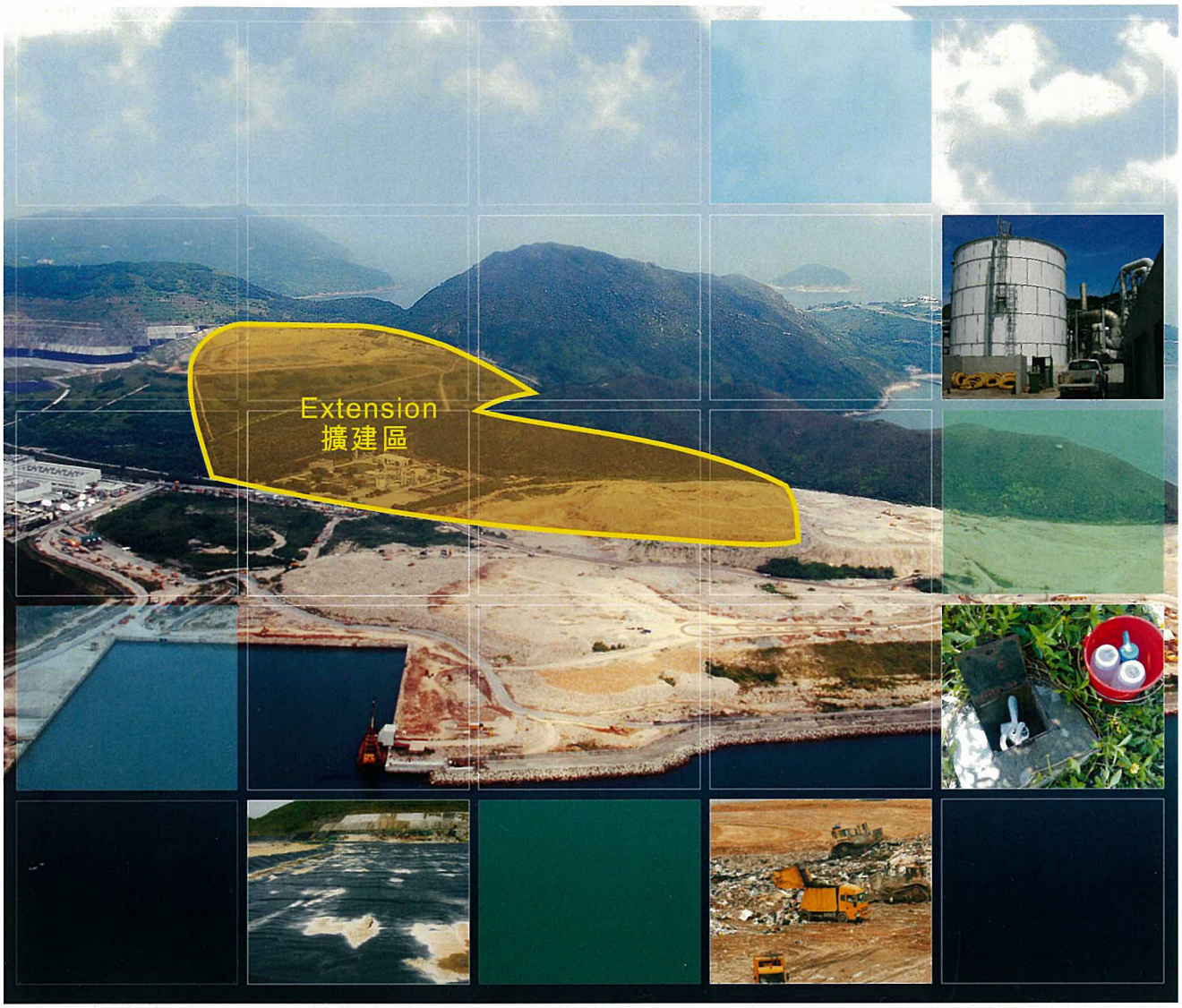
EXECUTIVE SUMMARY
行政摘要



環境保護署
Environmental Protection Department
The Government of the Hong Kong
Special Administrative Region

Agreement No. CE 10/2005 (EP)
South East New Territories (SENT) Landfill Extension
- Feasibility Study:
Environmental Impact Assessment Report
- Executive Summary

合約編號CE10/2005(EP)
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二零零七年十二月
December 2007

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Environmental Protection Department

Agreement No. CE 10/2005 (EP)
South East New Territories (SENT) Landfill Extension - Feasibility Study: Environmental Impact Assessment Report – Executive Summary

December 2007

Reference #0036286

For an on behalf of
Environmental Resources Management

Approved by: Dr Andrew Jackson

Signed:

Position: Managing Director

Date: 14 December 2007

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

The existing South East New Territories (SENT) Landfill site is located close to major urban areas. It receives about 6,200 tonnes waste each day. Based on the predicted waste input rate, it is anticipated that its capacity will be exhausted around 2012. As the planning, tendering and contract arrangement, detailed design, construction and commissioning of the landfill extension will take several years, it is essential to establish the environmental acceptability and engineering feasibility of the proposed SENT Landfill Extension ("the Extension") now.

ERM-Hong Kong, Ltd (ERM) has been commissioned by the Environmental Protection Department (EPD) to undertake the *South East New Territories (SENT) Landfill Extension – Feasibility Study* (the "Assignment") under *Agreement No. CE 10/2005(EP)*. As part of the Assignment, an Environmental Impact Assessment (EIA) Study has been prepared in accordance with *EIA Study Brief* (No. ESB-119/2004) issued under the *Environmental Impact Assessment Ordinance (EIAO)*.

The EIA Report addresses potential environmental impacts associated with the construction, operation, restoration and aftercare of the Extension ("the Project"). This *Executive Summary* summarises the key findings of the EIA.

1.2 JUSTIFICATION FOR THE NEED OF THE EXTENSION

Hong Kong is facing an imminent waste problem as our three existing strategic landfills are expected to be filled up within the next decade. In December 2005, the Government published the waste policy document "A Policy Framework for the Management of Municipal Solid Waste (2005-2014)" ("the Policy Framework"). This document sets out a comprehensive strategy for the management of municipal solid waste (MSW) in Hong Kong with clear targets and a ten-year (2005-2014) timetable for change. The strategy embraces the concepts of sustainable waste management and continues to adopt the three-tiered waste hierarchy with avoidance and minimization as top priorities, followed by reuse, recovery and recycling and with bulk waste reduction and landfill disposal at the bottom of the hierarchy.

The Government is therefore actively promoting initiatives to reduce waste generation and promote waste recycling. When comparing the waste statistics for 2006 with those of previous years, the amount of MSW disposed of at the three strategic landfills (WENT, NENT and SENT) dropped by 1% against an economic growth of 6.8% in 2006. Equally encouraging is the increase in the recovery rate of domestic waste from 16% in 2005 to 20% in 2006. At the same time, the overall recovery of MSW has also increased from 43% in 2005 (2.59 million tonnes) to 45% in 2006 (2.84 million tonnes), three

years ahead of the target stated in the Policy Framework. There are however areas of concern. Even though the amount of MSW landfilled was reduced by 1% in 2006, there is still a long way to go in achieving the Policy Framework's target of reducing the total MSW landfilled to less than 25%. In addition, despite EPD's efforts in waste reduction and recovery, the amount of MSW generated remains on an increasing trend. This is likely to be the result of growth in commercial, industrial and tourism-related activities in 2006 which has led to an increase of about 4% in commercial and industrial waste generation. Therefore, despite the progress achieved for source separation and waste recycling, it is important to press ahead with the other initiatives in the Policy Framework such as Producer Responsibility Schemes (PRSs), MSW charging, integrated waste management facilities (IWMF) and landfill extensions.

At the same time, the Government is also looking into building modern large scale integrated waste management facilities that would employ thermal treatment as a core technology as it is clearly not sustainable to continue to rely on landfilling alone for the disposal of untreated MSW. The IWMF are planned to be commissioned in the mid 2010s, assuming that good progress is made. As mentioned in the Policy Framework, landfills will still be required as the final repositories for non-recyclable waste, inert waste and waste residues after treatment. Taking into account the waste reduction and treatment initiatives in the Policy Framework,, it has been estimated that the demand for landfill space from 2006 to 2025 is around 200 million tonnes, while the remaining landfill capacity, at the end of 2004 was 90 million tonnes. The provision of sufficient landfill space by extending the capacity of the three existing landfills is an important and integral part of the waste management strategy in Hong Kong and is necessary to meet the shortfall of landfill capacity. Indeed, the Policy Framework recommended that commissioning of these extensions will be required in the early 2010s to mid-2010s.

In addition to the need for landfill capacity on a territory-wide basis, there is a need to meet the regional demand for waste disposal outlets. The three landfills are at strategic locations in Hong Kong and the extension of all three is necessary to maintain the overall waste disposal plan which is based on bulk waste transfer to avoid excessive number of waste collection vehicles travelling in the urban areas (1). Due to its close proximity to the urban areas,

(1) According to the White Paper "Pollution in Hong Kong – A Time to Act" issued on 5 June 1989 and the subsequent waste disposal strategy under the Waste Disposal Plan approved by the Governor in Council on 12 December 1989, there should be three new landfills in Hong Kong distributed on a regional basis for the following reasons:

- the daily quantity of MSW could not be handled by one or two landfills simply because of the strain that would be placed on the surrounding road network and on the landfill sites themselves;
- the increases in MSW were projected for the western and north-eastern New Territories and provision of disposal facility in each of these areas would help reduce transportation costs; and
- there would continue to be a need for a final disposal facility in reasonable proximity to Hong Kong Island in order to contain the transportation cost for waste arising from urban areas.

The existing 3 strategic landfills were therefore located at the western, north-eastern and south-eastern New Territories regions within the territory in the absence of other alternative site available in Kowloon and Hong Kong Island.

the SENT Landfill is the most highly used waste disposal facility amongst the three landfills, particularly by private waste collectors for commercial, industrial as well as construction wastes. It receives about 6,200 tonnes of municipal, construction and special wastes every day. If the SENT Landfill is closed, waste will have to be diverted to the NENT and WENT Landfills. This will require vehicles collecting waste from the catchments of the SENT Landfill to travel an additional hundred thousand kilometres per day in total through the built-up areas to the remotely located NENT and WENT Landfills, thus resulting in additional environmental impacts such as increased traffic movements, vehicular emissions and noise impacts on many more sensitive receivers en-route. To reduce these impacts, we would need a succession plan by developing new waste transfer and/or handling facilities in the south-east region of the territory, such as new handling facility for construction waste (ie the Construction Waste Handling Facility (CWHF)) and refuse transfer station for MSW (ie the South-East Kowloon Material Recovery and Transfer Station (SEKTS)). As the planning (including the site search), feasibility study, statutory environmental impact assessment process, tendering and contract arrangement, detailed design, construction and commissioning of these facilities would take equally long time as the landfill extension scheme, it further strengthens the importance of maximising the capacity of Extension where feasible in order to minimize those impacts as far as we could manage.

Projecting the time at which these new facilities will be available is very uncertain as the site for the CWHF will unlikely be available in the early 2010s and the site selection for the SEKTS has not yet been started. It will be a long planning and public consultation process to secure suitable waterfront sites at the Tseung Kwan O and South East Kowloon areas which are acceptable to the public for the development of these waste transfer/handlling facilities, but without compromising the overall planning and development of these two areas. In addition, the funding for developing these facilities has not been secured. Under an optimistic set of conditions to form a target programme at the present stage, they could possibly be in place by 2017. With SENT expected to be full by 2012, at least six years of additional void space is necessary. It is important to extend the lifespan of the SENT Landfill so that the Government can have time to plan and develop these new waste handling facilities.

1.3 OBJECTIVES OF AND APPROACH TO THE EIA STUDY

The Project is classified as a Designated Project under Schedule 2, Category G.1 and Q.1 of the *EIAO* and therefore the construction, operation, restoration and aftercare of the Extension will require an Environmental Permit.

The objectives of the EIA Study are to provide information on the nature and extent of environmental impacts arising from the Extension; to recommend appropriate mitigation measures to control the potential environmental impacts so that it complies with the requirements of the *Technical Memorandum on Environmental Impact Assessment Process of the EIAO* (EIAO-TM); and to

confirm the environmental acceptability of the Extension. Key environmental issues identified in the EIA Study Brief include air quality, noise, water quality, waste management, landfill gas hazards, ecology and landscape and visual impacts.

The EIA was conducted in accordance with the guideline on assessment methodologies provided in the *EIAO-TM*. The general approach for the assessment includes description of baseline environmental conditions for the impact assessment, identification and evaluation of potential impacts and recommendation of mitigation measures and an environmental monitoring programme. The assessments in this EIA Study are conducted using well-proven and internationally accepted methods based on reasonable worst-case conditions.

2.1 CONSIDERATION OF DIFFERENT EXTENSION OPTIONS

EPD identified 15 hectares of land in TKO Area 137 together with an adjoining narrow strip of land within the Clear Water Bay Country Park (CWBCP) as a potential site for the extension of the SENT Landfill. *Figures 2.1a* to *2.1e* show the five extension options identified and examined under the Assignment. The key information of each extension option is summarised in *Table 2.1a.*

Table 2.1a Key Information of Extension Options

Options	Characteristics	Net Void Space (million m^3)	Encroachment into CWBCP (hectares)	Estimated Construction Cost (HK$ per tonne of waste)	Additional Lifespan (years)
Option 1a	• Stand-alone landfill • No sharing of Infrastructure	1.3	0	350	<1
Option 1b	• Stand-alone landfill • Sharing of infrastructure with existing landfill	1.6	0	200	<1
Option 2	• Piggy-back landfill • Sharing of infrastructure with existing landfill	10	0	80	4
Option 3a	• Piggy-back landfill • Sharing of infrastructure with existing landfill	15	3	60	5
Option 3b	• Piggy-back landfill • Sharing of infrastructure with existing landfill	17	5	50	6

Note:
Construction cost of existing strategic landfill is about HK$60 per tonne.

2.2 OPTIONS EVALUATION

Five criteria were used to evaluate the five extension options:

- Landfill capacity offered;
- Efficiency of use of land;
- Cost effectiveness;
- Level of encroachment into Country Park; and
- Potential environmental impacts.

Engineering measures and additional landtake in TKO Area 137 have also been considered to maximise the void space while not encroaching the CWBCP.

