FORM
5

[redacted]

Application No. : VEP-549/2018
Reference No. :
(For official use)

# FORM 5
# ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE
# (CHAPTER 499)
# SECTION 13(1)

# Application for Variation of an Environmental Permit

## PART A PREVIOUS APPLICATIONS

☐ No previous application for variation of an environmental permit.

☑ The environmental permit was previously amended.

Application No. : VEP-389/2013

## PART B DETAILS OF APPLICANT

**B1. Name :** (person or company)

Civil Engineering and Development Department

[Note : In accordance with section 13(1) of the Ordinance, the person holding an environmental permit or a person who assumes responsibility for the designated project may apply for variation of the environmental permit.]

**B2. Business Registration No. :** (if applicable) [redacted]

**B3. Correspondence Address :**

[redacted]

**B4. Name of Contact Person :** [redacted]

**B5. Position of Contact Person :** [redacted]

**B6. Telephone No. :** [redacted]

**B7. Fax No. :** [redacted]

**B8. E-mail Address :** (if any) [redacted]

## PART C DETAILS OF CURRENT ENVIRONMENTAL PERMIT

**C1. Name of the Current Environmental Permit Holder :**

Civil Engineering and Development Department

**C2. Application No. of the Current Environmental Permit :** VEP-389/2013 (EP-134/2002/K)

**C3. The Current Environmental Permit was Issued in :** month / year

0 2 / 2 0 1 3

**Important Notes :** Please submit the application together with

(a) 3 copies of this completed form; and

(b) appropriate fee as stipulated in the Environmental Impact Assessment (Fees) Regulation

to the Environmental Protection Department at the following address :

The EIA Ordinance Register Office,
27th floor, Southorn Centre,130 Hennessy Road,
Wan Chai, Hong Kong.

RECEIVED
24 OCT 2018
EIAO Register Office, E.P.D.

☐ Tick (✓ ) the appropriate box

PART D PROPOSED VARIATIONS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL PERMIT

| D1<br>Condition(s) in the Current Environmental Permit | D2<br>Proposed Variation(s) | D3<br>Reasons for Variation(s) | D4<br>Describe the environmental changes arising from the proposed variation(s) : | D5<br>Describe how the environment and the community might be affected by the proposed variation(s) | D6<br>Describe how and to what extent the environmental performance requirements set out in the EIA report previously approved or project profile previously submitted for this project may be affected : | D7<br>Describe any additional measures proposed to eliminate, reduce or control any adverse environmental impact arising from the proposed variation(s) and to meet the requirements in the Technical Memorandum on Environmental Impact Assessment Process : |
|---|---|---|---|---|---|---|
| **Condition 2.15**<br>"A marine based transportation route for public fill shall be provided at TKO Area 137 to allow public fill to be transported by barges to and from Area 137. During the operation-removal overlapping phase (October 2003 to December 2018), delivery of public fill out of Area 137 shall all be by barges."<br><br>**Condition 2.16**<br>"The fill bank shall not receive further public fill from 1st January 2019." | **Condition 2.15**<br>"A marine based transportation route for public fill shall be provided at TKO Area 137 to allow public fill to be transported by barges to and from Area 137. During the operation-removal overlapping phase (October 2003 to December 2021), delivery of public fill out of Area 137 shall all be by barges."<br><br>**Condition 2.16**<br>"The fill bank shall not receive further public fill from 1st January 2022" | Extension of public fill bank operation at TKO Area 137 up to 2021 to meet the needs for temporary stockpiling area for public fill and enabling the clearance of the stockpiled materials from the fill bank. | Environmental changes are not expected. The facilities and daily operation remain unchanged for the next 3 years. The total stockpiling capacity will be reduced from 6 million cum to 4.2 million cum after handing over 13ha area for SENT Landfill extension tentatively by end 2018 and about 10ha area for development of desalination plant tentatively by mid-2019. | To verify no adverse impact on the environment and the community, potential air quality impact and noise impact have been reviewed and are concluded compliance with the relevant environmental standards set out in the approved EIA Report (AEIAR-060/2002) and the Technical Memorandum on EIA Process, as shown in the attachment. | The environmental performance requirements set out in the approved EIA Report will not be violated and comply with the Technical Memorandum on EIA Process. | No additional measures are required. |

## PART E DECLARATION BY APPLICANT

**E1. I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief. I understand the environmental permit may be suspended, varied or cancelled if any information given above is false, misleading, wrong or incomplete.**

[redacted] [redacted] [redacted]

Signature of Applicant | Full Name in Block Letters | Position


on behalf of Civil Engineering and Development Department 24 October 2018

Company Name and Chop (as appropriate) | Date

**NOTES :**

1. A person who constructs or operates a designated project in Part I of Schedule 2 of the Ordinance or decommissions a designated project listed in Part II of Schedule 2 of the Ordinance without an environmental permit or contrary to the permit conditions commits an offence under the Ordinance and is liable to a maximum fine of $5,000,000 and to a maximum imprisonment for 2 years.

2. A person for whom a designated project is constructed, operated or decommissioned and who permits the carrying out of the designated project in contravention of the Ordinance commits an offence and is liable to a maximum fine of $5,000,000 and to a maximum imprisonment for 2 years.


CEDD Civil Engineering and Development Department

# Environmental Review for Extension of Operation of Fill Bank at Tseung Kwan O Area 137

24 October 2018

**ERM**
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18 Tak Fung Street
Hunghom, Kowloon, Hong Kong
Telephone 2271 3000
Facsimile 2723 5660

www.erm.com

ERM

*The business of sustainability*

REPORT

Civil Engineering and Development Department

# Extension of Operation of Fill Bank at Tseung Kwan O Area 137: *Environmental Review Report*

24 October 2018

Reference 0414816

| | |
|---|---|
| For and on behalf of Environmental Resources Management | |
| Approved by: | Frank Wan |
| Signed: | |
| Position: | Partner |
| Date: | 24 October 2018 |

CONTENTS

# 1 INTRODUCTION

## 1.1 BACKGROUND

The potential environmental impacts associated with the construction, operation and decommissioning of the Fill Bank at Tseung Kwan O Area 137 (TKOFB or the Site) has been presented in the approved Environmental Impact Assessment (EIA) Report for the "Fill Bank at Tseung Kwan O Area 137" (EIAO Register No.: AEIAR-060/2002) (hereafter referred to as the Approved EIA Report).

According to the Conditions 2.15 and 2.16 of the current EP (EP-134/2002/K granted on 4 February 2013), the TKOFB should not receive further public fill from 1 January 2019. To meet the needs for temporary stockpiling area for public fill and to enable the clearance of the stockpiled materials at the TKOFB, CEDD proposes to extend the operation and decommissioning of TKOFB to 31 December 2021.

## 2.1 PROPOSED OPERATIONAL CHANGES TO THE TKOFB

In general, the facilities and daily operation of the TKOFB remains **unchanged** (see Figure 2 of EP-134/2002/K). The proposed operational changes to the TKOFB are presented in *Table 2.1a*.

*Table 2.1a Proposed Operational Changes*

| | Key Item | Assumptions in the Approved EIA Report/ Previous ER Reports | Future Status with Proposed Operational Changes |
|---|---|---|---|
| 1 | Operational phases of TKOFB | Up to 31 December 2018 | Up to 31 December 2021 |
| 2 | Area | 104 ha | Approximately 14 ha will be handed over to EPD for SENT Landfill Extension tentatively by 2018<br><br>Approximately 10 ha will be handed over to WSD for development of a Desalination Plant tentatively by mid-2019 |
| 3 | Total stockpiling capacity | 6 million $m^3$ of public fill | Remain unchanged before handing over approximately 14 ha and approximately 10 ha of the site to EPD in 2018 and WSD in 2019, respectively. The total stockpiling capacity will then be reduced to about 4.2 million $m^3$. |

## 2.2 CHANGES TO PROJECTS IN THE VICINITY OF THE TKOFB

The following changes to projects in the vicinity of TKOFB have been considered in this environmental review.

### 2.2.1 *Extension of South East New Territories (SENT) Landfill*

The existing SENT Landfill is located to the north-east and east of the TKOFB (see *Figure 2.2a*). EPD has proposed to extend the SENT Landfill to the south of its existing boundary. As advised by CEDD, the construction of SENT Landfill Extension will be expected to commence in October 2018, while its operation will be commenced tentatively in 2020. The cumulative impact associated with the construction and operation of SENT Landfill Extension is therefore considered in this ER. Prior to the construction of SENT Landfill Extension, about 14 ha of the TKOFB will be handed over to EPD. The

cumulative impacts arising from the construction and operation of the SENT Landfill Extension are discussed in *Section 3*.

### 2.2.2 *Construction & Demolition Materials Handling Facility (C&DMHF)*

As a long-term measure, a C&DMHF would potentially be built within TKOFB to replace all other C&D material handling facilities in TKO Area 137, but the implementation programme for the facility has not been firmed-up yet. According to CEDD, all public fill handling facilities (such as TKOFB, C&DMSF and C&DMCF) within TKO Area 137 will be decommissioned when the C&DMHF commences its operation. No concurrent operation of the TKOFB and the C&DMHF will occur and therefore no cumulative dust impacts from these facilities are anticipated.

It is possible that part of the TKOFB will still be operating when the C&DMHF is being constructed. The potential C&DMHF will be located within the reduced TKOFB site boundary (after handing over of part of the site to EPD and WSD). The construction of the potential C&DMHF will involve only minor earthwork which will be similar to the activities associated with the operation of the TKOFB. The potential dust impact arising from the construction of the C&DMHF is expected to be minimal with the implementation of good construction site practice as stipulated in the *Air Pollution Control (Construction Dust) Regulation*. As the construction of the potential C&DMHF will be located within the reduced TKOFB site boundary and that the associated construction works will be similar in nature as the operation of the TKOFB, it is considered that the potential dust impacts during the construction of the C&DMHF will be no worse than those due to the operation of the TKOFB before 2021 (ie before handing over that portion of the site for the construction of the C&DMHF). For this reason, no separate dust impact assessment was carried out for the scenario with the operation/decommissioning of the TKOFB and the construction of C&DMHF being carried out concurrently.

### 2.2.3 *Desalination Plant*

Water Supplies Department (WSD) is proposing a desalination plant south of the proposed SENT Landfill Extension. The site is about 10ha. As advised by WSD, the earliest takeover date of the reserved site for the construction of the desalination plant is mid-2019. The construction works is expected to complete by end of 2021. Air quality impact arising from the construction and operation of the proposed desalination plant are discussed in *Section 3*.

### 2.2.4 *Cross Bay Link and Tseung Kwan O – Lam Tin Tunnel*

Tseung Kwan O – Lam Tin Tunnel is a dual two-lane highway approximately 4.2 km long connecting Tseung Kwan O (TKO) at Po Shun Road in the east with proposed Trunk Road T2 in Kai Tak Development in the west. Part of the highway, approximately 2.6km long, is designed as the tunnel. Cross Bay Link will connect Tseung Kwan O – Lam Tin Tunnel to Wan Po Road near Area 86 to cope with the future traffic demand in Tseung Kwan O. The

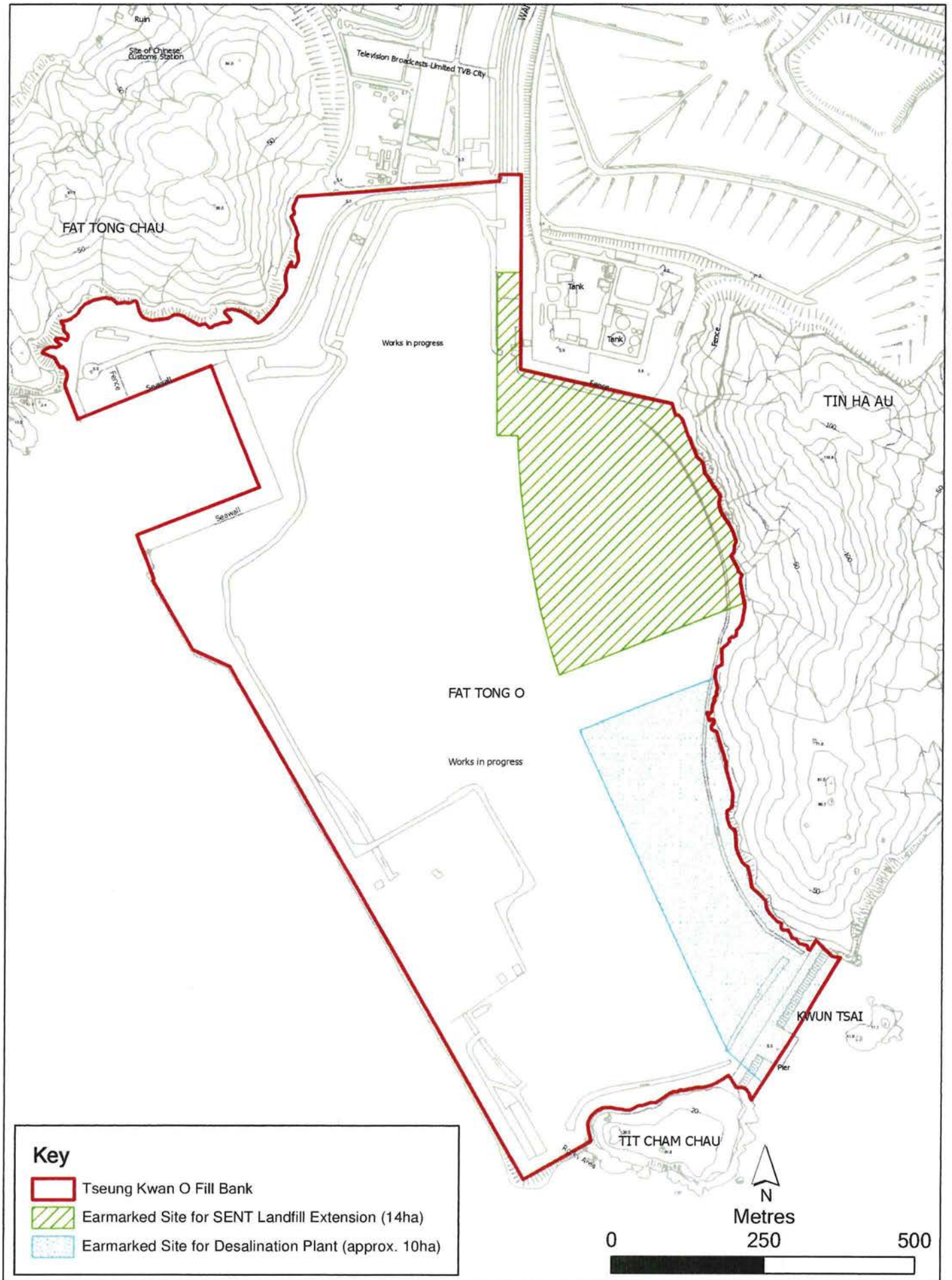


Figure 2.2a

Changes Anticipated in TKOFB

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Date: 19-Dec-2017

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construction of the Tseung Kwan O – Lam Tin Tunnel has already commenced in July 2016 and is expected to complete by mid-2022.

