui Ash Lagoons	+	0	0
Tuen Mun Area 38	0	-	-

8.2 Overall Consumer & User Performance

The overall consumer & user performance of various site options is summarised in **Tables 8-2**.

Table 8-2 Ranking of Consumer & User Performance for Potential Sites

Site	Score	Ranking
	Community Impact	
Tseung Kwan O Area 137	1	3
Ex-Lamma Quarry, Lamma Island	1	3
Ha Mei Wan, Lamma Island	1	3
Shek Kwu Chau	2	1
Tsang Tsui Ash Lagoons	2	1
Tuen Mun Area 38	1	3

Chapter 9 Outcomes of Stage 1 Assessment

9.1 Overall Ranking

Table 9-1 shows the overall score of each site, which combines the ranking of the 5 categories (i.e. environmental, engineering / technical, social, economics, and consumer & user).

Table 9-1 Overall Score for Potential Sites

Site	Score					
	Environmental	Technical/ Engineering	Social	Economics	Consumer & User	Overall (Rank)
Tseung Kwan O Area 137 (S1)	1.55	1.80	1.60	2.00	1.00	1.52 (3 rd)
Ex-Lamma Quarry, Lamma Island (S2)	1.45	1.70	1.60	2.00	1.00	1.46 (5 th)
Ha Mei Wan, Lamma Island (S3)	1.40	1.40	2.30	2.00	1.00	1.47 (4 th)
Shek Kwu Chau (S4)	2.30	1.50	1.60	2.00	2.00	2.06 (2 nd)
Tsang Tsui Ash Lagoons (S5)	2.35	2.70	2.00	2.30	2.00	2.28 (1 st)
Tuen Mun Area 38 (S6)	1.15	1.90	1.30	2.00	1.00	1.30 (6 th)

Whilst the rankings of the 6 potential site are not intended be interpreted directly as the preference for developing the IWME, it would serve as a good indication of the degree of concerns and potential problems associated with each of the site and may form the basis for eliminating site(s) which does not deserve further consideration.

It should be noted that Tuen Mun Area 38 (S6) has scored a “--” in the air quality impact criterion and hence should be ruled out from further consideration.

9.2 Recommended Short-listed Sites

In the light of the constraints discussed in the previous Chapters, the potential sites at Ha Mei Wan, Tseung Kwan O Area 137, Ex-Lamma Quarry and Tuen Mun Area 38 are not recommended for further consideration in the subsequent feasibility and EIA studies. However, to assure appropriateness and robustness of the weighting system adopted, a sensitivity analysis of the evaluation weightings on each of the evaluation criteria for all the 6 potential sites will be carried out in Stage 2 assessment. The constraints of the abovementioned 4 sites are summarized in the following:

□ Ha Mei Wan Site

- It is relatively close to the core habitat of Finless Porpoises and to the planned marine park near South Lamma Island;

- Waters around Ha Mei Wan are well-known high productive fishing grounds and spawning / nursery grounds;
- The construction of an artificial island would be necessary. The need of substantial dredging and massive reclamation would have substantial adverse impacts on the water quality in the vicinity;
- It would have significant visual impact on the substantial population residing in Wah Fu, Aberdeen, Ap Lei Chau and Wong Chuk Hang, and this would likely arouse concerns of these residents;
- The cumulative impact on air quality due to the emission by the nearby HEC Lamma Power Station; and
- It is likely to receive strong views from the local community.

❑ Tseung Kwan O Area 137 Site

- The site is currently the only available site in Hong Kong designated for PHIs such as oil depots, gas production plants, explosive depots, and liquefied petroleum gas bottling and storage facilities. Due to stringent safety requirements, there is great difficulty in identifying other PHIs sites that could meet with Hong Kong's future PHIs needs. Hence, should this site be taken for the development of IWMF, there will be no other available site to accommodate Hong Kong's future PHIs requirements;
- As the site is directly facing Siu Sai Wan, Chai Wan, and Heng Fa Chuen on the eastern side of Hong Kong Island as well as the Lohas Park of TKO, it would have significant visual impact on the substantial population residing in these areas. Taking into account the general negative perception of the community towards IWMF, the development of an IWMF in such an open location would likely arouse considerable concern of the community;
- There would be substantial air quality concern as dense population clusters exist in the prevailing downwind side of the site at the Eastern District of Hong Kong Island and Tseung Kwan O; and
- Long distance of hauling of ash residues.

❑ Ex-Lamma Quarry Site

- The proposed site is located at the ex-Lamma Quarry at the northern side of the island. It is directly facing a popular tourist spot, So Kwu Wan where seafood restaurants and a mariculture zone exist, and is in proximity to various indigenous villages such as Luk Chau village. The overall planning intention for Lamma Island is to conserve the natural landscape and rural character and to enhance the island as a leisure destination. Hence, the development of an IWMF at this location is not compatible with these existing landuse as well as the future development, and will fundamentally change the nature of this part of the island;
- The IWMF development would be incompatible with the planning intention of the remaining portion of the ex-Lamma Quarry site which is proposed for tourism and

recreation purposes, and the adjoining CDA site which is planned for comprehensive low-rise residential development. The Planning and Development Study on Hong Kong Island South and Lamma Island has identified the ex-quarry site as having potential for development of tourism and recreation activities. A zoning review of the site will be initiated pending detailed consideration of the appropriate uses/proposal. Regarding the "CDA" site, with an open sea view and easy accessibility to Sok Kwu Wan ferry pier, it has high potential for a comprehensive residential scheme to bring significant improvement to the existing environment; and

- As the site is directly facing Wah Fu, Aberdeen, Ap Lei Chau and Wong Chuk Hang on the southern side of Hong Kong Island, it would have significant visual effect on the substantial population residing in these areas. Taking into account the general negative perception of the community towards IWMF, the development of an IWMF in such an open location would likely arouse considerable concern of the community.

❑ Tuen Mun Area 38 Site

- Considerable air quality concerns already exist in the area which is subject to the effects of major air emissions (e.g. Castle Peak Power Plant, Green Island Cement, Shiu Wing Steel Mill) and other regional air emissions. The site has a very high potential of AQO exceedance (with a double negative (- -) ranking for air quality impact);
- There are considerable site constraints in terms of site size, number of developable berths at the sea front and landuse competition;
- The site is within the direct sightline from the residential area of Tuen Mun New Town which is in close proximity; and
- It is likely to receive strong views from the local community.

In view of the constraints listed, the above 4 sites are associated with substantial constraints which would be difficult to resolve and hence are unlikely to be promising sites for the IWMF development. As such, it is recommended further consideration should be given only to the remaining two sites as follows:

❑ Tsang Tsui Ash Lagoons; and

❑ Shek Kwu Chau.

The above two sites represent locations with different characteristics which would require further deliberations among the concerned parties on their suitability and more detailed environmental and feasibility studies.

For the Tsang Tsui Ash Lagoons site, the feasibility of co-locating the IWMF, the STF, and the WENT Landfill Extension within the same area should be further investigated under subsequent studies with a view to achieving better use of scarce land resources and environmental acceptability should this site be chosen for further consideration.

Regarding the Shek Kwu Chau site, its potential environmental and ecological impacts on the natural coastal landscape, marine ecology, water quality, fishery and some special faunal

species would need further study. In addition, the compatibility of the proposed IWMF with the adjacent rehabilitation centre would need to be carefully reviewed and considered.

Chapter 10 Approach and Methodology of Stage 2 Assessment

10.1 Introduction

This section presents the basic approach and methodology of the Stage 2 assessment for the 'short-listed' sites identified under the Stage 1 Assessment for IWMF development.

The Stage 2 Assessment will comprise two parts. The first part involves a sensitivity analysis of the evaluation weighting and scoring system adopted in Stage 1, whereas in the second part, a review of the Stage 1 assessment results will be conducted. The methodologies of the two parts are presented in the following sections.

10.2 Sensitivity Analysis

A sensitivity assessment will be carried out at Stage 2 assessment to verify the appropriateness/robustness of the weighting system adopted in Stage 1, that is, the baseline scenario. Three different percentage of biasing, 55 %, 60 % and 65 %, will be used for 5 scenarios as below:

- ❑ Environmental-biased (Scenario A);
- ❑ Engineering-biased (Scenario B);
- ❑ Economics-biased (Scenario C);
- ❑ Social-biased (Scenario D); and
- ❑ Consumer & user-biased (Scenario E).

The weighting of each category under Scenarios A – E, with percentage biasing of 55%, 60% and 65% is summarised in **Tables 10-1 to 10-3**.

Table 10-1 55 % Biased Weighting for Scenarios A-E

Evaluation Categories	Weighting					
	Baseline	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
Environmental	50 %	55 %	11.25 %	11.25 %	11.25 %	11.25 %
Technical / Engineering	10 %	11.25 %	55 %	11.25 %	11.25 %	11.25 %
Economics	10 %	11.25 %	11.25 %	55 %	11.25 %	11.25 %
Social	10 %	11.25 %	11.25 %	11.25 %	55 %	11.25 %
Consumer & User	20 %	11.25 %	11.25 %	11.25 %	11.25 %	55 %

Table 10-2 60 % Biased Weighting for Scenarios A-E

Evaluation Categories	Weighting					
	Baseline	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
Environmental	50 %	60 %	10 %	10 %	10 %	10 %
Technical / Engineering	10 %	10 %	60 %	10 %	10 %	10 %
Economics	10 %	10 %	10 %	60 %	10 %	10 %
Social	10 %	10 %	10 %	10 %	60 %	10 %
Consumer & User	20 %	10 %	10 %	10 %	10 %	60 %

Table 10-3 65 % Biased Weighting for Scenarios A-E

Evaluation Categories	Weighting					
	Baseline	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
Environmental	50 %	65 %	8.75 %	8.75 %	8.75 %	8.75 %
Technical / Engineering	10 %	8.75 %	65 %	8.75 %	8.75 %	8.75 %
Economics	10 %	8.75 %	8.75 %	65 %	8.75 %	8.75 %
Social	10 %	8.75 %	8.75 %	8.75 %	65 %	8.75 %
Consumer & User	20 %	8.75 %	8.75 %	8.75 %	8.75 %	65 %

In addition, an equal weighting scenario (Scenario F) will be investigated in the analysis, with the 20% weighting assigned for each category, as shown in **Table 10-4**.

Table 10-4 Equal Weighting Scenario (Scenario F)

Evaluation Categories	Weighting
Environmental	20 %
Technical / Engineering	20 %
Economics	20 %
Social	20 %
Consumer & User	20 %

The weighting of individual criteria within one category will remain unchanged.

10.3 Review of Stage 1 Assessment Results

For the review of Stage 1 Assessment, a conceptual layout plan will be developed for each of the 2 remaining sites short-listed under Stage 1 Assessment. Taking into account the conceptual layout plans at various sites, the results of Stage 1 assessment in terms of the non-environmental criteria, that is those under the categories of technical / engineering, economics, social and consumer & user, will be reviewed.

10.3.1 Conceptual Layout Plan

The conceptual layout plan for each of the 2 remaining sites is developed for the purpose of conducting the review of Stage 1 Assessment. Such layout plans are preliminary only, with an indication of the approximate size, to identify / visualise the potential issues associated with the construction of the IWMF in the technical / engineering aspects as well as other non-environmental aspects. The layout plans would need to be reviewed at subsequent studies. Detailed site layout will be developed and assessed at a later stage under a separate study should the 2 sites are further considered. As this Study focuses on the site selection for the initial phase (Phase 1) development of the IWMF only, the layout plans developed under this assessment exercise will only include facilities of the Phase 1 IWMF development.

10.3.1.1 Major Components

The layout plan of the IWMF will include facilities for thermal treatment as well as the associated ancillary facilities. A demonstration-scale MBT facility will also be included in the layout plan for the purpose of establishing the land requirement.

Figure 10-1 shows the major components of the IWMF.

The main components to be included in the layout plan are summarised in **Table 10-5**.

Table 10-5 Main Components of IWMF

Type of Facilities	Main Component
Thermal Treatment Facilities	Reception Hall
	Refuse Pit
	Ash Pit
	Combustor & Boiler
	Air Pollution Control
	Turbine Generators & Boiler Feedwater Treatment Area
	Flyash and Chemical Storage
	Bulky Waste Pit
	Stack
Demonstration -scale Mechanical-Biological Treatment Facilities	Mechanical Sorting Area
	Anaerobic Digester
	Gas Tank
Ancillary Facilities	Parking Area
	Administration Building & Visitor Centre
	Dormitories & Canteen*
	Berthing Facilities
	Landscaping Area

Note : * Provide if there is sufficient space.

Thermal Treatment Facility

For the major components of the thermal treatment facility, reference will be made to the WEF Study, as the thermal treatment systems for the two facilities are similar. In the WEF Study, two separate 3,000 tpd plants were proposed. For each plant, there were 6 nos. furnaces, with one furnace serving as a standby unit. Each furnace has a capacity of 600 tpd.

MBT Facility

For the MBT facility, since the process trains to be provided heavily depend on the type of incoming waste stream (i.e. recyclables) and the waste collection policy and strategy to be implemented by the government, which have not yet be confirmed at this stage, the individual components of the process trains would not be included in the layout. For the layout development purpose, a demonstration-scale MBT facility with a capacity of 200 tpd is assumed.

Ancillary Facilities

For effective and efficient IWWMF operation, ancillary facilities, including berthing area, administration building, parking area and landscaping / buffer area would need to be provided.

Table 10-6 summarises the capacity of the treatment components of the IWWMF, which would be adopted for developing the conceptual layout plan.

Table 10-6 Capacities of the IWWMF to be Adopted for Layout Plan Development

Treatment Component	Capacity (tpd)
Thermal Treatment	3,000
Mechanical-Biological Treatment	200

Since the capacity of the thermal treatment facility is the same as that for a WEF plant proposed under the WEF Study, the land requirement and layout of the TT facility would be similar to that of the WEF plant.

For the MBT facility, as the process trains or individual components are not yet confirmed at this stage, it would be more appropriate to reserve sufficient size of land for conservatism. According to the '*Review of Integrated Waste Management Technologies - Feasibility Study*' (IWMT), the land required for a MBT facility would be in a range of 0.007 - 0.009 ha/tpd. This would form the basis of determining the land requirement of the facility.

Based on the capacity of the IWWMF shown in **Table 10-6**, the following land requirement for accommodating the IWWMF will be adopted for layout plan development.

Table 10-7 Land Requirements for the IWWMF

Treatment Component	Approximate Site Area (ha)
Thermal Treatment	10
Mechanical-Biological Treatment	2

The land uptake for the thermal treatment facility of the IWMF as shown on **Table 10-7** is estimated based on the land take requirement adopted in the WEF Study, in which a land take of approximately 10 ha is required for one 1Mtpa (about 3,000 tpd) capacity WEF. For the MBT facility, the estimated land requirement for a facility with 200 tpd capacity would be approximately 2 ha, based on the unit area of 0.009 ha/tpd recommended in the '*Review of Integrated Waste Management Technologies - Feasibility Study*'.

The approximate dimensions of main components of the IWMF are shown on **Figure 10-1**.

10.3.2 Approach of Review

For the review of Stage 1 Assessment, a holistic review of the 2 short-listed sites in terms of the evaluation criteria except the environmental ones will be carried out.

Therefore, this part will focus on the addition information and/or new issues / constraints identified through the development of the layout plan, which may affect the appropriateness of the Stage 1 evaluation.

Chapter 11 Sensitivity Analysis

This section presents the findings of the sensitivity analysis of the weighting system adopted under Stage 1 Assessment. A series of sensitivity tests has been conducted on each of the evaluation categories, which are environmental, technical / engineering, economics, social and consumer & user, to test the robustness of the findings. The sensitivity tests involve recalculation of scores under various scenarios with heavier weightings applied to each of the basic categories so as to determine how each category affects the results. A scenario with equal weightings applied to all categories was also carried out. Details of the sensitivity analysis and scoring for each scenario are included in **Appendix B**.

11.1 Analysis Results

The results of sensitivity analysis are summarised in **Tables 11-1** and **11-2**, which show respectively the overall scores and ranking of the six short-listed sites for 6 scenarios, including environmental-biased, technical/engineering-biased, economics-biased, social-biased, consumer & user-biased and equal-weighting biased, with 55%, 60% and 65% biasing. The results of the baseline scenario are also included in the tables for comparison.

Table 11-1 Overall Score for Sensitivity Analysis with 55%, 60% and 65% Biasing

Site		Score																	
		Tseung Kwan O Area 137			Ex-Lamma Quarry, Lamma Island			Ha Mei Wan, Lamma Island			Shek Kwu Chau			Tsang Tsui Ash Lagoons			Tuen Mun Area 38		
Percentage Biased (%)		55	60	65	55	60	65	55	60	65	55	60	65	55	60	65	55	60	65
Baseline		1.52			1.46			1.47			2.06			2.28			1.30		
A	Environmental Biased	1.57	1.57	1.57	1.51	1.50	1.49	1.52	1.51	1.50	2.06	2.09	2.12	2.31	2.31	2.32	1.33	1.31	1.29
B	Technical / Engineering Biased	1.68	1.70	1.71	1.62	1.63	1.63	1.52	1.51	1.50	1.71	1.69	1.67	2.46	2.49	2.51	1.66	1.69	1.71
C	Economics Biased	1.77	1.80	1.82	1.75	1.78	1.80	1.79	1.81	1.83	1.93	1.94	1.95	2.28	2.29	2.29	1.70	1.74	1.77
D	Social Biased	1.59	1.60	1.60	1.57	1.58	1.58	1.92	1.96	2.00	1.76	1.74	1.72	2.15	2.14	2.12	1.40	1.39	1.37
E	Consumer & User Biased	1.33	1.30	1.26	1.31	1.28	1.24	1.35	1.31	1.27	1.93	1.94	1.95	2.15	2.14	2.12	1.26	1.24	1.21
F	Equal Weighting Biased	1.59			1.55			1.62			1.88			2.27			1.47		

Note: Score in bold indicates the highest score
 Score in italics indicates the lowest score

Table 11-2 Overall Ranking for Sensitivity Analysis with 55%, 60% and 65% Biasing

Site		Ranking																	
		Tseung Kwan O Area 137			Ex-Lamma Quarry, Lamma Island			Ha Mei Wan, Lamma Island			Shek Kwu Chau			Tsang Tsui Ash Lagoons			Tuen Mun Area 38		
Percentage Biased (%)		55	60	65	55	60	65	55	60	65	55	60	65	55	60	65	55	60	65
Baseline		3			5			4			2			1			6		
A	Environmental Biased	3	3	3	5	5	5	4	4	4	2	2	2	1	1	1	6	6	6
B	Technical / Engineering Biased	3	2	2	5	5	5	6	6	6	2	3	4	1	1	1	4	3	2
C	Economics Biased	4	4	4	5	5	5	3	3	3	2	2	2	1	1	1	6	6	6
D	Social Biased	4	4	4	5	5	5	2	2	2	3	3	3	1	1	1	6	6	6
E	Consumer & User Biased	4	4	4	5	5	5	3	3	3	2	2	2	1	1	1	6	6	6
F	Equal Weighting Biased	4			5			3			2			1			6		

Note: Ranking in bold indicates the highest ranking
Ranking in italics indicates the lowest ranking

11.2 Implications

Results of the sensitivity analysis clearly demonstrate that:

- The Tsang Tsui Ash Lagoons site ranks the first in all scenarios; and
- The Tuen Mun Area 38 site is the least possible site for all scenarios, except the technical / engineering-biased scenario, for which the Ha Mei Wan site is the least possible sites.