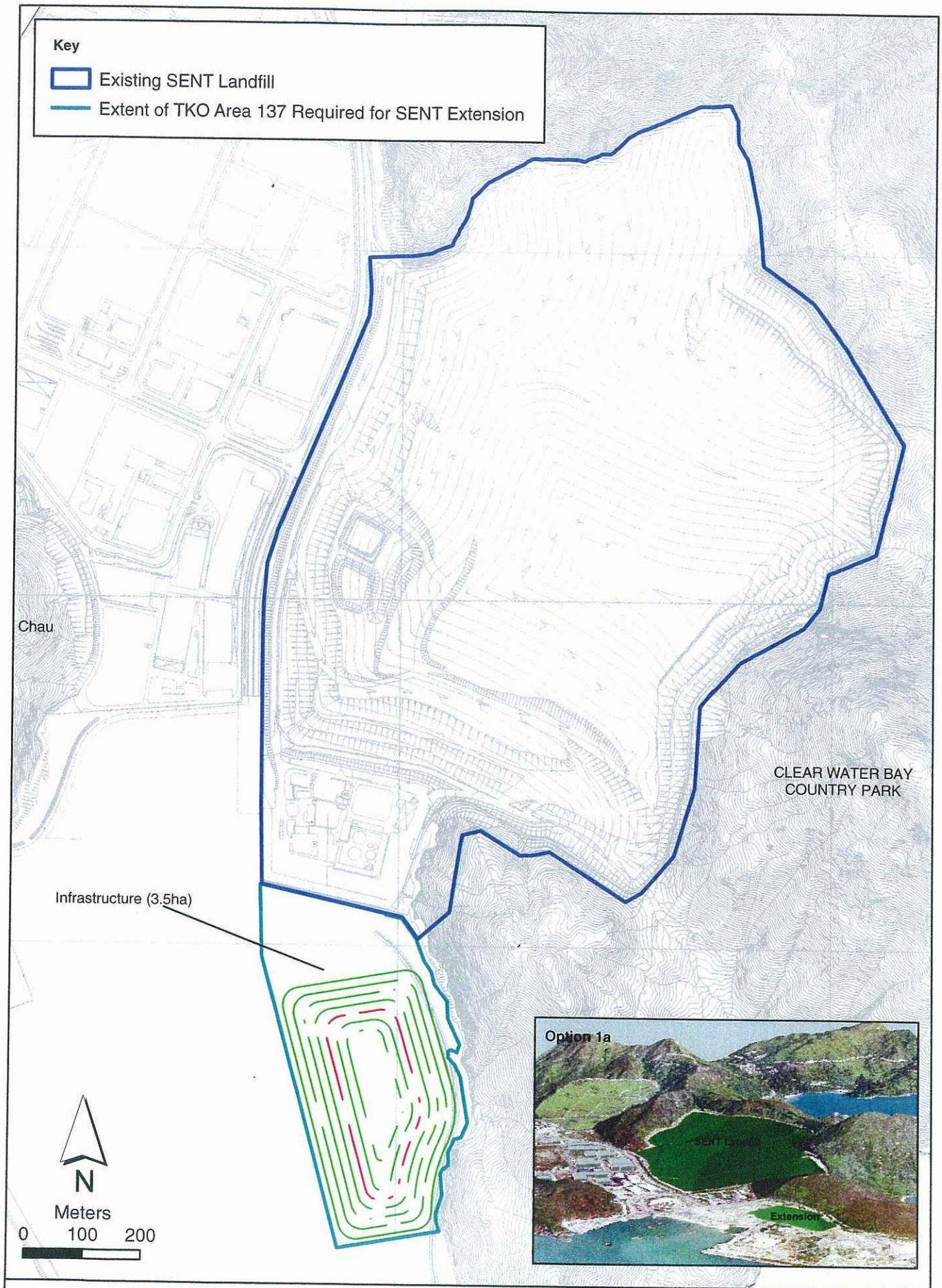

FIGURE 2.1a

Option 1a

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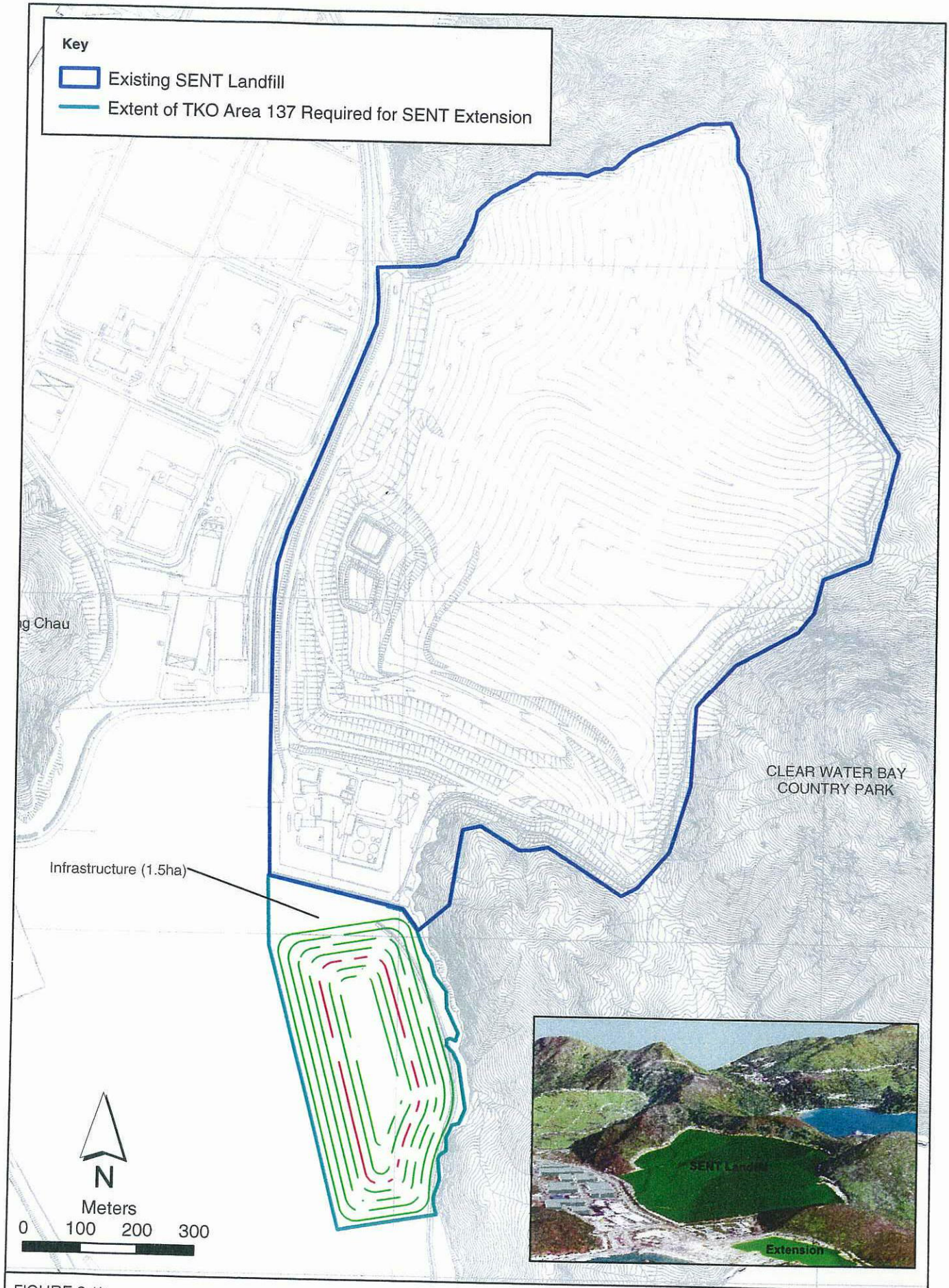

FIGURE 2.1b

Option 1b

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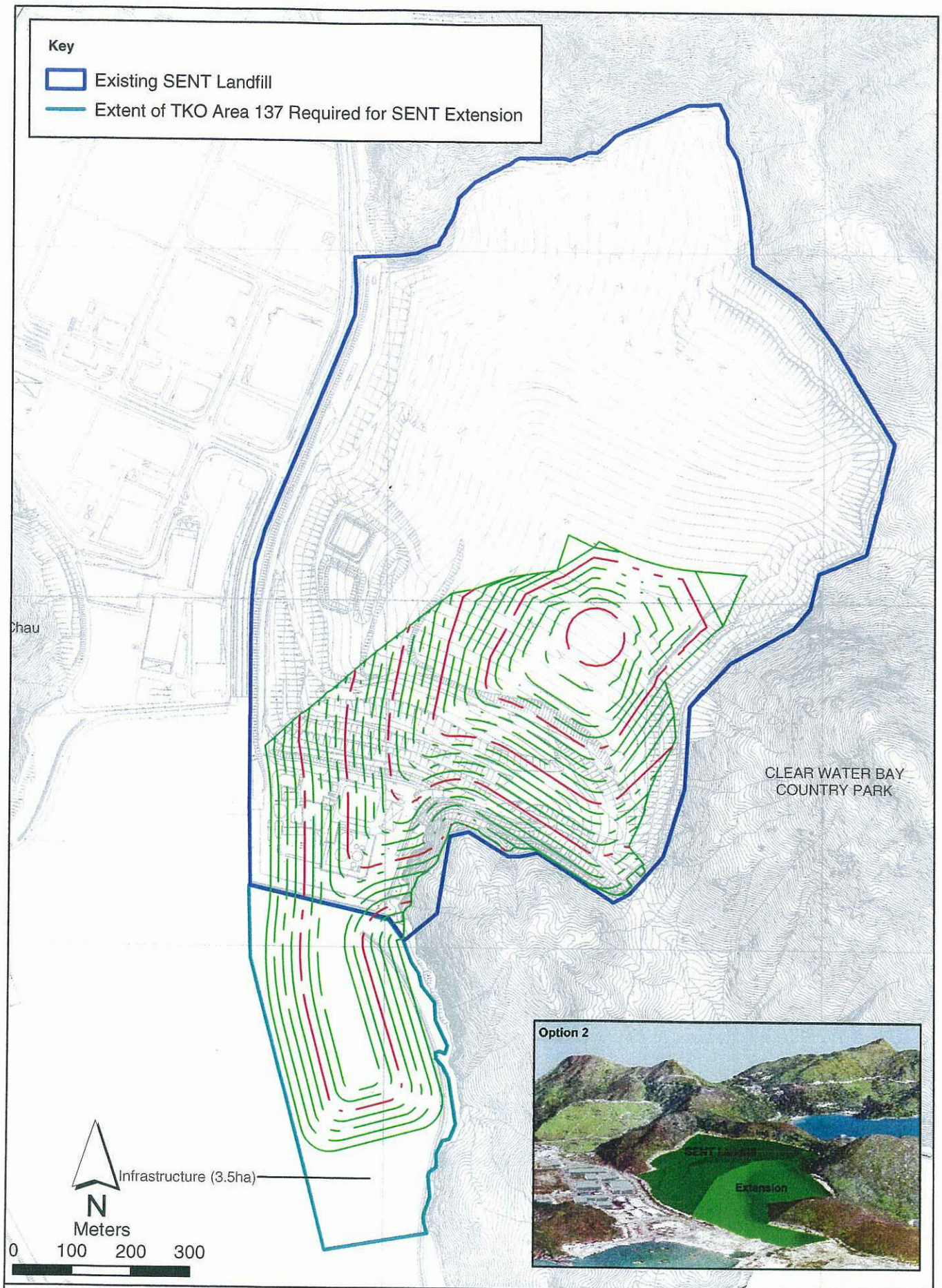

FIGURE 2.1c

Option 2

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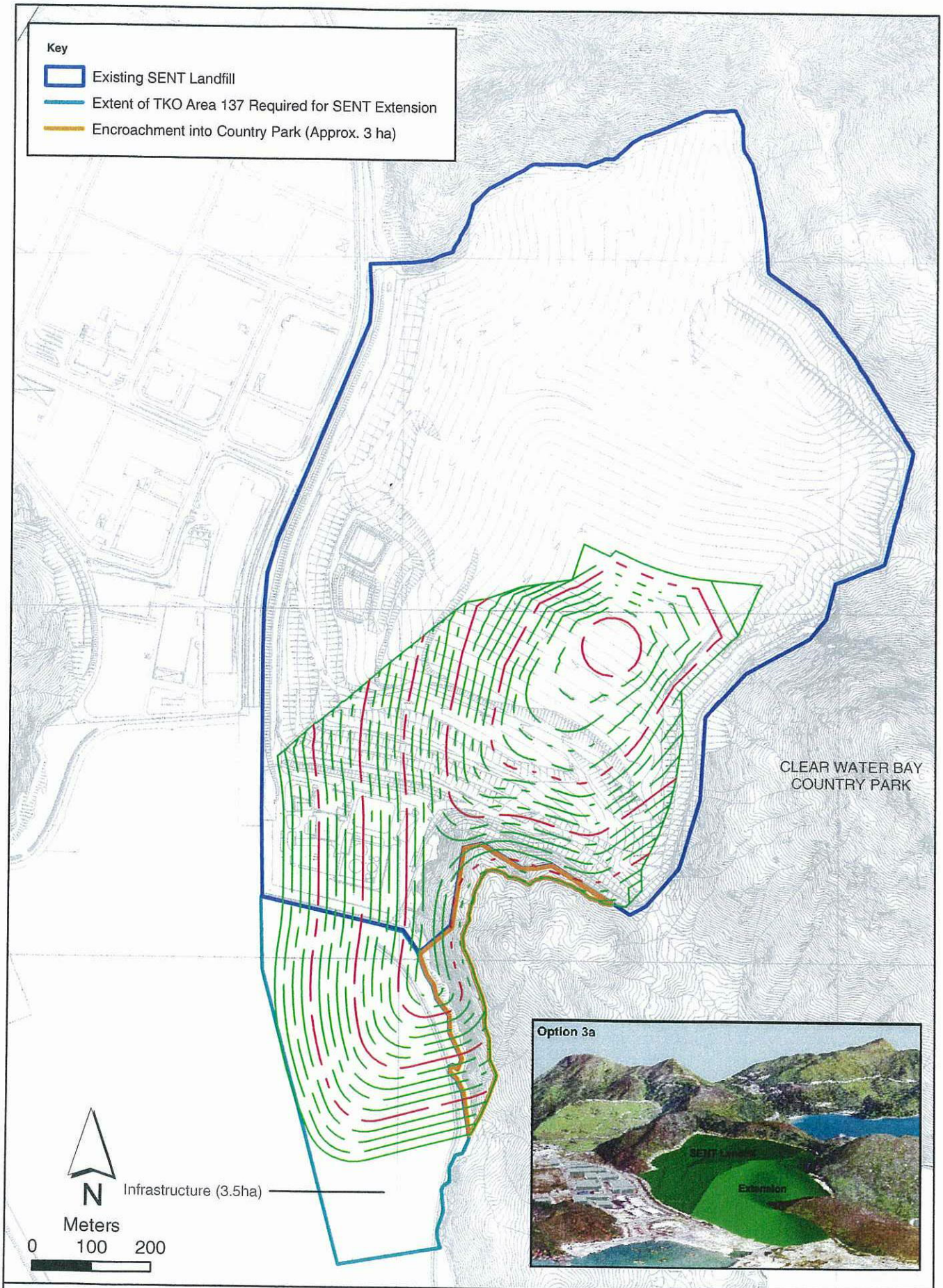