## 2.3 *POTENTIAL ENVIRONMENTAL IMPACT*

With reference to the *Approved EIA Report* and the latest available information on the facilities within and adjacent to TKOFB, potential cumulative air quality impact and noise impact during the extended operation period is expected to be the key concern of the proposed variation. No adverse impact is anticipated on water quality, landscape and visual, and landfill gas hazard due to the proposed operational changes to the TKOFB, with the continual implementation of the environmental control and mitigation measures recommended in the *Approved EIA Report* and the maximum stockpiling height will remain unchange.

Detailed discussions of the air quality and noise impacts are shown in the subsequent *Sections 3* and *4*.

# 3 AIR QUALITY IMPACT ASSESSMENT

## 3.1 INTRODUCTION

This *Section* assesses the potential air quality impact associated with the operation of the TKOFB due to the proposed variations presented in *Sections 2.1* and *2.2*.

## 3.2 LEGISLATIVE REQUIREMENT AND EVALUATION CRITERIA

The principal legislation for the management of air quality in Hong Kong is the *Air Pollution Control Ordinance* (APCO) (Cap. 311). Under the APCO, the *Hong Kong Air Quality Objectives* (AQOs) (see *Table 3.2a*) stipulate the statutory limits for air pollutants and the maximum allowable numbers of exceedances over specific periods.

***Table 3.1 Hong Kong Air Quality Objectives***

| Air Pollutant | Averaging Time | Concentration ($\mu g\ m^{-3}$) [a] | No. of Exceedances Allowed per Year |
|---|---|---|---|
| Sulphur Dioxide ($SO_2$) | 10 minute | 500 | 3 |
| | 24-hours | 125 | 3 |
| Respirable Suspended Particulates (RSP) [b] | 24-hours | 100 | 9 |
| | Annual | 50 | - |
| Fine Suspended Particulates (FSP) [c] | 24-hours | 75 | 9 |
| | Annual | 35 | - |
| Nitrogen Dioxide ($NO_2$) | 1-hour | 200 | 18 |
| | Annual | 40 | - |
| Carbon Monoxide (CO) | 1-hour | 30,000 | 0 |
| | 8-hour | 10,000 | 0 |
| Ozone ($O_3$) | 8-hour | 160 | 9 |
| Lead | Annual | 0.5 | - |

**Notes:**

(a) Measured at 293K and 101.325 kPa.

(b) Suspended particles in air with a nominal aerodynamic diameter of 10 μm or less

(c) Suspended particles in air with a nominal aerodynamic diameter of 2.5 μm or less

The *Technical Memorandum on the Environmental Impact Assessment Process* (EIAO-TM) issued under the *EIAO* states the hourly concentration of Total Suspended Particulates (TSP) should not exceed 500 $\mu g\ m^{-3}$ (measured at 25 °C and 1 atmosphere) at Air Sensitive Receivers (ASRs) for dust impact assessment. The *Air Pollution Control (Construction Dust) Regulation* also recommends dust control measures for dust generating activities. Requirements stipulated in the *Air Pollution Control (Non-road Mobile*

*Machinery) (Emission) Regulation* will also be followed to control potential emissions from non-road mobile machinery within TKOFB.

## 3.3 BASELINE CONDITIONS

The Study Area is within 500m from the TKOFB site boundary as shown in *Figure 3.1.* SENT Landfill and TVB City are located to the north-east and north of the Site, respectively. Wan Po Road is the major road linking the Site and TKO town. The local air quality of the Project Site area is primarily influenced by vehicular emissions from local road networks and within TKOFB, as well as emissions associated with the operation of the TKOFB, including dust emissions from fill handling activities, truck movement and stockpiling areas, as well as marine emissions.

### 3.3.1 *EPD's Air Quality Monitoring Station*

The nearest EPD's Air Quality Monitoring Station (AQMS) is located at Tseung Kwan O District. The latest 5-year concentrations (2013 - 2017) of RSP, FSP, $NO_2$ and $SO_2$ recorded at this AQMS are presented in *Table 3.2.*

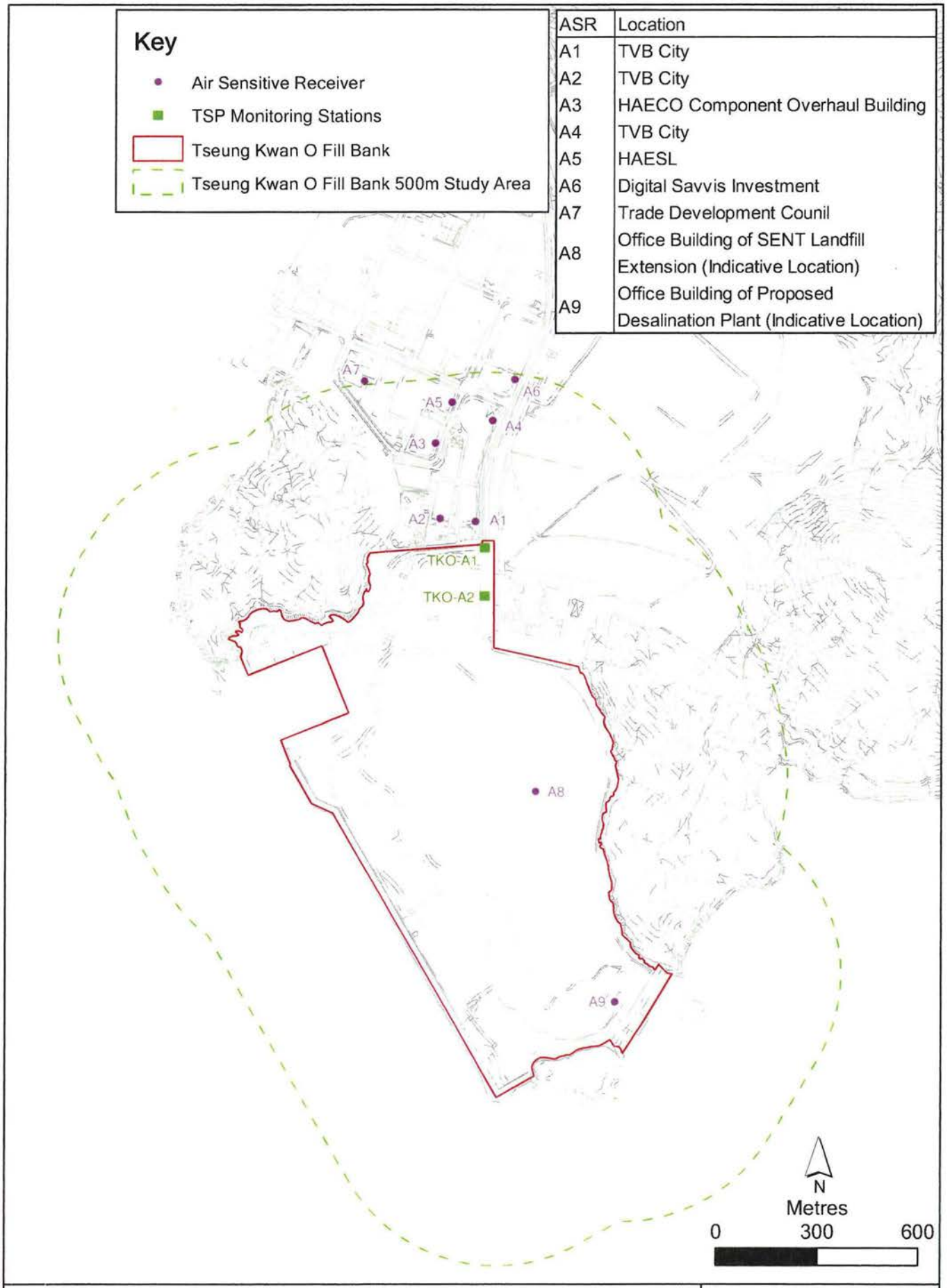
*Table 3.2* ***Concentrations of Air Pollutants Measured at the EPD's TKOAQMS in the Past 5 Years (2013 – 2017)***

| Year | Concentration of Pollutants (μg $m^{-3}$) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 19th highest 1-hour $NO_2$ | Annual $NO_2$ | 4th highest 24-hour $SO_2$ | 4th highest 10-min $SO_2$ [a] | 10th highest 24-hour RSP | Annual RSP | 10th highest 24-hour FSP | Annual FSP |
| 2013 | - | - | - | - | - | - | - | - |
| 2014 | - | - | - | - | - | - | - | - |
| 2015 | - | - | - | - | - | - | - | - |
| 2016 | 127 | 29 | 13 | 40 | 59 | 27 | 41 | 17 |
| 2017 | 165 | 28 | 15 | 39 | 65 | 31 | 43 | 18 |
| **Prevailing AQOs** | **200** | **40** | **125** | **500** | **100** | **50** | **75** | **35** |

**Note:**
(a) Operation of TKO AQMS was commenced in 2016.

No measurement was conducted at the TKO AQMS from 2013 to 2015. The $NO_2$, $SO_2$, RSP and FSP concentrations in 2016 and 2017 are below their respective prevailing AQOs.

It should be noted that the TKO AQMS is situated in TKO residential area and more than 5km away from the Project site. Given the differences in land use and the considerable separation distance, the monitoring data recorded at TKO AQMS may not be representative of the current baseline air quality at the Project site.




| ASR | Location |
|---|---|
| A1 | TVB City |
| A2 | TVB City |
| A3 | HAECO Component Overhaul Building |
| A4 | TVB City |
| A5 | HAESL |
| A6 | Digital Savvis Investment |
| A7 | Trade Development Counil |
| A8 | Office Building of SENT Landfill Extension (Indicative Location) |
| A9 | Office Building of Proposed Desalination Plant (Indicative Location) |

Figure 3.1

Locations of Representative Air Sensitive Receivers and TSP Monitoring Stations

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Date: 10/8/2018

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## 3.4 AIR SENSITIVE RECEIVERS

A number of representative existing and planned ASRs have been identified within the Study Area and they are listed in *Table 3.3*. The locations of the identified representative ASRs are shown in *Figure 3.1*.

*Table 3.3* ***Identified Representative ASRs***

| ASR | Description | Type of Use [a] | Approximate Separation Distance from the Site Boundary (m) | Approx Base Elevation (m) | Approximate Max. Height (m above ground) |
|---|---|---|---|---|---|
| A1 | TVB City | Commercial | 60 | 5.3 | 30 |
| A2 | TVB City | Commercial | 90 | 5.3 | 30 |
| A3 | HAESL | Industrial | 310 | 5.3 | 30 |
| A4 | TVB City | Commercial | 360 | 6.1 | 30 |
| A5 | HAESL Component Overhaul Building | Industrial | 420 | 5.8 | 30 |
| A6 | Digital Savvis Investment | Commercial | 485 | 9.5 | 30 |
| A7 | Trade Development Council | Commercial | 510 | 7.7 | 20 |
| A8 | Office Building of SENT Landfill Extension (Indicative Location) [b] | Industrial | 75 [a] | 5.0 | 4.5 |
| A9 | Office Building of Desalination Plant (Indicative Location) [b] | Industrial | 50 [a] | 5.0 | 30 |

Note:

(a) Approximate separation distance from the reduced TKOFB boundary after land hand over for the proposed SENT Landfill Extension and the desalination plant.

(b) The locations and maximum heights of A8 and A9 are provided by EPD and WSD.

## 3.5 POTENTIAL SOURCES OF AIR EMISSIONS

### 3.5.1 *Air Emission Sources Associated with TKOFB Operation*

Potential key air emission sources within TKOFB were identified as below:

- Dust emissions from the TKOFB operational activities including fill material handling at stockpiling areas and barging points, operation of material crushing and sorting facilities, truck movements on major haul roads, as well as wind erosion from stockpiling areas;
- Vehicular emissions from internal roads within TKOFB (incoming trucks and internal trucks); and
- Emissions from marine vessels (e.g. barges, derrick lighters, tug boats) during berthing and maneuvering for exporting and importing fill materials; and

- Emissions from diesel generators for the operation of the material crushing and sorting facilities, site offices and other general site operation.

### 3.5.2 *Air Emission Sources in the Vicinity of TKOFB*

Other potential key air emission sources within the Study Area include:

- Dust emissions during construction of the proposed SENT Landfill Extension;
- Vehicular emissions from external roads within 500m of the Study Area; and
- Emissions associated with the operation of the proposed SENT Landfill Extension, the proposed Desalination Plant and existing HAESL located in Tseung Kwan O Industrial Estate (TKOIE).

Tentatively, the construction period of SENT Landfill Extension is expected to be from 2018 to 2020, while that of the proposed desalination plant is from 2019 to 2021.

The work sites of the Cross Bay Link and Tseung Kwan O - Lam Tin Tunnel, which is currently under construction and is expected to complete by mid-2022, are located more than 1km away from the nearest identified ASRs in the Study Area. Potential cumulative air quality impact arising from the construction of the Cross Bay Link and Tseung Kwan O - Lam Tin Tunnel is not expected.

### 3.5.3 *Key Air Pollutants of Concern*

The operation of TKOFB primarily involves a number of activities including fill material handling, truck movements on haul roads as well as operation of sorting and crushing facilities, which may potentially give rise to air quality impact at nearby ASRs. Operation of marine vessels, truck movements and generators associated with the overall site operation may also contribute gaseous emissions. Therefore, TSP, RSP, FSP, $NO_2$ and $SO_2$ were identified to be the key air pollutants of concern during the TKOFB extended operation and they have been assessed quantitatively.

## 3.6 *Assessment Methodology and Assumptions*

### 3.6.1 *Dust Emissions from TKOFB Operational Activities*

As discussed in *Section 3.5*, dust emission sources associated with TKOFB operational activities include fill material handling (loading/unloading at stockpiling areas and barging points), truck movement on haul roads and wind erosion from stockpiling areas. The locations of the aforementioned dust emission sources during the TKOFB extended operation are illustrated in *Figures 3.2a* and *3.2b*. The TSP, RSP and FSP emission rates were estimated based on published documents and references such as *Compilation of Air*

*Pollutant Emission Factors, AP-42, 5th Edition* by the United States Environmental Protection Agency (USEPA). Dust mitigation measures as discussed in *Section 3.7* have been considered in the assessment.