Whilst there are some changes in the ranks of the other sites under the tested scenarios, the changes are considered not substantial. As such, the assessment result obtained from the Stage 1 Assessment would not require revision. Tseung Kwan O Area 137 Site, Ex-Lamma Quarry Site, Ha Mei Wan Site and Tuen Mun Area 38 Site would remain to be the sites eliminated from further consideration.

Although the aim of this Study is not to select the best site option but to eliminate the highly-constrained or problematic sites, the consistency of rankings for the most and least possible sites suggests that the baseline scenario is considered to be appropriate to be adopted for this site selection.

Chapter 12 Review of Stage 1 Assessment Results

12.1 Conceptual Layout Plan

Figures 12-1 to 12-2 show the conceptual layout plans of the IWMF at the two short-listed sites. These layout plans are preliminary only, and subject to further revision at a later stage.

According to these layout plans, the IWMF (Phase 1) can be accommodated into both of the sites.

The site area of each site for housing the IWMF with the thermal treatment as the core technology plus a demonstration-scale MBT for mixed MSW is summarised in Table 12-1.

Table 12-1 Site Area of IWMF (Phase 1)

Site	Approximate Site Area (ha)
Shek Kwu Chau	11.6 (9.6)
Tsang Tsui Ash Lagoons	10.4 (8.4)

Note 1: The area shown in the parenthesis excludes the area for the demonstration-scale MBT facility.

The following section outlines the impact of the layout plan on the Stage 1 Assessment.

12.2 Impact on Stage 1 Assessment

The layout plans shown that the IWMF located at the Tsang Tsui Ash Lagoons site would occupy a smaller site area as it is assumed that no new berthing facilities would be required by utilising the existing facilities of the WENT Landfill. No new obvious / substantial constraints were identified based on the layout plan prepared. As such, the ranking of various criteria for the two sites remain unchanged.

12.3 Final Overall Ranking

After the review of the Stage 1 Assessment results, the overall score of the two short-listed sites, which combines the rankings of the 5 categories (i.e. environmental, engineering / technical, social, economics, and consumer & user) is revised as follows:

Table 12-2 Final Overall Score for Potential Sites

Site	Score					
	Environmental	Technical/ Engineering	Social	Economics	Consumer & User	Overall (Rank)
Shek Kwu Chau (S4)	2.30	1.50	1.60	2.00	2.00	2.06 (2 nd)
Tsang Tsui Ash Lagoons (S5)	2.35	2.70	2.00	2.30	2.00	2.28 (1 st)

For the non-environmental evaluation, the overall score for potential sites are presented in **Table 12-3**.

Table 12-3 Final Overall Non-environmental Score for Potential Sites

Site	Score				
	Technical/ Engineering	Social	Economics	Consumer & User	Overall (Rank)
Shek Kwu Chau (S4)	1.50	1.60	2.00	2.00	0.91 (2 nd)
Tsang Tsui Ash Lagoon (S5)	2.70	2.00	2.30	2.00	1.10 (1 st)

The above table illustrates that Tsang Tsui Ash Lagoon site is ranked the first in terms of non-environmental criteria. As mentioned in Section 3.9, the category of 'environmental' is assigned with a heavier weighting than the other four categories as this category, in particular the criterion of air quality impact, is considered to be the major concern in the site search assessment. Hence the overall scores for the potential sites would be dominated by the environmental scores of the respective sites. **Tables 12-2** and **12-3** show that the Tsang Tsui Ash Lagoons and Shek Kwu Chau sites are ranked as the first two sites, suggesting that these two sites would have better performance than the other four sites in terms of both overall (including environmental) and non-environmental criteria.

12.4 Recommended Sites for Further Investigation

Based on the Stage 2 Review results, the ranking of the potential sites remains the same, with Tsang Tsui Ash Lagoons site ranked as the most possible and preferable site. Since no substantial constraint is identified for any sites under the Stage 2 Review, the two sites short-listed under Stage 1 assessment are recommended for further investigation. The two sites are:

- ❑ Tsang Tsui Ash Lagoons; and
- ❑ Shek Kwu Chau.

The ranking assigned for each site is solely for the qualitative evaluation so as to identify the possible sites for further study. Hence, it should have no implication to the results of the subsequent study, in which the environmental performance and acceptability of each site will be quantitatively assessed.

Chapter 13 Discussion on Short-listed Sites

The section summarizes the key attributes of the two short-listed sites identified in the site evaluation process. It aims at highlighting the site characteristics and discussing any salient issues which may need further investigation in subsequent studies.

13.1 Shek Kwu Chau

Shek Kwu Chau is an island located to the south of Chi Ma Wan Peninsula of Lantau Island and about 2.6 km to the west of Cheung Chau. It is located advantageously remote from any major population clusters of Hong Kong. There is only a very light population living in a rehabilitation centre managed by the SARDA.

The key attributes of this site are listed below:

- ❑ Located close to the southern border of Hong Kong waters and remote from any major population clusters;
- ❑ Sparse air sensitive receivers in close proximity to the site and away from the prevailing downwind directions;
- ❑ Minimal traffic impact resulted from marine transfer of waste despite land transport not feasible;
- ❑ Reclamation and statutory gazette procedures required and a longer lead time for site availability anticipated;
- ❑ Potential water quality, marine ecology and fishery impacts expected. Nevertheless, the impacts are likely to be mitigable;
- ❑ Landscape and visual impact, including the impact on coastal scenery and relative naturalness of the island due to reclamation works, may arise but likely be minimized with careful siting of the reclamation to the southwestern side of the island and sensible outlook design; and
- ❑ Some fauna in the terrestrial habitat of the island may be of ecological interest that the compatibility needs to be addressed.

13.2 Tsang Tsui Ash Lagoons

By locating adjacent to the WENT Landfill, the site has an operational advantage of easy sharing of existing infrastructures (e.g. berthing facilities) and flexible waste diversion between the landfill and the IWMF. Cumulative air impact may be a concern although mitigable given its close proximity to the proposed Sludge Treatment Facility and the power stations in Black Point and Castle Peak.

Key attributes for this site include:

- ❑ The site is close to the WENT Landfill and the planned WENT Extension. Sharing of infrastructures and transfers / diversion of waste are possible and flexible;
- ❑ No reclamation needed although site formation still required;
- ❑ Site availability hinged on the result of negotiations with CLP which currently uses the site for ash disposal and other operation purposes;
- ❑ Site background air quality relatively more dependent on the influence of the air quality of the Pearl River Delta and potential concerns on cumulative air quality impact with the power stations at Black Point and Castle Peak and the proposed Sludge Treatment Facility anticipated; and
- ❑ Prevailingly considered as an unwanted landuse by Tuen Mun residents although located some 5.5 km from Tuen Mun Town across the Castle Peak and the connected mountain ridge.

Table 13-1 summaries the key attributes of the above sites.

Table 13-1 Key Attributes for the Short-listed Sites

Category	Shek Kwu Chau	Tsang Tsui Ash Lagoons
Environmental	<ul style="list-style-type: none"> Located favourably in the south-western border of HK where the prevailing wind direction (northeast) will disperse the emission away from the populated areas. Relatively few ASRs and located away from the downwind direction. Very light population in close proximity. Surrounding waters being the habitat of Chinese White Dolphin and Finless Porpoise. Potential implications to water quality and fishery due to reclamation. Potential implication to the coastal scenery and relative naturalness due to reclamation. Some fauna on the island may be of ecological interest. 	<ul style="list-style-type: none"> Site surrounded by well formed bund (no reclamation needed) and water quality impact avoided. A disturbed environment being used for ash management. Constraint to accommodate new air emission source in view of multiple emission sources already existed in the area.
Technical / Engineering	<ul style="list-style-type: none"> Reclamation required and hence longer construction period. Allow marine transport of waste and ash only. Relatively distant from existing waste management facilities (landfills). 	<ul style="list-style-type: none"> Close to existing waste management facilities (landfills and proposed STF) and infrastructures may be shared. Both marine and land transport of waste and ash possible. No reclamation needed although site formation still required.
Economics	<ul style="list-style-type: none"> Relatively higher construction cost due to reclamation. 	<ul style="list-style-type: none"> Construction and operation cost of berthing facilities potentially saved if those of WENT Landfill can be shared.
Social	<ul style="list-style-type: none"> South Lantau and surrounding waters mainly intended for recreation and coastal protection. Compatibility with the adjacent rehabilitation centre to be reviewed. 	<ul style="list-style-type: none"> Negotiation with CLP on the recovery of the ash lagoon required. Located close to the WENT Landfill and the proposed STF.
Consumer & User	<ul style="list-style-type: none"> Remote from any major population clusters. 	<ul style="list-style-type: none"> No major population in close proximity although administratively located in Tuen Mun District.

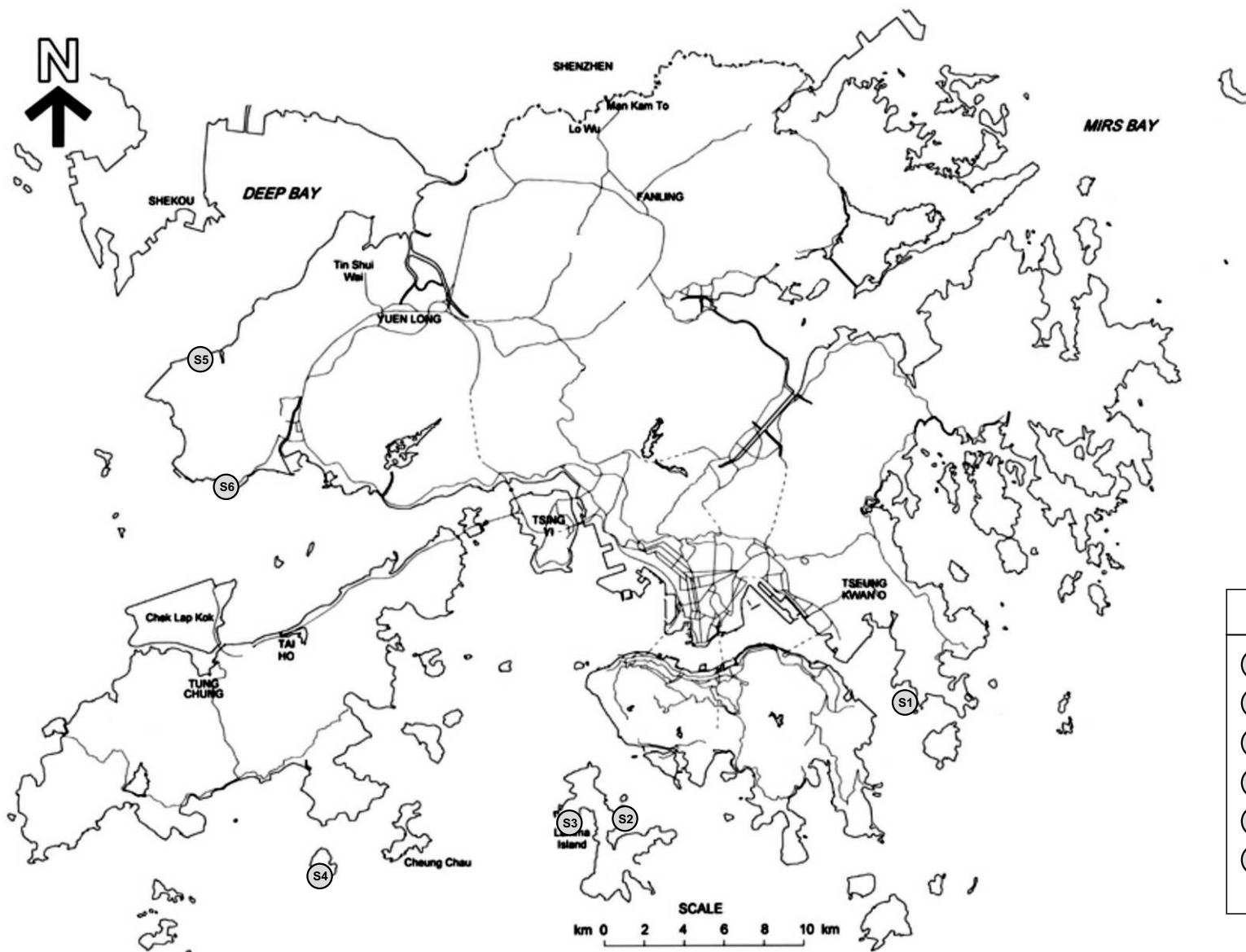
Chapter 14 Conclusion

The present Study has considered various sites with the apparent potential to develop the proposed IWMF Phase 1 through a 2-stage Assessment exercise. In the Stage 1 Assessment, by considering the site characteristics against 20 criteria which are classified under the main categories of environmental, engineering / technical, social, economics, and consumer and users, 4 sites – Tseung Kwan O Area 137, Ex-Lamma Quarry, Ha Mei Wan and Tuen Mun Area 38 – were not recommended for further EIA and Feasibility Studies as potential sites for the development of IWMF, in view of their constraints which would be difficult to resolve. Then in the stage 2 Assessment, the assigned weightings to individual selection criteria and the scores given to the individual sites were varied under 6 scenarios in a sensitivity test so as to verify the robustness of the Stage 1 results. A review of the preliminary site layout plans was also carried out for the remaining 2 potential sites – Tsang Tsui Ash Lagoons and Shek Kwu Chau – in the Stage 2 study. It was confirmed that Tsang Tsui Ash Lagoons and Shek Kwu Chau were the short-listed sites recommended for further studies for the IWMF Phase 1 development.

As such, the conclusion of the site search exercise recommended the following two short-listed sites be taken to the next stage for detailed quantitative assessments and investigation with a view to developing the first phase of the IWMF:

- ❑ Tsang Tsui Ash Lagoons; and
- ❑ Shek Kwu Chau.

Figures



Potential Sites for Integrated Waste Management Facilities

- (S1) Tseung Kwan O Area 137
- (S2) Ex-Lamma Quarry, Lamma Island
- (S3) Ha Mei Wan, Lamma Island
- (S4) Shek Kwu Chau
- (S5) Tsang Tsui Ash Lagoon
- (S6) Tuen Mun Area 38

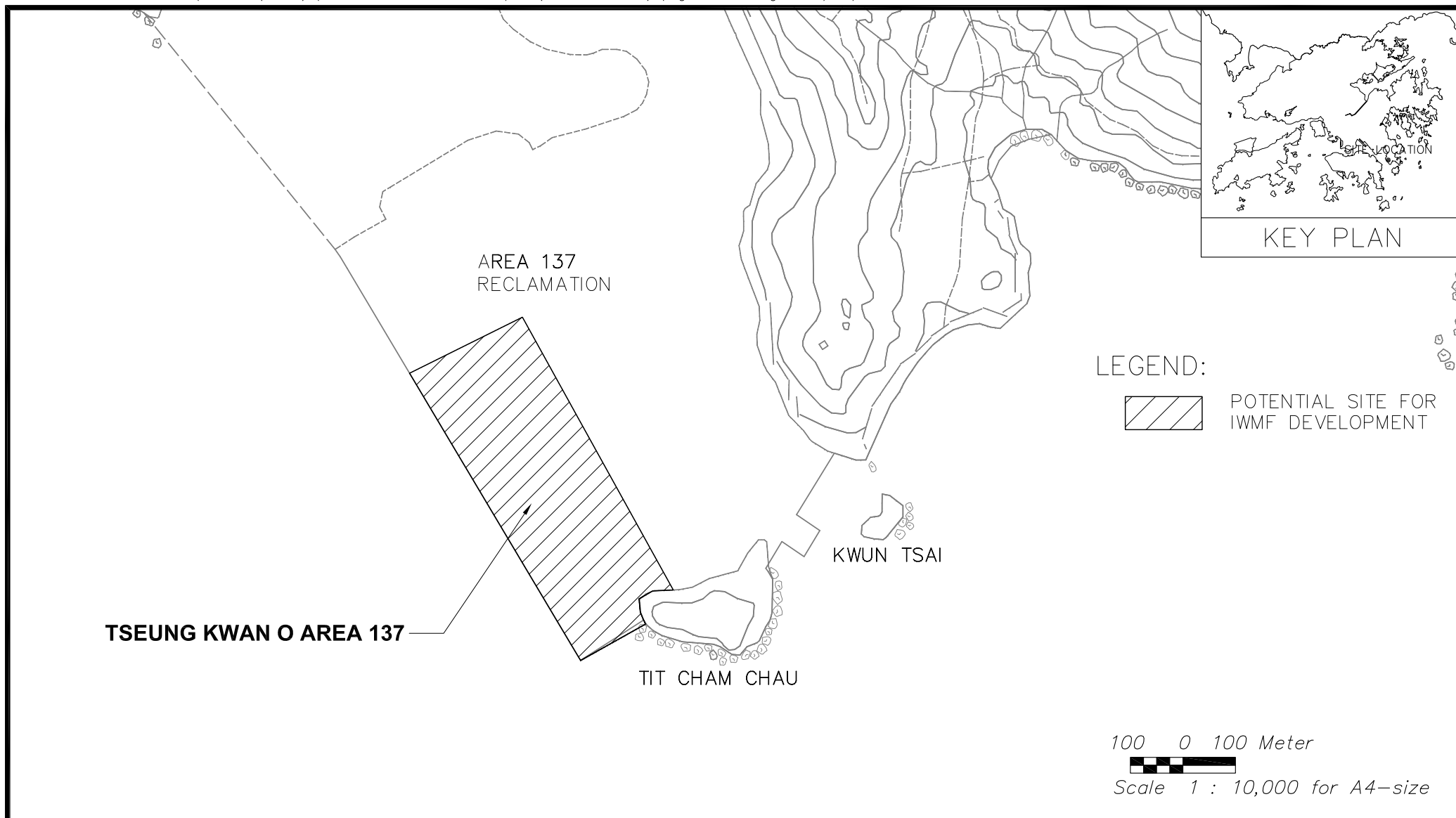
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**Figure 2-1
Locations of Potential Sites for
Integrated Waste Management Facilities**