FIGURE 2.1d

Option 3a

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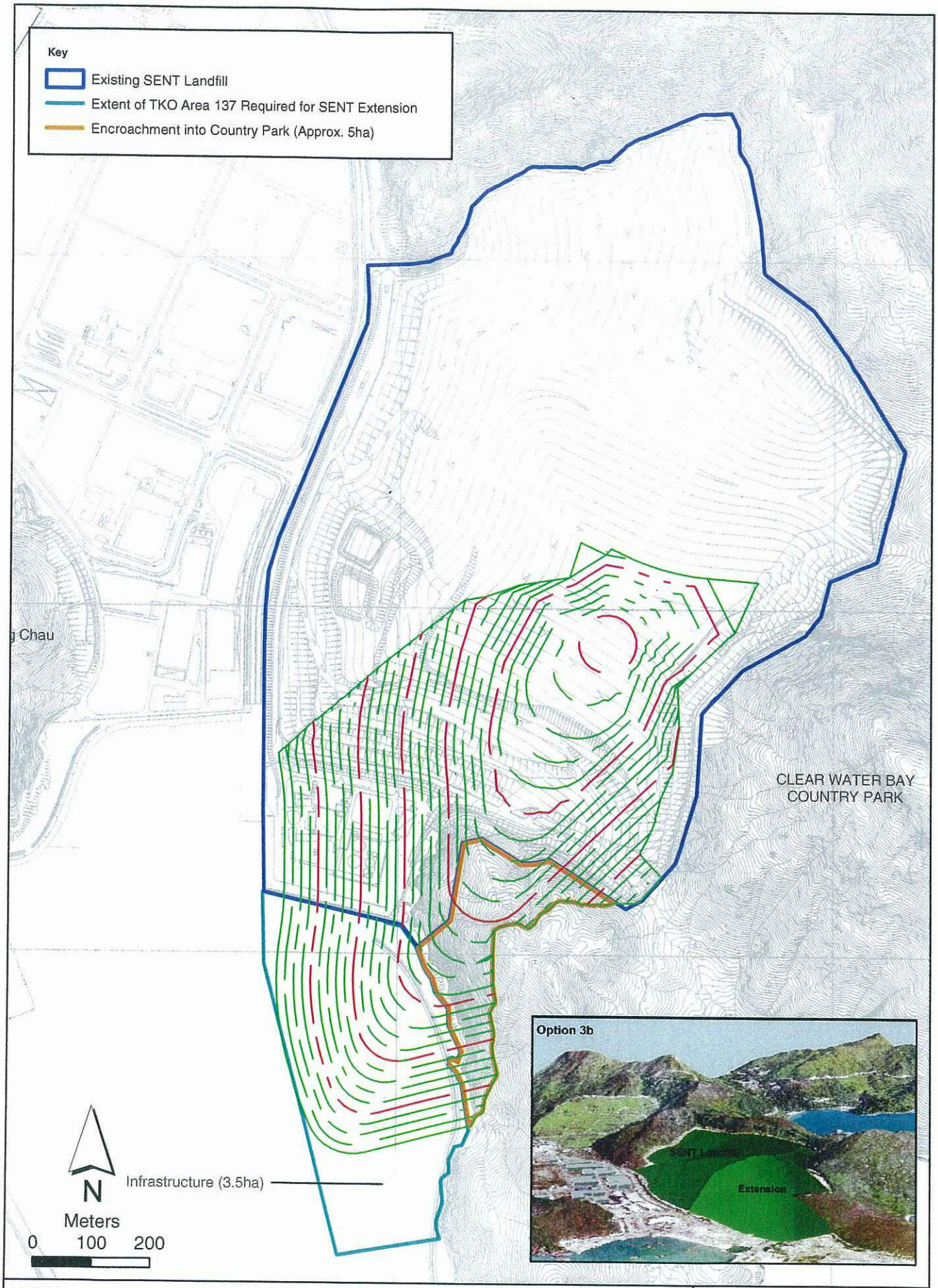

FIGURE 2.1e

Option 3b

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2.2.1 Landfill Capacity

The stand-alone options (Options 1a and 1b) provide very low void capacity, equivalent to an extended lifetime for the SENT Landfill of less than one year. The piggyback options (Options 2, 3a and 3b) provide significantly higher void capacity. Option 3b provides the highest void capacity of all options evaluated and provides sufficient time for the new generation of waste management facilities to come into operation.

2.2.2 Efficient Use of Land

All options make use of the 15 hectares of land in TKO Area 137 that adjoins the southern end of the existing SENT Landfill. Options 3a and 3b require additional land to be borrowed from the CWBCP area. As Option 3b will deliver the greatest void capacity per unit site area, it presents the most efficient use of the land that could be made available.

2.2.3 Cost Effectiveness

The stand-alone options have the highest unit capital cost (per tonne of waste). Option 3b has the lowest capital cost and is thus the most cost effective option.

2.2.4 Encroachment into Country Park

Options 1a, 1b and 2 will not encroach into the CWBCP and hence will have no direct impact on the CWBCP. Options 3a and 3b will make temporary encroachments of approximately 3 ha and 5 ha respectively. These options will therefore have a direct impact on the habitat of CWBCP and wildlife within the country park. It is noted that the potential encroachment area is a cliff face dominated by shrubland and grassland. At present, there are no hiking trails or formal footpaths in the area. The area can only be accessed from the existing SENT Landfill or the fill bank in TKO Area 137 and has not been used for recreational and educational purposes. The 9-month ecological baseline survey identified that the affected habitats within CWBCP comprise shrubland and grassland that is not of high ecological value. While some wildlife species of conservation interest (including birds, butterflies, bats and reptiles) were recorded within the direct impact area, all of these species were found to be highly mobile and were found to have access to an abundant number of similar habitats close by and within the CWBCP area.

2.2.5 Environmental Impacts

Due to their smaller scale, Options 1a and 1b will have lower environmental impacts at local level when compared with the other options. However, their shorter lifespan may mean that diversion of waste collection vehicles to other landfills will be required for a longer period, thus generating more environmental impacts at a territorial level. Conversely, the larger scale Options 2 and 3a will have greater environmental impacts at the local scale but, due to their longer lifespan, lower environmental impacts at territorial level. With careful design and good site management and progressive

restoration, local environmental impacts can be mitigated. Option 3b, as the largest extension option, will generate greater environmental impacts at the local scale than the other four and will impact upon the natural habitats within the CWBCP. Impacts on the CWBCP can be mitigated by compensatory planting and appropriate afteruse development of the encroached area to enhance educational and recreational value.

2.2.6 Engineering Measures Considered

Engineering measures that would increase void space but avoid the extension encroaching into the CWBCP were considered. These included building a retaining wall or earth bunds around the waste mound. To make these measures effective, the retaining wall or earth bund would need to be over 40m tall. Such measures would have considerable cost implications and the earth bund itself may consume a significant portion of landfill voidspace. The standalone feature would also be difficult to integrate with the surrounding landscape and visually difficult to accept. Such engineering measures were therefore not put forward for further consideration.

2.2.7 Additional Landtake in TKO Area 137

An option to increase the amount of land that is used within TKO Area 137 has been investigated, to investigate whether encroachment into the CWBCP could be avoided. To develop an extension of capacity equivalent to that in Option 3b without encroachment into the CWBCP would require approximately double the size of the identified site in TKO Area 137 to be used. Due to high demand of land in TKO Area 137, additional allocation of land is not feasible. Also, to extend the SENT Landfill further south adjacent to the CWBCP can only provide limited additional void space.

2.2.8 Selection of the Preferred Option

With reference to Clause 3.3.2 of the Study Brief, consideration was given to avoid or minimize the encroachment onto the CWBCP and the disturbance to the ecosystems in the adjacent areas including the CWBCP. Hence, Options 1a, 1b and 2, which do not encroach upon the CWBCP are considered first.

Of the five options examined, Options 1a and 1b would have the least impacts on CWBCP and the sensitive receivers in the vicinity in terms of both construction and operation. However, the additional landfill void capacity provided by these options is very small, making them inefficient in terms of cost and use of available land. The lifespan of these options is also short and thus will result in longer period where waste collection vehicles move waste to the more remote landfills, in turn resulting in more environmental impacts at territorial level. These options are thus not recommended.

Option 2's void capacity is 6 times than that of Option 1b and will not require additional land within the CWBCP. However, the void capacity will only be 10 Mm^3 (ie still well below the target void capacity), and the construction cost will be more expensive than that of the existing strategic landfills. Compared with Options 3a and 3b, the void space provided by Option 2 is 50% less than

these encroachment options. To maximise utilisation of the existing landfills, some diversion of the waste collection vehicles to the other two landfills will be required, hence will still creating environmental impacts at a territorial level. Option 2 would have similar local environmental impacts to Options 3a and 3b, except that no natural habitat would be impacted directly. Visually, Option 2 does not blend with the surrounding environment as well as Options 3a and 3b. Use of engineering measures to increase voidspace whilst avoiding encroachment was found to be expensive and likely to result in an adverse visual impact. The resulting gain in void space is small.

As Options 1a, 1b and 2 cannot provide sufficient landfill voidspace to help meet demand in Hong Kong for the next 20 years, Option 3a and 3b, which require temporary encroachment into the CWBCP were considered further.

Options 3a and 3b will both have direct impacts on the CWBCP. In terms of maximising void capacity, making the most effective use of available land and achieving the highest cost effectiveness, Option 3b performs the best. The local environment impacts, similar to those associated with Option 2, can be mitigated by careful design and good site practices. The temporary encroachment area is primarily a cliff face without any hiking trail and proper access. It is unlikely that public enjoyment of CWBCP would be affected. In terms of impacts on natural habitats, the encroachment area is of low to moderate ecological value with flora and fauna commonly found within the CWBCP. When the temporary encroached area is restored together with the fully restored landfill in the vicinity after the completion of landfill operation, it is anticipated that the restored Extension could be enriched to enable a higher amenity value for public enjoyment.

It is understood that there is a public need for both landfill space and country park. The loss of void space as a result of not maximising the use of this Extension Site will be reprovided at other landfills, as a result of reduction of landfill space in other landfills as well as an overall shortfall of landfill space in Hong Kong within the next 20 years and the environmental impacts caused by longer journey to these landfills. When balancing all of the above considerations, Option 3b, giving the largest void space and lifespan while able to control environmental impacts to more acceptable levels with proper design and mitigation, is recommended as the preferred option for detailed EIA.

2.3 CONSIDERATION OF ALTERNATIVE CONSTRUCTION METHODS AND SEQUENCE OF WORKS

2.3.1 Site Formation

It is recommended that the Extension Site at TKO Area 137 and the existing SENT Landfill Infrastructure Area will be formed by filling, instead of excavation in the SENT Landfill Infrastructure Area and the TKO Area 137. This method will ensure smaller amount of excavated material to be generated

and avoid the base of the landfill intercepting groundwater level, which is relatively shallow in TKO Area 137.

2.3.2 Slope Formation

The construction methods identified for the slope formation work, their respective environmental benefits and dis-benefits have been examined. Blasting techniques are preferred over non-explosive methods. Though blasting is associated with relatively higher magnitude of environmental impacts, these are very short lived and can be mitigated. In contrast, impacts associated with non-explosive methods or open excavation (including continual use of noisy hydraulic breakers) would be longer lived and are therefore not preferred. Blasting would also be more cost effective and help ensure the timely completion of the works.

2.3.3 Drainage Tunnels

Similarly, alternative methods for constructing the two small drainage tunnels have been examined. Tunnel boring is preferred over blasting. Both options have similar environmental impacts, most of which will be confined within the tunnel. Tunnel boring, however, has higher productivity and a better controlled excavation profile while blasting brings with it potential safety concerns over the use of explosives in a confined space in close proximity to potential sources of landfill gas.

2.3.4 Sequencing

The sequence of constructing the Extension is:

1) construction of a new infrastructure area which will also be designed to treat leachate and landfill gas from the existing SENT Landfill;
2) demolition of the infrastructure at the existing SENT Landfill; and
3) formation and lining of the entire base of the landfill, including the slope formation, prior to commencement of waste placement.

This works sequence will ensure uninterrupted operation of the existing SENT Landfill, a smooth transition of operations to the extension and safe operation during landfilling.

2.3.5 Phasing

The Extension will be developed in Phases. Within each Phase, it is proposed that filling should start on the western side (ie the side closest to Wan Po Road and the nearby sensitive receivers). The western perimeter of the Phase will be filled to its intended height, and the outward face of the landfill will be progressively restored. This completed portion of the Phase will then act as a screen to minimise noise, visual and air quality impacts from the tipping operations within the remaining part of that Phase.

3.1 DESIGN OF THE EXTENSION

A layout plan of the preferred extension option is shown in *Figure 3.1a*. The Extension is a "piggyback" landfill occupying the existing SENT Landfill infrastructure area, 15 hectares of TKO Area 137 and approximately 5 hectares of the CWBCP. The infrastructure area will be located at the southern end of the Project Site.

The Extension covers an area of around 50 hectares (including the area required for site infrastructure). Discounting the void space required for engineering works, daily and intermediate cover, the total net void capacity for waste is around 17 Mm^3. The lifespan of the Extension is estimated to be around six years, with operations starting in 2013 (1).

The design of the Extension includes:

- A landfill liner and cap – these are made of impermeable materials and are designed to contain waste, leachate and landfill gas within the waste boundary.

- A landfill gas management system – this comprises a number of landfill gas collector wells and pipelines to gather the landfill gas and a landfill gas treatment facility. Together, these elements will control landfill gas build-up and prevent migration of landfill gas off the site and into the surrounding area.

- A leachate management system – this comprises a number of leachate collection and extraction points, pipelines and a treatment plant. This system will control the leachate level within the landfill and ensure that treated leachate complies with the effluent discharge standard set for the Extension.

- A surface water management system – this comprises surface water cut off channels constructed around the perimeter of the landfill site and drainage tunnels. These features will prevent surface water from upland areas from entering the Extension and will also prevent contaminated runoff of the Extension from discharging to the surrounding area.

