

**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-540/2018

**PART B DETAILS OF APPLICANT**

**B1. Name :** (person or company)  
Water Supplies 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. :** [REDACTED]  
(if applicable)

**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 :**  
Water Supplies Department

**C2. Application No. of the Current Environmental Permit :** VEP-540/2018

**C3. The Current Environmental Permit was Issued in :** month / year  
01 / 2018

**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.

Tick (✓) the appropriate box

**PART D PROPOSED VARIATIONS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL PERMIT**

D1. Condition(s) in the Current Environmental Permit :	D2. Proposed Variation(s) :	D3. Reason for Variation(s) :	D4. Describe the environmental changes arising from the proposed variation(s) :	D5. Describe how the environment and the community might be affected by the proposed variation(s) :	D6. 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. 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 :
<p><b>Proposed Variation (A):</b> Figure 1 – Project Location Plan</p>	<p><b>Proposed Variation (A):</b> Figure 1 is proposed to be amended in accordance with the realigned fresh water main as shown in <b>Attachment A</b>.</p>	<p><b>Proposed Variation (A):</b> The original alignment of the fresh water main runs through Wan Po Road and Po Hong Road, which are key vehicular access roads in Tseung Kwan O (TKO) serving local residents and community (e.g. in Lohas Park and Po Lam). Construction of water main along majority sections of Wan Po Road and Po Hong Road was identified during the detailed design stage to cause unacceptable traffic impact to the local residents and community in TKO. Realignment of the water main is therefore necessary to resolve the traffic constraints.</p>	<p><b>Proposed Variation (A):</b> No adverse environmental impacts are anticipated from the proposed variation. For details, please refer to the environmental review in <b>Attachment B</b> and <b>Attachment C</b>.</p>	<p><b>Proposed Variation (A):</b> The proposed variation would not cause any unacceptable impact to the environment and the community with proper implementation of the recommended mitigation measures. For details, please refer to <b>Attachment B</b> and <b>Attachment C</b>.</p>	<p><b>Proposed Variation (A):</b> The environmental performance requirements set out in the EIA Report and Environmental Review Report (ERR) previously approved for this project will not be affected by the proposed variation. For details, please refer to <b>Attachment B</b> and <b>Attachment C</b>.</p>	<p><b>Proposed Variation (A):</b> The mitigation measures recommended in the EIA Report and ERR previously approved for this project have been reviewed to be adequate for the revised design of the fresh water main. No additional mitigation measures are required for the proposed variation. Details are presented in <b>Attachment B</b> and <b>Attachment C</b>.</p>