### 3.6.2 *Emissions from Marine Vessels and Diesel Generators*

Berthing and maneuvering emissions from marine vessels (i.e. barges, derrick lighters, tug boats) for exporting and importing fill materials, as well as emissions from diesel generators associated with the overall site operation may give rise to RSP, FSP, $NO_2$ and $SO_2$ impacts. As confirmed by CEDD, the usage of the temporary barging point at GEO's Explosive Off-loading is highly infrequent. Also, the temporary barging point located within the land area of the proposed desalination plant will be handed over to WSD for the construction of the desalination plant. The associated marine emissions would be highly insignificant and is considered not necessary to be included in this assessment. There are a total of 7 barging points at the TKO Basin in which 3 barging points will be used for exporting public fill while 4 barging points are used to receive incoming public fill. At any one time, a maximum of 6 marine vessels will be at berth at the TKO Basin. In addition, a total of 5 barging points located south of the TKO Basin will be used to export public fill for use by various construction projects in Hong Kong during the extended operation (e.g. The Hong Kong International Airport Three-Runway System reclamation, Tung Chung East reclamation). There will be two main maneuvering route entering and leaving the TKOFB (i.e. one to and from the TKO Basin and one to and from the barging points south of the TKO Basin). The locations of the barging points, maneuvering routes and the diesel generators are shown in *Figures 3.2a* and *3.2b.*

### 3.6.3 *Vehicular Emissions from Internal and External Roads*

$NO_2$, RSP and FSP emissions arising from TKOFB internal road traffic (incoming trucks and internal trucks) and other external road traffic within the Study Area will contribute to the overall air quality impacts and thus have been considered in the quantitative assessment. The internal road alignment is illustrated in *Figures 3.2a* and *3.2b*. Other external roads within the Study Area identified are illustrated in *Figures 3.3a* and *3.3b*. The highest projected hourly traffic flows for the identified roads during the extended operation were provided by the Project's traffic consultant. Other traffic information including the hourly vehicle speed and vehicle breakdown of 16 vehicle types for 24 hours for the identified roads were also provided by the Project's traffic consultant. The traffic forecast has been endorsed by Transport Department.

### 3.6.4 *Other Emissions in the Vicinity of TKOFB*

Excavation and material handling works will be required during the construction of the SENT Landfill Extension which is expected to commence in 2018. According to email reply from EPD's Landfills and Development Group on 13 September 2017, it has been confirmed that the excavation and material handling rate as assumed in the 2013 ER Report remain valid. During the operation of the proposed SENT Landfill Extension, potential dust

emissions from active filling and haul roads as well as stack emissions may arise. In addition, emissions from the existing HAESL stack and the stack of the proposed desalination plant may contribute to the overall air quality impacts within the Study Area. Therefore, these emissions have also been included in this assessment.

### 3.6.5 *Assumptions and Modelling Approach*

*Modelling Scenarios*

Taking into account the proposed SENT Landfill Extension and desalination plant to be constructed and operated during the extended operation of TKOFB, two modelling scenarios, Scenario 1 and Scenario 2, have been assessed. Scenario 1 represents the assessment year of 2019 and considers the case prior to the operation of the proposed SENT Landfill extension and desalination plant. Scenario 2 represents the assessment year of 2020 assuming both SENT Landfill extension and desalination plant have commenced operation. As mentioned in *Section 2.2.3*, the proposed desalination plant is expected to commence operation in end of 2021. For the purpose of this assessment, it was assumed that the future office of the proposed desalination plant (i.e. ASR A9) exists in Scenario 2 as a conservative assessment.

Potential air quality impacts at the existing ASR A1 to A7 have been assessed in Scenario 1. Potential air quality impacts at the future office of SENT Landfill Extension (ASR A8) and desalination plant (ASR A9), in addition to ASR A1 to A7, have been assessed in Scenario 2. Details of Scenario 1 and Scenario 2 are summarised in *Table 3.4*.

*Table 3.4* *Summary of Modelling Scenarios Adopted in the Assessment*

| Modelling Scenario | Descriptions | ASR | Emission Sources |
|---|---|---|---|
| Scenario 1 | Prior to the operation of SENT Landfill Extension and desalination plant | ASR 1 to ASR 7 | • Emissions associated with TKOFB operational activities (*Figure 3.2a*) [a]<br>• Vehicular emissions from external roads within Study Area (*Figure 3.3a*)<br>• Dust emissions from SENT Landfill Extension construction (*Figure 3.3a*)<br>• Industrial emissions (i.e. existing HAESL stack) (*Figure 3.3a*) |
| Scenario 2 | During operation of SENT Landfill Extension and desalination plant. | ASR 1 to ASR 9 | • Emissions associated with TKOFB operational activities (reduced TKOFB operational area) (*Figure 3.2b*)<br>• Vehicular emissions from external roads within Study Area (*Figure 3.3b*)<br>• Dust emissions from SENT Landfill Extension operation (*Figure 3.3b*)<br>• Industrial emissions (i.e. proposed stacks of SENT Landfill Extension and desalination plant, existing HAESL stack) (*Figure 3.3b*) |

**Note:**

(a) For Scenario 1, TKOFB operational area covers the site area for the proposed desalination plant. Emissions from material handling activities and wind erosion associated with TKOFB operation within the site area of the proposed desalination plant have been assumed. According to the approved EIA report for the Desalination Plant (AEIAR-192/2015), the key land-based construction activities during the construction phase would be minor excavation works for pile foundation and concreting works and thus dust emissions may arise from material handling during excavation and wind erosion of exposed areas. The nature of works associated with TKOFB operation within the site area of the proposed desalination plant is similar to that being carried out during the construction phase of the desalination plant. Also, as concluded in the approved EIA report, the construction dust impact arising from the construction of the desalination plant is expected to be minor, with the implementation of dust control measures recommended in the *Air Pollution Control (Construction Dust) Regulations* and good site practices. Therefore, it is considered that Scenario 1 sufficiently reflects the potential dust impact that may arise during the construction of the desalination plant.

*Air Dispersion Model and Meteorological Data*

An EPD recommended air dispersion model, AERMOD, was used to assess the air quality impact at the identified ASRs from dust emission sources and marine emissions. The quantitative assessment has been conducted following the latest EPD's *Guidelines for Local-scale Air Quality Assessment Using Model.*

The relevant PATH grids in which the identified ASRs are located have been identified. The predicted meteorological data for the relevant PATH grids were used for model input. The relevant PATH grids for the identified ASRs are shown in *Table 3.5.*

*Table 3.5* ***Relevant PATH Grids for the Representative ASRs***

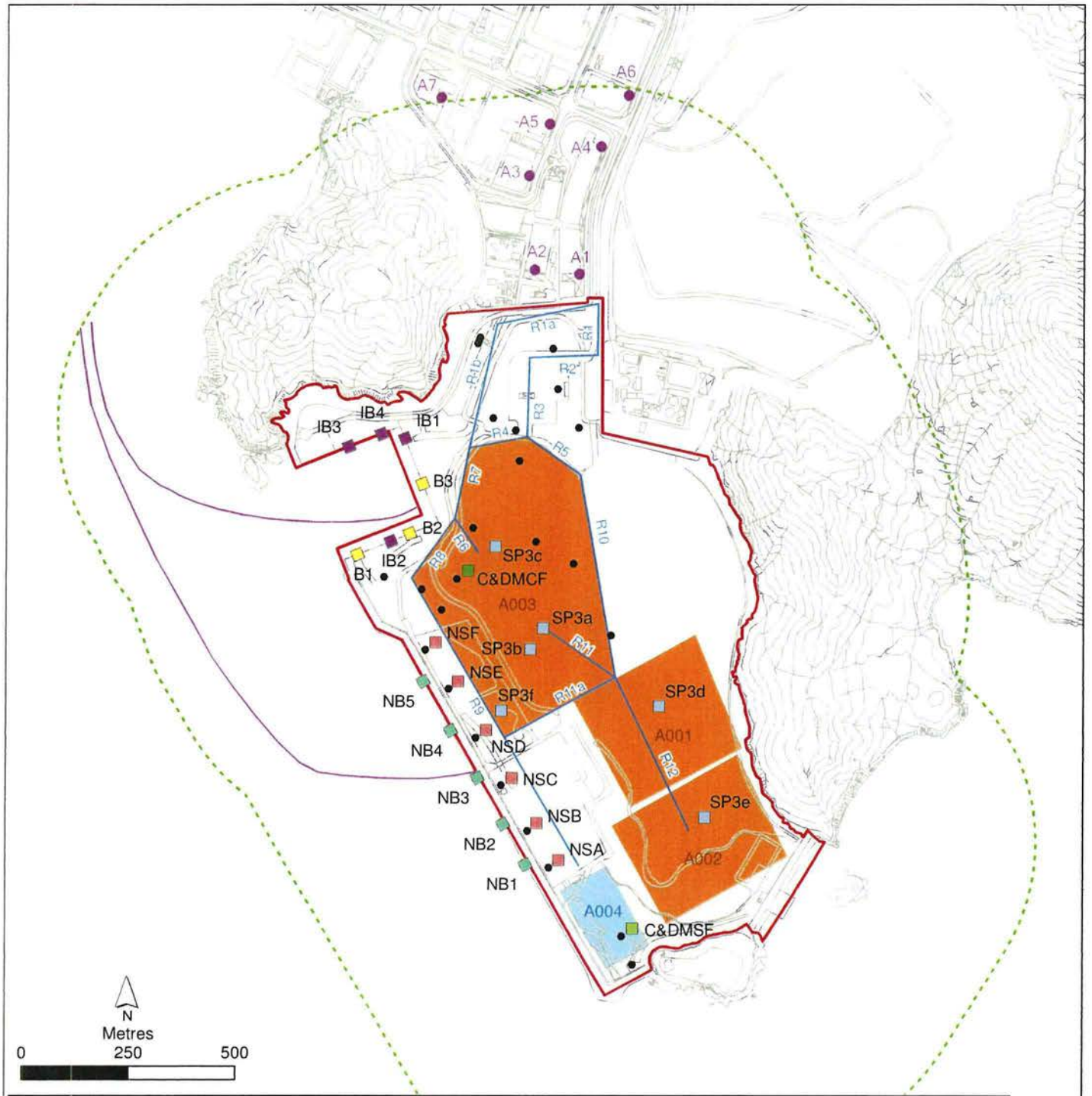
| ASR | Description | Relevant PATH Grid |
|---|---|---|
| A1 | TVB City | 50, 29 |
| A2 | TVB City | 50, 29 |
| A3 | HAESL | 50, 29 |
| A4 | TVB City | 50, 29 |
| A5 | HAESL Component Overhaul Building | 50, 29 |
| A6 | Digital Savvis Investment | 50, 29 |
| A7 | Trade Development Council | 50, 29 |
| A8 | Office Building of SENT Landfill Extension (Indicative Location) | 50, 28 |
| A9 | Office Building of Desalination Plant (Indicative Location) | 50, 27 |

AERMET was run to generate AERMOD-ready meteorological data for AERMOD model input. The land use parameters, including albedo, bowen ratio and surface roughness are required inputs for AERMET. The land use of 1km from the identified ASRs within each PATH grid has been evaluated to determine the PATH-grid specific surface roughness values. The land use of 10km x 10km from the Project site has also been evaluated to determine the values of albedo and bowen ratio for the PATH grids.

The AERMET/AERMOD model input parameters and assumptions for the assessment are summarised in *Table 3.6*.

*Table 3.6* ***Model Input Parameters and Assumptions for Assessment***

| Input Parameters & Assumptions | Descriptions |
|---|---|
| Air dispersion model | AERMOD |
| Type of source | • Point sources, area sources |
| Assessment parameter | • 1-hour TSP<br>• 24-hour RSP and annual RSP<br>• 24-hour FSP and annual FSP<br>• 1-hour $NO_2$ and annual $NO_2$<br>• 10-minute $SO_2$ and 24-hour $SO_2$ |
| Meteorological data | • Weather Research and Forecasting Model (WRF) data in 2010 from PATH-2016 to be used to input into AERMET to produce AERMOD-ready meteorological data<br>• PATH Grid – (50,27), (50,28) and (50,29)<br>• Actual mixing heights recorded by the HKO in 2010 were in the range of 121m to 1,667m. Mixing heights from WRF data which are lower than 121m or higher than 1,667m to be adjusted to 121m and 1,667m, respectively<br>• Wind direction of 0° to be adjusted to 360°<br>• Wind speed smaller than 1m $s^{-1}$ to be adjusted to 1m $s^{-1}$<br>• Anemometer height of WRF data = 9m |




## Legend

- ASR
- Construction & Demolition Material Sorting Facilities (Others)
- Fill Loading and Unloading Points
- Other Barging Points for Exporting Materials
- TKOFB Barging Points for Exporting Materials
- TKOFB Barging Points for Importing Materials
- TKOFB Construction & Demolition Material Crushing Facility
- TKOFB Construction & Demolition Material Sorting Facility
- Generators
- Haul Roads
- Marine Vessel Maneuvering Route
- Open Area
- Stockpiling Areas
- Tseung Kwan O Fill Bank
- Tseung Kwan O Fill Bank 500m Study Area