- A groundwater management system – this comprises a specially designed drainage layer below the liner at the base of the landfill. This layer is designed to collect and transport groundwater away from the liner to the collection sumps at the boundary of the Extension.

(1) All engineering and environmental assessments in this Assignment are based on the assumption that the existing SENT Landfill will be closed by about 2012 and the extension will commence operation in 2013. This timetable is subject to change and will be determined based on the actual closure date of the existing SENT Landfill.

- Odour management and control system – key features comprise enclosing all the leachate storage and treatment tanks (1), applying deodorizers or odour suppression agents at the active tipping face and at the western site boundary, minimising the sizes of the active tipping face and special waste trench, provision of mobile cover for the special waste trench, covering the non-active tipping face with impermeable liner, prompt covering of MSW with soil or selected inert materials, enclosing the weighbridge area, provision of vehicle washing facility and progressive restoration of areas reaching the finished profile.

- Site infrastructure – this includes waste reception facilities (eg weighbridge, reception kiosk); vehicle wash facilities; offices and visitor centre; a laboratory; maintenance workshops; a storage area; the landfill gas treatment facility and leachate treatment plant described above.

3.2 IMPLEMENTATION PROGRAMME

The key dates of the implementation programme are shown in *Table 3.2a*.

Table 3.2a Key Dates of Implementation Programme

Key Stage of the Project	Indicative Date
Start construction	2011
Commissioning of new infrastructure facilities	2011
Demolition of existing infrastructure facilities	2012
Stop taking waste at the existing SENT Landfill	2012
Start waste intake at the Extension	2013
Stop taking waste at the Extension	2018
End of aftercare for the Extension	2048

(1) Except the Sequential Batch Reactor (SBR) tanks to avoid overheating of the wastewater which would affect the biological treatment process.

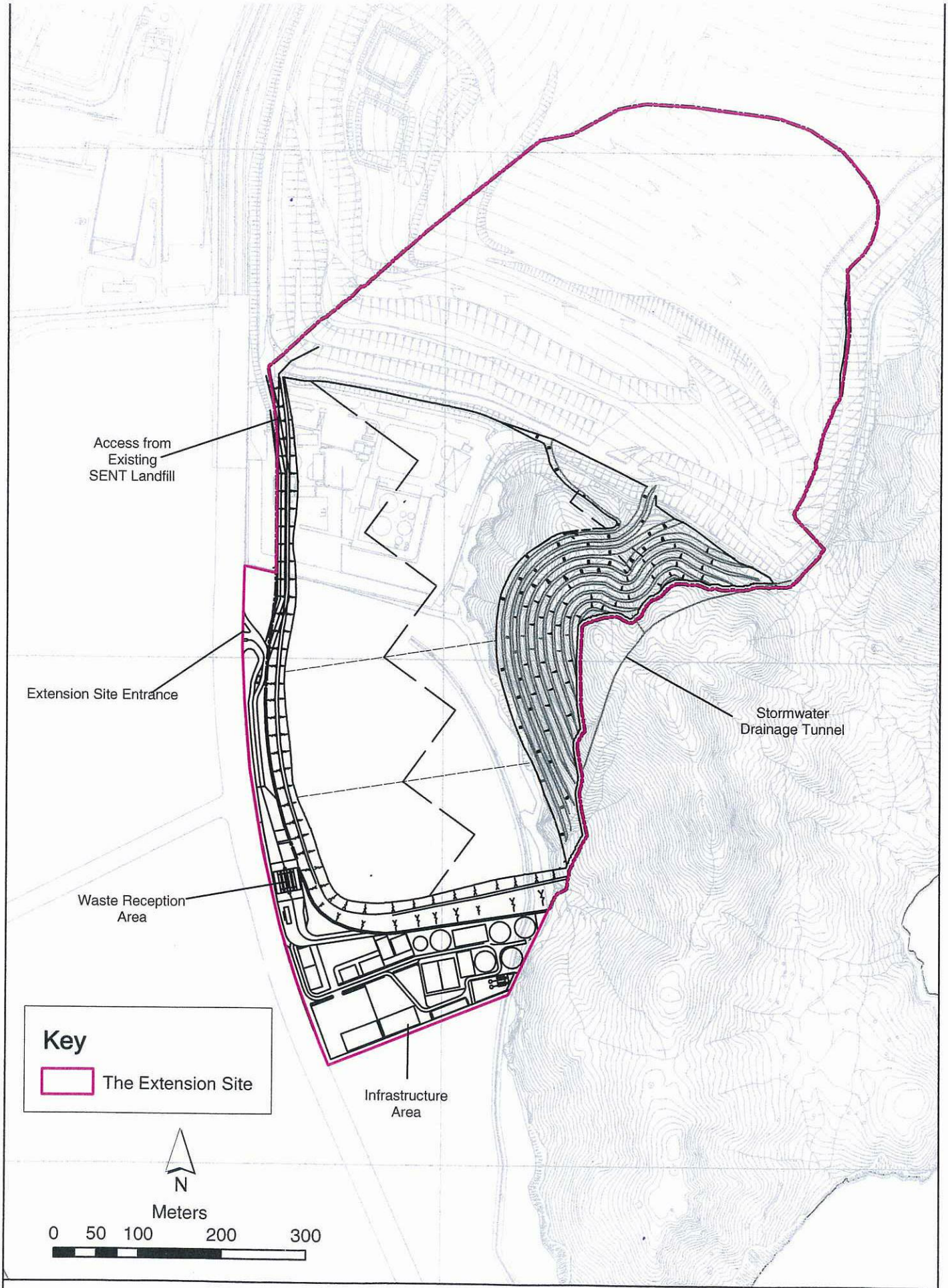

FIGURE 3.1a

Layout Plan of the Extension

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4 ENVIRONMENTAL IMPACTS

The potential environmental impacts associated with the Project are summarised in the following sections.

4.1 AIR QUALITY

Potential dust nuisance from construction activities and gaseous emissions from plant have been evaluated. With the implementation of the recommended dust control measures and good construction site practices, it is not anticipated that the construction of the Extension will cause adverse dust and air quality impacts.

The concentrations of gaseous emissions predicted to be generated by the landfill gas treatment facility, the leachate treatment plant and the LFG generator are within the relevant Air Quality Objectives (AQOs), international chronic and acute reference guidelines and health risk guidelines at air sensitive receivers (ASRs) taking into account other gaseous emissions within 500m from the Extension site boundary and the general background contributions. The volatile organic compounds (VOCs) emissions from the Extension are predicted to be low at the site boundary and that levels are within the respective trigger levels. It is therefore not envisaged that the operation of the Extension will cause adverse air quality impact to the identified ASRs with respect to potential VOCs emissions from the landfill.

The design of the Extension has incorporated a stringent odour management and control system (see *Section 3.1*). Good site practices and housekeeping would be stipulated in the operation contract.

With the exceptions of those ASRs in the immediate vicinity of the boundary of the Extension, no exceedances of the odour criterion were predicted with the implementation of the odour management and control system. Residual impacts were predicted in a small area zoned for industrial development covering part of TKO Area 137 and TVB City adjacent to the Extension boundary.

The frequency of the exceedances at TVB City will be reduced through the adoption of rephrasing of waste tipping activity (1). Over the six year operation period, the number of exceedances at TVB City is expected to diminish to zero as the separation distances and heights between the active tipping face and the ASRs increases. It should be noted that the odour emission rate of the special waste trench adopted in the assessment based on uncovered trench scenario is conservative and the actual emissions will be much lower as the trench will be covered and the air trapped inside the trench will be scrubbed prior to discharge to the atmosphere. Furthermore, no sludge from sewage treatment works will be received in the Extension.

(1) No waste tipping activity at the northern sector of the Extension between July and November.

Hence, it is anticipated that the actual odour level and number of exceedances will be much less than that predicted in this assessment. The residual impacts are considered acceptable taking account of (i) the nature of the places affected, (ii) the small number of people impacted, and (iii) the transient nature, low frequency and magnitude of the exceedances.

During the aftercare phase, air emission sources are primarily associated with the landfill gas management facility and the LFG generator. The Extension will be sealed with a capping system (including an impermeable liner) and the entrapped landfill gas will be extracted for utilisation or flaring. The vent gas produced in the enclosed tanks will be either diverted to the flares or to an air scrubber. The scrubbed vent gas will be used as part of the air intake for the aeration system of the SBR tank. The odour sources will be limited to the sequential batch reactor tanks of the leachate treatment plant. As the emission strength and scale of the Extension operation during this phase are significantly reduced compared to the operation and restoration phases, no adverse odour impact is anticipated. The impact from gaseous emissions from the landfill gas treatment facility and the LFG generator is predicted to be within the AQO criteria, reference acute and chronic concentrations and health risk guidelines at any of the identified ASRs. It is therefore concluded that the aftercare of the Extension will not cause adverse air quality impacts to the identified ASRs.

The requirements of regular monitoring of dust, odour, ambient VOCs, ammonia and hydrogen sulphide, and gaseous emissions from stacks have been recommended and detailed in the *EM&A Manual*.

4.2 NOISE

The predicted construction noise levels at identified noise sensitive receivers (NSRs) are well below the noise criteria specified in the *EIAO-TM.* Hence, no adverse construction noise impact is anticipated.

The predicted operation noise levels due to the Extension, including the fixed plant items, at the representative NSRs are within the noise criteria mentioned in relevant TMs. Following the closure of the landfill, noise impact during the aftercare phase is anticipated to be negligible.

The road traffic noise at NSRs due to Wan Po Road, Chiu Shun Road and the future Cross Bay Link have been predicted. The off-site road traffic noise contribution due to the Extension is considered insignificant.

While no adverse noise impacts are expected during the operation and restoration phases of the Extension, it is recommended that good site practices be implemented to further minimise any noise impact.

4.3 WATER QUALITY

With the implementation of the mitigation measures set out in the EIA and good construction site practices, there will be no adverse impacts on water quality.

A surface water drainage system will be constructed around the active tipping area to prevent stormwater from entering the landfill and get contaminated, and vice versa prevent contaminated rainwater from discharging off the site. Contaminated runoff will be collected by this system and treated with leachate. A comprehensive leachate containment system will be installed to contain leachate generated from the landfill. Construction quality control and assurance procedures will be implemented to ensure that joints are properly sealed and to avoid damage to the impermeable liner during construction of this system.

The hydrogeological assessment concludes that, while the landfill cap remains intact and leachate control is maintained, there will be no adverse impacts on groundwater quality. Even in the very long term (on a timescale of several hundred years), when the landfill cap degrades and the active leachate control can no longer perform their full function, the potential impacts on groundwater quality are predicted to be slight. Under such conditions, the quality of groundwater discharges to Junk Bay would still comply with the effluent discharge standards set out in the *Water Pollution Control Ordinance*.

Leachate and sewage collected from the Extension will be treated at the on-site leachate treatment plant. Effluent will be discharged to the public sewer for conveying to the Government treatment works for further treatment. Treated effluent entering the sewer will comply with the effluent discharge standards set out in the *Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Inshore Waters*. There will be no adverse water quality impact.

4.4 WASTE MANAGEMENT

The waste arisings during the construction, operation, restoration and aftercare phases include excavated material, construction and demolition material, general refuse from daily operations, chemical waste from maintenance of plant and equipment and sludge from the leachate treatment plant. The quantity, quality and timing of these waste arisings have been identified. With good site practices, the potential environmental impacts associated with the storage, handling, collection, transport and disposal of the identified waste arisings from the Extension will be within acceptable limits set out in the *EIAO-TM*. No adverse waste management impacts are anticipated.

4.5 *LANDFILL GAS HAZARD*

The potential hazards associated with sub-surface migration of landfill gas from the existing SENT Landfill to the Extension and from the Extension to the adjacent existing and future developments have been assessed. Both the existing SENT Landfill and the Extension are considered as a "medium" source. Comprehensive and proven landfill gas control measures have been installed in the existing SENT Landfill and will be installed in the Extension. The source-pathway-target analysis shows that landfill gas risk posed by the SENT Landfill and the Extension is medium to high during both construction and operation phases within the Extension Site. Whereas the risk posed by the Extension to the adjacent developments ranges from very low to low depending on the nature and location of the these developments.

In general, underground rooms or voids should be avoided as far as practicable in the design of the infrastructure area of the Extension. Other precautionary and protection measures during construction, design, operation and restoration phases of the Extension have been recommended. It is expected that with the proposed precautionary measures in place, the potential risk of landfill gas migration to the respective targets will be minimal. Regular monitoring of landfill gas in perimeter landfill gas monitoring wells and service voids along the Extension Site boundary will be undertaken to ensure that no unacceptable off-site migration of landfill gas occurs.

4.6 *ECOLOGY*

The terrestrial and aquatic ecological resources recorded within the Study Area (including the Extension Site and the 500m buffer area) include plantation, shrubland, grassland, developed area, seasonal stream and subtidal habitats, as well as associated wildlife. Of these habitats, shrubland has a moderate ecological value, whilst other habitats are of low or low to moderate ecological value. The ecological value of the developed area is negligible.

The majority of the proposed Extension will be located in habitats which have already disturbed or developed including the existing SENT Landfill and the fill bank in TKO Area 137. The proposed Extension will encroach into a small strip (approximately 5 ha) of the CWBCP, comprising shrubland and grassland habitats of low to moderate ecological value. The potential impacts on these natural habitats within the CWBCP are considered to be low to moderate. With the implementation of the recommended mitigation measures, no adverse residual impact is expected. There are no marine works involved and no marine habitats and species will be affected.

A survey recorded 11 wildlife species of conservation interest (including birds, butterflies, bat and reptile) at the Extension Site. As these species are highly mobile and as there is a large extent of similar habitat in the vicinity of the Extension, the impacts on wildlife are considered to be minimal.

The EIA sets out mitigation measures to reduce ecological impacts. These include the adoption of surface water, groundwater, leachate and landfill gas management systems, good construction practices and provision of compensatory planting. These measures will reduce potential disturbance to the surrounding environment and will also help provide a habitat of higher ecological value than that of the existing site.

4.7 LANDSCAPE AND VISUAL IMPACT

With mitigation measures in place, the landscape impacts would range from "insubstantial" to "substantial" at landscape resources during construction phase. The landscape impacts will be reduced to "insubstantial to moderate" during the operation and restoration phases and further reduced to "insubstantial to slight" at year 10 of the aftercare phase when the restored landscape is fully mature. There will be "Slight positive" landscape impacts on the reclaimed TKO Area 137.