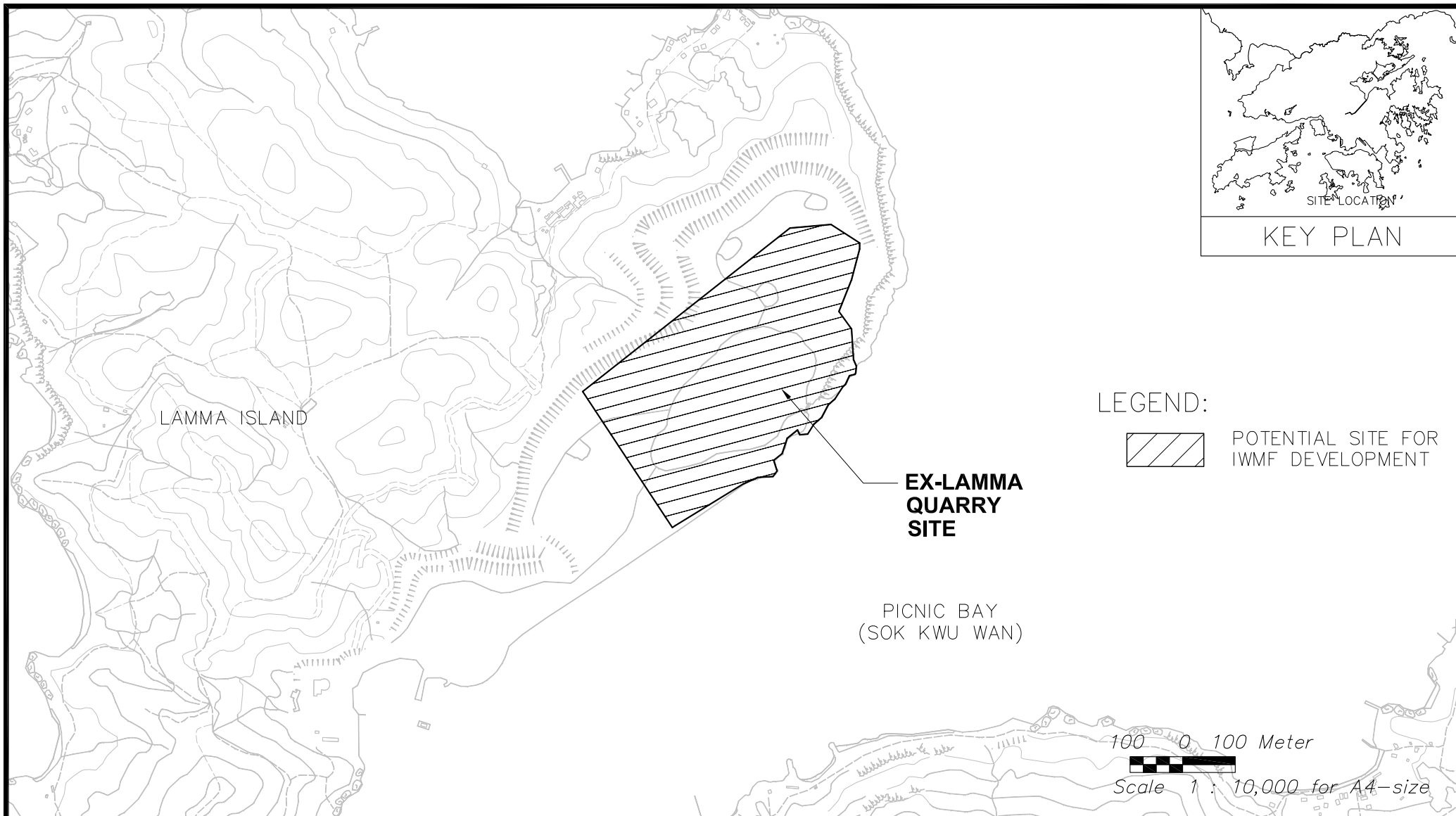
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Figure 2-2
**Location of
Tseung Kwan O Area 137**



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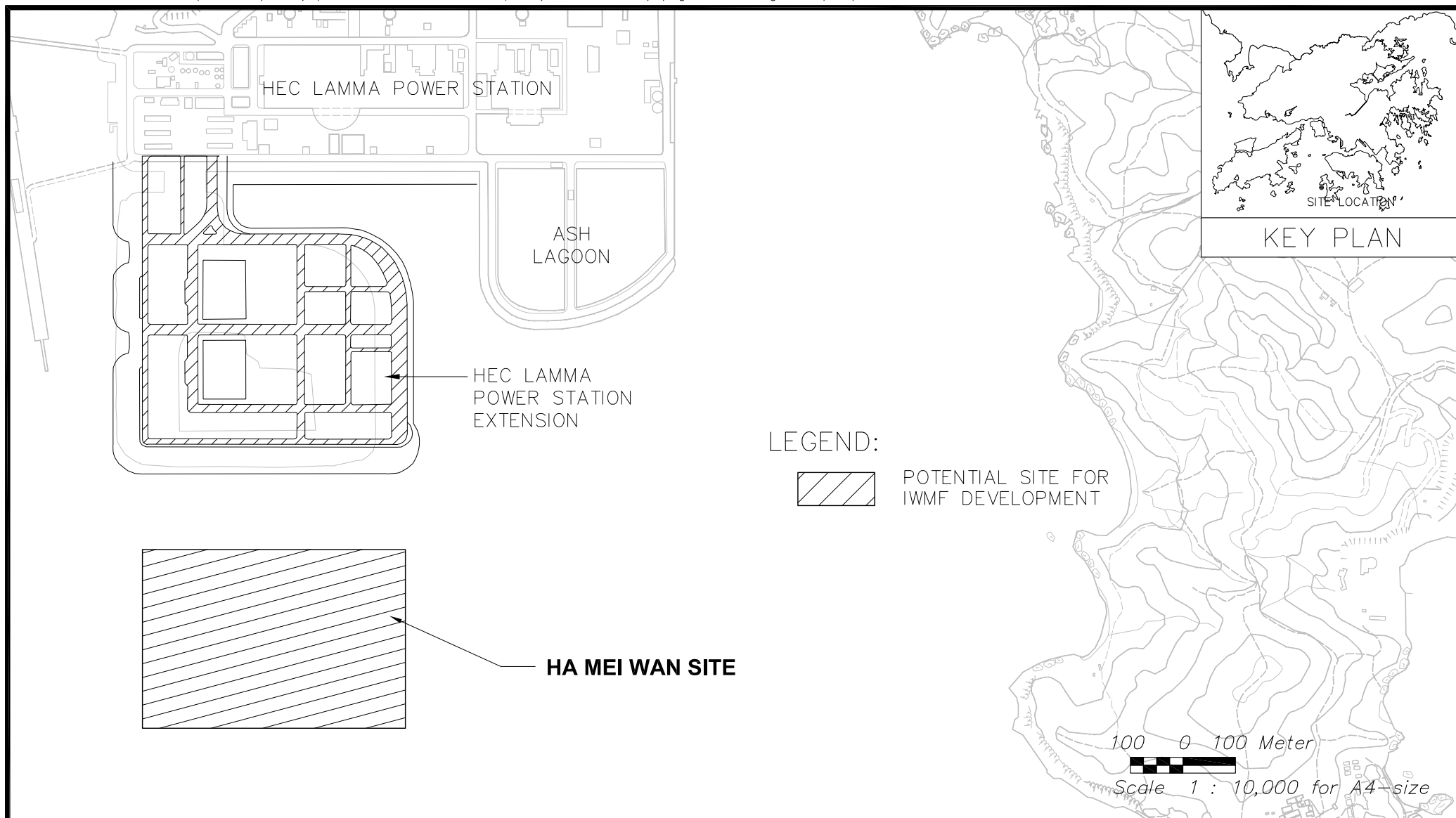


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Figure 2-3

**Location of
Ex-Lamma Quarry, Lamma Island**



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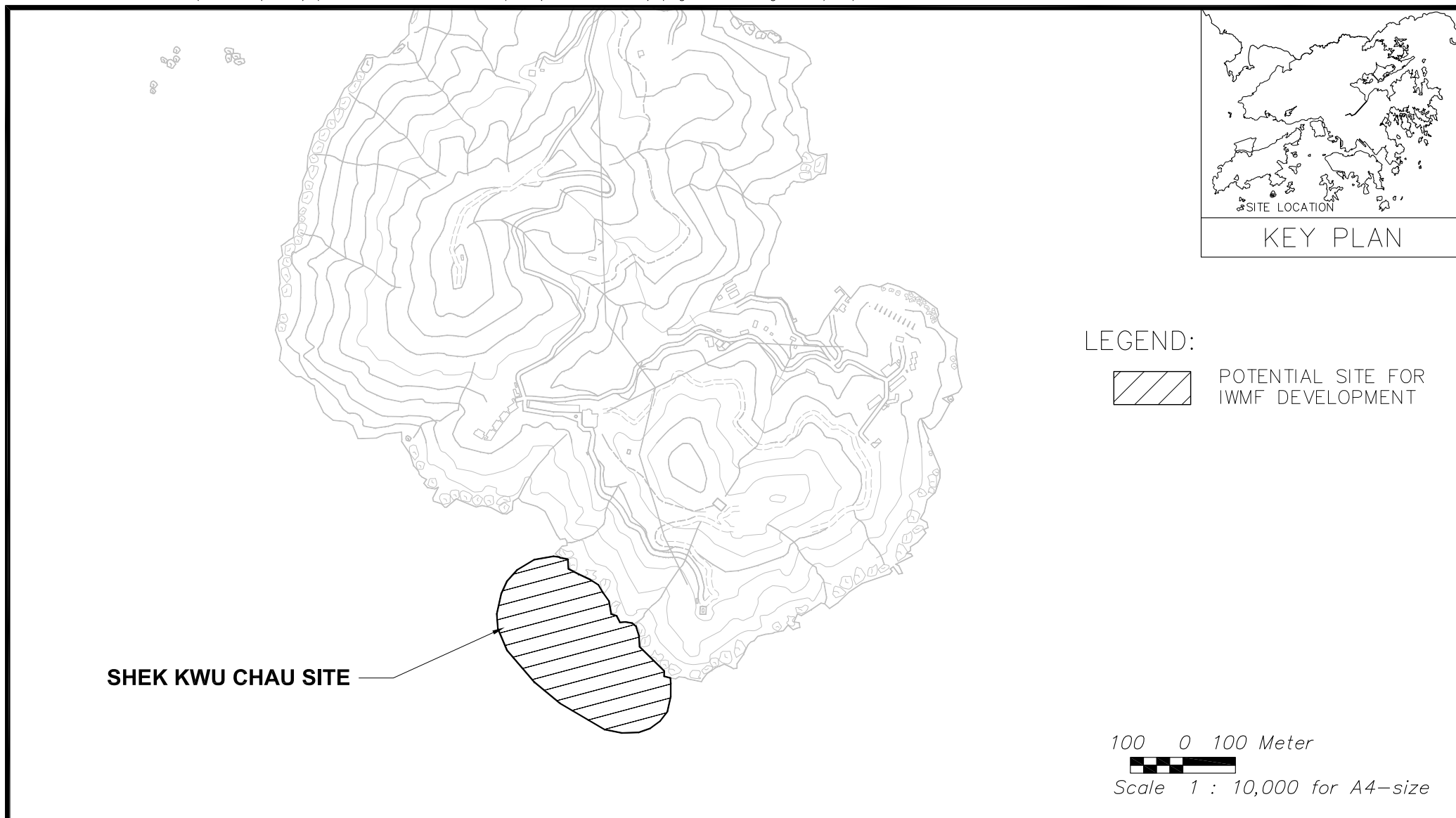


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Figure 2-4

**Location of
Ha Mei Wan, Lamma Island**



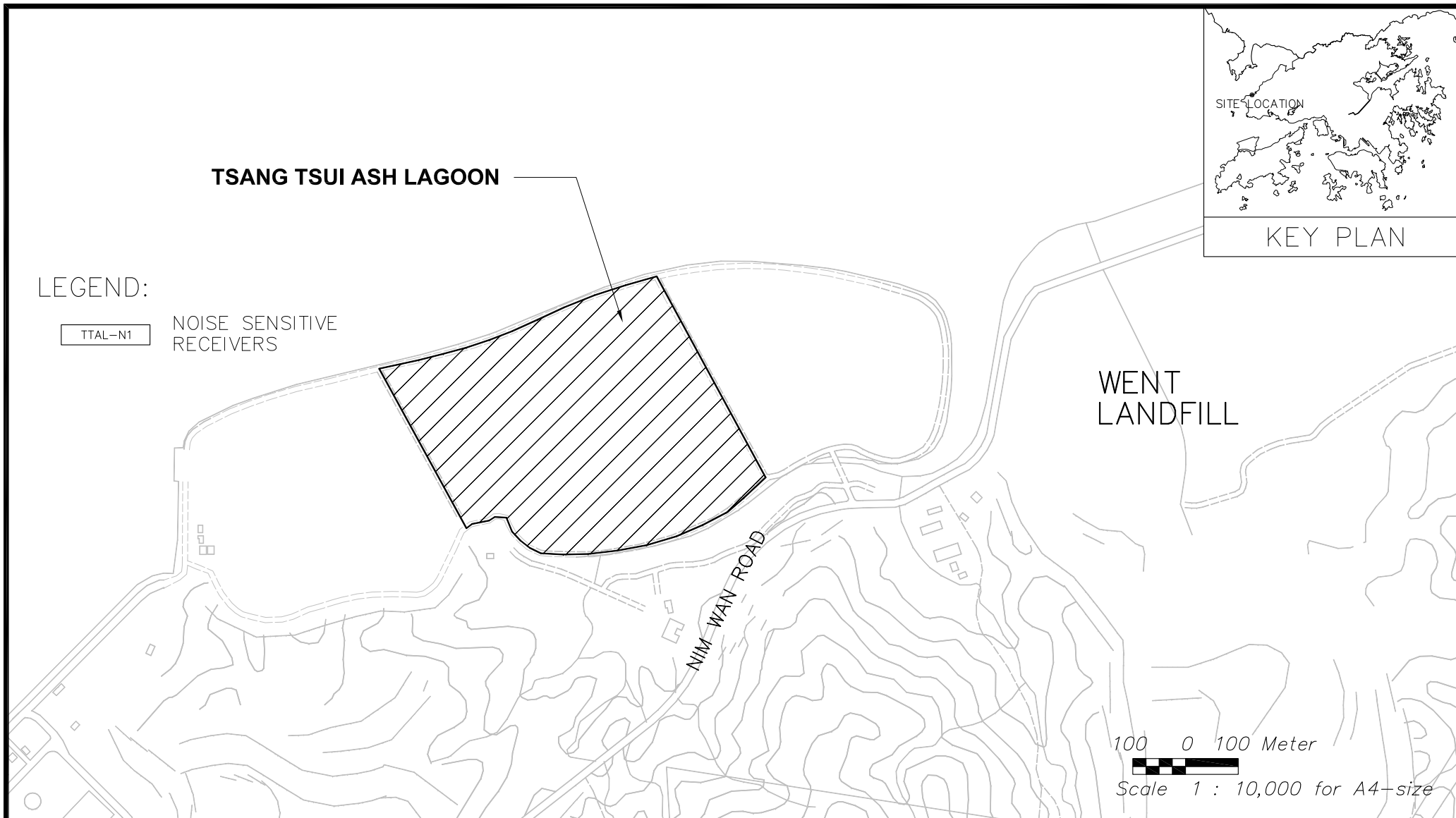
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Figure 2-5
Location of
Shek Kwu Chau



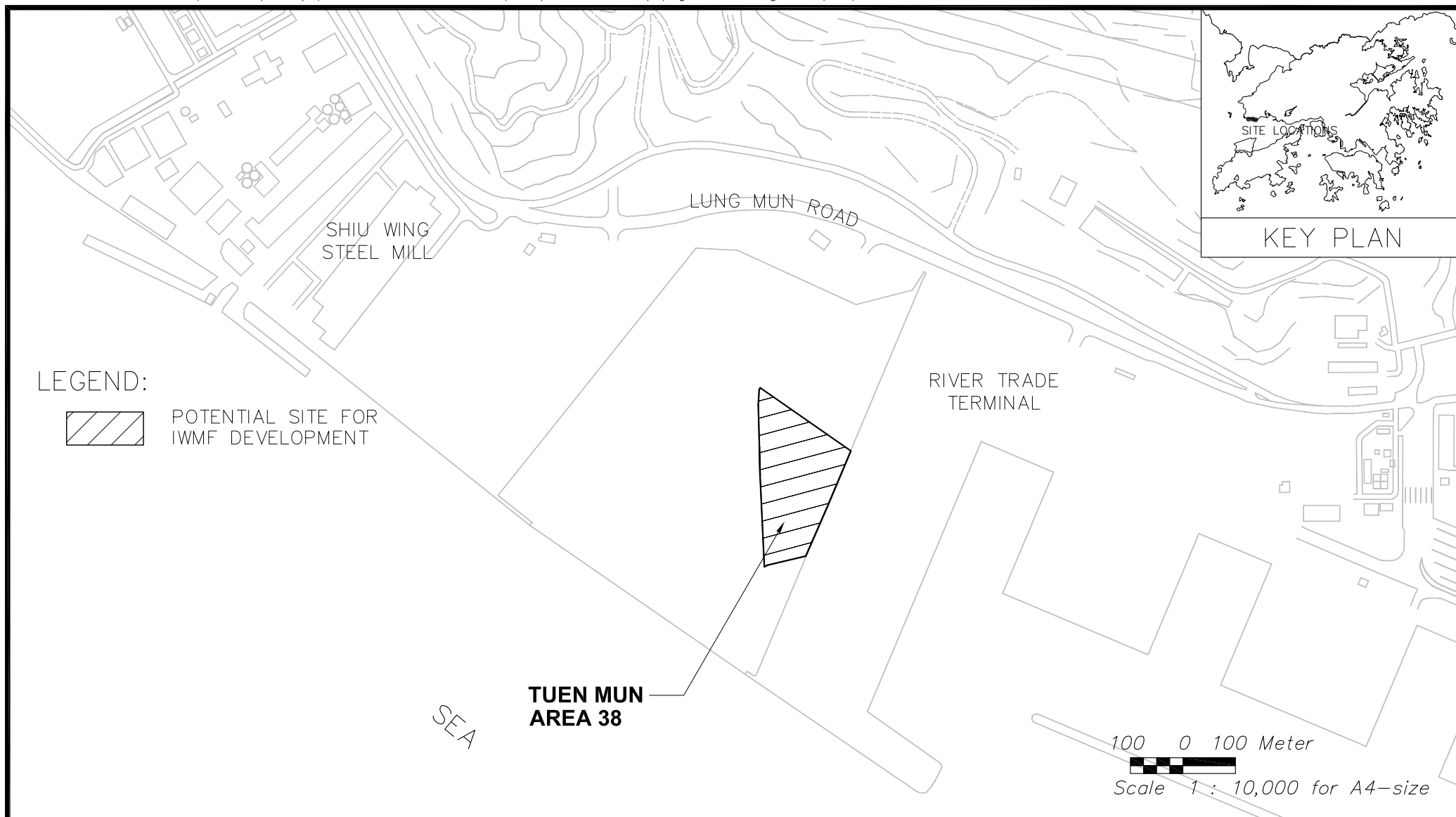
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Figure 2-6
**Location of
Tsang Tsui Ash Lagoon**