**PART D PROPOSED VARIATIONS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL PERMIT (CONTINUED)**

D1.  Condition(s) in the Current Environmental Permit :	D2.  Proposed Variation(s) :	D3.  Reason for Variation(s) :	D4.  Describe the environmental changes arising from the proposed variation(s) :	D5.  Describe how the environment and the community might be affected by the proposed variation(s) :	D6.  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.  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 :
<p><b>Proposed Variation (B):</b></p> <p>Part C, Condition 2.23</p> <p><b><i>Submissions of As-Built Drawings of Measures for Mitigating Landscape and Visual Impacts</i></b></p> <p>The Permit Holder shall, no later than 1 month before the commencement of operation of the Project, submit 4 hard copies and 1 electronic copy of as-built drawing(s) on landscape and visual mitigation measures to the Director for record. The as-built drawings shall be accompanied with explanatory statement showing the final locations, size, number and species of planting to demonstrate compliance with the approved submissions under Condition 2.11. This as-built submission shall be certified by the ET Leader and verified by the IEC that the landscape and visual mitigation proposal approved under Condition 2.11 has been fully and properly implemented.</p>	<p><b>Proposed Variation (B):</b></p> <p>Part C, Condition 2.23</p> <p><b><i>Submissions of As-Built Drawings of Measures for Mitigating Landscape and Visual Impacts</i></b></p> <p>The Permit Holder shall, <u>within 1 month, or otherwise agreed with the Director, after completion of the relevant landscape and visual mitigation works of the Project</u>, submit 4 hard copies and 1 electronic copy of as-built drawing(s) on landscape and visual mitigation measures to the Director for record. The as-built drawings shall be accompanied with explanatory statement showing the final locations, size, number and species of planting to demonstrate compliance with the approved submissions under Condition 2.11. This as-built submission shall be certified by the ET Leader and verified by the IEC that the landscape and visual mitigation proposal approved under Condition 2.11 has been fully and properly implemented.</p>	<p><b>Proposed Variation (B):</b></p> <p>The desalination plant would be developed by phase. The completion timing of the proposed slope mitigation works, the dedicated trunk feed system for transfer of fresh water output, the first stage of the desalination plant and the second stage of the desalination plant would be different. The proposed variation is necessary to facilitate phased completion of different work components of the Project, at the same time providing the required submission at suitable phase to fulfill the intention of Condition 2.23 of the Environmental Permit.</p>	<p><b>Proposed Variation (B):</b></p> <p>The as-built drawing(s) on landscape and visual mitigation measures would remain to be submitted after completion of the landscape and visual mitigation works. There is no change to the existing approach/practice on the provision of the recommended landscape and visual mitigation measures. Therefore, no environmental change would be arisen from the proposed variation.</p>	<p><b>Proposed Variation (B):</b></p> <p>The details and implementation programme of the recommended landscape and visual mitigation measures would remain to be provided in the Landscape and Visual Mitigation Plan for approval under Condition 2.11 of the EP. The measures would still be implemented in accordance with the recommended time frame in the approved Landscape and Visual Mitigation Plan. There is no change to the existing approach/practice on the provision of the recommended landscape and visual mitigation measures. Therefore, no environmental change would be arisen from the proposed variation, and the proposed variation would not affect the environment nor community.</p>	<p><b>Proposed Variation (B):</b></p> <p>The proposed variation is related to the time frame of the submission of as-built drawing(s) on landscape and visual mitigation measures only. There is no change to the existing approach/practice on the provision of the recommended landscape and visual mitigation measures, e.g. following the implementation time frame in the approved Landscape and Visual Mitigation Plan. Therefore, no environmental change would be arisen from the proposed variation, and there would be no impact on the environmental performance requirements set out in the EIA report nor Project Profile previously submitted for the Project.</p>	<p><b>Proposed Variation (B):</b></p> <p>The proposed variation would not result in any environmental change, impact on the environment/community, nor impact on the environmental performance requirements. No additional measures are required nor proposed.</p>

**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.



Signature of Applicant



Full Name in Block Letters



Position



on behalf of

Water Supplies Department

Company Name and Chop (as appropriate)