Most of the sensitive residential receivers are relatively distant from the Extension. With mitigation measures in place, the visual impacts to the sensitive residential receivers would range from "Insubstantial" to "slight" at the visual sensitive receivers during construction phase and slightly worsen to "Insubstantial to moderate" during the operation and restoration phases as the volume and height of the landfill gradually increase. During the aftercare phase, the impact will be reduced to "Insubstantial to slight" on day 1 of the aftercare phase, when landfilling operations have ceased; and further reduced to "Insubstantial" as the landscape restoration gradually matures.

4.8 ENVIRONMENTAL MONITORING AND AUDIT

Environmental monitoring and audit requirements have been identified and recommended to implement to ensure the effectiveness of the recommended mitigation measures. These requirements are specified in the *EM&A Manual*. The monitoring requirements cover the area of dust, organic emissions, odour, gaseous emissions, surface water, groundwater, leachate and landfill gas. Regular site audits throughout the construction, operation, restoration and aftercare of the Extension have also been recommended.

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5 OVERALL CONCLUSION

The environmental impact assessment (covering air quality, noise, water quality, waste management, landfill gas hazards, ecology and landscape and visual impacts) has concluded that no unacceptable environmental impacts are envisaged as a result of the construction, operation, restoration and aftercare of the Extension, provided that the recommended mitigation measures are implemented. It is predicted that there will be residual odour impact on air sensitive receivers in the immediate vicinity of the Extension Site boundary. Taking account of the nature of the developments affected, the number of people impacted, the transient nature, low frequency and magnitude of the exceedances, the residual impacts are considered acceptable.

Recommendations for an environmental monitoring and audit programme have been prepared to ensure the effectiveness of the recommended mitigation measures.

目錄

1 引言

1.1 背景

現存的新界東南堆填區鄰近市區，每天接收約 6,200 公噸廢物。根據預測的廢物接收速度，預計該堆填區的容量將於 2012 年左右飽和。由於擴建堆填區的規劃、招標和合約安排、詳細設計、施工和啓用等程序需時數年，因此，現在必須確定擬建的新界東南堆填區擴建部份的環境可接受程度和工程可行性。

香港環境資源管理顧問有限公司受環境保護署（以下簡稱「環保署」）委託，根據編號 CE10/2005(EP) 的合約，進行「新界東南堆填區擴建工程可行性研究」（以下簡稱「該項可行性研究」）。顧問公司按照「環境影響評估條例」（以下簡稱「環評條例」）所發出的「環評研究大綱」（編號 ESB-119/2004），進行了一項環境影響評估研究（以下簡稱「環評研究」），作爲該項可行性研究的其中一環。

是次環評的報告，闡述了擴建工程（以下簡稱「是項工程」）在施工、運作、復修和護理期間可能造成的環境影響。本「行政摘要」則概述是次環評研究的主要結果。

1.2 需要進行擴建計劃的理據

預計香港現有的三個策略性堆填區將於未來十年內填滿，因此，本港正面臨迫切的廢物問題。政府於 2005 年 12 月發表一份廢物政策文件「都市固體廢物管理政策大綱（2005-2014）」（以下簡稱「該政策大綱」）。這份文件闡述了香港管理都市固體廢物的整體策略，其中包括多項清晰的目標和一個爲期十年（2005-2014 年）的實施時間表。這個策略包含了可持續的廢物管理概念，並沿用廢物層級理念，把廢物分爲三個層級：以避免和減少產生廢物爲最優先的一級，然後是廢物再用、回收和循環再造；而最低的一級是減少廢物體積和棄置於堆填區。

政府已積極地推動減少產生廢物和鼓勵把廢物循環再造。2006 年在經濟增長 6.8%的情況下，在三個策略性堆填區（新界東北、新界東南及新界西堆填區）棄置的廢物量比起前一年已下降 1%；同樣令人鼓舞的就是家居廢物的回收率亦由 2005 年的 16%升至 2006 年的 20%，而整體的都市固體廢物回收率亦由 2005 年的 43%（259 萬噸）增至 2006 年的 45%（284 萬噸），提早了三年達到該政策大綱中提出的目標。雖然如此，目前都市固體廢物的管理仍有隱憂。在 2006 年，雖然堆填區接收的都市固體廢物已減少 1%，但仍然遙遜於該政策大綱提出將堆填處理的都市固體廢物總量減至少於 25%的目標。縱然環保

署已積極提倡減廢及回收，目前的都市固體廢物仍然持續增長。主要原因是在 2006 年的商業、工業及旅遊有關的行業增長令工商業廢物增加了 4%。因此，除加強源頭分類及循環再造外，尚需落實推行該政策大綱中提及的其他措施，如生產者責任計劃、廢物收費、綜合廢物管理設施及擴建現有堆填區等。

政府亦明白單獨依賴堆填區棄置未經處理的都市固體廢物，並不是一個可持續的方法。因此，政府現正研究興建以熱能處理爲核心技術的先進大型綜合廢物管理設施。如工作進度良好，建議的綜合廢物管理設施預計會在 2010 年代中期運作。然而，一如政策大綱所述，本港仍然有需要以堆填區作爲最後存放設施，用以處置各種不可循環再造的廢物、惰性廢物和經過處理後的廢物渣滓。據估計，連同政策大綱內的減少廢物和處理廢物措施所能發揮的作用，從 2006 年至 2025 年間的堆填區空間需求仍達 2 億公噸，但堆填區的剩餘容量（於 2004 年底）只有 9 千萬公噸。因此，本港的廢物管理策略中的重要一環，便是擴建三個現有的堆填區來補救目前堆填區容量短缺情況。事實上，該政策大綱預計在 2010 年代的初期至中期便需要使用這些擴建部份。

除了增加全港的堆填區容量外，現時亦有需要滿足地區性的廢物處理要求。現有的三個堆填區均位於策略性的位置，而全港整體的廢物處理計劃是利用集中廢物運輸，以避免過多的廢物收集車輛於市區行走(1) 。爲維持現有的整體廢物處理計劃，擴建現有三個堆填區是必須的。由於位置接近市區，新界東南堆填區是全港使用率最高的廢物處置設施，每天接收約 6,200 噸都市固體廢物、建築廢物和特殊廢物，尤其廣爲上述各類廢物的私營收集者使用。若新界東南堆填區關閉，便必須把廢物轉運往新界東北和新界西堆填區。廢物收集車輛將需每天多行額外數十萬公里車程，把新界東南堆填區收集到的廢物運往距離較遠的新界東北和新界西堆填區，這樣將會增加對沿途環境的影響，例如增加車輛廢氣、交通和噪音影響等。爲減少有關影響，本港需要一個長遠的計劃，在東南新界發展新的廢物轉運及處理設施，例如建築廢物處理設施及都市固體廢物轉運或處理設施（如東南九龍物料回收及轉運站）。由於規劃（包括選址）、可行性研究、法定環境影響評估程序、招標及合約安排、詳細設計、施工及運行測試等將需時多年，並將和擴建堆填區後的使用時間相若。因此增加堆填區的容量，以減少在其他設施啓用前的風險尤爲重要。

(1) 根據一九八九年六月五日推出的《白皮書：對抗污染莫遲疑》及同年十二月十二日審批的《香港廢物處理計劃》，本港應有三個策略性堆填區，根據以下原因分佈不同區域：

- 每日的都市固體廢物不應由一個或二個堆填區處理，以免令附近道路及堆填區本身造成過重負擔。
- 預料新界西及新界東北的都市固體廢物生產量會增加，因此需要在該地區提供廢物處理設施，以減少交通成本。
- 有需要在鄰近港島的地區提供最後廢物處理設施，以減少運送市區產生的廢物的交通成本。

由於在九龍及港島區內未能找到合適的地點，現有的三個策略性堆填區位於新界西、新界東北及新界東南。

由於預計在 2010 年代初仍未能提供建築廢物處理設施所需用地，而東南九龍都市固體廢物轉運或處理設施的選址過程仍未展開，因此現時未能提供確定上述兩項新設施的啓用時間。要在將軍澳及東南九龍臨海地段選出合適及爲公眾接受的地方，而又不影響區內規劃及發展，將需要一段長時間作詳細規劃及進行公眾資詢。另外，有關設施的資金審批還未落實。按照樂觀條件設定時間表，現時估計有關設施最早能在 2017 年啓用。由於東南新界堆填區預計將於 2012 年填滿，因此將需要額外的容量來應付最少 6 年的廢物棄置需求。所以，必須延長新界東南堆填區的使用期，使政府有足夠時間規劃和發展這些新廢物處理設施。

1.3 環評研究的目的和方法

本工程項目是「環評條例」附表 2 的 G.1 和 Q.1 類指定工程項目，因此，無論是擴建堆填區的施工、運作、復修或護理，都需要申領環境許可證。

是次環評研究的目的包括：對擴建計劃可能造成的環境影響，提供有關影響性質和範圍的資料；建議適當的緩解措施，以便控制各種潛在環境影響，務求能夠符合「環境影響評估條例技術備忘錄」（以下簡稱「環評技術備忘錄」）的要求；及證實擴建計劃在環保方面的可接受程度。環評研究大綱所提出的主要環境事宜包括：空氣質素、噪音、水質、廢物管理、沼氣危險、生態，以及景觀及視覺影響。

是次環評是按照「環評技術備忘錄」所闡述的評估方法指引進行。一般評估方法包括：闡述是次影響評估的基線環境情況、識別和評估潛在影響，以及建議緩解措施和環境監察計劃。是次環評研究的各項評估，均採用行之有效和國際上接受的方法，並根據合理的最壞情況而進行。

2 *方案篩選*

2.1 各個擴建方案的考慮

環保署在將軍澳 137 區選定一幅 15 公頃土地，以及與之相連位於清水灣郊野公園內的一片狹長土地，可以作爲新界東南堆填區擴建計劃的選址。*圖 2.1a 至 2.1e* 所示，是目前已找到，並在是次可行性研究中選定及加以研究的五個擴建方案。每個擴建方案的主要資料均羅列於表 *2.1a*。

表 2.1a 擴建方案主要資料

擴建方案	特點	淨容量（百萬立方米）	佔用清水灣郊野公園面積（公頃）	估計建設成本（每噸廢物所需港元）	額外使用期（年）
方案 1a	• 單一堆填區 • 單一基礎設施	1.3	0	350	<1
方案 1b	• 單一堆填區 • 與現有堆填區共用基礎設施	1.6	0	200	<1
方案 2	• 層疊式堆填區 • 與現有堆填區共用基礎設施	10	0	80	4
方案 3a	• 層疊式堆填區 • 與現有堆填區共用基礎設施	15	3	60	5
方案 3b	• 層疊式堆填區 • 與現有堆填區共用基礎設施	17	5	50	6