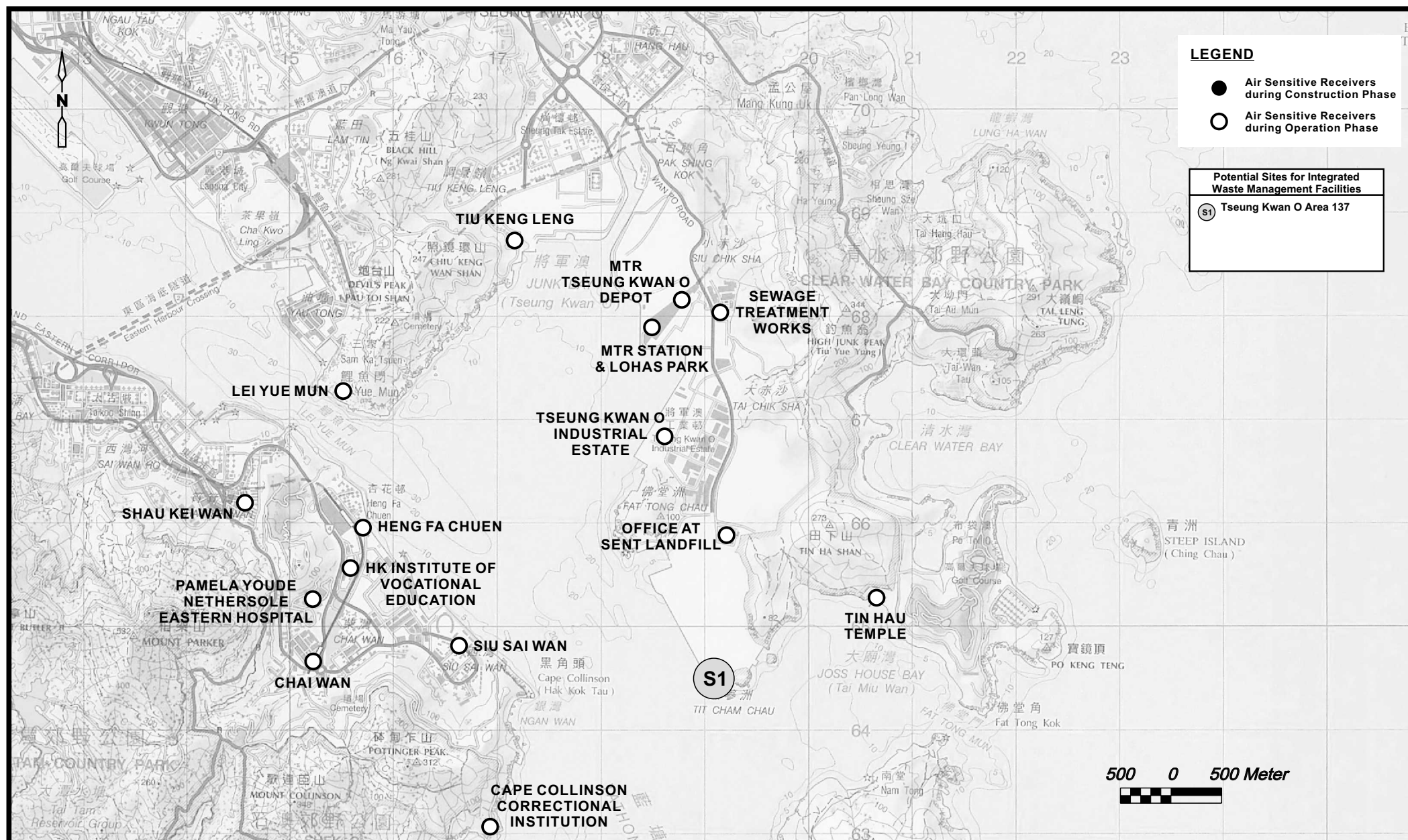
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Figure 2-7
**Location of
Tuen Mun Area 38**



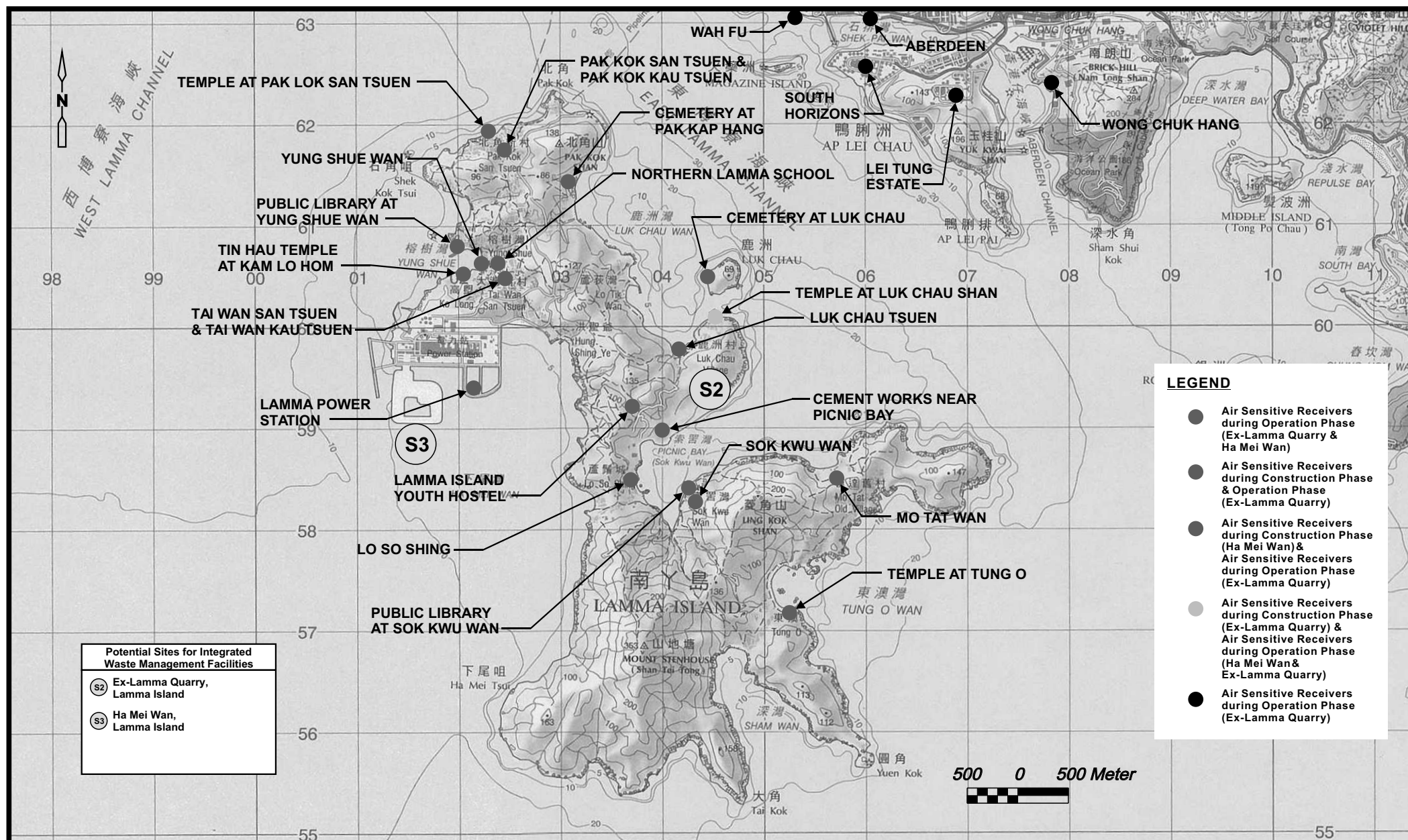
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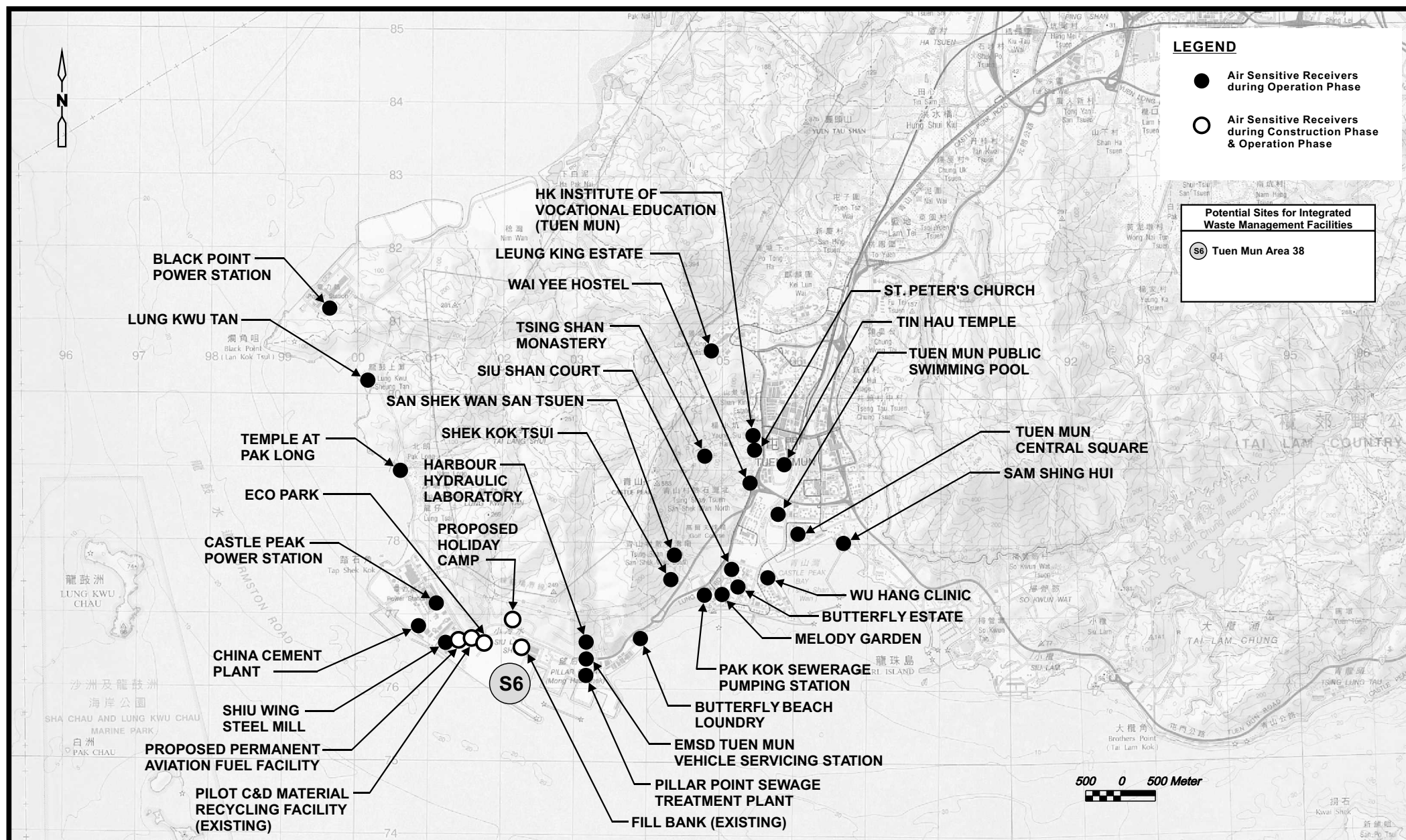


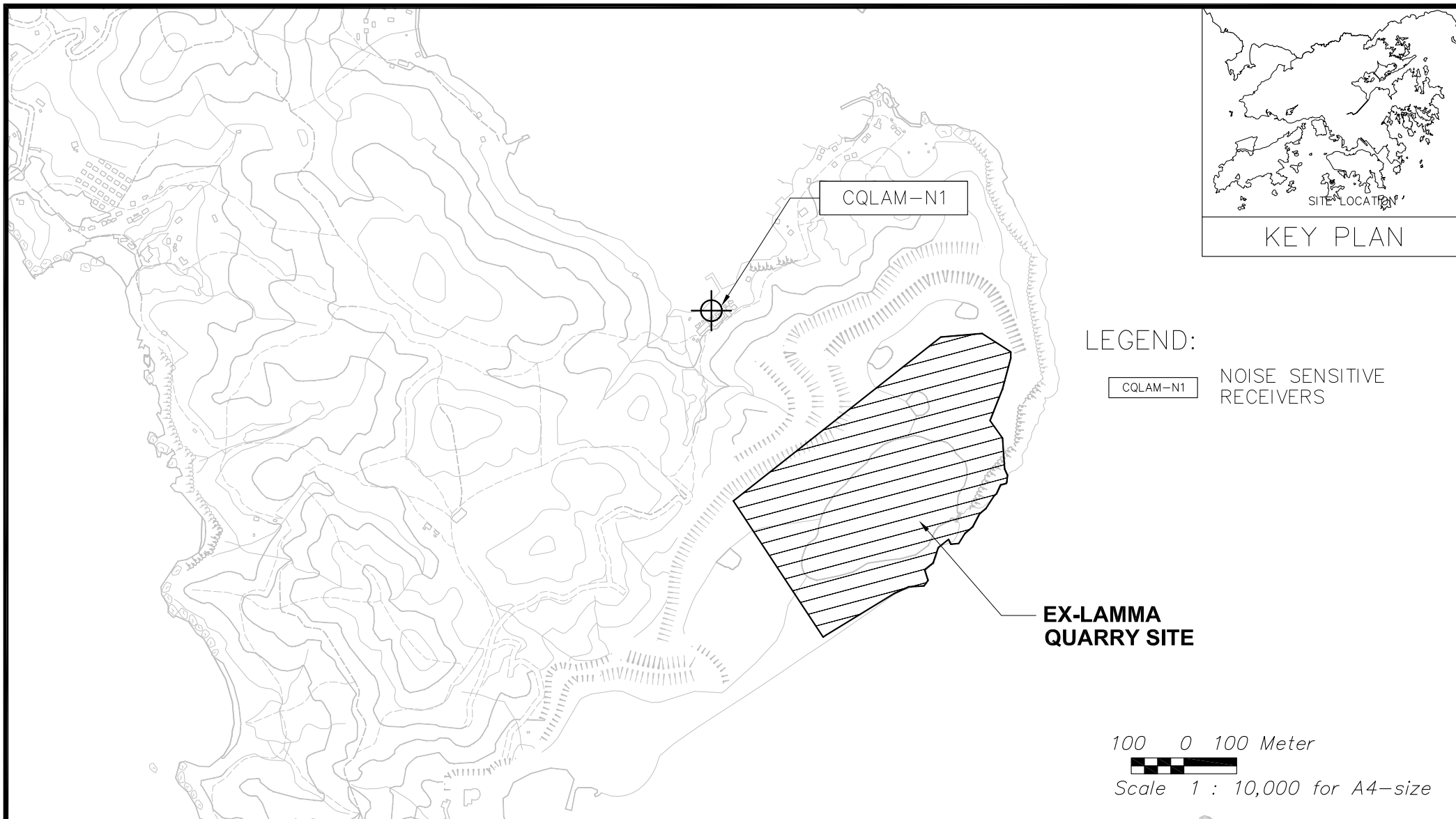
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**Figure 4-1
Air Sensitive Receivers at
Tseung Kwan O Area 137**







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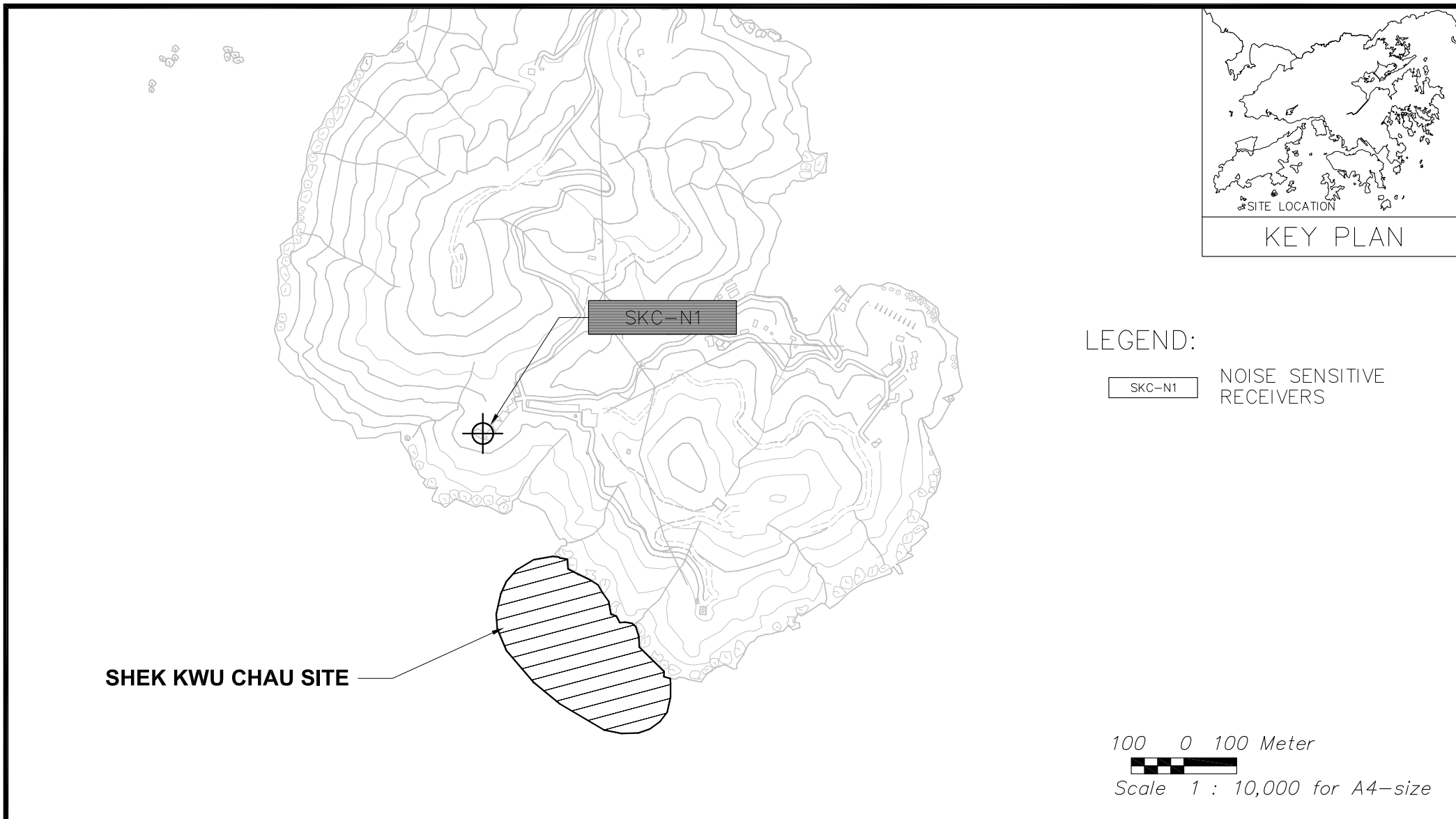