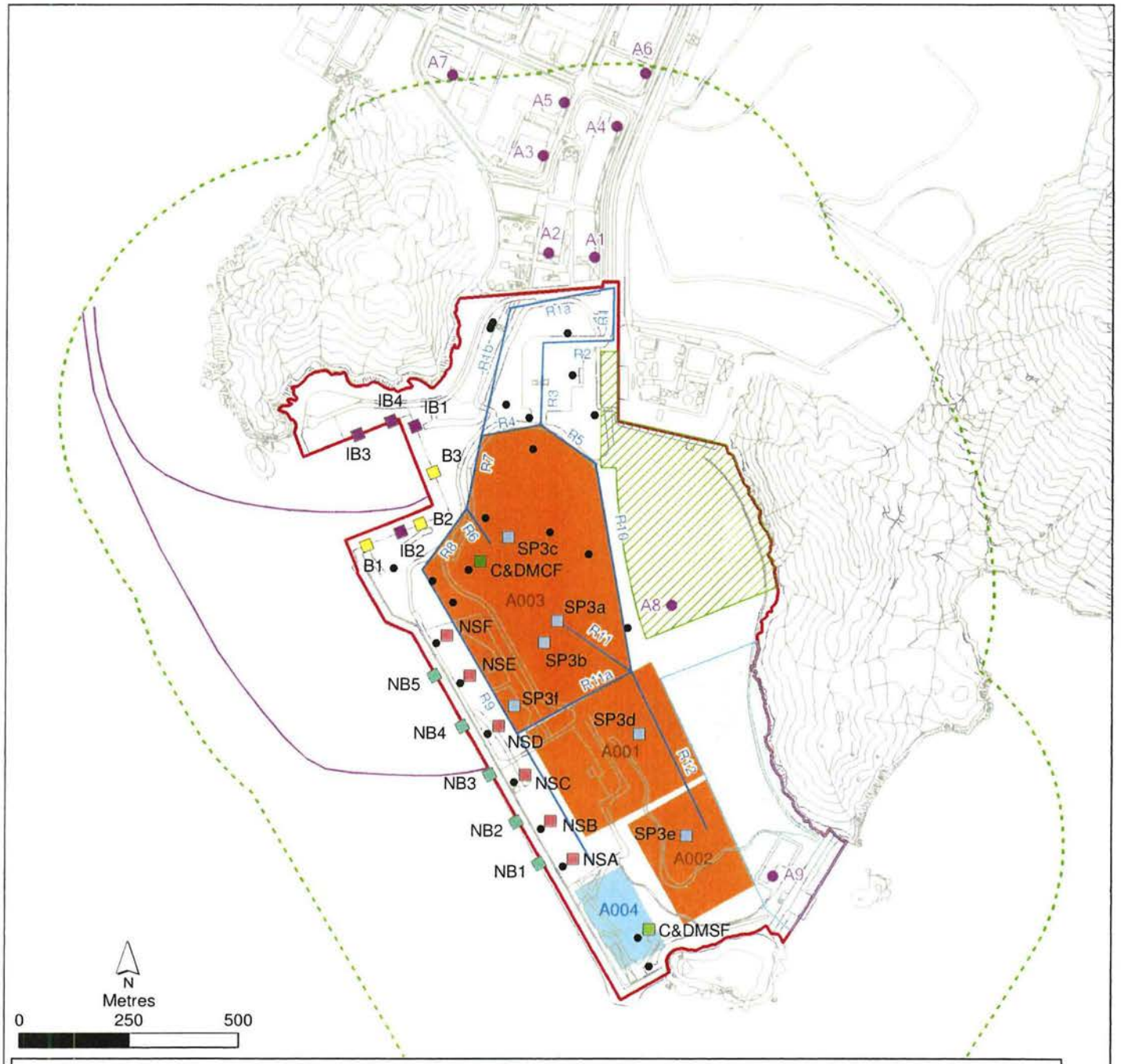
Figure 3.2a

Locations of Major Emission Sources Associated with Tseung Kwan O Fill Bank Operation (Scenario 1)

File: T:\GIS\CONTRACT\0414816\mxd\0414816_TKOFB_Dust_Scn_1_v2.mxd
Date: 18/10/2018

Environmental Resources Management

ERM




## Legend

- ASR
- Construction & Demolition Material Sorting Facilities (Others)
- Fill Loading and Unloading Points
- Other Barging Points for Exporting Materials
- TKOFB Barging Points for Exporting Materials
- TKOFB Barging Points for Importing Materials
- TKOFB Construction & Demolition Material Crushing Facility
- TKOFB Construction & Demolition Material Sorting Facility
- Generators
- Haul Roads
- Marine Vessel Maneuvering Route
- Earmarked Site for SENT Landfill Extension (14ha)
- Earmarked Site for Desalination Plant (approx. 10ha)
- Tseung Kwan O Fill Bank
- Tseung Kwan O Fill Bank 500m Study Area
- Open Area
- Stockpiling Areas

Figure 3.2b

Locations of Major Emission Sources Associated with Tseung Kwan O Fill Bank Operation (Scenario 2)

File: T:\GIS\CONTRACT\0414816\mxd\0414816_TKOFB_Dust_Scn_2_v2.mxd
Date: 23/10/2018

Environmental Resources Management

ERM

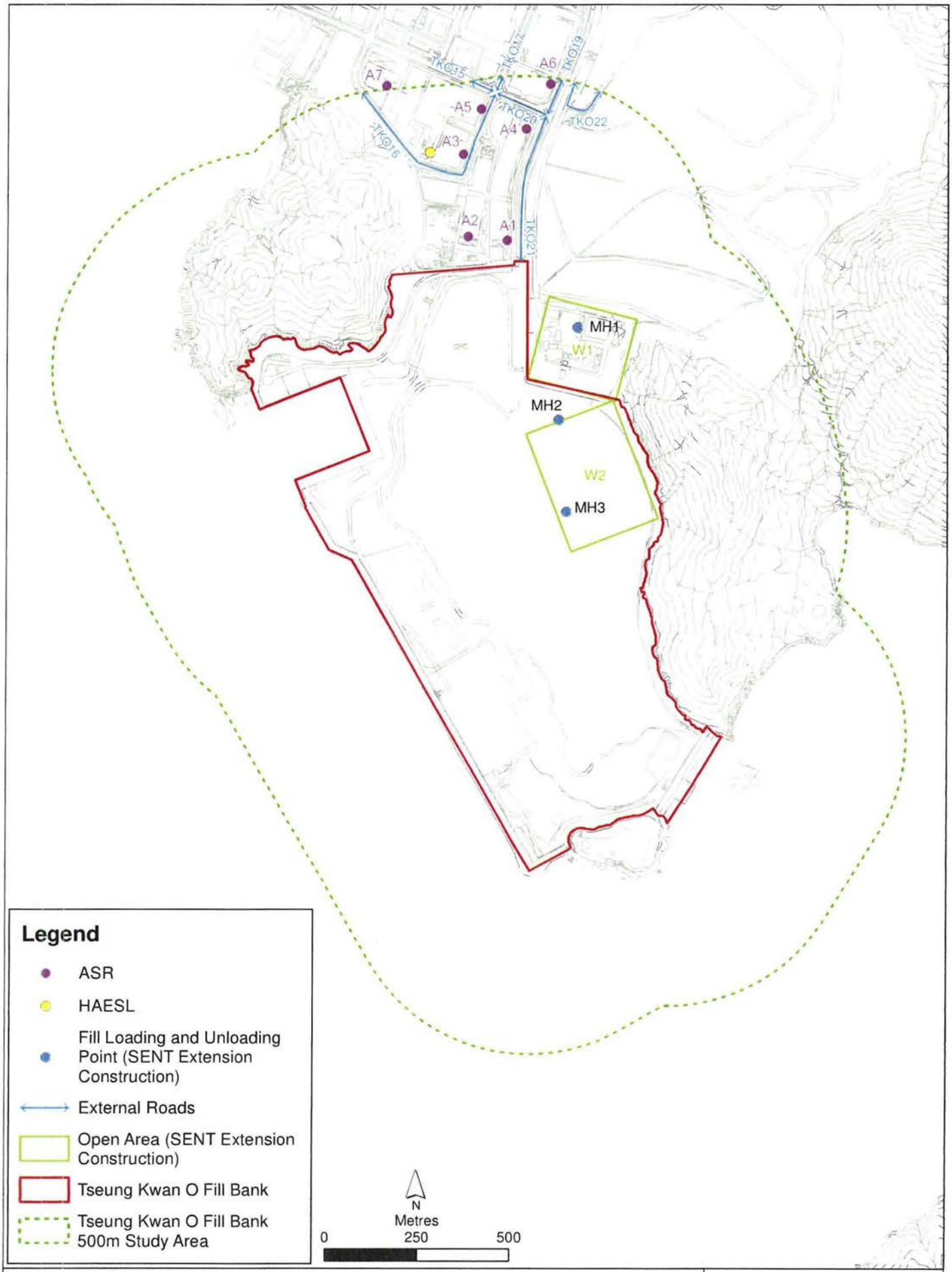



Figure 3.3a

External Roads and Industrial Sources within 500m Study Area (Scenario 1)

File: T:\GIS\CONTRACT\0414816\mxd\0414816_TKOFB_External_Roads_n_Industrial_Sources _Scn_1.mxd
Date: 10/8/2018

Environmental Resources Management

ERM

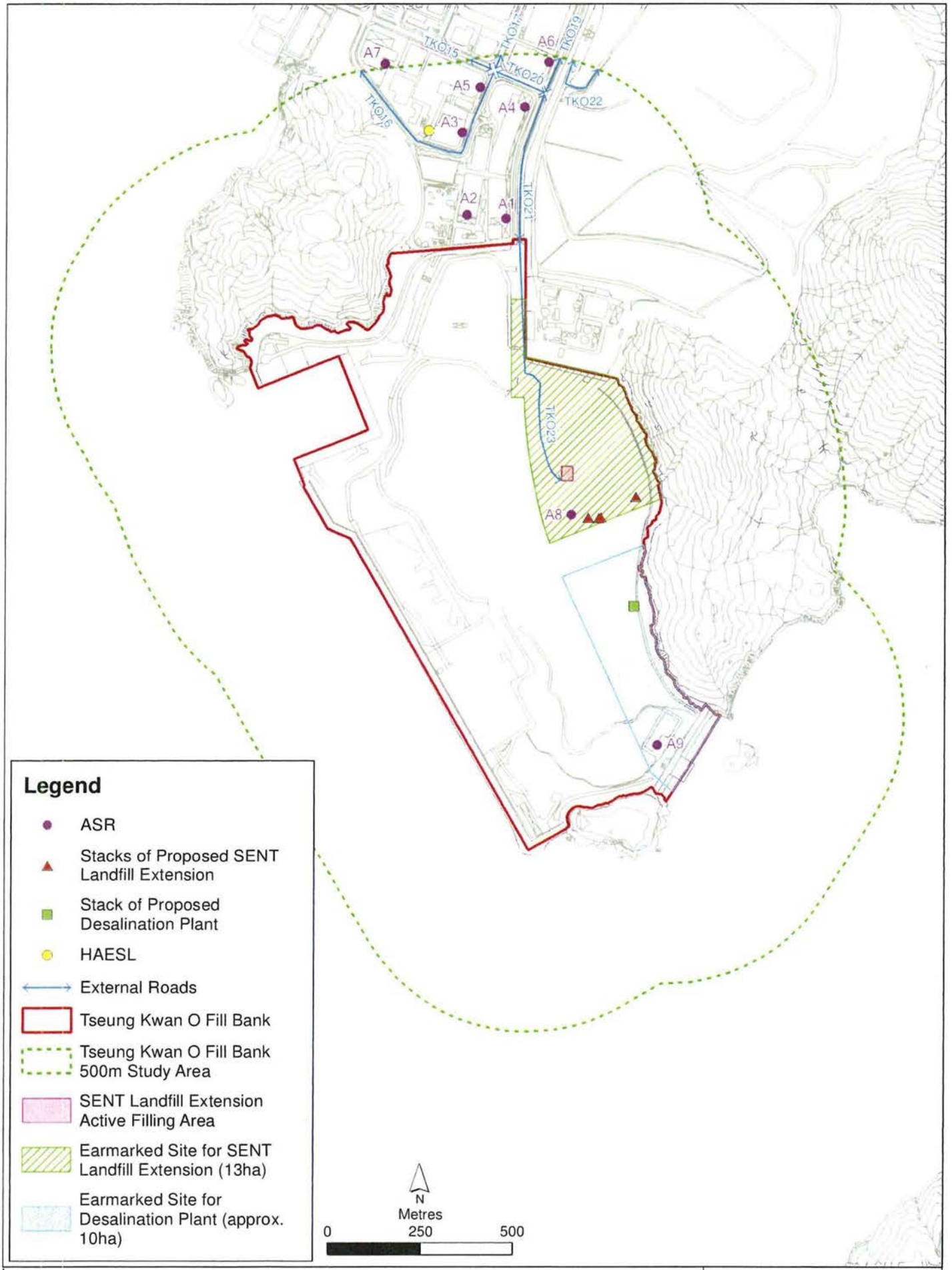



Figure 3.3b

External Roads and Industrial Sources within 500m Study Area (Scenario 2)

File: T:\GIS\CONTRACT\0414816\mxd\0414816_TKOFB_External_Roads_n_Industrial_Sources _Scn_2.mxd
Date: 6/9/2018

Environmental Resources Management

ERM

An EPD recommended model, EMFAC-HK v3.4, was used to predict the vehicular emission factors of $NO_x$, RSP and FSP for the 16 vehicle types in 2019 (for Scenario 1) and 2020 (for Scenario 2). "EMFAC" mode was used for the model run.

An EPD recommended air dispersion model, CALINE4, was used for predicting the $NO_2$, NO, RSP and FSP impacts due to vehicular emissions from the identified internal roads and external roads within the Study Area for Scenario 1 and Scenario 2. Since the highest road height allowed in the input into CALINE4 model is limited at 10m, any road with road height greater than 10m was set at a height of 10m in the CALINE4 model as a conservative approach.

The land use types have been examined within an area of 3 km radius from the concerned PATH grids. As industrial, commercial and residential land uses account for less than 50% of the examined area, rural area was assumed and the surface roughness height of 100 cm for rural area was adopted for the CALINE4 model run. Wind directional variability was calculated based on the following formula according to the stability class with reference to Irwin, J.S., 1980 (1).

$$S_o = S \times (Z_o/15cm)^{0.2}$$

*Where*

*$Z_o$ = is the surface roughness length (in cm) of the PATH grid;*
*$S_o$ = is the standard deviation of the horizontal wind direction Fluctuations (in degrees)*
*S = is the standard deviation of the horizontal wind direction fluctuations (in degrees) for an aerodynamic surface roughness length of 15cm with reference to Irwin, J.S., 1980. S is a function of Pasquill stability class.*

*Table 3.7* shows the standard deviations of the horizontal wind direction fluctuations under different Pasquill Stability categories for the concerned PATH grid.

***Table 3.7 The Standard Deviation of the Horizontal Wind Direction Fluctuations under Different Pasquill Stability Categories***

| Pasquill Stability Class | Standard Deviation of the Horizontal Wind Direction Fluctuations (in degrees) |
|---|---|
| **PATH Grid (50,27), (50,28), (50,29)** | |
| A | 32.9 |
| B | 32.9 |
| C | 25.6 |
| D | 18.3 |
| E | 11.0 |
| F | 5.6 |

(1) Dispersion Estimate Suggestion #8: Estimation of Pasquill Stability Categories. U.S. Environmental Protection Agency, Research Triangle Park, NC. (Docket Reference No.II-B-10), Irwin, J.S., 1980.