註： (a) 現有策略性堆填區的建設成本約爲每公噸 HK$60。

2.2 方案評價

上述五個方案均以下列五項準則進行評價：

- 堆填區容量；
- 土地運用效率；
- 成本效益；
- 佔用郊野公園的程度；及
- 潛在環境影響。

此外，亦考慮過以工程方法，以及於將軍澳 137 區徵用更多土地來盡量增加擴建區的容量，以避免佔用清水灣郊野公園。

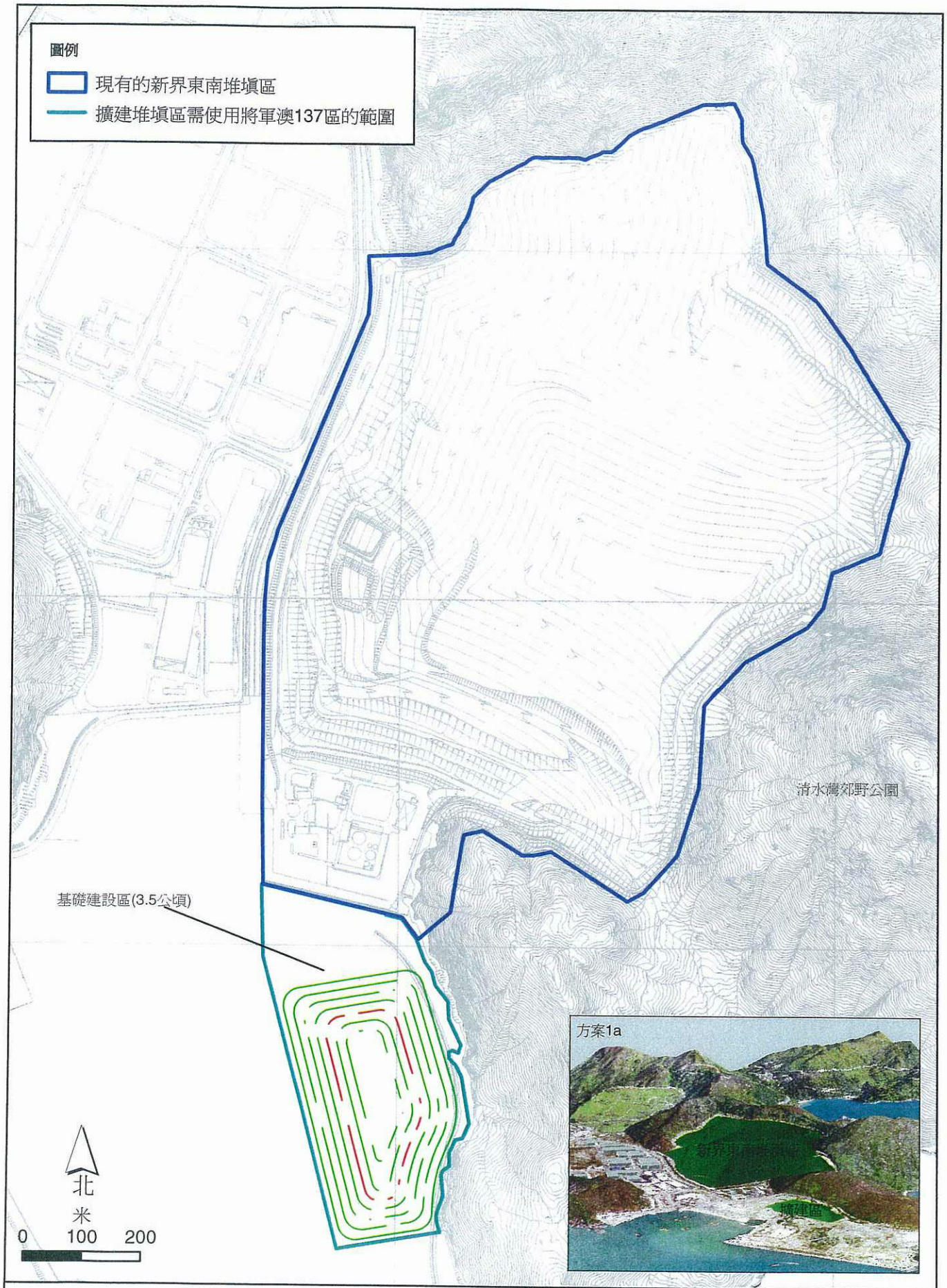

圖2.1a

擴建方案 1a

File: 0036286_Option1a_1_chi.mxd
Date: 09/01/2007

Environmental Resources Management

ERM

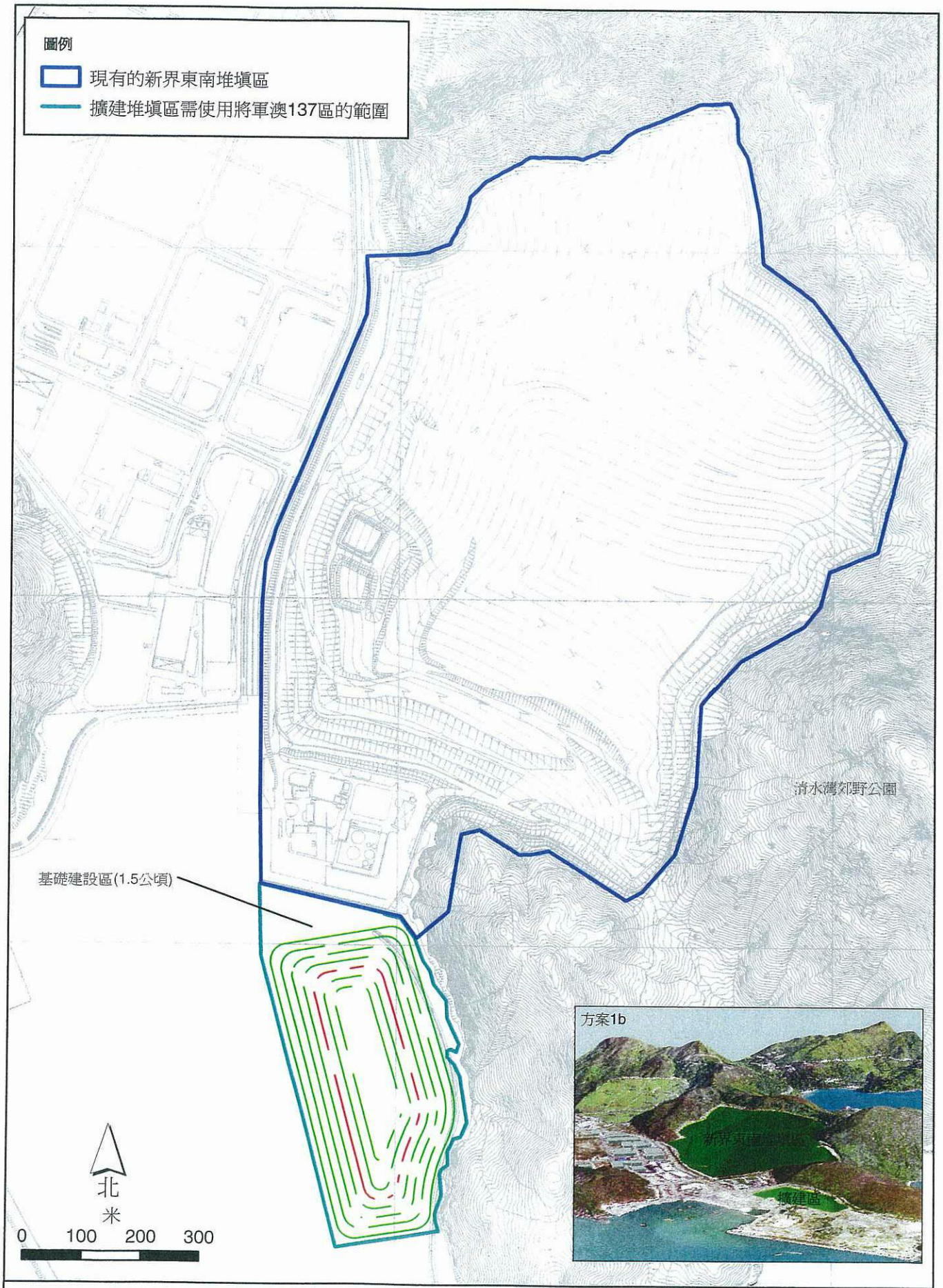

圖2.1b

擴建方案 1b

File: 0036286_Option1b_chi.mxd
Date: 09/01/2007

Environmental Resources Management ERM

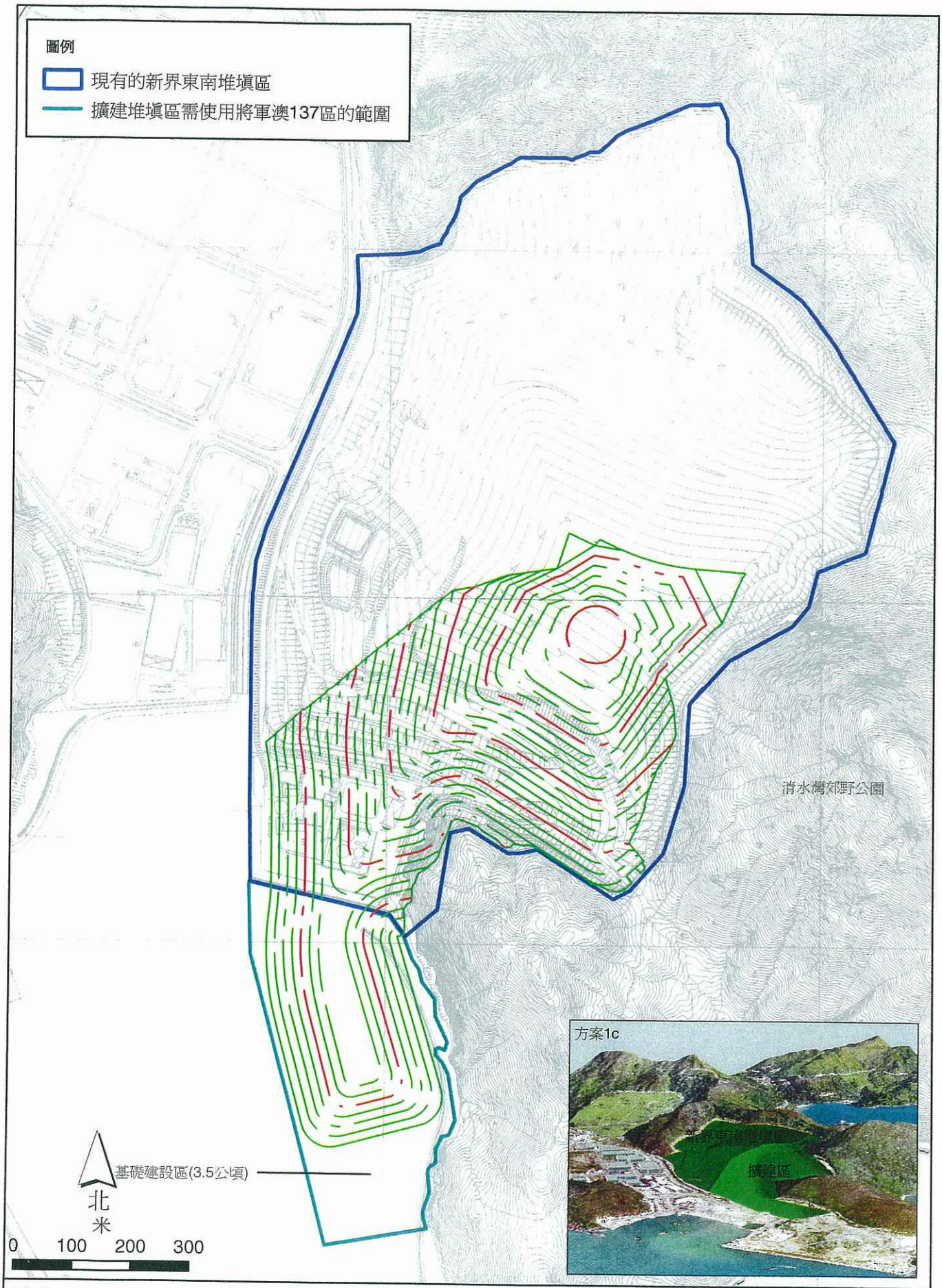

圖2.1c

擴建方案2

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Date: 09/01/2007

Environmental Resources Management ERM

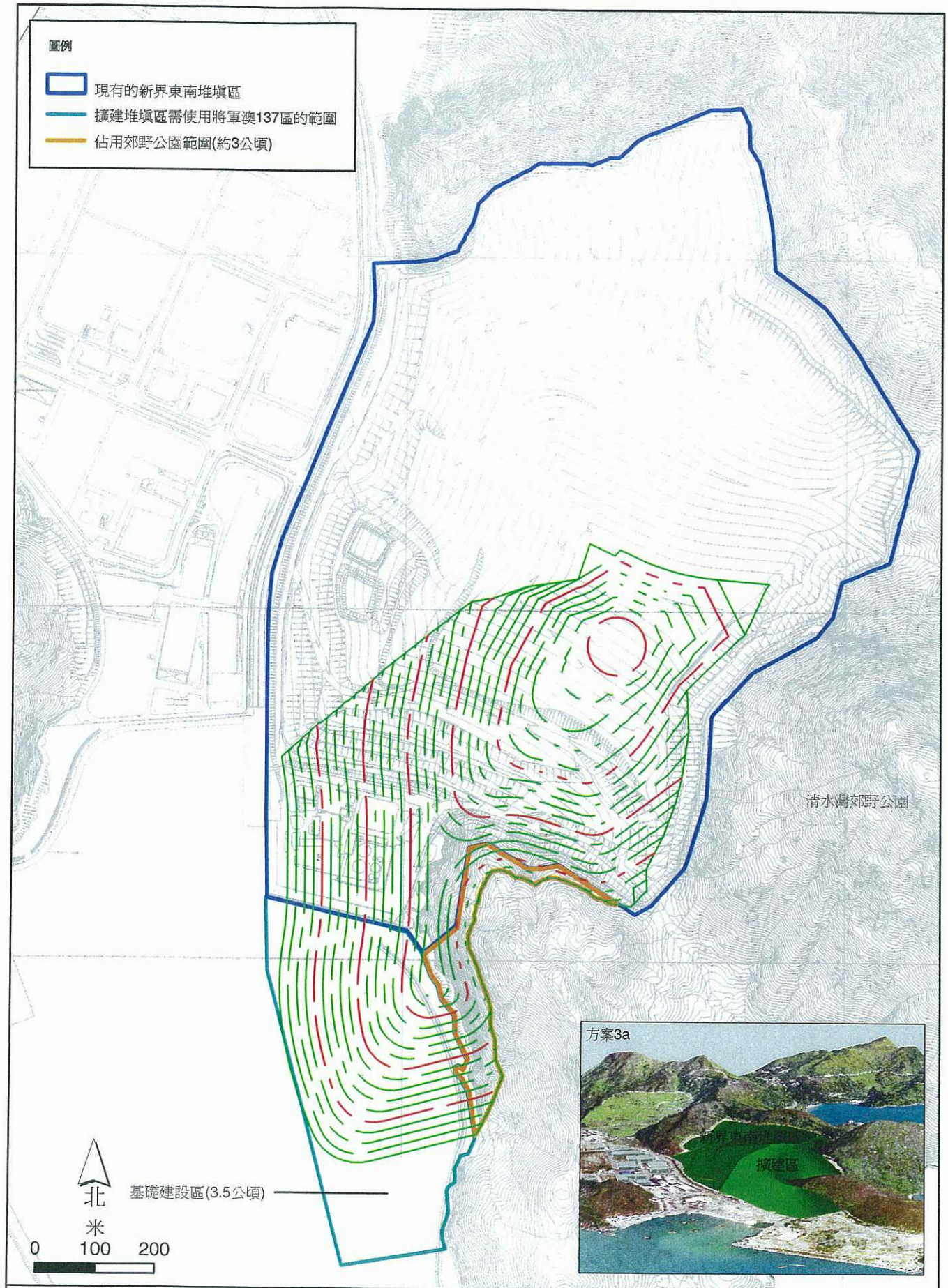

圖2.1d

擴建方案 3a

File: 0036286_Option3a_2_chi.mxd
Date: 04/12/2007

Environmental Resources Management ERM

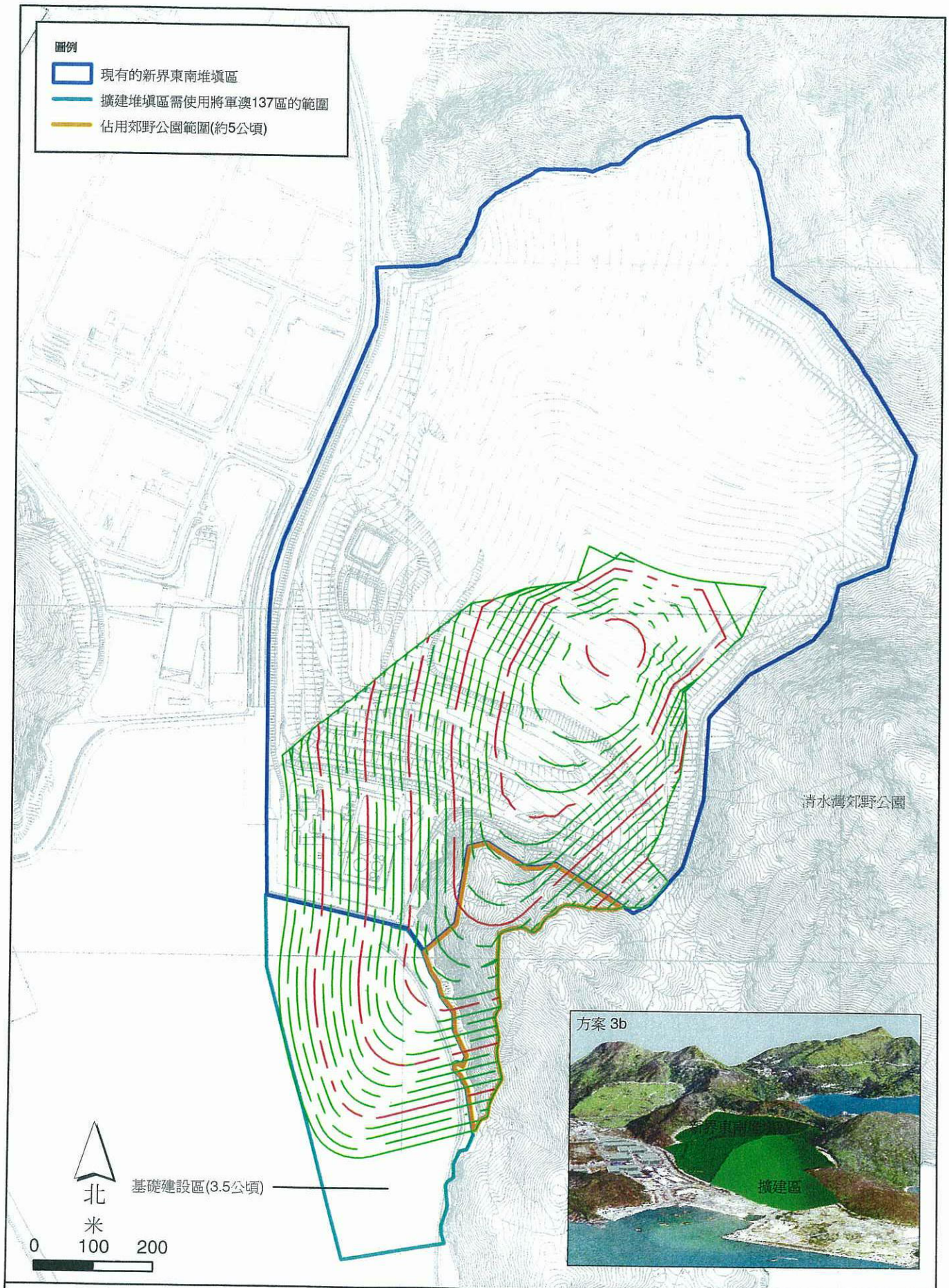

圖2.1e

擴建方案 3b

File: 0036286_Option3b_2_chi.mxd
Date: 04/12/2007

Environmental Resources Management ERM

2.2.1 堆填區容量

各個單一堆填區方案（方案 1a 和 1b）所能提供的可用容量都很小；約等於把新界東南堆填區的可用期延展不足一年。各個堆疊方案（方案 2、3a 和 3b）提供顯著較高的可用容量，其中以方案 3b 所提供的可用容量最大，並能提供足夠額外可用時間，直至新廢物管理設施落成使用。