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Figure 4-6

**Noise Sensitive Receivers at
Lamma Island**



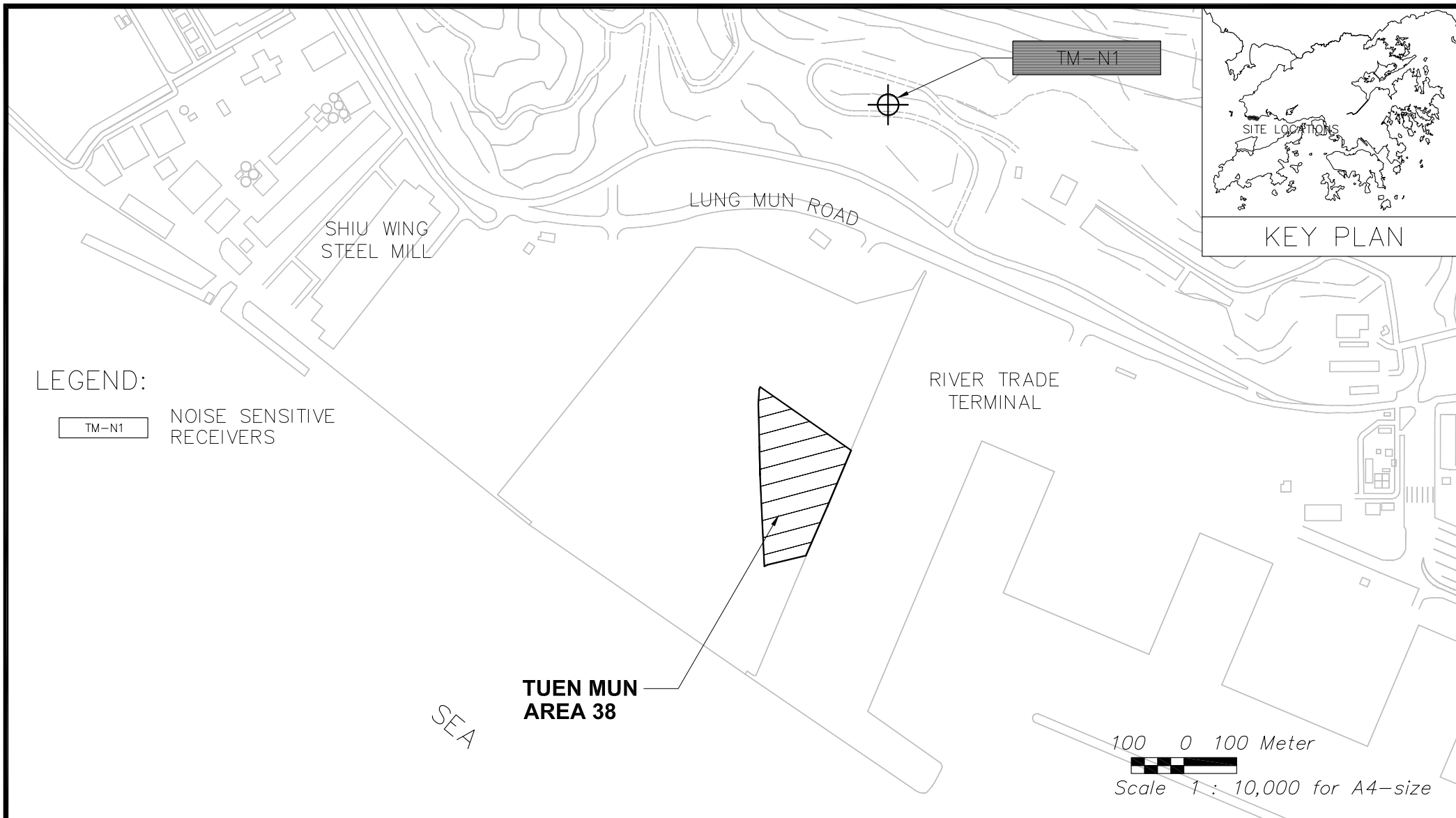
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**Figure 4-7
Noise Sensitive Receivers at
Shek Kwu Chau**



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Figure 4-8

**Noise Sensitive Recivers at
Tuen Mun Area 38**



Figure 4-9 Aerial View of Tseung Kwan O Area 137
(Source: Google Maps)

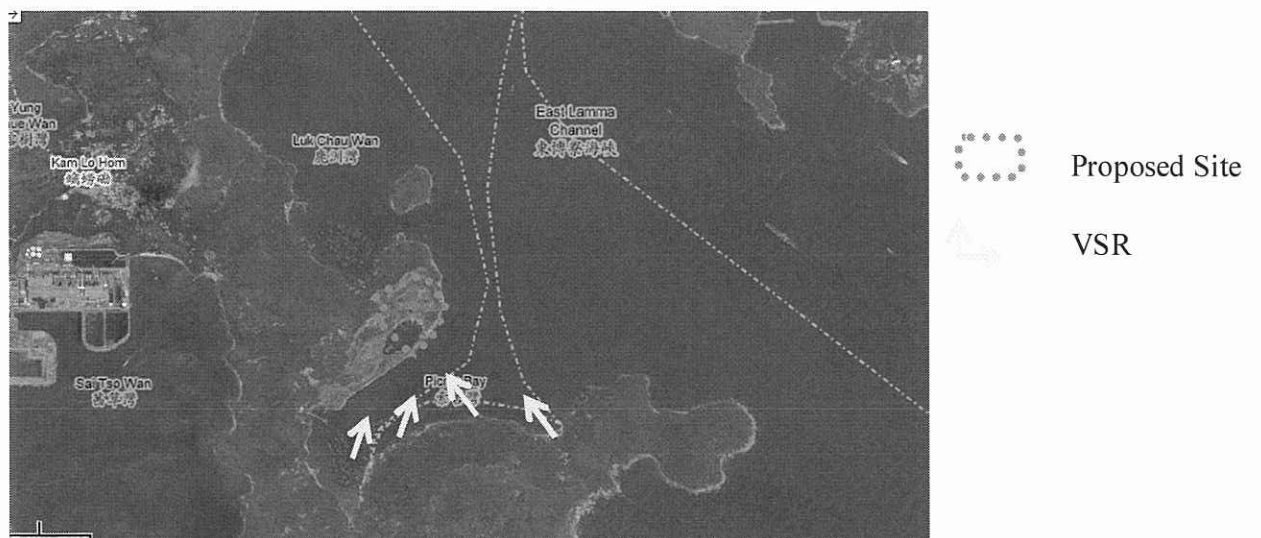


Figure 4-10 Aerial View of Ex-Lamma Quarry, Lamma Island
(Source: Google Maps)

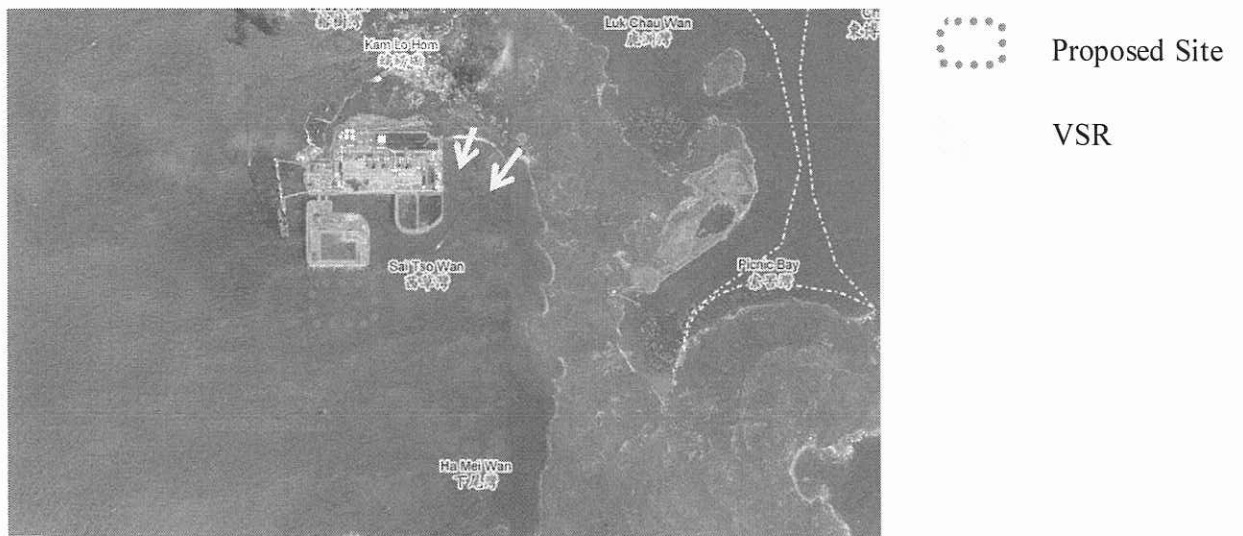


Figure 4-11 Aerial View of Ha Mei Wan, Lamma Island
(Source: Google Maps)

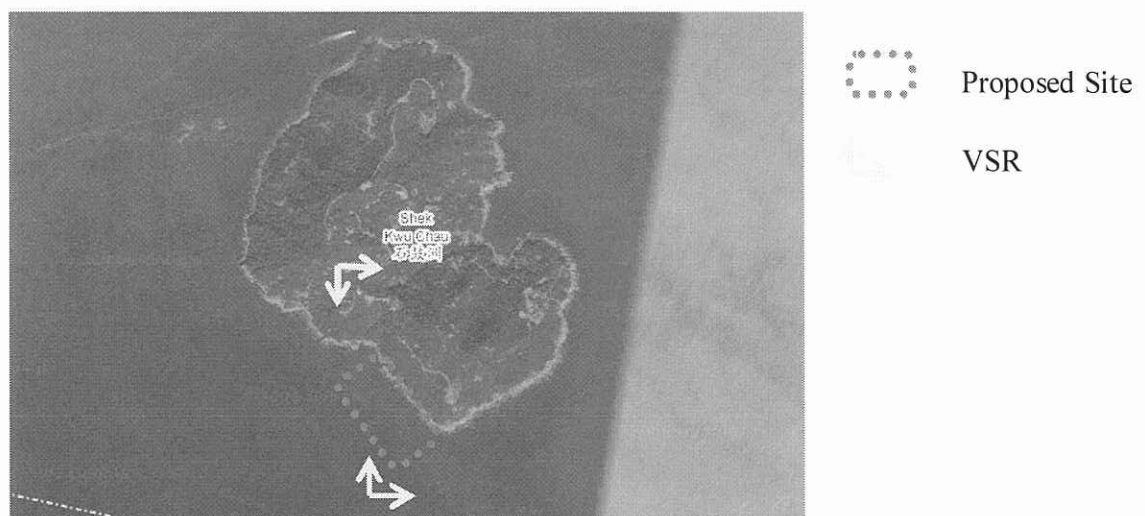


Figure 4-12 Aerial View of Shek Kwu Chau
(Source: Google Maps)



Figure 4-13 Aerial View of Tsang Tsui Ash Lagoons
(Source: Google Maps)

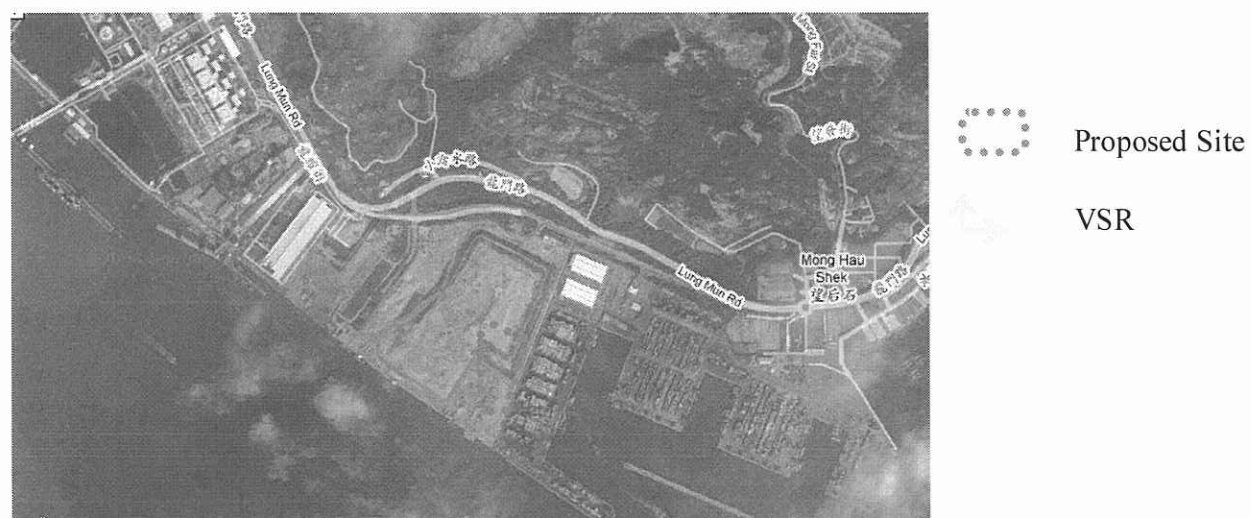
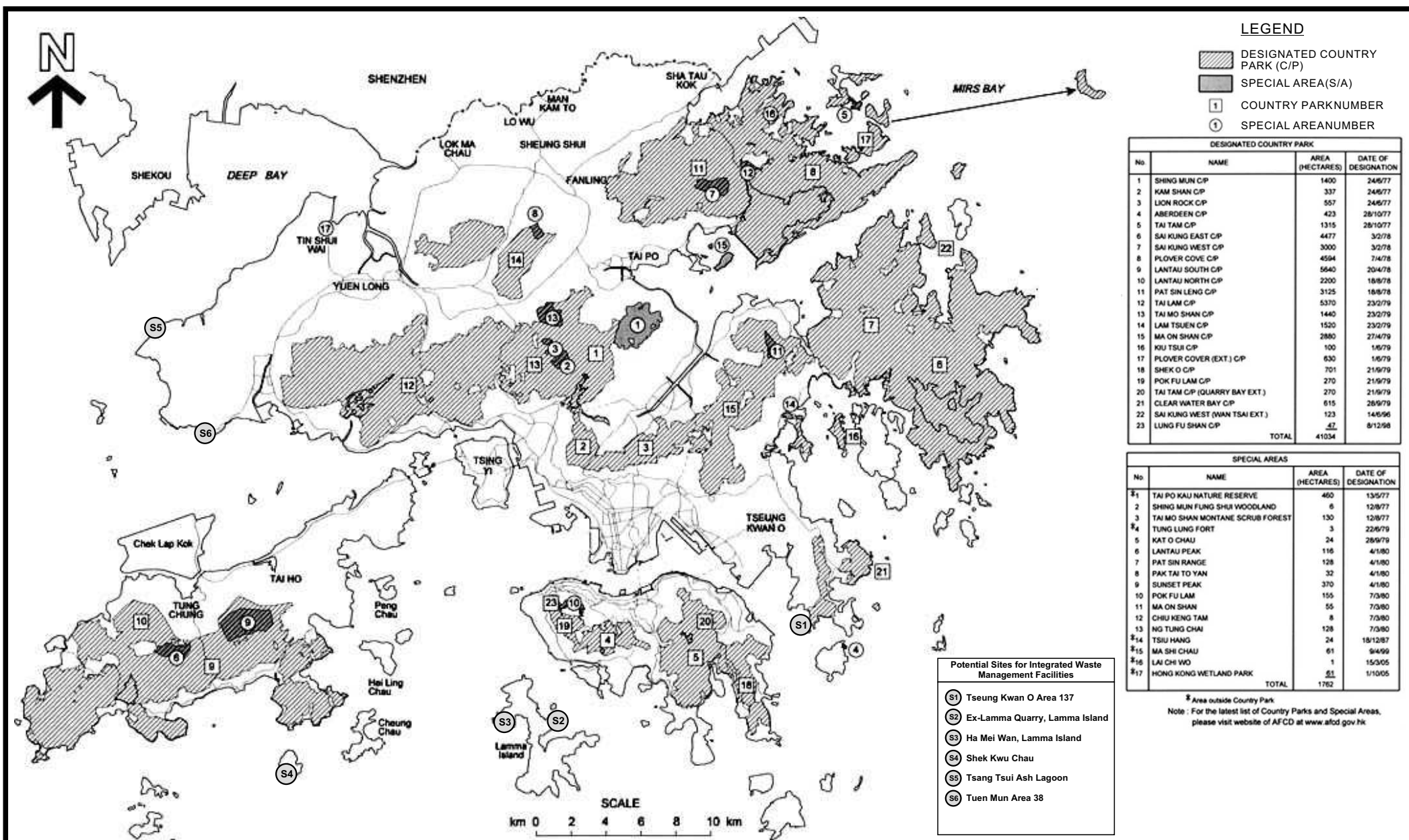
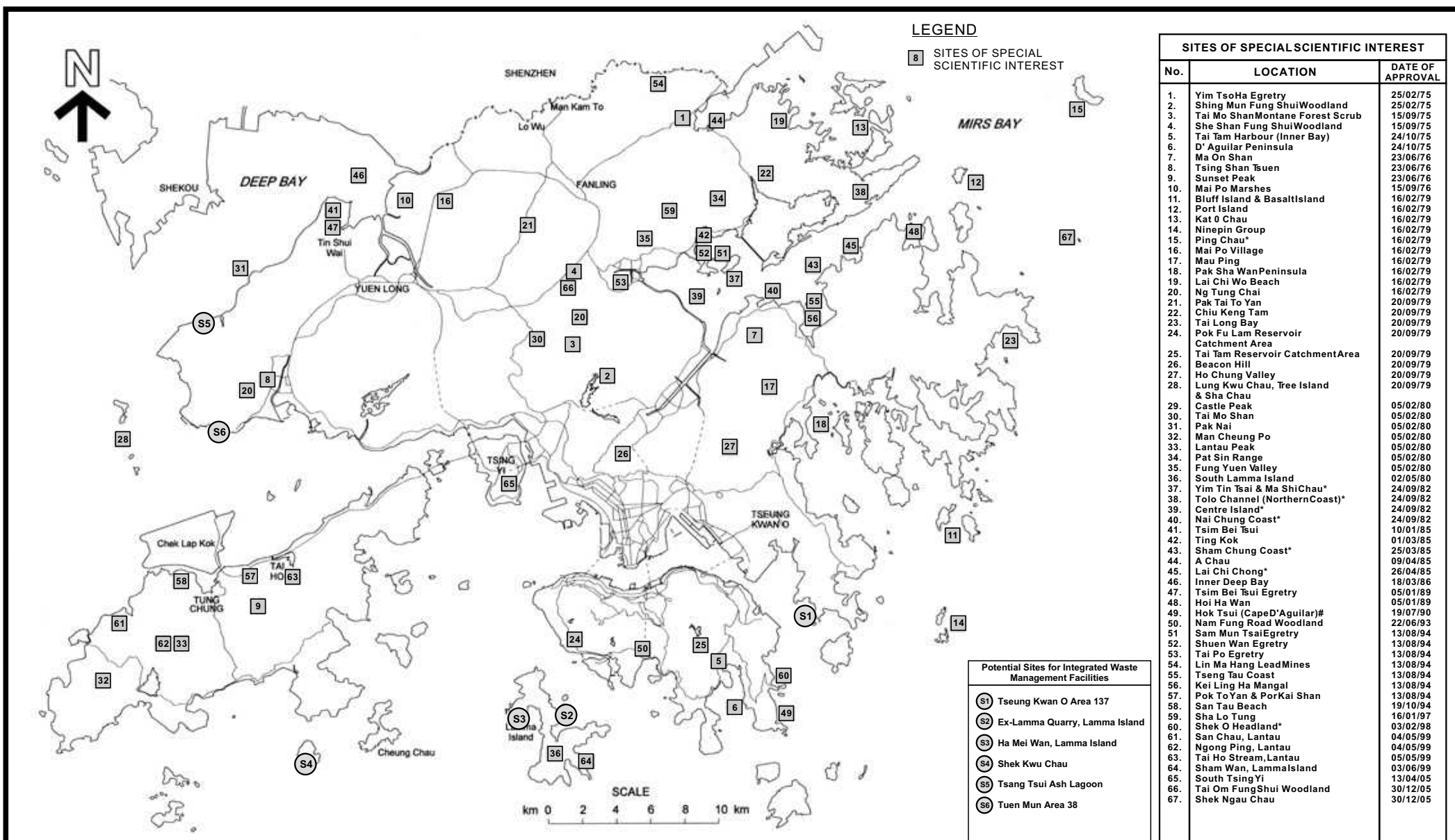
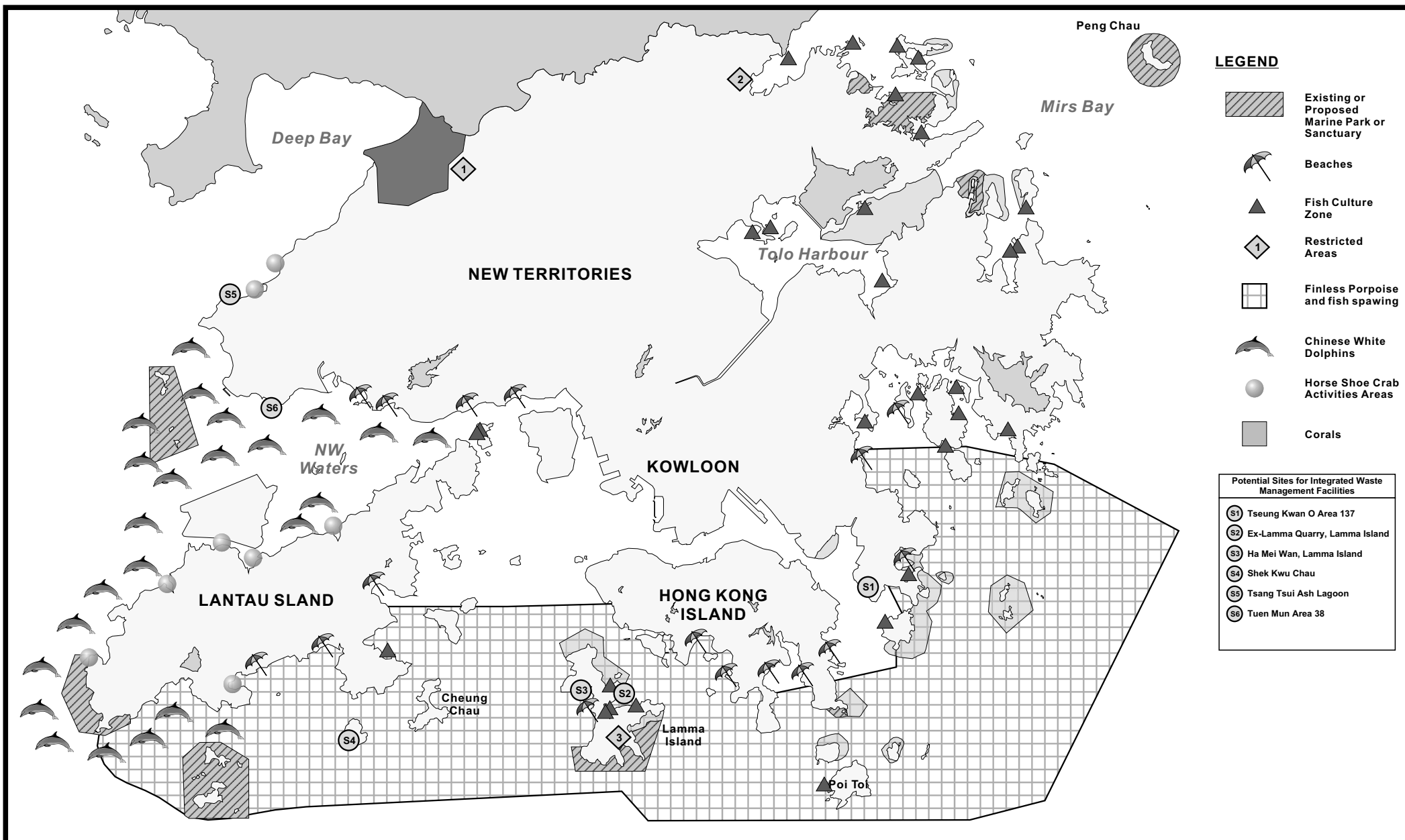
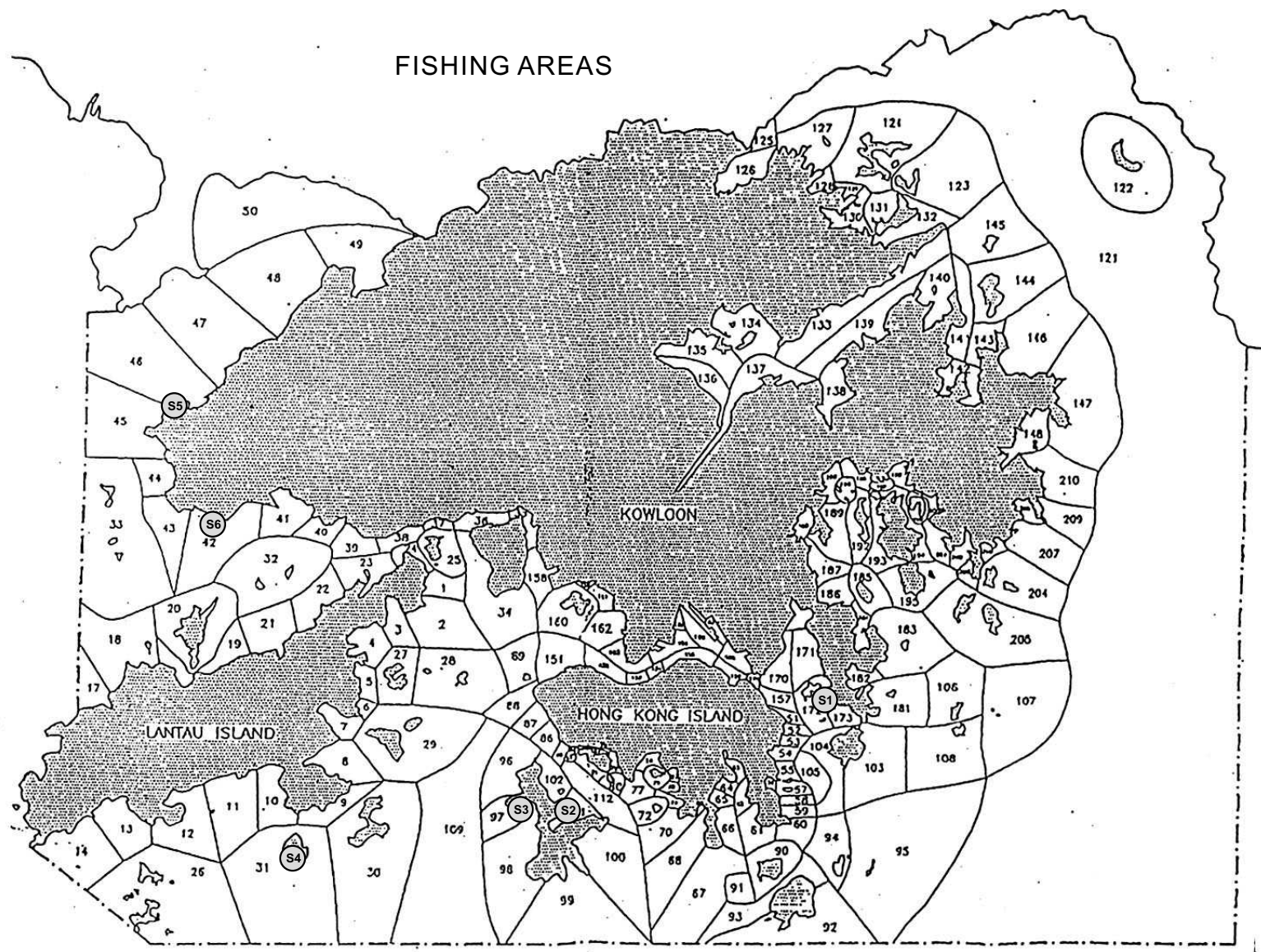