The CALINE4 model input parameters and assumptions are summarised in *Table 3.8.*

*Table 3.8* ***Model Input Parameters and Assumptions for Assessment of Vehicular Emissions***

| Input Parameters & Assumptions | Descriptions |
|---|---|
| Air dispersion model | • CALINE4 |
| Vehicle emission factors | • EMFAC-HK emission factors for 2019 (Scenario 1) [a]<br>• EMFAC-HK emission factors for 2020 (Scenario 2) [a] |
| Assessment parameter | • 24-hour RSP and annual RSP<br>• 24-hour FSP and annual FSP<br>• 1-hour $NO_2$ and annual $NO_2$ |
| Meteorological data | • Weather Research and Forecasting Model (WRF) data in 2010 from PATH-2016<br>• PATH Grid – (50,27), (50,28) and (50,29)<br>• Actual mixing heights recorded by the HKO in 2010 were in the range of 121m to 1667m. Mixing heights from WRF data which are lower than 121m or higher than 1,667m to be adjusted to 121m and 1,667m, respectively<br>• Wind speeds smaller than the 0.5 m $s^{-1}$ recommended by the CALINE4 model were adjusted to 0.5 m $s^{-1}$.<br>• Stability class calculated by PCRAMMET (version 99169)<br>• Calculation of wind directional variability based on stability class and surface roughness length of 100 cm for rural areas. |

**Note:**

(a) The highest traffic forecast during the extended period was used for both scenarios as a conservative assessment.

*Background Air Quality*

The background air pollutant concentrations predicted by the PATH-2016 model in 2019 and 2020 for the PATH grids within the Study Area adopted in this assessment are presented in *Table 3.9.*

*Table 3.9* ***Background Air Pollutant Concentrations Predicted by the PATH-2016 Model in 2019 and 2020***

| PATH Grid | Concentration of Pollutants (μg $m^{-3}$) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 19th highest 1-hour $NO_2$ | Annual $NO_2$ | 4th highest 24-hour $SO_2$ | 4th highest 10-min $SO_2$ [a] | 10th highest 24-hour RSP [b] | Annual RSP [b] | 10th highest Daily Max. 8-hour $O_3$ | Daily Max. 1-hour CO | Daily Max. 8-hour CO |
| *Year 2019* | | | | | | | | | |
| 50, 27 | 72 | 8 | 21 | 105 | 69 | 32 | 156 | 1004 | 816 |
| 50, 28 | 76 | 8 | 21 | 107 | 68 | 30 | 155 | 1002 | 813 |
| 50, 29 | 78 | 8 | 21 | 109 | 68 | 30 | 156 | 1003 | 815 |
| *Year 2020* | | | | | | | | | |
| 50, 27 | 68 | 8 | 21 | 105 | 68 | 31 | 156 | 1004 | 815 |
| 50, 28 | 73 | 8 | 21 | 107 | 67 | 30 | 155 | 1001 | 813 |

| PATH Grid | Concentration of Pollutants (μg $m^{-3}$) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 19th highest 1-hour $NO_2$ | Annual $NO_2$ | 4th highest 24-hour $SO_2$ | 4th highest 10-min $SO_2$ (a) | 10th highest 24-hour RSP (b) | Annual RSP (b) | 10th highest Daily Max. 8-hour $O_3$ | Daily Max. 1-hour CO | Daily Max. 8-hour CO |
| 50, 29 | 74 | 7 | 21 | 109 | 68 | 30 | 156 | 1002 | 815 |
| **Prevailing AQOs** | **200** | **40** | **125** | **500** | **100** | **50** | **160** | **30,000** | **10,000** |

**Notes:**

(a) The multiplicative factor for the stability class calculated for each hour was applied to the 1-hour $SO_2$ concentrations to estimate the 10-minute $SO_2$ concentrations.

(b) An adjustment of 26.5ug/$m^3$ and 15.6ug/$m^3$ were added to the RSP background for calculation of 24-hour RSP and annual RSP, respectively.

As shown in *Table 3.9*, the background air pollutant concentrations in the relevant PATH grids in 2019 and 2020 are below the relevant AQO criteria.

The hourly background $NO_2$, RSP and $SO_2$ concentrations in 2019 and 2020 predicted by the PATH-2016 model were used to establish the background contributions for the cumulative impact assessment under Scenario 1 and Scenario 2, respectively. In accordance with the *Guidelines on Choice of Models and Model Parameters* published by EPD, an adjustment of 26.5 μg $m^{-3}$ and 15.6 μg $m^{-3}$ was added to hourly RSP background predicted by PATH-2016 for the assessment of 24-hour and annual RSP, respectively.

FSP data are not available in the hourly PATH-2016 background concentration results provided by the EPD. According to the EPD's *Guidelines on the Estimation of $PM_{2.5}$ for Air Quality Assessment in Hong Kong*, FSP hourly background data can be obtained by multiplying the PATH-2016 hourly RSP background with a weight fraction. *Table 3.10* presents the EPD recommended FSP to RSP ratios which are adopted in this assessment.

***Table 3.10 FSP to RSP Ratios as recommended by the EPD***

| | Annual | 24-hour |
|---|---|---|
| FSP ($PM_{2.5}$)/RSP ($PM_{10}$) ratio | 0.71 | 0.75 |

**Note:**

(a) Reference to EPD's *"Guidelines on the Estimation of $PM_{2.5}$ for Air Quality Assessment in Hong Kong"*.

*Post-processing of Modelling Results*

For stack emissions, the hourly concentrations of $NO_x$ were predicted at the relevant assessment heights of the identified ASRs. Ozone Limiting Method (OLM) was adopted for the conversion of $NO_x$ to $NO_2$. The initial $NO_2/NO_x$ ratio for stack emissions was assumed to be 0.1 (1) and the conversion of $NO_x$ to $NO_2$ was calculated as follows:

(1) Air Quality Studies for Heathrow: Base Case, Segregated Mode, Mixed Mode and Third Runway Scenarios modelled using ADMS-Airport, 2007.

$$[NO_2]_{pred} = 0.1x[NO_X]_{pred} + MIN\ \{0.9x[NO_X]_{pred}, \text{ or } (46/48)x[O_3]_{bkgd}\}$$

*where*

$[NO_2]_{pred}$ = *the predicted $NO_2$ concentration*
$[NO_X]_{pred}$ = *the predicted $NO_X$ concentration*
*MIN* = *means the minimum of the two values within the brackets*
$[O_3]_{bkgd}$ = *the representative $O_3$ background concentration; (46/48) is the molecular weight of $NO_2$ divided by the molecular weight of $O_3$*

For vehicular emissions, individual $NO_2/NO_x$ ratios of each vehicle type in 2019 (for Scenario 1) and 2020 (for Scenario 2) have been used to estimate the overall NO and $NO_2$ emissions arising from road traffic with reference to recommendation in EPD's *Guidelines for Local-scale Air Quality Assessment Using Models.* The predicted NO concentrations were converted to $NO_2$ based on OLM and were added with the predicted $NO_2$ concentrations to determine the total predicted $NO_2$ concentrations at the ASRs. The total predicted $NO_2$ concentrations were calculated as follows:

$$[NO_2]_{pred\ total} = [NO_2]_{pred} + MIN\ \{[NO]_{pred}, \text{ or } (46/48)x[O_3]_{bkgd}\}$$

*where*

$[NO_2]_{pred\ total}$ = *the total predicted $NO_2$ concentration*
$[NO_2]_{pred}$ = *the predicted $NO_2$ concentration directly emitted from tailpipe emissions*
$[NO]_{pred}$ = *the predicted NO concentration*
*MIN* = *means the minimum of the two values within the brackets*
$[O_3]_{bkgd}$ = *the representative $O_3$ background concentration; (46/48) is the molecular weight of $NO_2$ divided by the molecular weight of $O_3$*

Predicted ozone concentrations in 2019 (for Scenario 1) and 2020 (for Scenario 2) obtained from the PATH-2016 model were used for the conversion of $NO_x$ to $NO_2$ in OLM.

The hourly $SO_2$ concentrations at the identified ASRs were converted into 10-minute $SO_2$ concentrations for comparison with the respective AQO criterion. According to the EPD's *"Guidelines on the Estimation of 10-minute Average $SO_2$ Concentration for Air Quality Assessment in Hong Kong"*, it is recommended that the stability-dependent multiplicative factors from Duffee *et al.*, 1991[1] be used. The conversion factors adopted in this assessment for the different stability classes are shown in *Table 3.11*.

***Table 3.11 Conversion Factors from 1-hour to 10-minutes Mean Concentrations***

| Pasquill Stability Class | Conversion Factor (1-hour to 10-minute) |
|---|---|
| A | 2.45 |
| B | 2.45 |
| C | 1.82 |
| D | 1.43 |
| E | 1.35 |
| F | 1.35 |

(1) Richard A. Duffee, Martha A. O'Brien and Ned Ostojic (1991) Odor Modeling - Why and How. Page 295, *Recent Developments and Current Practices in Odor Regulations, Controls and Technology.* Air & Waste Management Association, 1991.

| Pasquill Stability Class | Conversion Factor (1-hour to 10-minute) |
|---|---|

Note:

(a) Reference to the EPD's *"Guidelines on the Estimation of 10-minute Average $SO_2$ Concentration for Air Quality Assessment in Hong Kong"*

*Cumulative Impact*

The predicted TSP, RSP, FSP, $NO_2$ and $SO_2$ results from AERMOD and CALINE4 model at each ASR were added up with the PATH-2016 background RSP and FSP concentrations on an hour-by-hour basis. Considering that vehicular RSP emissions also contribute to the total TSP impact, TSP results from AERMOD were added up with the RSP results from CALINE4 and PATH-2016 background RSP concentrations to assess the cumulative TSP impact. The relevant time period averages for each air pollutant assessed were calculated and compared with the relevant assessment criteria to evaluate the cumulative air quality impact at the identified ASRs.

## 3.7 *MITIGATION MEASURES FOR EXTENDED TKOFB OPERATION*

Relevant dust control measures stipulated in the *Air Pollution Control (Construction Dust) Regulation* have been implemented during the operation of the TKOFB and will continue to be implemented in the extension period. Requirements stipulated in the *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* will also be followed to control potential emissions from non-road mobile machinery within TKOFB during the extension period.

Existing dust control measures that will continue to be undertaken during the proposed extended operation include the following:

- Temporary slope surfaces of the stockpiling areas shall be covered with tarpaulin sheets or other impermeable sheets, or sprayed with water or a dust suppression chemical;
- Major haul roads and material stockpiling areas will be watered at least once every hour during operation to ensure that the roads and stockpiling areas are kept sufficiently dampened;
- Site hoarding of at least 2.4m high shall be provided along the boundaries of the site except at the site entrance/exit;
- Vehicle wheel washing facilities including high pressure water jets shall be provided at designated vehicle exit points and operated by designated staff. Before leaving the site, every vehicle shall be washed to remove any dusty materials from its body and wheels;
- Trucks carrying dusty load entered to the site shall be sprayed with water once the impervious sheeting covering the load is removed;

- All public fill delivery trucks carrying dusty load leaving the fill bank shall be required to be covered entirely by clean impervious sheeting to prevent the dusty materials leaking from the vehicles;

- All haul roads within the site shall be paved with concrete, bituminous materials, hardcores or metal plates;

- At the barging point, the drop height between the barge and dump trucks shall be minimised;

- Tipping halls provided for transfer of public fill from trucks to barges shall be top and 3-sides enclosed;

- Truck speed shall be controlled to within 10km/hour;

- All dusty fill materials shall be sprayed with water or a dust suppression chemical prior to loading, unloading or transfer so as to maintain the fill material wet, except of situations where the moisture content of the dusty material is a matter of concern;

- Loading of public fill delivered by barges to the site shall be sprayed with water at the material landing point to minimise dust emissions except when the materials are sufficiently dampened when landed. Any mist spraying applied should only dampen the dusty materials and overwatering should be avoided;

- Belt conveyor systems used for transfer of dusty materials shall be enclosed on top and 2 sides. Every transfer point between two conveyors shall be totally enclosed;

- Belt conveyor shall be equipped with bottom plates or other similar means to prevent falling of materials from the return belt;

- The vertical distance between the belt conveyor and the material landing point shall be maintained at no more than 1m;

- Dusty materials loaded from a belt conveyor outlet to stockpiles, storage bins, trucks, barges and other open areas shall be sprayed with water or a dust suppression chemical; and

- Final slope surfaces shall be treated by compaction, followed by hydroseeding, vegetation planting or other suitable surface stabilizer approved by CEDD to prevent the washing away of stockpiled material.

## 3.8 *EVALUATION OF IMPACTS*

### 3.8.1 *TSP, RSP and FSP Impacts*

Cumulative TSP, RSP and FSP impacts on the identified ASRs for Scenario 1 and Scenario 2 have been assessed. The predicted cumulative maximum 1-hour TSP, the 10th highest 24-hour and annual RSP, and the 10th highest 24-

hour and annual FSP at the worst affected height of the identified ASRs for Scenario 1 and Scenario 2 are presented in *Table 3.12*, and *Table 3.13*, respectively.

*Table 3.12* ***Predicted Cumulative TSP, RSP and FSP Concentrations at the Worst Affected Height at Identified ASRs (Scenario 1)***

| ASR | Predicted Cumulative Concentration (μg m$^{-3}$) | | | | |
|---|---|---|---|---|---|
| | Max 1-hour TSP | 10th Highest 24-hour RSP [a] | Annual RSP | 10th Highest 24-hour FSP [a] | Annual FSP |
| A1 | 372.2 | 71.5 | 33.5 | 52.4 | 22.6 |
| A2 | 332.7 | 70.6 | 32.8 | 52.3 | 22.3 |
| A3 | 233.2 | 69.7 | 31.6 | 52.3 | 21.9 |
| A4 | 236.0 | 69.9 | 31.6 | 52.3 | 22.0 |
| A5 | 213.5 | 69.8 | 31.4 | 52.4 | 21.9 |
| A6 | 216.9 | 69.7 | 31.3 | 51.7 | 21.8 |
| A7 | 211.7 | 69.6 | 30.9 | 51.9 | 21.7 |
| **Criteria [b]** | **500** | **100** | **50** | **75** | **35** |

**Note:**

(a) The AQO allows 9 exceedances over a year, therefore, the results presented are in the 10th highest.

(b) The 1-hour TSP criterion is referenced from EIAO-TM. RSP and FSP criteria are AQO criteria.