2.2.2 土地運用效率

所有方案都利用位於將軍澳 137 區內，毗鄰現有新界東南堆填區南端的 15 公頃土地。方案 3a 和 3b 都需要從清水灣郊野公園額外借用土地。在各方案中，方案 3b 的每單位工地面積能夠提供最高的可用容量，因此土地運用效率亦屬最高。

2.2.3 成本效益

以處理每噸廢物所需資金計算，獨立堆填區方案需要最多資金。方案 3b 的建設成本最低，因此是最具成本效益的方案。

2.2.4 佔用郊野公園的程度

方案 1a、1b 和 2 都不會臨時佔用清水灣郊野公園，因此不會直接影響該郊野公園。方案 3a 和 3b 分別會佔用郊野公園土地約 3 公頃和 5 公頃。因此，這兩個方案都會直接影響清水灣郊野公園的生境和野生動物。唯可能會佔用的地區是一個懸崖，主要是灌木地和草地。該區現時沒有遠足小徑或正式行人路，因此，只能從現時的新界東南堆填區或將軍澳 137 區內的填料庫前往；而且，該區從未被用作康樂及教育用途。根據爲期 9 個月的生態基線調查發現，清水灣郊野公園內受影響的生境都屬生態價值不高的灌木地和草地。雖然直接受影響的地區內有一些具保育價值的野生動物（包括雀鳥、蝴蝶、蝙蝠和爬行類動物），但牠們的流動性都很高，而且在清水灣郊野公園內和附近很多類似的生境中都可找到它們的蹤影。

2.2.5 環境影響

方案 1a 和 1b 的規模較小，因此對當地的環境影響比其他方案都較低。然而，它們的可用期較短，因此，廢物收集車可能需要有一段較長的時間轉往其他堆填區，造成更多全港性的環境影響。相反地，規模較大的方案 2 和 3a 會對當地造成較大的環境影響，但由於可用期較長，可能造成的全港性環境影響亦會較小。此外，地方性的環境影響可以透過仔細的設計、良好的工地管理和漸進式的復修計劃等予以緩解。方案 3b 是規模最大的擴建方案，對當地造成的環境影響會比其他四個方案都較大，而且會影響清水灣郊野公園內的天然生境。然而，該方案對清水灣郊野公園的影響可以透過補償種植予以緩解，亦

可於使用後對曾佔用的地區進行適當後期發展，務求促進其教育及康樂價值。

2.2.6 曾予考慮的工程措施

可行性研究已考慮過一些可以增加擴建區容量，但無需佔用清水灣郊野公園的工程措施；其中包括在廢物堆四周建造一幅擋土牆或土堤。若要這項措施有效，擋土牆或土堤的高度必須超過 40 米。這項措施可能涉及相當高的成本，而且，土堤本身亦可能佔用相當多的堆填區可用空間。作爲一項獨立的設施，它可能難以融入四周景觀，而且，在視覺上亦難被接受。因此，這項工程措施沒有被提出作進一步考慮。

2.2.7 將軍澳 137 區內的額外用地

可行性研究曾經考慮一個增加擴建堆填區在將軍澳 137 區內用地的方案，藉此探討是否可以避免佔用郊野公園。若要開拓一個與方案 3b 容量相同的擴建區而無需佔用清水灣郊野公園，所需要的土地面積，會比目前在將軍澳 137 區內所選定的地點約大兩倍。由於將軍澳 137 區內的土地需求很高，因此，在區內再額外撥出土地並未可行。而且，新界東南堆填區若向南面毗鄰清水灣郊野公園的地方擴建，亦只能提供有限的額外容量。

2.2.8 篩選最可取方案

是次可行性研究按照研究概要第 3.3.2 條的要求，考慮了如何避免或減少佔用清水灣郊野公園，以及滋擾鄰近地區，包括清水灣郊野公園的生態系統。因此，首先考慮了無需佔用清水灣郊野公園的方案 1a、1b 和 2。

在五個被審查的方案中，方案 1a 和 1b 在施工和運作期間對清水灣郊野公園和附近敏感受體的影響都會最小。然而，這兩個方案所能提供的額外堆填區容量都很小，因此在成本和土地運用上都欠缺效率。此外，這兩個方案的使用期都很短，因此，廢物收集車會有較長時間需要把廢物運往較遠的堆填區，這樣會對全港範圍造成更多環境影響。故此，這兩個方案都未獲推薦採用。

方案 2 的可用容量比方案 1b 大 6 倍，而且無需額外佔用清水灣郊野公園內的土地。然而，它們的可用容量亦只有 10 萬立方米（仍低於可用容量目標），而且以處理每噸廢物計的建造成本亦會比現有的策略性堆填區昂貴。方案 2 所能提供的可用空間，比佔用郊野公園的方案 3a 和 3b 小 50%。爲了充份利用現存的堆填區，有部份廢物收集車需要轉往其他兩個堆填區，所以仍會造成全港性的環境影響。方案 2 對當地環境所造成的影響，會與方案 3a 和 3b 相若，但不會直接影響天然生境。在視覺上，方案 2 融入四周環境的程度不及方案 3a 和

3b。此外，研究發現，以工程措施增加可用空間而避免佔用郊野公園的構思是昂貴的，亦可能造成不良的視覺影響。同時，這個方法只能增加很小可用空間。

由於方案 1a、1b 和 2 都不能爲香港未來的 20 年提供足夠的堆填區可用空間，因此，是次研究對需要臨時佔用清水灣郊野公園的方案 3a 和 3b 作出深入考慮。

方案 3a 和 3b 都會對清水灣郊野公園造成直接影響。方案 3b 在提供最大可用空間、善用土地和達致最佳成本效益方面，都能夠取得最好的效果。在對當地環境的影響方面，此方案與方案 2 相若，也可以透過小心設計和良好施工方法來加以緩解。被臨時佔用的地區主要是一個崖面，沒有任何小徑或正規通道。因此，該方案不會影響社會大眾享用清水灣郊野公園。在天然生境的影響方面，被臨時佔用地區的生態價值屬偏低至中等，當中的植物和動物都是清水灣郊野公園內常見的種類。在堆填區運作結束後，被臨時佔用區會與附近的堆填區一起加以復修。預計可以對復修後的擴建區加以美化，藉此增加其康樂價值，供社會大眾享用。

社會大眾既需要堆填區空間，亦需要郊野公園。然而，若不能善用這個擴建地點，不足的可用堆填空間便需由其他堆填區補足；結果不但會減少其他堆填區的可用空間，以致香港在未來 20 年內出現整體堆填區空間不足的情形，而且還會因爲運送廢物至這些堆填區的路程較長而造成環境影響。在權衡上述各種利弊後，方案 3b 獲推薦作詳細環評研究的最可取方案。它能夠提供最大的可用空間和可用時間，同時亦能夠透過妥善的設計和緩解措施，把環境影響控制在可接受水平。

2.3 不同施工方法和工序的考慮

2.3.1 平整工地

建議採用填土而非挖掘的方式，來造成位於將軍澳 137 區和現有新界東南堆填區基礎設施區內的擴建地點。這個方法將產生較少掘出物料，也可以避免堆填區底部置於將軍澳 137 區內較淺的地下水範圍。

2.3.2 斜坡建造

是次研究檢討了各種可行的斜坡建造方法，以及它們對環境的利弊。採用爆破技術比非爆破方法優勝。雖然爆破會對環境造成較大影響，但爲時非常短暫，而且可以緩解。相對而言，採用非爆破或挖掘的方法（包括持續使用噪吵的液壓破碎機）會造成較長時間的影響，因此並不可取。爆破亦較具成本效益，有助於確保準時完工。

2.3.3 排水隧道

是次研究亦檢討了兩條小型排水隧道的不同建造方法。結果顯示，隧道鑽挖法比爆破法更可取。兩個方案的環境影響相若，而且大部份影響都局限在隧道內。然而，鑽挖法的效率較高，亦較容易控制挖掘形狀。爆破法則需於接近潛在沼氣來源的封閉空間內使用炸藥，因此會有潛在的安全問題。

2.3.4 工序安排

建造擴建區的工序如下：

1) 建造一個新基礎設施區，來處理來自現有新界東南堆填區及未來擴建區的滲濾污水和沼氣。
2) 拆除現有新界東南堆填區的基礎設施；及
3) 將整個堆填區底部的建造和鋪墊，包括斜坡的平整，然後才開始放置廢物。

這個工序安排可以確保現時的新界東南堆填區能夠不間斷地運作，以及把運作暢順地轉至擴建區，並確保其運作安全。

2.3.5 階段劃分

這個擴建計劃會分階段進行。建議每個階段都從西側（即最靠近環保大道及附近的敏感受體的一邊）開始堆填。在每個階段的西面邊界堆填至預定高度後，開始逐步復修堆填區向外的一面。這個完成部份便可以形成一面屏障，有助於減低來自該個階段其餘部份的噪音、視覺和空氣質素影響。

3.1 擴建區的設計

圖 3.1a 是最可取擴建方案的平面圖。這個擴建區是一個層疊式堆填區，佔用現時新界東南堆填區的基礎設施區、將軍澳 137 區的 15 公頃土地，以及清水灣郊野公園約 5 公頃土地。基礎設施區將位於本工程項目地點的南端。

擴建區佔地約達 50 公頃（包括工地基礎設施所需要的範圍）。在扣除工程所需空間，以及每日覆蓋層和中期覆蓋層所佔空間後，可作堆填廢物之用的可用容量約爲 17 萬立方米。擴建區的可用期估計長約六年，約於 2013 年啓用(1)。

擴建區的設計包括：

- 堆填區墊層和覆蓋－這些部份都用不透氣物料造成，可以把廢物、滲濾污水和沼氣限制在廢物範圍內。
- 沼氣管理系統－包括多個沼氣收集井和管道，以及一個沼氣處理設施。這些部份合起來便可以控制沼氣積累，並防止沼氣逸出工地外及轉移至附近地區。
- 滲濾污水處理系統－包括多個滲濾污水收集及抽取點、管道和一個處理廠。這個系統會控制堆填區內的滲濾污水水位，並確保處理後的滲濾污水符合擴建區的特定污水排放標準。
- 地面水管理系統－包括在堆填區四周邊沿建造的地面水截流渠，以及排水隧道。這些設備會防止高地的地面水流進擴建區，亦會防止擴建區內的已受污染徑流排進附近地區。
- 地下水管理系統－包括一個位於堆填區底部墊層之下，經過特別設計的排水層。這個排水層的設計，是要把地下水收集起來，引離墊層，並送至擴建區邊界的收集坑。
- 氣味管理及控制系統－主要的特色包括：把所有滲濾污水儲存缸和處理缸加以封閉 (2)；在使用中的廢物傾卸面和工地西面邊界採用辟味劑或抑味劑；盡量縮小使用中的廢物傾卸面和特殊廢物槽的大小；爲特殊廢物槽提供流動覆蓋；以不透氣的墊層覆蓋非使用的傾

(1) 是次研究的所有工程及環境評估均假設現有的新界東南堆填區將於 2012 年左右關閉，而擴建區則於 2013 開始運作。本時間表或會改變，全視乎現有的新界東南堆填區的真實關閉日期而定。

(2) 順序分批反應器的處理缸屬例外，以免廢水過熱而影響生物處理過程。

卸面；即時以泥土或選定的惰性物料覆蓋都市固體廢物；封閉磅橋區；提供車輛洗滌設施，以及逐步復修已填滿的範圍。

- 工地基礎設施－包括：廢物接收設施（例如磅橋、接收崗）、車輛洗滌設施、辦公室及訪客中心、實驗室、維修工場、儲存區、上述沼氣處理設施及滲濾污水處理廠。

3.2 實施計劃

實施計劃的主要日期均羅列於*表 3.2a*。

表3.2a 實施計劃主要日期

項目主要階段	大約日期
動工	2011
新基礎設施啓用	2011
拆除現有基礎設施	2012
現有新界東南堆填區停止接收廢物	2012
擴建區開始接收廢物	2013
擴建區停止接收廢物	2018
擴建區護理期完成	2048