Figure 4-14 Aerial View of Tuen Mun Area 38
(Source: Google Maps)









Potential Sites for Integrated Waste Management Facilities	
(S1)	Tseung Kwan O Area 137
(S2)	Ex-Lamma Quarry, Lamma Island
(S3)	Ha Mei Wan, Lamma Island
(S4)	Shek Kwu Chau
(S5)	Tsang Tsui Ash Lagoon
(S6)	Tuen Mun Area 38

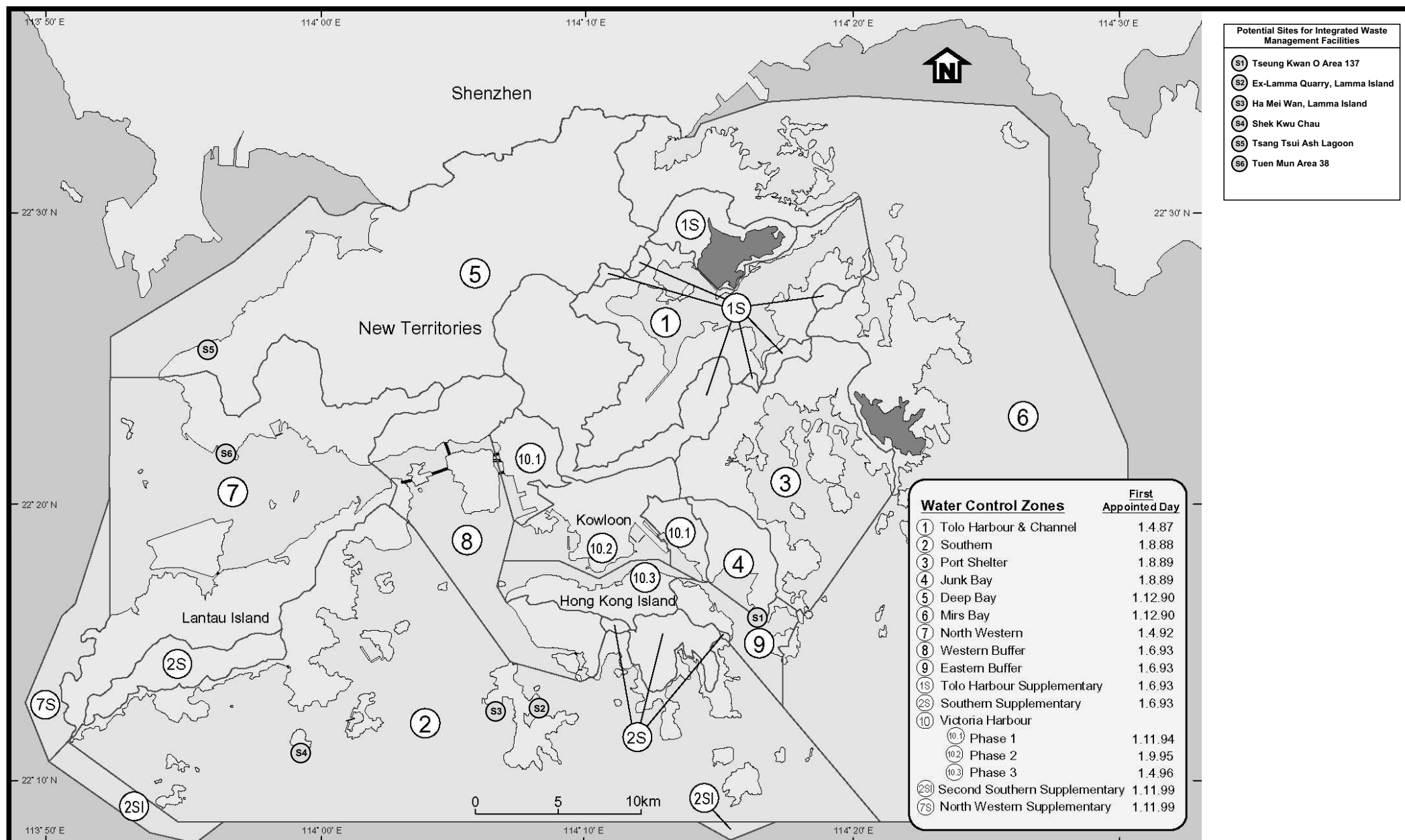
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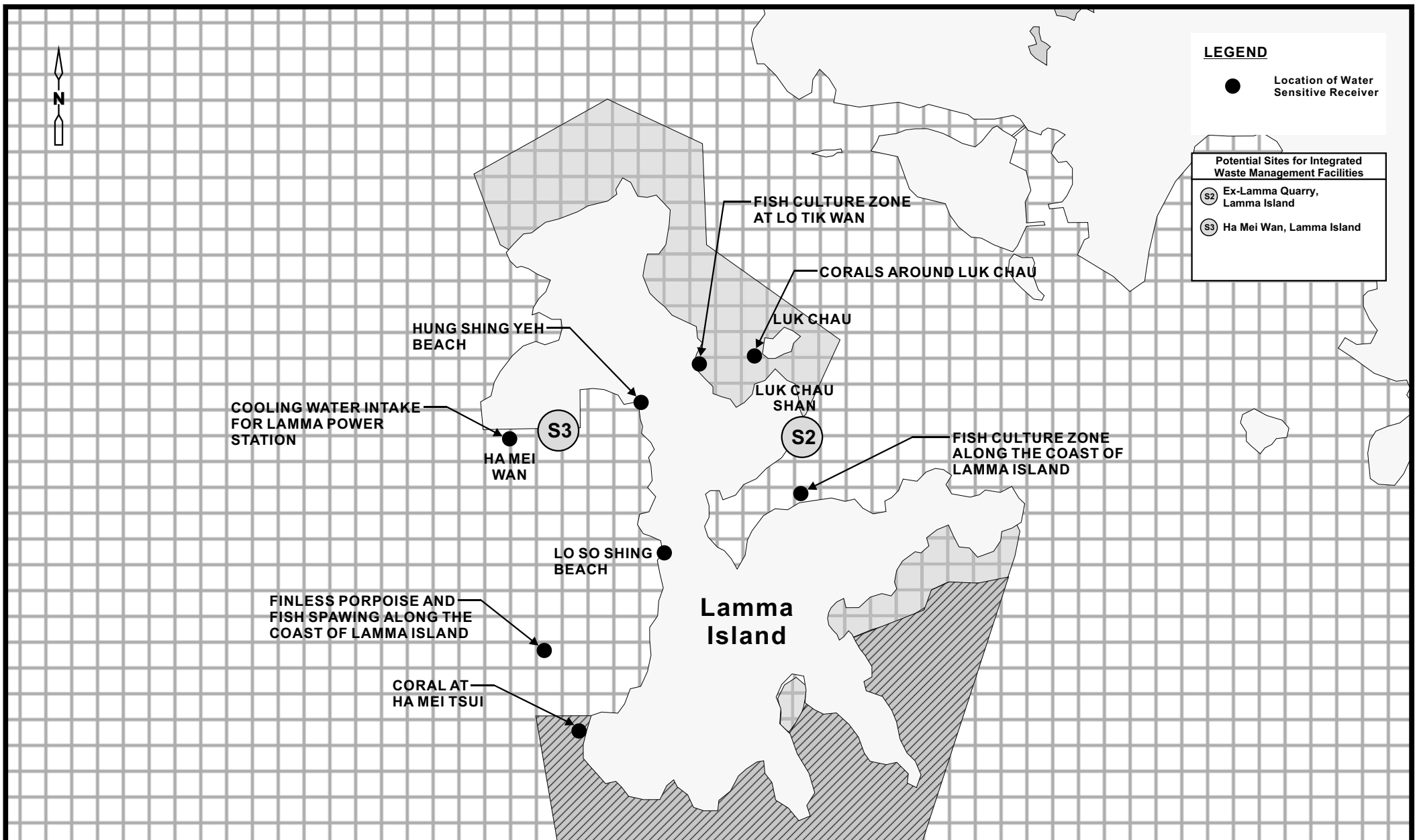