*Table 3.13* ***Predicted Cumulative TSP, RSP and FSP Concentrations at the Worst Affected Height at Identified ASRs (Scenario 2)***

| ASR | Predicted Cumulative Concentration (μg m$^{-3}$) | | | | |
|---|---|---|---|---|---|
| | Max 1-hour TSP | 10th Highest 24-hour RSP [a] | Annual RSP | 10th Highest 24-hour FSP [a] | Annual FSP |
| A1 | 418.0 | 70.2 | 33.5 | 51.6 | 22.5 |
| A2 | 340.2 | 70.1 | 32.8 | 51.7 | 22.2 |
| A3 | 241.4 | 68.5 | 31.5 | 51.4 | 21.8 |
| A4 | 254.4 | 68.7 | 31.5 | 51.6 | 21.9 |
| A5 | 221.6 | 68.7 | 31.3 | 51.6 | 21.8 |
| A6 | 234.2 | 68.5 | 31.2 | 51.4 | 21.7 |
| A7 | 211.7 | 68.4 | 30.9 | 51.3 | 21.6 |
| A8 | 484.4 | 73.5 | 34.7 | 51.0 | 22.3 |
| A9 | 262.6 | 69.4 | 32.2 | 51.2 | 22.5 |
| **Criteria [b]** | **500** | **100** | **50** | **75** | **35** |

**Note:**

(a) The AQO allows 9 exceedances over a year, therefore, the results presented are in the 10th highest.

(b) The 1-hour TSP criterion is referenced from EIAO-TM. RSP and FSP criteria are AQO criteria.

The assessment results show that the cumulative TSP, RSP and FSP impacts at the identified ASRs for both scenarios comply with the relevant AQO criteria. Therefore, adverse dust impact due to the extended operation of TKOFB is not anticipated.

### 3.8.2 *$NO_2$ Impacts*

Cumulative $NO_2$ impacts on the identified ASRs for Scenario 1 and Scenario 2 have been assessed. The predicted cumulative 19th highest 1-hour $NO_2$ and annual $NO_2$ at the worst affected height of the identified ASRs for Scenario 1 and Scenario 2 are presented in *Table 3.14*.

*Table 3.14* ***Predicted Cumulative $NO_2$ Concentrations at the Worst Affected Height at Identified ASRs***

| ASR | Predicted Cumulative Concentration (μg $m^{-3}$) | | | |
|---|---|---|---|---|
| | Scenario 1 | | Scenario 2 | |
| | 19th Highest 1-hour $NO_2$ [a] | Annual $NO_2$ | 19th Highest 1-hour $NO_2$ [a] | Annual $NO_2$ |
| A1 | 159.8 | 21.2 | 158.9 | 21.1 |
| A2 | 146.3 | 18.1 | 144.2 | 18.3 |
| A3 | 132.3 | 14.9 | 132.2 | 14.9 |
| A4 | 126.1 | 18.7 | 125.5 | 18.3 |
| A5 | 126.8 | 16.5 | 125.9 | 16.3 |
| A6 | 126.0 | 16.1 | 125.0 | 15.9 |
| A7 | 120.8 | 12.2 | 115.1 | 12.3 |
| A8 | - | - | 143.8 | 17.8 |
| A9 | - | - | 105.4 | 10.1 |
| **AQO Criteria** | **200** | **40** | **200** | **40** |

**Notes:**

(a) The AQO allows 18 exceedances over a year, therefore, the results presented are in the 19th highest.

The assessment results show that the cumulative $NO_2$ impacts at the identified ASRs for both scenarios comply with the relevant AQO criteria. Therefore, adverse cumulative $NO_2$ impact arising from the extended operation of TKOFB is not anticipated.

### 3.8.3 *$SO_2$ Impacts*

Cumulative $SO_2$ impacts on the identified ASRs for Scenario 1 and Scenario 2 have been assessed. The predicted cumulative 4th highest 10-minute $SO_2$ and 4th highest 24-hour $SO_2$ at the worst affected height of the identified ASRs for Scenario 1 and Scenario 2 are presented in *Table 3.15*.

*Table 3.15* ***Predicted Cumulative $SO_2$ Concentrations at the Worst Affected Height at Identified ASRs***

| ASR | Predicted Cumulative Concentration (μg $m^{-3}$) | | | |
|---|---|---|---|---|
| | Scenario 1 | | Scenario 2 | |
| | 4th Highest 10-min $SO_2$ [a] | 4th Highest 24-hour $SO_2$ [a] | 4th Highest 10-min $SO_2$ [a] | 4th Highest 24-hour $SO_2$ [a] |
| A1 | 108.8 | 21.0 | 108.8 | 20.9 |
| A2 | 108.8 | 21.0 | 108.8 | 20.9 |
| A3 | 108.8 | 21.0 | 108.8 | 20.9 |
| A4 | 108.8 | 21.0 | 108.7 | 20.9 |

| ASR | Predicted Cumulative Concentration (μg m$^{-3}$) | | | |
|---|---|---|---|---|
| | Scenario 1 | | Scenario 2 | |
| | 4th Highest 10-min $SO_2$ [a] | 4th Highest 24-hour $SO_2$ [a] | 4th Highest 10-min $SO_2$ [a] | 4th Highest 24-hour $SO_2$ [a] |
| A5 | 108.8 | 21.0 | 108.7 | 20.9 |
| A6 | 108.8 | 21.0 | 108.7 | 20.9 |
| A7 | 108.8 | 21.0 | 108.7 | 20.9 |
| A8 | - | - | 107.2 | 21.3 |
| A9 | - | - | 107.6 | 20.6 |
| **AQO Criteria** | **500** | **125** | **500** | **125** |

**Note:**

(a) The AQO allows 3 exceedances over a year, therefore, the results presented are in the 4th highest.

The assessment results show that the cumulative $SO_2$ impacts at the identified ASRs for both scenarios comply with the relevant AQO criteria. Therefore, adverse air quality impact from potential $SO_2$ emissions during the extended operation of TKOFB is not anticipated.

## 3.9 *EM&A REQUIREMENTS*

The existing 1-hour and 24-hour TSP monitoring at monitoring stations TKO-A1 and TKO-A2 as required under the EM&A programme will be continued during the extended operation period. The locations of TKO-A1 and TKO-A2 are shown in *Figure 3.1*. The monitoring frequency and equipment will be the same as the existing monitoring programme (i.e. 1-hour TSP levels and 24-hour TSP levels are monitored three times every six days and once every six days, respectively, using high volume samplers). The maximum and average 1-hour and 24-hour TSP levels from January 2014 to November 2017 are presented in *Table 3.16*.

*Table 3.16* ***Summary of Measured Hourly and Daily TSP Monitoring Data at TKO-A1 and TKO-A2 from January 2014 to November 2017***

| Results | TKO-A1 | | TKO-A2 | |
|---|---|---|---|---|
| | Hourly TSP Concentration (μg m$^{-3}$) [a] | Daily TSP Concentration (μg m$^{-3}$) [a] | Hourly TSP Concentration (μg m$^{-3}$) [a] | Daily TSP Concentration (μg m$^{-3}$) [a] |
| Maximum | 368 | 200 | 367 | 184 |
| Average | 238 | 101 | 228 | 96 |
| **TSP Criteria** | **500** | **260** | **500** | **260** |

**Note:**

(a) Reference to TKO Area 137 Fill Bank Monthly EM&A Reports from January 2014 to November 2017 (http://www.epd.gov.hk/eia/english/register/aep/ep1342002_index.html)

*Table 3.16* shows that the measured hourly and daily TSP concentrations at TKO-A1 and TKO-A2 are generally low. No exceedance of the hourly or daily TSP criterion at TKO-A1 and TKO-A2 was recorded in the mentioned monitoring period.

# 4 NOISE

## 4.1 INTRODUCTION

This *Section* assesses the potential noise impacts associated with the extended operation of the TKOFB.

## 4.2 LEGISLATIVE REQUIREMENTS AND EVALUATION CRITERIA

### 4.2.1 *Fixed Plant Noise*

The principal legislation relating to the control of operational noise is the *EIAO*. The *EIAO-TM*, issued under the *EIAO*, provides guidelines and noise criteria for evaluating the noise impacts.

The *Noise Control Ordinance (Cap. 400)* (*NCO*) also provides means to assess operational noise impacts. The *Technical Memorandum on Noise From Places Other than Domestic Premises, Public Places or Construction Sites* (*IND-TM*) issued under the *NCO* specifies the applicable Acceptable Noise Levels (ANLs) for the operation of the TKOFB.

In accordance with the *Approved EIA Report* and the ER Reports, noise generated from the use of Powered Mechanical Equipment (PME) in the TKOFB would be within the ANL - 5dB(A) criterion, i.e. 60 dB(A) and 50dB(A), during the day-time and evening period and night-time period, respectively.

### 4.2.2 *Road Traffic Noise*

The traffic noise standards for planning purposes specified in Table 1 under Annex 5 of the *EIAO-TM* was employed as the noise limits for the road traffic noise impact assessment. The applicable road traffic noise standards are 70dB(A) $L_{10,\ 1hr}$ and 65dB(A) $L_{10,\ 1hr}$ for domestic premises and education institutions, respectively. These noise limits were applied for the peak hour traffic flows and for uses that rely on opened windows for ventilation.

In situations where the predicted traffic noise levels at the Noise Sensitive Receivers (NSRs) are above the noise standards but noise contribution attributable to TKOFB operations is less than 1.0dB(A), the noise contribution from TKOFB operations is considered insignificant.

## 4.3 NOISE SENSITIVE RECEIVERS

With reference to the Approved EIA Report and the ER Reports, the nearest existing NSR is Island Resort located at more than 1.8km in Siu Sai Wan to the south-west of the TKOFB. New residential developments in TKO Area 86, i.e. Lohas Park Phases I to III, The Capitol, Le Prestige, Le Prime and Herema, are located at about 1.6km to the north of the TKOFB. Planned residential

development in TKO Area 85 between Wan Po Road and Shek Kok Road (Planning Application No.: A/TKO/107) and The Beaumont, are located at about 2km to the north of the TKOFB.

Other NSRs located further north from the TKOFB along Wan Po Road are selected for the off-site traffic noise assessment based on latest information. According to the approved environmental assessment in support of the planning application for A/TKO/107, self-protecting design will be adopted. Two towers are designed as a "Y-shape" with single-aspect design adopted (ie non-sensitive façade) to the west facing Wan Po Road. The "wing" (ie flats 20 to 23) of both towers effectively reduces the view angle from Wan Po Road to other sensitive facades (ie flats 11 to 19). Therefore, flat 11 of both towers are selected as the representative assessment points with limited views towards Wan Po Road.

The Study Area for the assessment is shown in *Figure 4.3a*. The locations of the identified representative existing and planned NSRs selected for assessment are presented in *Figures 4.3b* to *4.3e*.

## 4.4 POTENTIAL SOURCES OF IMPACT

### 4.4.1 *Fixed Plant Operation*

*Operations of TKOFB*

Noise will arise from the use of PME during the extended operation period of the TKOFB from to January 2019 to the end of 2021.

Changes to the facilities within the TKOFB include the following:

- approximately 14 ha and approximately 10 ha of land in TKOFB will be handed over to EPD and WSD in 2018 and 2019, respectively. The total stockpiling capacity will then be reduced from 6 million $m^3$ to 4.2 million $m^3$.

As confirmed by CEDD, the PME to be used during the daytime of the extended operation period of the TKOFB will be the same as that listed in the fixed plant inventory presented in the HKZMB, HKBCF (Reclamation Works) - Design and Construction, Supporting Document of VEP for Fill Bank at TKO 137 (BCF ER 2011) for the various facilities within TKOFB, which is extracted in *Table 4.1*.

***Table 4.1 Fixed Plant Inventory in TKOFB during Daytime and Evening Time Period***

| Fixed Plant Inventory [a] |
|---|
| Truck movement within TKOFB |
| Stockpiling |
| Decommissioning |
| Operation of the C&D Material Sorting Facility |
| Operation of Sorting Facility (Vibratory Scrapper) |

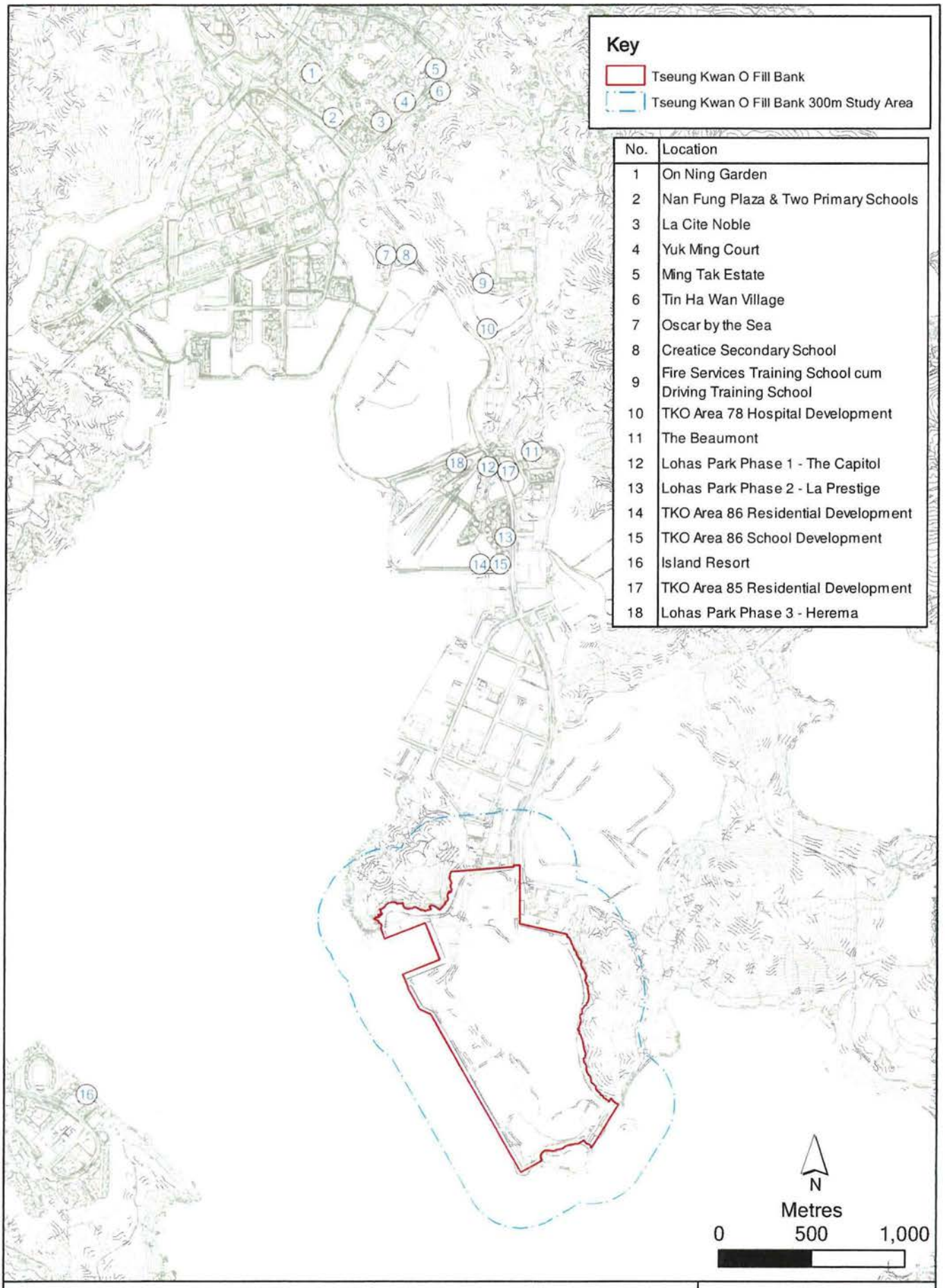



Figure 4.3a

The 300m Study Area for Noise Impact Assessment and Representative Noise Sensitive Receivers along Wan Po Road