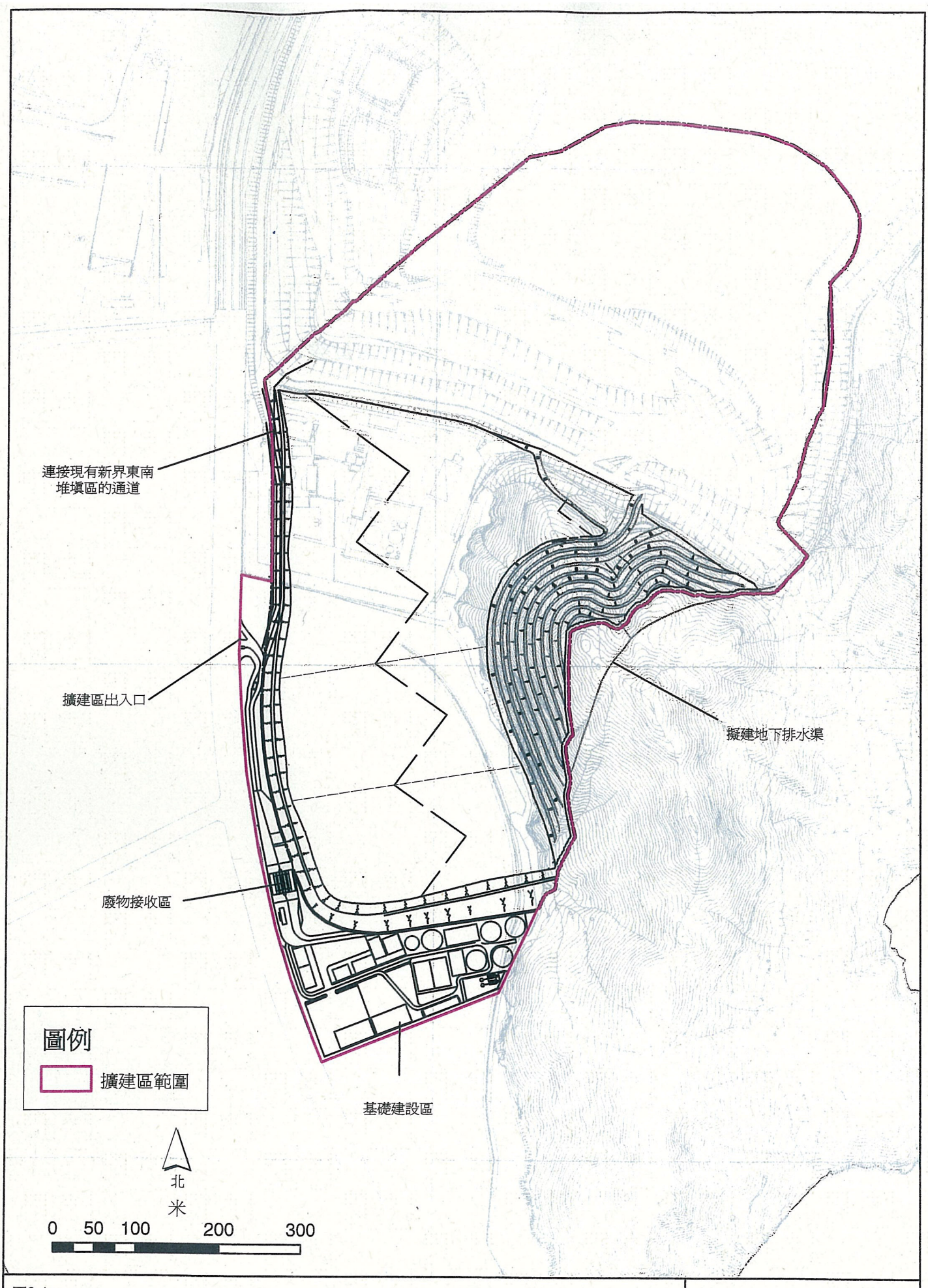

圖3.1a

擴建區的平面佈置示意圖

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Environmental Resources Management

ERM

本頁特意留空

4 環境影響

下文摘述本工程項目可能造成的環境影響。

4.1 空氣質素

是次研究評估了建造工作可能產生的塵埃滋擾，以及設備可能排放的廢氣。預計在實施評估報告所建議的塵埃控制措施和良好工地守則後，擴建區的建造工程將不會造成不良的塵埃或空氣質素影響。

根據預測，由沼氣處理設施、滲濾污水處理廠和沼氣發電機排放的氣體，在易受空氣污染影響的受體的濃度均符合相關的香港空氣質素指標、國際慢性及急性參考指引及健康風險指引。該預測濃度已計算在 500 米研究範圍內所排放的氣體在內，並包括背景濃度。預計各種揮發性有機化合物在擴建區邊界處的水平會偏低，而且均低於有關的警戒水平。因此，預計擴建區在運作時可能產生的揮發性有機化合物，將不會對已知的易受空氣污染影響的受體造成不良空氣質素影響。

擴建區的設計已經包括一個嚴格的氣味管理和控制系統（見 *3.1 節*）。此外，亦會於運作承辦合約採用良好工地守則和管理方法。

除了在擴建區邊界側的易受空氣污染影響的受體之外，預計在裝設氣味管理及控制系統後，該區的氣味影響將不會超過相關標準。預計在將軍澳 137 區部份被劃作工業用地的小範圍，以及在擴建區邊界旁的電視廣播城，都會受到一些剩餘影響。

電視廣播城方面的超標次數，亦可以透過改變傾倒廢物的時間安排而得以減少(1)。在爲期六年的運作期間，使用中的廢物傾卸面和各個易受空氣污染影響的受體之間的分隔距離和高度都會不斷增加，因此，預計在電視廣播城的超標數目會逐漸減少至零。應予注意的是，這次評估對特殊廢物槽所採用的氣味散發率，是根據廢物槽無覆蓋的情況，屬於審慎數值。在真實情況下，由於廢物槽會有覆蓋，因此所散發的氣味會少得多；而且，困在槽中的空氣會先予洗滌，然後才排入大氣中。此外，擴建區不會接收污水廠的淤泥。因此預計，實際的氣味水平和超標次數，都會比這次評估所預測的數值少得多。考慮到：(i) 受影響項目的性質；(ii) 受影響的人數較少；及(iii) 超出標準的情況只屬暫時性，及出現的頻率和程度都屬偏低，本工程地方的剩餘影響應屬可接受範圍。

在護理階段，氣體散發的主要來源是沼氣管理設施和沼氣體發電機。擴建區設計會以一個覆蓋系統（包括不透氣的墊層）把擴建區密封，

(1) 在七月至十一月期間，不在擴建區的北部傾倒任何廢物。

然後把被封的沼氣抽出使用或燃燒。於密閉缸所排出的氣體會抽至沼氣管理設施燃燒或經淨氣設備加以處理。已清洗的氣體會用於順序分批式反應器的曝氣系統中。氣味來源將會局限於滲濾污水處理廠的順序分批反應器處理缸。這個階段的氣味強度和擴建區的運作規模都比運作和復修階段顯著縮小，因此，預計不會造成不良氣味影響。根據預測，沼氣處理設施所排放的廢氣對任何已知易受空氣污染影響的受體的影響，都會符合香港空氣質素指標、急性及慢性參考濃度及健康風險指引。因此，總結來說擴建區在護理期間，將不會對已知的空氣質素敏感受體造成不良空氣質素影響。

有關塵埃、氣味、背景揮發性有機化合物、氨、二氧化硫和煙囪排放的氣體的定期監察要求，均於「環境監察與審核手冊」作出了建議和詳細闡述。

4.2 噪音

在各個已知噪音敏感受體處的預測建築噪音水平，均遠低於「環評技術備忘錄」所訂準則。因此，預計不會出現不良的建築噪音影響。

根據預測，在噪音敏感受體處的堆填區運作噪音水平（包括固定設備所產生的噪音）均符合相關「技術備忘錄」要求。預計在堆填區關閉後，護理階段的噪音影響將屬微不足道。

是次研究已對環保大道、昭信路和未來的跨灣連接路 (Cross Bay Link) 沿線的噪音敏感受體的交通噪音水平作出預測。擴建區交通所產生的新增噪音水平，並不顯著。

雖然預計擴建區在運作和復修階段不會造成噪音影響，但仍建議實施良好工地守則，以進一步減少任何噪音影響。

4.3 水質

在實施是次環評所闡述的緩解措施，並採用良好工地守則後，本工程項目將不會對水質造成不良影響。

本工程項目會在傾倒區四周建造一個地面水排水系統，以防止雨水流入堆填區而受到污染，亦防止已受污染的雨水流出工地範圍。已受污染的徑流會由這個系統收集，並與滲濾污水一起加以處理。此外，亦會裝設一個全面的滲濾污水防洩系統，把堆填區所產生的滲濾污水封閉在區內。在裝設系統時，會實施質量控制和保證程序，以確保各個接口均已妥當密封，並避免在建造這個系統時損毀不滲漏墊層。

水力地質評估結論認爲，只要堆填區的覆蓋層保持完好，並能妥善控制滲濾污水，本工程項目將不會對地下水的水質造成任何不良影響。

縱使在極長遠的時間（以數百年計），當堆填區覆蓋層退化，而且滲濾污水的主要控制設施已經逐漸未能發揮全部功用，預計地下水可能受到的潛在影響仍屬輕微。在這種情況下，流進將軍澳的地下水水質，仍會符合「水污染管制條例」所規定的污水排放標準。

從擴建區收集到的滲濾污水和其他污水，都會在現場的滲濾污水處理廠加以處理。該廠處理過的污水會排進公共污水渠，並輸送至政府的處理廠作進一步處理。進入污水渠的已處理污水會符合「技術備忘錄 - 排放入排水及排污系統、內陸及海岸水域的流出物的標準」內所規定的污水排放標準。水質將不會受到任何不良影響。

4.4 廢物管理

在本工程項目的施工、運作、復修和護理階段可能產生的廢物包括：挖掘物料、建造及拆卸物料、日常運作所產生的一般垃圾、維修機器和設備所產生的化學廢物，以及滲濾污水處理廠所產生的淤泥。是次研究已經估計了這些廢物的數量、質量和產生時間。在採用良好工地守則後，存放、處理、收集、運輸和處置這些廢物時對環境可能產生的影響，將會符合「環評技術備忘錄」所規定的可接受限度。因此，預計本工程項目不會造成任何不良廢物管理影響。

4.5 沼氣危險

是次研究評估了現有新界東南堆填區的沼氣從地底轉移至擴建區，以及從擴建區轉移至毗鄰的現有和未來發展項目的潛在危險。在這方面，現有的新界東南堆填區及其擴建區都屬於「中等」程度的危險來源。現有的新界東南堆填區已經全面裝設行之有效的沼氣控制措施，同時未來亦會在擴建區內裝設。根據來源－途徑－目標分析結果顯示，新界東南堆填區和擴建區在施工和運作階段對擴建區工地所造成的沼氣風險，屬於中等至偏高。然而，擴建區對毗鄰發展項目所構成的風險，則介乎十分低至偏低，視乎這些發展項目的性質和位置而定。

一般而言，擴建區的基礎設施區應該盡量避免採用地下室或洞穴式的設計。是次研究亦爲擴建區的施工、設計和運作及復修等階段，建議了其他預防和保護措施。預計在實施這些預防措施後，沼氣轉移至各個目標地點的潛在風險會極低。有關方面將會對邊界的沼氣監察井和維修空間進行定期監察，以確保沼氣沒有轉移至堆填區外。

4.6 生態

在研究區內（包括擴建區工地及其 500 米緩衝區）記錄到的陸地和水中生態資源包括：種植區、灌木地、草地、已發展區、季節性河溪和

潮下生境，以及相關的野生動物。在這些生境之中，灌木地具有中等生態價值，而其他生境則具有偏低，或偏低至中等的生態價值。已發展區的生態價值屬微不足道。

擬建的擴建區大部份都會位於已受滋擾及已發展的生境中，其中包括現有的新界東南堆填區和將軍澳 137 區內的填料庫。擬建的擴建區會佔用清水灣郊野公園的一小片土地（約 5 公頃），其中包括具有偏低至中等生態價值的灌木地和草地生境。這些位於清水灣郊野公園內的天然生境可能會受到偏低至中等程度的影響。預計在實施是次研究所建議的緩解措施後，不會造成不良的剩餘影響。由於擴建工程不包括海事工程，因此不會影響海洋生境和物種。

根據一次調查的記錄，擴建區工地內有 11 種具保育價值的野生動物（包括雀鳥、蝴蝶、蝙蝠和爬行動物）。由於這些動物的流動性都高，而且擴建區附近有很多類似的生境，因此，本工程項目對這些野生動物的影響極輕微。

是次環評研究闡述了多項可以減少生態影響的緩解措施，其中包括：採用地面水、地下水、滲濾污水和沼氣管理系統、良好工地守則，以及進行補償種植。這些措施會減少本項目對附近環境的潛在滋擾，亦有助於形成一個比現有地點具更高生態價值的生境。

4.7 景觀及視覺影響

在實施緩解措施後，本工程項目在施工階段對景觀資源的影響會介乎「不多」至「很多」。在運作和復修階段，景觀影響會減少至「不多至中等」，而在護理階段的第 10 年，當復修後的景觀完全成長後，影響會再減少至「不多至輕微」。填海而得的將軍澳 137 區則會受到「輕微正面」的景觀影響。

住宅類的敏感受體大都距離擴建區頗遠。在實施各項緩解措施後，住宅類視覺敏感受體在施工階段所受到的視覺影響，會介乎「不多」至「輕微」，並會在運作和復修階段時因爲堆填區的體積和高度逐漸增加，輕微惡化至「不多至中等」。在護理階段的首天，亦即堆填區運作停止後，視覺影響會減少至「不多至輕微」，並會在景觀復修工作逐漸完成時，再減少至「不多」。

4.8 環境監察與審核

是次環評研究已找出各項環境監察與審核要求，並建議本工程項目予以實施，以確保各項建議緩解措施的成效。這些要求都已在「環境監察與審核手冊」中闡述。它們所涵蓋的範圍包括：塵埃、有機物質的

排放、氣味、氣體排放、地面水、地下水、滲濾污水和沼氣。此外，亦建議在擴建區的施工、運作、復修和護理階段進行定期現場審核。

本頁特意留空

5 *總結*

是次環境影響評估（涵蓋了空氣質素、噪音、水質、廢物管理、沼氣危險、生態和景觀及視覺影響）結論認爲，在實施是次評估所建議的各項緩解措施後，擴建區的施工、運作、復修和護理都不會對環境造成不可接受的影響。預測擴建區邊界附近的易受空氣污染影響的受體會受到剩餘氣味影響。在考慮過受影響的發展項目的性質、受影響人數、影響的過渡性質、超出標準的次數和程度等因素後，是次評估認爲有關的剩餘影響屬可以接受。

是次環評研究已經擬訂建議實施的環境監察與審核計劃，以確保各項建議緩解措施的成效。