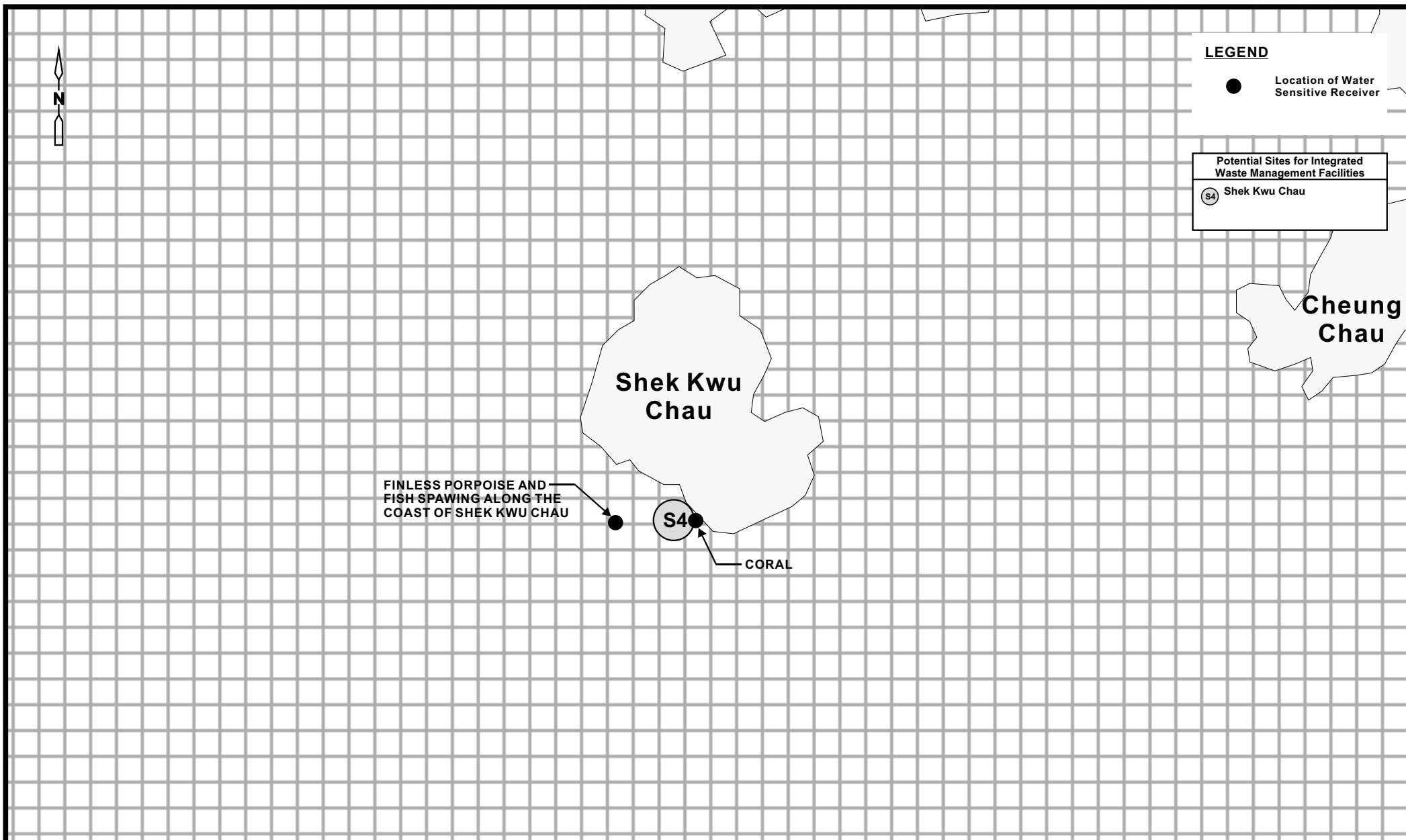
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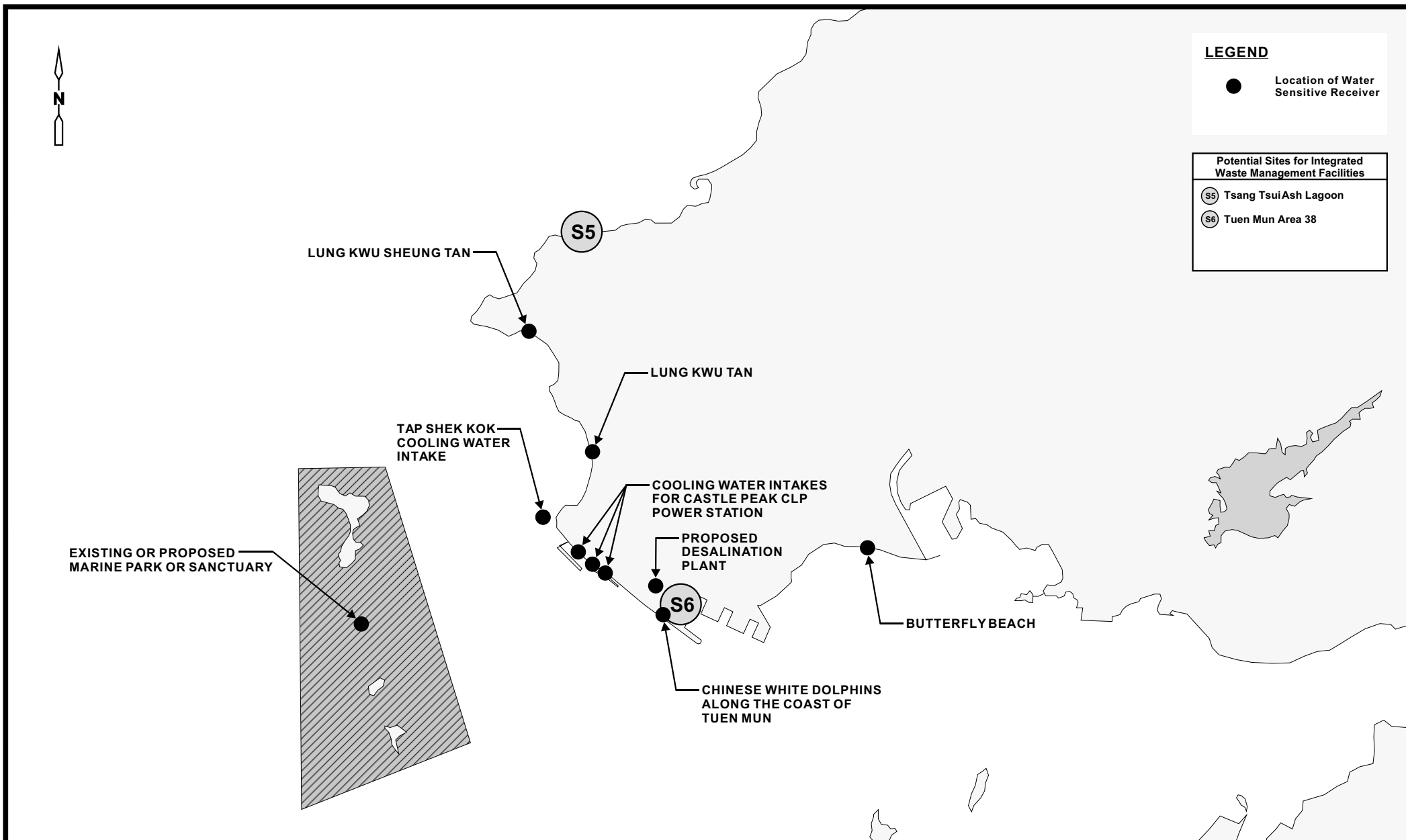
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**Figure 4-18
AFCD Fishing Areas**









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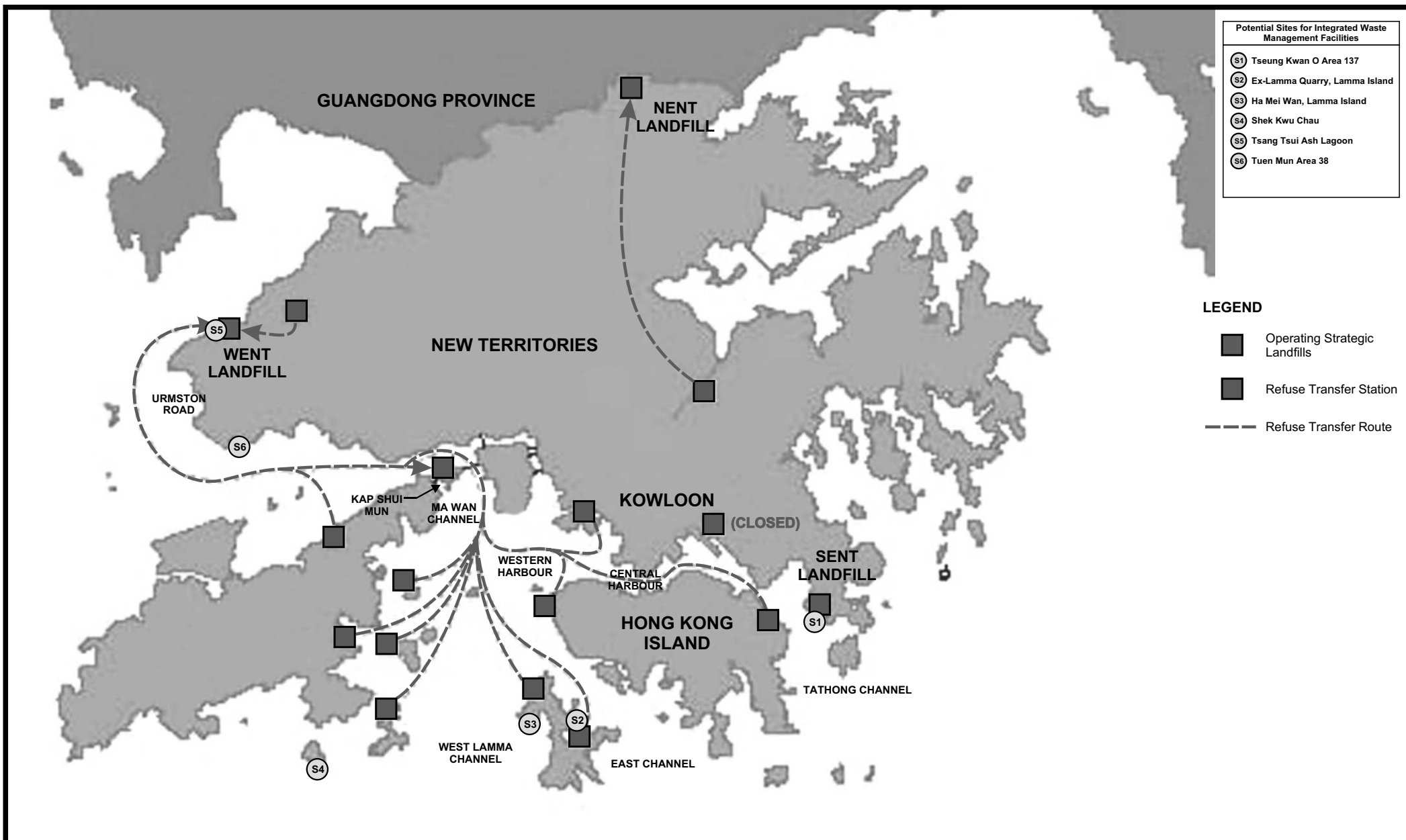


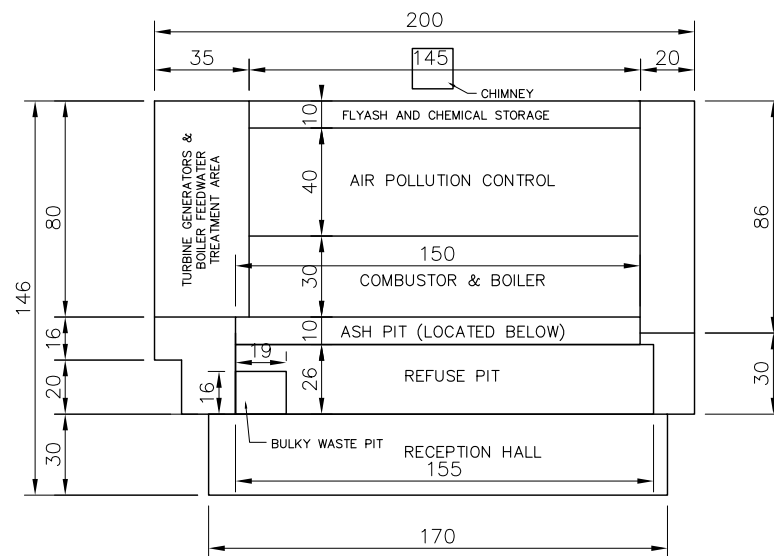
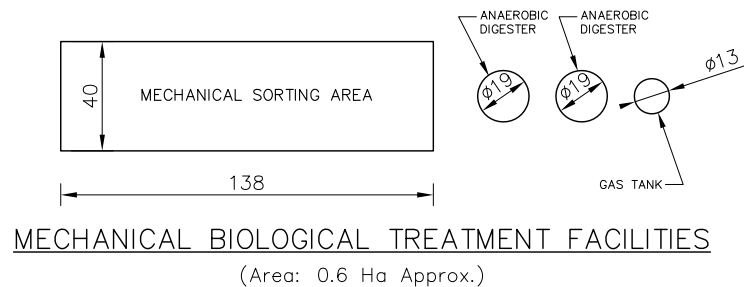
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Figure 4-22
Water Sensitive Receivers at
Tuen Mun Area 38







20 0 20 Meter



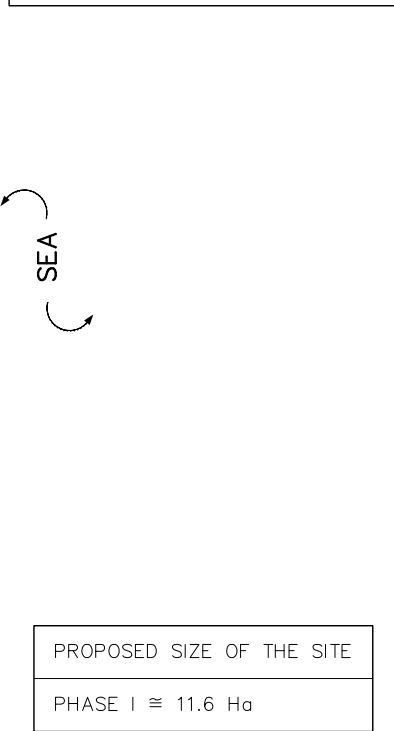
Scale 1 : 2000 for A3-size




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SITE SEARCH FOR INTEGRATED WASTE MANAGEMENT FACILITIES
IN HONG KONG FOR MUNICIPAL SOLID WASTE**

**Figure 10-1
Typical Dimensions of Major Treatment
Components of IWMP**



30 0 30 Meter

 Scale 1 : 3000 for A3-size

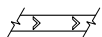
LEGEND:



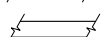
INBOUND TRUCK SCALE



OUTBOUND TRUCK SCALE



RAMP



ONE LANE ROAD



TWO LANE ROAD



PHASE 1

NOTE:

WASHWATER TREATMENT PLANT LOCATED BENEATH RECEPTION HALL
TRUCK WASHING AREA LOCATED BENEATH RECEPTION HALL

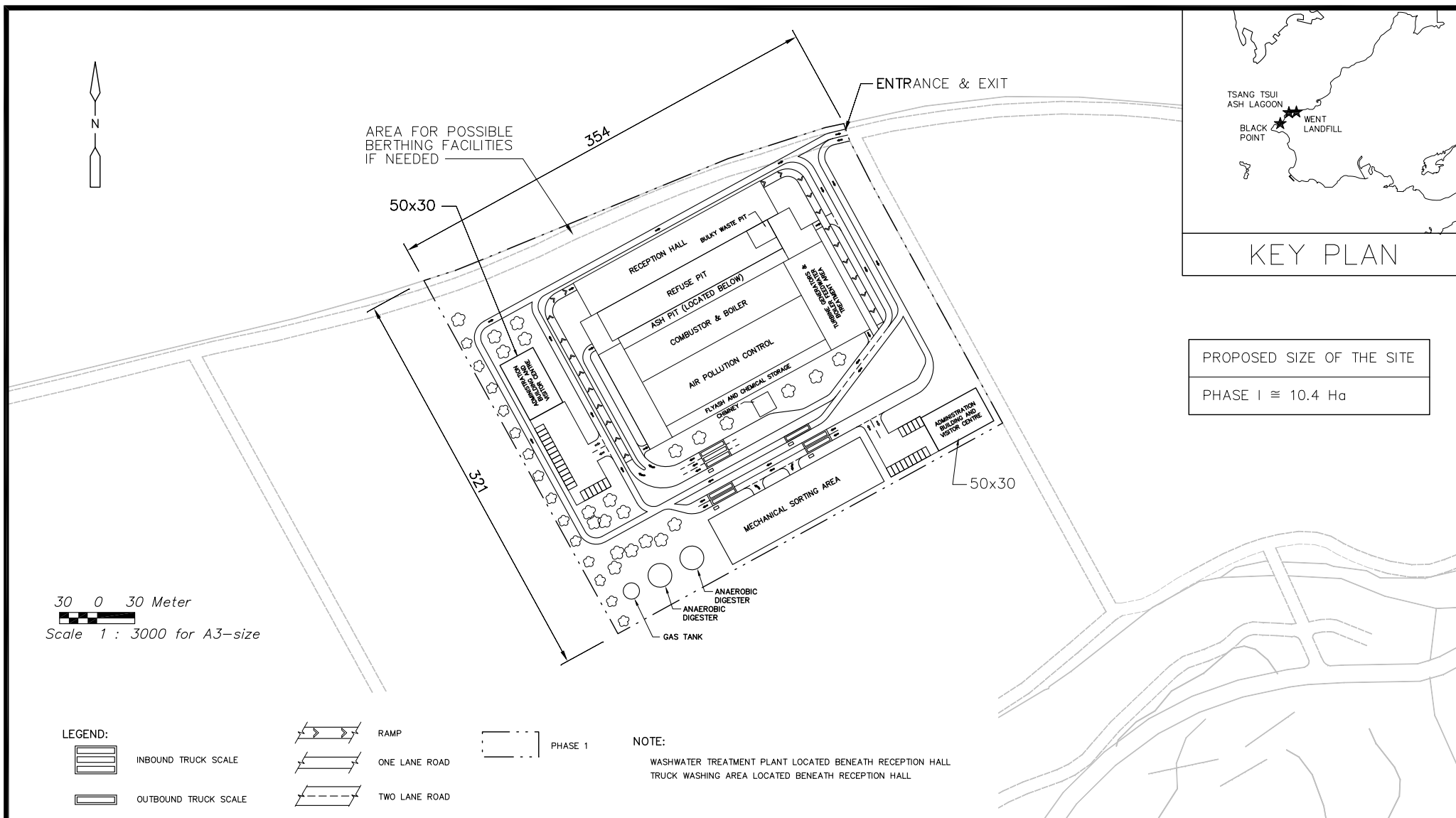
CDM



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Figure 12-1
Conceptual Layout Plan for
Potential IWMF Site at Shek Kwu Chau



CDM



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Figure 12-2
Conceptual Layout Plan for Potential
IWMF Site at Tsang Tsui Ash Lagoons

Appendix A

List of Air Sensitive Receivers

Table A1 - Air Sensitive Receivers during Construction Phase

Location of Potential Sites for IWMF	Air Sensitive Receiver (ASR)		
	ASR Reference No.	Location	Nearest Distance (m)
Tseung Kwan O Area 137	Nil	Nil	Nil
Ex-Lamma Quarry, Lamma Island	ELQ - A1	Luk Chau Tsuen	240
	ELQ - A2	Temple at Luk Chau Shan	480
Ha Mei Wan, Lamma Island	HMW - A1	Lamma Power Station	200
Shek Kwu Chau	SKC - A1	Shek Kwu Chau Treatment and Rehabilitation Centre	140
Tsang Tsui Ash Lagoon	TTSL - A1	Tsang Kok (residential)	500
	TTSL - A2	Planned WENT Landfill Extension 'B'	400
	TTSL - A3	Temple at Tsang Tsui	450
	TTSL - A4	Proposed Sludge Treatment Facility	500
Tuen Mun Area 38	TM - A1	Fill Bank (Existing)	1
	TM - A2	Eco-Park Phase II	100
	TM - A3	Potential Site for 'Holiday Camp'	120
	TM - A4	Pilot C&D Material Recycling Facility (Existing)	210
	TM - A5	Proposed Permanent Aviation Fuel Facility	460

Table A2 - Air Sensitive Receivers during Operation Phase

Location of Potential Sites for IWMF	Air Sensitive Receiver (ASR)		
	ASR Reference No.	Location	Nearest Distance (m)
Tseung Kwan O Area 137	TKO - A1	Office at SENT Landfill	1080
	TKO - A2	Tin Hau Temple at Po Toi O	1710
	TKO - A3	Tseung Kwan O Industrial Estate	1350
	TKO - A4	Siu Sai Wan (residential)	2050
	TKO - A5	Siu Sai Wan (school)	2000
	TKO - A6	Cape Collinson Correctional Institution	2500
	TKO - A7	Tseung Kwan O Sewage Treatment Plant	2950
	TKO - A8	Chai Wan (residential)	3500
	TKO - A9	Heng Fa Chuen (residential)	3500
	TKO - A10	HK Institution of Vocational Education (Chai Wan)	3250
	TKO - A11	Chai Wan (place of worship)	3000
	TKO - A12	Heng Fa Chuen (school)	3500
	TKO - A13	Pamela Youde Nethersole Eastern Hospital	3700
	TKO - A14	MTR Tseung Kwan O Depot	3500
	TKO - A15	Lei Yue Mun (residential)	4250
	TKO - A16	Shau Kei Wan (residential)	4800
	TKO - A17	MTR Station and Lohas Park	3100
	TKO - A18	Tiu Keng Leng	3990
Ex-Lamma Quarry, Lamma Island	ELQ - A1	Luk Chau Tsuen	240
	ELQ - A2	Temple at Luk Chau Shan	480
	ELQ - A3	Cement Works near Picnic Bay	800
	ELQ - A4	Sok Kwu Wan (residential)	640
	ELQ - A5	Lamma Island Youth Hostel	640
	ELQ - A6	Public library at Sok Kwu Wan	800
	ELQ - A7	Cemetery at Luk Chau	840
	ELQ - A8	Lo So Shing (school, residential)	920
	ELQ - A9	Lamma Power Station	1880