File: T:\GIS\CONTRACT\0414816\mxd\0414816_TKOFB_NSR.mxd
Date: 22/10/2018

Environmental Resources Management

ERM

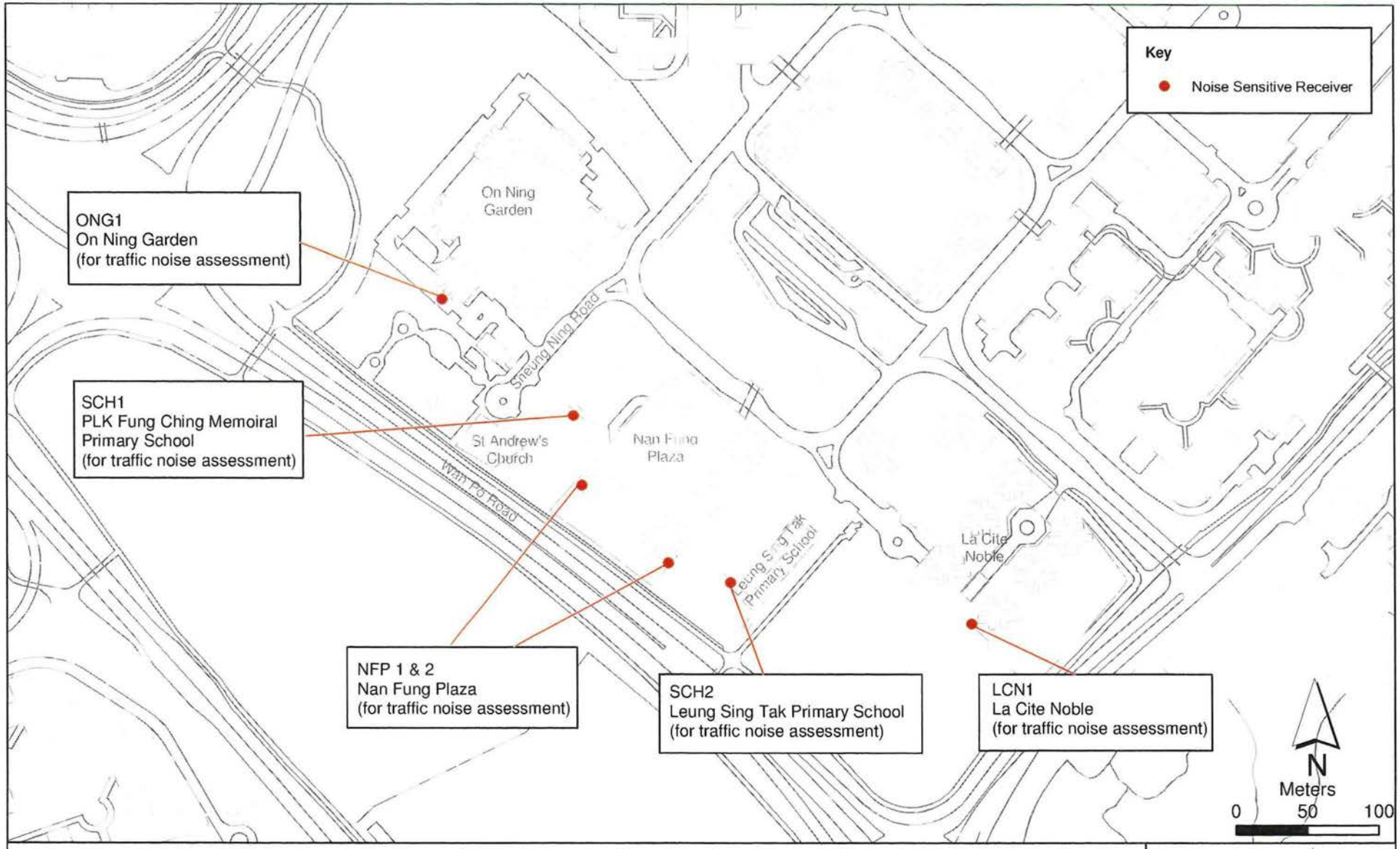



Figure 4.3b

Locations of the Noise Sensitive Receivers for Assessment

File: 0082991_NSR_1.mxd
Date: 15/08/2008

Environmental Resources Management

ERM

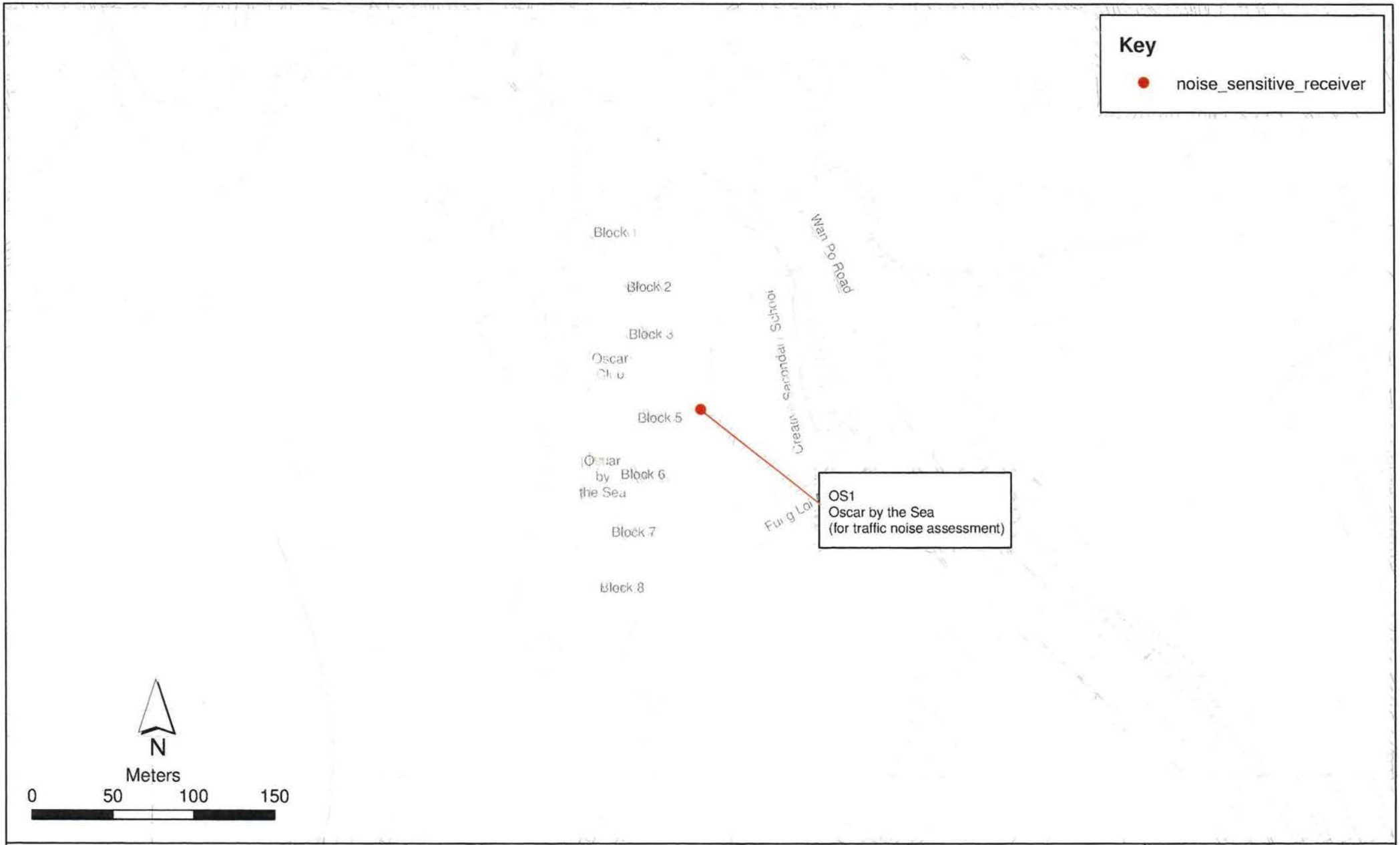



Figure 4.3c

Locations of the Noise Sensitive Receivers for Assessment

File: 0082991_NSR_3.mxd
Date: 15/08/2008

Environmental Resources Management

ERM

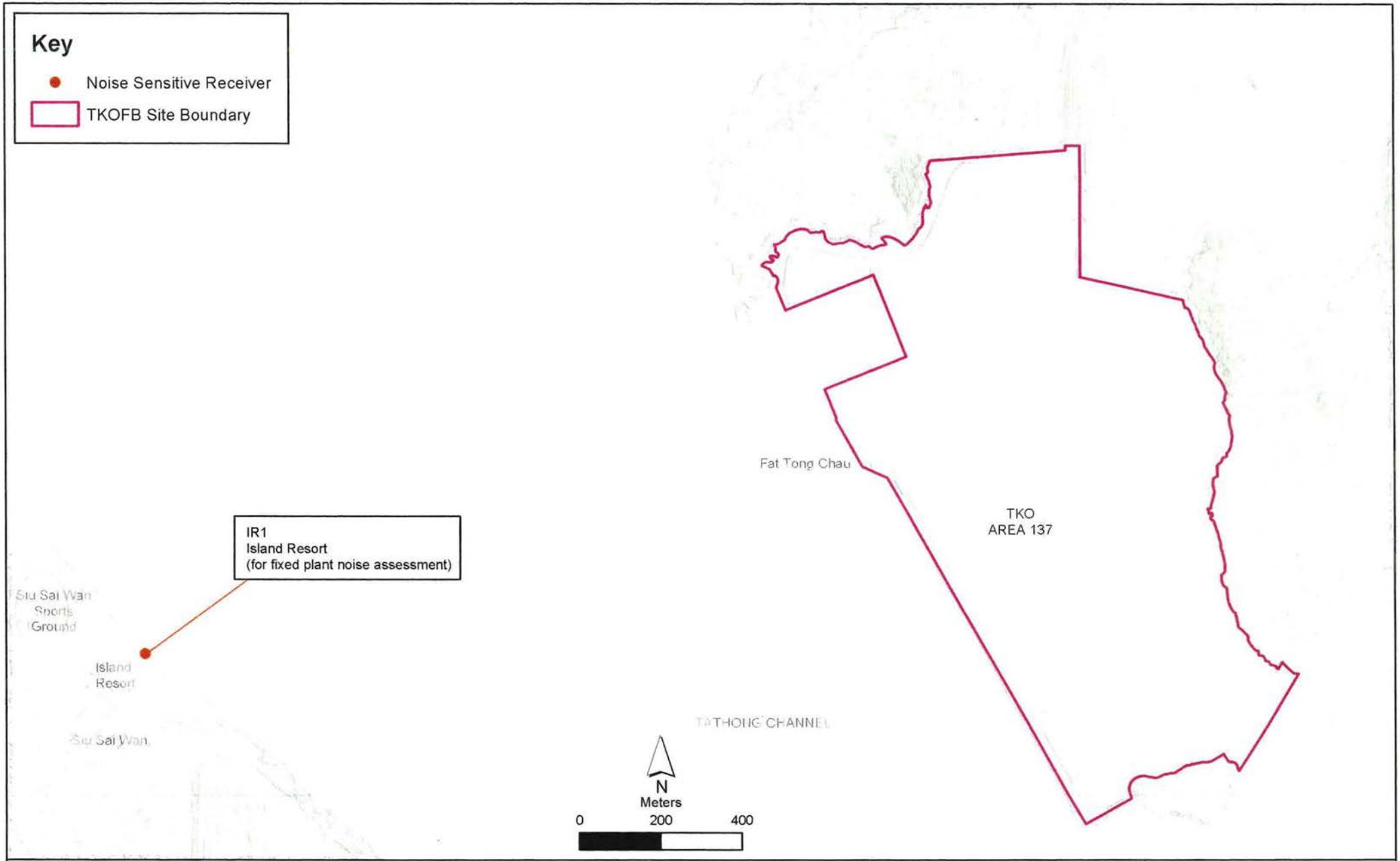



Figure 4.3d

Locations of Existing Noise Sensitive Receivers for Assessment

File: T:\GIS\CONTRACT\0164330\Mxd\0164330_Existing_NSR_Location.mxd
Date: 15/1/2013

Environmental Resources Management

ERM

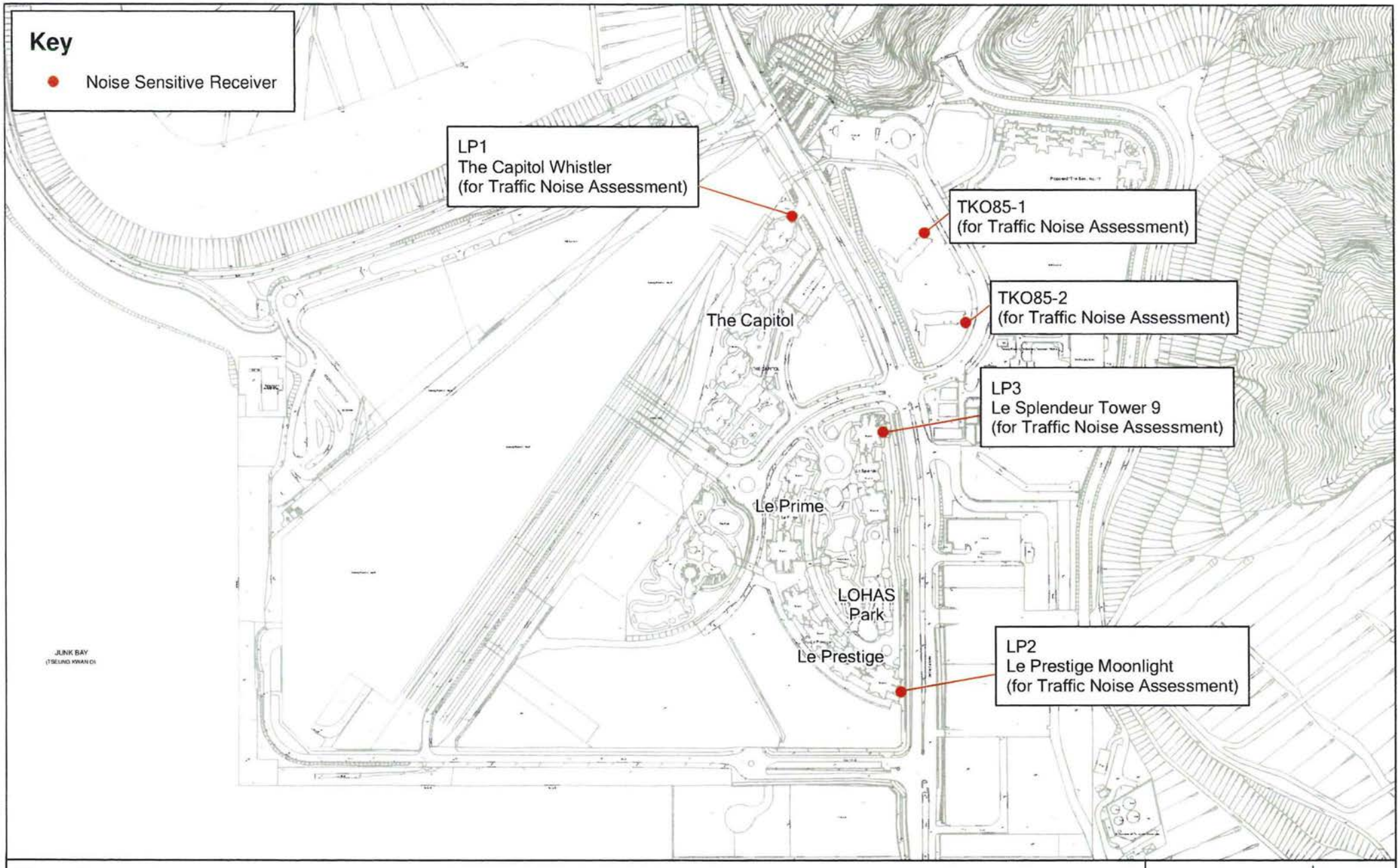



Figure 4.3e

Location of Representative Noise Sensitive Receiver for Assessment

File: T:\GIS\CONTRACT\0414816\mxd\0414816_TKOFB_Existing_NSR.mxd
Date: 05-Jul-2018

Environmental Resources Management

ERM

| Fixed Plant Inventory [a] |
|---|
| Operation of Crushing and Screening Plant |
| Truck movement due to Additional Barging Points |
| Operation of Barging Point A |
| Operation of Barging Point B |
| Operation of Barging Point C |
| Operation of Barging Point D |
| Operation of Barging Point E |
| Operation of Sorting Plant A |
| Operation of Sorting Plant B |
| Operation of Sorting Plant C |
| Operation of Sorting Plant D |
| Operation of Sorting Plant E |
| Operation of Sorting Plant F |

**Note:**

(a) Based on the fixed plant inventory presented in the BCF ER 2011.

The TKOFB will be operated for 24 hours a day, as previously assessed in the approved ER 2008 Report. The PME to be used during the night-time period will be the same as that listed in the fixed plant inventory presented in the approved ER 2008 Report (May 2008) (1) except the quantity of derrick barge increased from 1 to 4, which is extracted in *Table 4.2*.

*Table 4.2* ***Fixed Plant Inventory in TKOFB during Night-time Period***

| PME | Quantity |
|---|---|
| Dump truck (5.5 tons<Gross vehicle weight≤38 tons) | 30 |
| Water lorry (Gross vehicle weight≥38 tons) | 1 |
| Excavator | 6 |
| Generator, super-silenced | 3 |
| Generator, silenced | 1 |
| Derrick barge | 4 |

**Note:**

(a) Based on the fixed plant inventory presented in the approved ER 2008 Report (May 2008) except the quantity of derrick barge increased from 1 to 4.

### *4.4.2 Road Traffic Noise*

*Representative Noise Sensitive Receivers*

With reference to the approved ER 2008 Report, the NSRs that may potentially be affected by the TKOFB are updated as follows.

The residential development at Area 86 (A86R2) is named as Lohas Park with Phase I (The Capitol), Phase IIa (Le Prestige), Phase IIb (Le Prime) and Phase III (Herema) completed. The assessment points (LP1 and LP2) presented in the ER 2008 Report are still considered as the worst affected locations among

(1) Fill Bank at Tseung Kwan O Area 137, Variation to Environmental Permit, dated May 2008

these developments. As mentioned in *Section 4.3*, assessment points at TKO Area 85 (TKO85-1 & TKO85-2) have been included in the assessment.

TKO Area 78 is planned for a hospital development which will be fully equipped with centralised air-conditioning system that it will not rely on openable window for ventilation. A Fire Services Training School cum Driving Training School is located at Pak Shing Kok, TKO Area 78. The training school is fully equipped with air-conditioning system and it is at a lower elevation such that the topographic condition blocks the direct line of sight to Wan Po Road. Based on these, no road traffic noise assessment point has been assigned to the external façade of the above-mentioned developments.

The locations of the identified representative NSRs are updated and presented in *Figures 4.3a* to *4.3e*.

*TKOFB Traffic*

As mentioned in *Section 2*, the nos. of incoming truck trips (public fill delivered by road) will remain unchanged before handing over approximately 14 ha and approximately 10 ha of the site to EPD in 2018 and WSD in 2019, respectively. Currently, a portion of the public fill is delivered to the TKOFB by barges. However, to represent the worst-case assessment, the road traffic noise impact assessment conducted in this environmental review has assumed that all public fill would be delivered by trucks. As estimated by the Traffic Consultant, the no. of truck associated with the transportation of materials to the TKOFB via land routes during the proposed extension period will be 1,845 trucks per day. This worst case scenario assumption is made for assessment purpose only. With CEDD's encouragement of direct match of public fill and facilitation of public fill delivery by vessels instead of land transport, recent records of current operation indicate that the daily incoming truck trips were around 1,500 as public fill was also delivered by barges. CEDD will continue to encourage and maximise the delivery by barges in future such that the delivery by trucks would be minimised.

Delivery of materials to the TKOFB by road will not occur between 20:00 hrs and 08:00 hrs of the next day, road traffic noise during the night-time period would not be a concern.

## 4.5 ASSESSMENT METHODOLOGY

### 4.5.1 *Fixed Plant Operation*

Noise impact assessment due to fixed plant noise from TKOFB was undertaken based on standard acoustic principles as per the requirements of the *EIAO-TM*. During daytime and evening time (07:00 hrs to 23:00 hrs), the same fixed plant inventory, including the types and quantities of PME, and the relevant sound power levels, as that presented in the BCF ER 2011 was adopted for the assessment. The assumptions adopted in the BCF ER 2011 were used for the purpose of the present assessment.

Based on the same fixed plant inventory, including the types and quantities of PME, as presented in the approved ER 2008 Report (May 2008), the assessment results were extracted from the approved ER 2008 Report (May 2008) and presented in this ER .

### 4.5.2 *Road Traffic Noise*

Road carriageways along Wan Po Road from the Site have been taken into consideration in the traffic noise impact assessment.

The road scheme was divided into segments, each of which was assigned with a set of road layout defining the road width, surface type, traffic mix/ flow/ speed and roadside barrier type. The WS Atkins noise model *RoadNoise* from *NoiseMap Enterprise* was used to carry out segmentation and calculation process, in accordance with the UK Department of Transport *Calculation of Road Traffic Noise* (CRTN) procedures. CRTN is the methodology accepted by the EPD for road traffic noise calculations and is the method stipulated in the *EIAO-TM.*

Traffic noise impact associated with the TKOFB has been assessed based on the maximum AM and PM peak hour traffic forecast during the proposed extension period. The traffic forecast has been endorsed by Transport Department.

## 4.6 *EVALUATION OF IMPACTS*

### 4.6.1 *Fixed Plant Operation*

The daytime / evening time noise levels due to the operation of the TKOFB at the representative NSRs were predicted and are summarised in *Table 4.3.* The predicted noise levels comply with the day-time / evening time noise criterion of 60dB(A), stated in *Section 4.2.1.*

*Table 4.3* ***Predicted Operational Noise Levels at Representative NSRs during Daytime / Evening Period***

| NSR | Predicted Facade Noise Level, $L_{eq, 30\ min}$ dB(A) |
|---|---|
| Island Resort | 60 |
| The Lohas Park | 57 |

The predicted night-time noise levels due to the operation of the TKOFB at the representative NSRs are summarised in *Table 4.4.* The predicted noise levels comply with the night-time noise criterion of 50dB(A), stated in *Section 4.2.1.*

*Table 4.4* *Predicted Operational Noise Levels at Representative NSRs during Night-time Period*

| NSR | Predicted Facade Noise Level, $L_{eq, 30\ min}$ dB(A) |
|---|---|
| Island Resort | 46 |
| The Lohas Park | 46 |

Based on the above-mentioned results, no adverse fixed plant noise impact is expected due to the extension of the TKOFB during daytime and evening time, and night-time periods.

### 4.6.2 *Road Traffic Noise*

The predicted noise levels at the representative NSRs during the proposed extension period are summarised in *Table 4.5*.

*Table 4.5* *Road Traffic Noise Levels at Representative NSRs*

| NSR | Predicted Façade Noise Level, dB(A) | | | | | |
|---|---|---|---|---|---|---|
| | AM Peak | | | PM Peak | | |
| | With TKOFB | Without TKOFB | Contribution due to TKOFB (a) | With TKOFB | Without TKOFB | Contribution due to TKO FB (a) |
| ONG1 | 51.7-64.0 | 50.8-63.2 | - | 52.1-64.2 | 51.5-63.6 | - |
| SCH1 | 43.4-48.9 | 42.5-48.1 | - | 43.9-49.1 | 43.3-48.5 | - |
| NFP1 | 52.4-65.0 | 51.5-64.2 | - | 52.8-65.2 | 52.2-64.6 | - |
| NFP2 | 62.2-64.3 | 61.3-63.5 | - | 62.7-64.7 | 62.0-64.1 | - |
| SCH2 | 53.9-64.6 | 53.0-63.9 | - | 54.2-65.0 | 53.6-64.4 | - |
| LCN1 | 57.1-64.5 | 56.3-63.7 | - | 57.3-64.9 | 56.8-64.3 | - |
| OS1 | 48.7-65.4 | 47.8-64.7 | - | 49.4-66.1 | 48.8-65.6 | - |
| LP1 | 58.9-69.9 | 57.9-69.0 | - | 59.4-70.4 | 58.6-69.8 | - |
| LP2 | 62.3-69.7 | 61.5-68.8 | - | 62.8-70.2 | 61.9-69.5 | - |
| LP3 | 67.1-**74.3** | 66.2-**73.4** | 0.9 | 67.6-**74.8** | 66.7-**74.1** | 0.7-0.9 |
| TKO85-1 | 64.0-66.6 | 63.1-65.8 | - | 64.5-67.1 | 63.8-66.5 | - |
| TKO85-2 | 61.6-65.0 | 60.6-64.1 | - | 62.1-65.5 | 61.1-64.7 | - |

**Notes**:

(a) The contribution due to TKOFB will only be presented for those NSRs with predicted traffic noise levels exceeding the noise standards and noise levels with TKOFB are greater than those without TKOFB.

(b) Bold value indicates exceedance over the corresponding noise standards.

The results indicate that noise levels at most of the representative NSRs comply with the HKPSG noise standard of 70dB(A) and 65dB(A) for domestic premises and educational institution, respectively. For those NSRs with predicted traffic noise levels exceeding the noise standards, the noise contribution due to TKOFB is less than 1.0dB(A) at all NSRs. Based on this, noise impact from traffic along Wan Po Road due to the TKOFB is considered insignificant.

### 4.6.3 *Cumulative Impact*

In accordance with the approved EIA Report for SENT Landfill Extension (Register No.: AEIAR-117/2008), the predicted maximum operational noise levels are 53dB(A) at the Lohas Park and 50dB(A) at Island Resort during daytime and evening time periods, and 47dB(A) at the Lohas Park and 46dB(A) at Island Resort during night-time period. Cumulative noise levels are 58 and 60dB(A) during daytime and evening time periods; and 49 and 50dB(A) during night-time period, hence comply with the noise criteria for bot daytime and evening time periods and night-time period. Cumulative impacts are therefore not anticipated during operation phase.

In accordance with the approved EIA Report for Desalination Plant at Tseung Kwan O (Register No.: AEIAR-192/2015), noise impact from operation phase is not anticipated as no NSRs were identified within the 300m of the operational site area and all equipment will be accommodated inside the plant room. Based on this, no cumulative noise impact is expected from the Project.

## 4.7 *MITIGATION MEASURES*

The contractor will continue to implement the noise management measures currently adopted as per the recommendations in *Section 5.5.13* of the *Approved EIA Report.*

As no adverse noise impact is expected during the extended operation period of the TKOFB, no additional mitigation measures are considered necessary.

## 4.8 *CONCLUSION*

1,845 trucks per day is estimated based on transportation of materials to the TKOFB via land routes only which is considered as the worst case scenario. CEDD will also consider to maximise the option of marine transfer (including the optimum use of barging facilities) in order to minimise the number of truck trips per day. Therefore, no adverse noise impacts are anticipated at the representative NSRs due to fixed plant operation and off-site traffic during the extended operation period of the TKOFB.

To meet the territorial need for temporary stockpiling areas for public fill and to enable the clearance of the stockpiled materials at the TKOFB, CEDD proposes to extend the operation and decommissioning of the TKOFB to 31 December 2021. A portion of the existing TKOFB (about 14 ha) will be handed over to EPD for the SENT Landfill Extension and about 10 ha will be handed over to WSD for the development of a desalination plant.

An environmental review has been carried out to assess the potential environmental impacts associated with the extended operation of the TKOFB. The assessment indicates that no adverse environmental impacts are anticipated due to extending the operation period of the TKOFB from 1 January 2019 to 31 December 2021.

The proposed changes to operation of the TKOFB will therefore not constitute a material change to the TKOFB and it is considered that these changes could be incorporated into the Environmental Permit of the TKOFB via a variation of the existing EP.