Table A2 - Air Sensitive Receivers during Operation Phase

Location of Potential Sites for IWMF	Air Sensitive Receiver (ASR)		
	ASR Reference No.	Location	Nearest Distance (m)
Ex-Lamma Quarry, Lamma Island (Cont'd)	ELQ - A10	Temple at Tung O	2200
	ELQ - A11	Northern Lamma School	2240
	ELQ - A12	Cemetery at Pak Kap Hang	2440
	ELQ - A13	Tin Hau Temple at Kam Lo Hom	2480
	ELQ - A14	Public library at Yung Shue Wan	2840
	ELQ - A15	Temple at Pak Kok San Tsuen	3360
	ELQ - A16	Pak Kok San Tsuen & Pak Kok Kau Tsuen	3080
	ELQ - A17	Mo Tat Wan (residential)	1160
	ELQ - A18	Lei Tung Estate	3210
	ELQ - A19	Tai Wan San Tsuen & Tai Wan Kau Tsuen	1840
	ELQ - A20	Yung Shue Wan (residential)	2200
	ELQ - A21	Wah Fu (residential)	3550
	ELQ - A22	Aberdeen (residential)	3730
	ELQ - A23	Wong Chuk Hang (residential)	4500
	ELQ - A24	South Horizons (Ap Lei Chau)	2990
Ha Mei Wan, Lamma Island	HMW - A1	Lamma Power Station	200
	HMW - A2	Sok Kwu Wan (residential)	2760
	HMW - A3	Tin Hau Temple at Kam Lo Hom	1640
	HMW - A4	Lamma Island Youth Hostel	1880
	HMW - A5	Lo So Shing (school, residential)	1960
	HMW - A6	Cement works near Picnic Bay	1880
	HMW - A7	Northern Lamma School	1840
	HMW - A8	Public library at Yung Shue Wan	2120
	HMW - A9	Public library at Sok Kwu Wan	2640
	HMW - A10	Cemetery at Pak Kap Hang	2840
	HMW - A11	Temple at Luk Chau Shan	3000
	HMW - A12	Temple at Pak Kok San Tsuen	3120

Table A2 - Air Sensitive Receivers during Operation Phase

Location of Potential Sites for IWMF	Air Sensitive Receiver (ASR)		
	ASR Reference No.	Location	Nearest Distance (m)
Ha Mei Wan, Lamma Island (Cont'd)	HMW - A13	Cemetery at Luk Chau	3120
	HMW - A14	Temple at Tung O	3800
	HMW - A15	Pak Kok San Tsuen & Pak Kok Kau Tsuen	3000
	HMW - A16	Mo Tat Wan (residential)	3800
	HMW - A17	Tai Wan San Tsuen & Tai Wan Kau Tsuen	1760
	HMW - A18	Yung Shue Wan (residential)	1840
Shek Kwu Chau	SKC - A1	Shek Kwu Chau Treatment and Rehabilitation Centre	140
	SKC - A2	Chi Ma Wan Peninsula (residential)	2530
	SKC - A3	Cheung Chau (residential)	3330
	SKC - A4	Mong Tung Wan Hostel	3670
	SKC - A5	Cheung Chau (schools)	4000
	SKC - A6	Hung Shing Temple	4270
	SKC - A7	Cheung Chau Municipal Service Building	4330
	SKC - A8	Cheung Chau Sewage Pumping Station	4330
	SKC - A9	Christian Zheng Sheng College	4470
	SKC - A10	Pak Tai Temple	4670
	SKC - A11	St. John Hospital	4730
	SKC - A12	Chi Ma Wan Correctional Institute and Drug Addiction Treatment Centre	4870
	SKC - A13	The Alliance Bible Seminary	4870
	SKC - A14	Warwick Hotel	4930
Tsang Tsui Ash Lagoon	TTSL - A1	Tsang Kok (residential)	500
	TTSL - A2	Planned WENT Landfill Extension 'B'	400
	TTSL - A3	Temple at Tsang Tsui	450
	TTSL - A4	Proposed Sludge Treatment Facility	500
	TTSL - A5	Black Point Power Station	1150
	TTSL - A6	Lung Kwu Tan (residential)	2000
	TTSL - A7	Temple at Pak Long	3250

Table A2 - Air Sensitive Receivers during Operation Phase

Location of Potential Sites for IWMF	Air Sensitive Receiver (ASR)		
	ASR Reference No.	Location	Nearest Distance (m)
Tsang Tsui Ash Lagoon (Cont'd)	TTSL - A8	Villages at Sheung Pak Nai	4250
	TTSL - A9	Ha Tsuen Heung Pak Nai Public School	5000
	TTSL - A10	Castle Peak Power Station	4600
	TTSL - A11	Office at NENT Landfill	1250
	TTSL - A12	Villages at Ha Pak Nai	2150
	TTSL - A13	Leung King Estate	4040
	TTSL - A14	Tsing Shan Monastery	4750
Tuen Mun Area 38	TM - A1	Fill Bank (Existing)	1
	TM - A2	Eco-Park Phase II	100
	TM - A3	Potential Site for 'Holiday Camp'	120
	TM - A4	Pilot C&D Material Recycling Facility (Existing)	210
	TM - A5	Proposed Permanent Aviation Fuel Facility	460
	TM - A6	Harbour Hydraulic Laboratory	650
	TM - A7	EMSD Tuen Mun Vehicle Servicing Station	700
	TM - A8	Shiu Wing Steel Mill	700
	TM - A9	Pillar Point Sewage Treatment Plant	750
	TM - A10	Castle Peak Power Station	1000
	TM - A11	China Cement Plant	820
	TM - A12	Butterfly Beach Laundry	1350
	TM - A13	Lung Kwu Tan (residential)	1650
	TM - A14	Pak Kok Sewage Pumping Station	2250
	TM - A15	Tuen Mun South (schools, residential)	2650
	TM - A16	Melody Garden	2750
	TM - A17	Temple at Pak Long	2600
	TM - A18	Wu Hang Clinic	3200
	TM - A19	Butterfly Estate	3050
	TM - A20	Tsing Shan Monastery	3900

Table A2 - Air Sensitive Receivers during Operation Phase

Location of Potential Sites for IWMF	Air Sensitive Receiver (ASR)		
	ASR Reference No.	Location	Nearest Distance (m)
Tuen Mun Area 38 (Cont'd)	TM - A21	Wai Yee Hostel	3500
	TM - A22	Tuen Mun Public Swimming Pool	3650
	TM - A23	Tuen Mun North (industrial buildings, schools, resi	4250
	TM - A24	Tuen Mun Central Square	3750
	TM - A25	St. Peter's Church	3900
	TM - A26	HK Institute of Vocational Education (Tuen Mun)	4500
	TM - A27	Tin Hau Temple	4100
	TM - A28	Sam Shing Hui	4850
	TM - A29	Black Point Power Station	4900
	TM - A30	Siu Shan Court	3250
	TM - A31	San Shek Wan San Tsuen	3050
	TM - A32	Shek Kok Tsui	2700
	TM - A33	Leung King Estate	4950

Appendix B

Sensitivity Analysis

Table B1 - Baseline Scenario

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	50.00%	0.78	0.73	0.70	1.15	1.18	0.58
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	10.00%	0.18	0.17	0.14	0.15	0.27	0.19
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	10.00%	0.20	0.20	0.20	0.20	0.23	0.20
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	10.00%	0.16	0.16	0.23	0.16	0.20	0.13
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	20.00%	0.20	0.20	0.20	0.40	0.40	0.20
Overall Site Score	100.00%	1.52	1.46	1.47	2.06	2.28	1.30
Site Ranking - Baseline Scenario		3	5	4	2	1	6

Table B2 - Scenario A - Environmental Biased (55%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	55.00%	0.85	0.80	0.77	1.27	1.29	0.63
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	11.25%	0.20	0.19	0.16	0.17	0.30	0.21
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	11.25%	0.23	0.23	0.23	0.23	0.26	0.23
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	11.25%	0.18	0.18	0.26	0.18	0.23	0.15
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	11.25%	0.11	0.11	0.11	0.23	0.23	0.11
Overall Site Score	100.00%	1.57	1.51	1.52	2.06	2.31	1.33
Site Ranking - Baseline Scenario		3	5	4	2	1	6

Table B3 - Scenario B - Technical / Engineering Biased (55%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	11.25%	0.17	0.16	0.16	0.26	0.26	0.13
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	55.00%	0.99	0.94	0.77	0.83	1.49	1.05
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	11.25%	0.23	0.23	0.23	0.23	0.26	0.23
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	11.25%	0.18	0.18	0.26	0.18	0.23	0.15
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	11.25%	0.11	0.11	0.11	0.23	0.23	0.11
Overall Site Score	100.00%	1.68	1.62	1.52	1.71	2.46	1.66
Site Ranking - Baseline Scenario		3	5	6	2	1	4

Table B4 - Scenario C - Economics Biased (55%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	11.25%	0.17	0.16	0.16	0.26	0.26	0.13
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	11.25%	0.20	0.19	0.16	0.17	0.30	0.21
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	55.00%	1.10	1.10	1.10	1.10	1.27	1.10
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	13.75%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	11.25%	0.18	0.18	0.26	0.18	0.23	0.15
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	11.25%	0.11	0.11	0.11	0.23	0.23	0.11
Overall Site Score	100.00%	1.77	1.75	1.79	1.93	2.28	1.70
Site Ranking - Baseline Scenario		4	5	3	2	1	6

Table B5 - Scenario D - Social Biased (55%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	11.25%	0.17	0.16	0.16	0.26	0.26	0.13
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	11.25%	0.20	0.19	0.16	0.17	0.30	0.21
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	11.25%	0.23	0.23	0.23	0.23	0.26	0.23
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	55.00%	0.88	0.88	1.27	0.88	1.10	0.72
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	11.25%	0.11	0.11	0.11	0.23	0.23	0.11
Overall Site Score	100.00%	1.59	1.57	1.92	1.76	2.15	1.40
Site Ranking - Baseline Scenario		4	5	2	3	1	6

Table B6 - Scenario E - Consumer & User Biased (55%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	11.25%	0.17	0.16	0.16	0.26	0.26	0.13
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	11.25%	0.20	0.19	0.16	0.17	0.30	0.21
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	11.25%	0.23	0.23	0.23	0.23	0.26	0.23
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	11.25%	0.18	0.18	0.26	0.18	0.23	0.15
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	55.00%	0.55	0.55	0.55	1.10	1.10	0.55
Overall Site Score	100.00%	1.33	1.31	1.35	1.93	2.15	1.26
Site Ranking - Baseline Scenario		4	5	3	2	1	6

Table B7 - Scenario A - Environmental Biased (60%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	60.00%	0.93	0.87	0.84	1.38	1.41	0.69
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	10.00%	0.18	0.17	0.14	0.15	0.27	0.19
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	10.00%	0.20	0.20	0.20	0.20	0.23	0.20
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	10.00%	0.16	0.16	0.23	0.16	0.20	0.13
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	10.00%	0.10	0.10	0.10	0.20	0.20	0.10
Overall Site Score	100.00%	1.57	1.50	1.51	2.09	2.31	1.31
Site Ranking - Baseline Scenario		3	5	4	2	1	6

Table B8 - Scenario B - Technical / Engineering Biased (60%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	10.00%	0.16	0.15	0.14	0.23	0.24	0.12
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	60.00%	1.08	1.02	0.84	0.90	1.62	1.14
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	10.00%	0.20	0.20	0.20	0.20	0.23	0.20
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	10.00%	0.16	0.16	0.23	0.16	0.20	0.13
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	10.00%	0.10	0.10	0.10	0.20	0.20	0.10
Overall Site Score	100.00%	1.70	1.63	1.51	1.69	2.49	1.69
Site Ranking - Baseline Scenario		2	5	6	3	1	3

Table B9 - Scenario C - Economics Biased (60%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	10.00%	0.16	0.15	0.14	0.23	0.24	0.12
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	10.00%	0.18	0.17	0.14	0.15	0.27	0.19
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	60.00%	1.20	1.20	1.20	1.20	1.38	1.20
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	10.00%	0.16	0.16	0.23	0.16	0.20	0.13
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	10.00%	0.10	0.10	0.10	0.20	0.20	0.10
Overall Site Score	100.00%	1.80	1.78	1.81	1.94	2.29	1.74
Site Ranking - Baseline Scenario		4	5	3	2	1	6

Table B10 - Scenario D - Social Biased (60%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	10.00%	0.16	0.15	0.14	0.23	0.24	0.12
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	10.00%	0.18	0.17	0.14	0.15	0.27	0.19
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	10.00%	0.20	0.20	0.20	0.20	0.23	0.20
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	60.00%	0.96	0.96	1.38	0.96	1.20	0.78
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	10.00%	0.10	0.10	0.10	0.20	0.20	0.10
Overall Site Score	100.00%	1.60	1.58	1.96	1.74	2.14	1.39
Site Ranking - Baseline Scenario		4	5	2	3	1	6

Table B11 - Scenario E - Consumer & User Biased (60%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	10.00%	0.16	0.15	0.14	0.23	0.24	0.12
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	10.00%	0.18	0.17	0.14	0.15	0.27	0.19
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	10.00%	0.20	0.20	0.20	0.20	0.23	0.20
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	10.00%	0.16	0.16	0.23	0.16	0.20	0.13
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	60.00%	0.60	0.60	0.60	1.20	1.20	0.60
Overall Site Score	100.00%	1.30	1.28	1.31	1.94	2.14	1.24
Site Ranking - Baseline Scenario		4	5	3	2	1	6

Table B12 - Scenario A - Environmental Biased (65%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	65.00%	1.01	0.94	0.91	1.50	1.53	0.75
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	8.75%	0.16	0.15	0.12	0.13	0.24	0.17
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	8.75%	0.18	0.18	0.18	0.18	0.20	0.18
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	8.75%	0.14	0.14	0.20	0.14	0.18	0.11
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	8.75%	0.09	0.09	0.09	0.18	0.18	0.09
Overall Site Score	100.00%	1.57	1.49	1.50	2.12	2.32	1.29
Site Ranking - Baseline Scenario		3	5	4	2	1	6

Table B13 - Scenario B - Technical / Engineering Biased (65%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	8.75%	0.14	0.13	0.12	0.20	0.21	0.10
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	65.00%	1.17	1.11	0.91	0.98	1.76	1.24
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	8.75%	0.18	0.18	0.18	0.18	0.20	0.18
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	8.75%	0.14	0.14	0.20	0.14	0.18	0.11
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	8.75%	0.09	0.09	0.09	0.18	0.18	0.09
Overall Site Score	100.00%	1.71	1.63	1.50	1.67	2.51	1.71
Site Ranking - Baseline Scenario		2	5	6	4	1	2

Table B14 - Scenario C - Economics Biased (65%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	8.75%	0.14	0.13	0.12	0.20	0.21	0.10
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	8.75%	0.16	0.15	0.12	0.13	0.24	0.17
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	65.00%	1.30	1.30	1.30	1.30	1.50	1.30
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	8.75%	0.14	0.14	0.20	0.14	0.18	0.11
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	8.75%	0.09	0.09	0.09	0.18	0.18	0.09
Overall Site Score	100.00%	1.82	1.80	1.83	1.95	2.29	1.77
Site Ranking - Baseline Scenario		4	5	3	2	1	6

Table B15 - Scenario D - Social Biased (65%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	8.75%	0.14	0.13	0.12	0.20	0.21	0.10
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	8.75%	0.16	0.15	0.12	0.13	0.24	0.17
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	8.75%	0.18	0.18	0.18	0.18	0.20	0.18
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	65.00%	1.04	1.04	1.50	1.04	1.30	0.85
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	8.75%	0.09	0.09	0.09	0.18	0.18	0.09
Overall Site Score	100.00%	1.60	1.58	2.00	1.72	2.12	1.37
Site Ranking - Baseline Scenario		4	5	2	3	1	6

Table B16 - Scenario E - Consumer & User Biased (65%)

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	8.75%	0.14	0.13	0.12	0.20	0.21	0.10
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	8.75%	0.16	0.15	0.12	0.13	0.24	0.17
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	8.75%	0.18	0.18	0.18	0.18	0.20	0.18
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	8.75%	0.14	0.14	0.20	0.14	0.18	0.11
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	65.00%	0.65	0.65	0.65	1.30	1.30	0.65
Overall Site Score	100.00%	1.26	1.24	1.27	1.95	2.12	1.21
Site Ranking - Baseline Scenario		4	5	3	2	1	6

Table B17 - Equal Weighting Scenario F

Criteria	Detailed Weighting	Score					
		Tseung Kwan O Area 137	Ex-Lamma Quarry, Lamma Island	Ha Mei Wan, Lamma Island	Shek Kwu Chau	Tsang Tsui Ash Lagoons	Tuen Mun Area 38
Environmental							
Air	40.00%	1	1	1	3	2	0
Noise	10.00%	3	3	3	2	3	3
Visual	10.00%	1	1	1	2	3	1
Ecology	10.00%	3	2	3	1	2	3
Water	15.00%	2	2	1	1	2	2
Hazard	15.00%	1	1	1	3	3	1
Weighted Score	100.00%	1.55	1.45	1.40	2.30	2.35	1.15
Ranking		3	4	5	2	1	6
Basic Criterion Weighting and Score	20.00%	0.31	0.29	0.28	0.46	0.47	0.23
Technical / Engineering							
Ease of Integration	30.00%	1	1	1	1	3	2
Site Access	20.00%	3	2	2	2	3	2
Constraints to Site Layout	10.00%	1	2	2	2	3	1
Utilities	10.00%	2	2	1	1	2	2
Construction Duration	10.00%	2	2	1	1	2	2
Construction Risk	10.00%	3	3	2	2	2	3
Operational Risk	10.00%	1	1	1	2	3	1
Weighted Score	100.00%	1.80	1.70	1.40	1.50	2.70	1.90
Ranking		3	4	6	5	1	2
Basic Criterion Weighting and Score	20.00%	0.36	0.34	0.28	0.30	0.54	0.38
Economics							
Capital Cost	30.00%	2	2	1	1	3	2
Operating Cost	40.00%	2	2	2	2	2	2
Opportunity Cost	30.00%	2	2	3	3	2	2
Weighted Score	100.00%	2.00	2.00	2.00	2.00	2.30	2.00
Ranking		2	2	2	2	1	2
Basic Criterion Weighting and Score	20.00%	0.40	0.40	0.40	0.40	0.46	0.40
Social							
Land Use	70.00%	1	1	2	1	2	1
Traffic Impact	30.00%	3	3	3	3	2	2
Weighted Score	100.00%	1.60	1.60	2.30	1.60	2.00	1.30
Ranking		3	3	1	3	2	6
Basic Criterion Weighting and Score	20.00%	0.32	0.32	0.46	0.32	0.40	0.26
Consumer & User							
Community	100.00%	1	1	1	2	2	1
Weighted Score	100.00%	1.00	1.00	1.00	2.00	2.00	1.00
Ranking		3	3	3	1	1	3
Basic Criterion Weighting and Score	20.00%	0.20	0.20	0.20	0.40	0.40	0.20
Overall Site Score	100.00%	1.59	1.55	1.62	1.88	2.27	1.47
Site Ranking - Baseline Scenario		4	5	3	2	1	6