11.3.2024

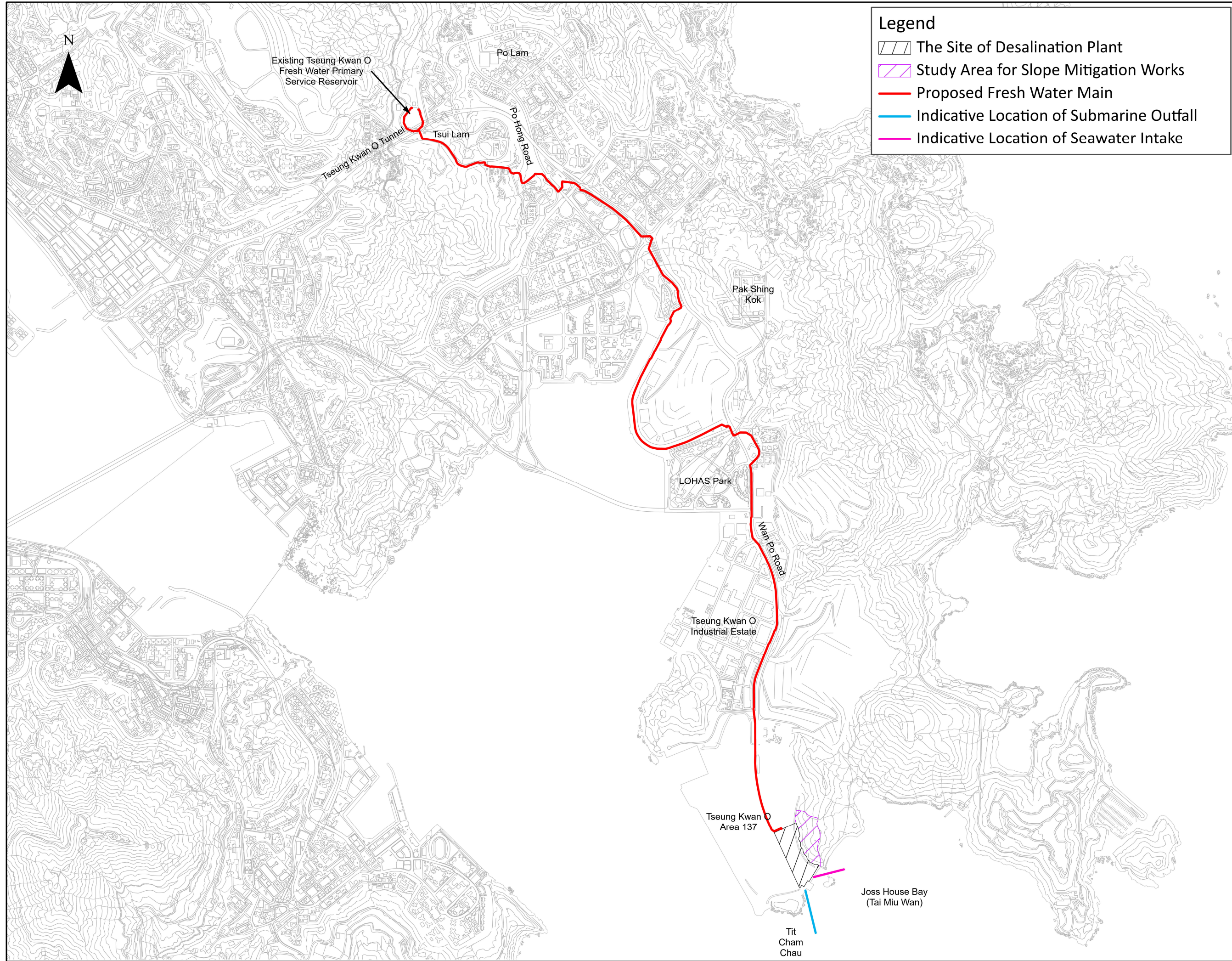
Date

**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.

Attachment A  
Revised Figure 1 of Environmental Permit





**Legend**

-  The Site of Desalination Plant
-  Study Area for Slope Mitigation Works
-  Proposed Fresh Water Main
-  Indicative Location of Submarine Outfall
-  Indicative Location of Seawater Intake

Revision	Description			
	Designed	Reviewed	Drawn	Checked
Initial	-	-	-	-
Date	-	-	-	-
Approved				

Agreement No. **CE 21/2012 (WS)**

Project Title  
**First Stage of Desalination Plant at Tseung Kwan O - Investigation, Design and Construction**

Figure Title  
**Revised Figure 1 - Project Location Plan**

Drawing No. Attachment A      Revision -

Scale  
**A3: 1:28,000**

Client  
 水務署  
Water Supplies Department

Consultant  
 **binnies**  
BINNIES HONG KONG LIMITED  
賓尼士工程顧問有限公司



**Attachment B**  
**Supporting Document for**  
**Variation of Environmental Permit -**  
**Updated Environmental Review Report**  
**for Fresh Water Mains**

ISSUE 2 (FINAL)

# UPDATED ENVIRONMENTAL REVIEW REPORT FOR FRESH WATER MAINS

Agreement No. CE 8/2015 (WS)

First Stage of Desalination Plant at Tseung Kwan O  
– Investigation, Design, Construction

B&V PROJECT NO. 190495/29.2200

Report Authorized For  
Issue By:

  
For and on Behalf of  
Black & Veatch Hong Kong Limited

PREPARED FOR

Water Supplies Department

20 JANUARY 2020



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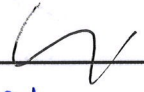
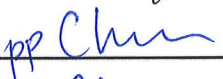

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	Name	Signature	Date
Prepared by	K. L. Lee		20 January 2020
Checked by	Amy Cheung		20 January 2020
Reviewed by	Christina Ko		20 January 2020

# 1 Introduction

## 1.1 Background

- 1.1.1 Water Supplies Department (WSD) plans to develop a desalination plant at Tseung Kwan O (TKO) Area 137, together with all ancillary facilities and the slope mitigation works in the adjoining Clear Water Bay Country Park (hereafter also referred to as “the Project”).
- 1.1.2 The Project is classified as a Designated Project (DP) under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Impact Assessment (EIA) was completed in accordance with the EIAO under the Feasibility Study (FS) stage of the Project. The EIA Report for the Project (Register No.: AEIAR-192/2015) was approved on 4 November 2015 under the EIAO (hereafter also referred to as “EIA 2015”). Following the approval of the EIA 2015, the Environmental Permit (EP) (EP No: EP- 503/2015), covering the construction and operation of Project, was granted on 4 December 2015. Amendment of the EP was applied under the EIAO on 5 January 2018 due to changes of the desalination plant design recommended after the EIA stage. The amended EP (EP No: EP-503/2015/A) was subsequently granted on 26 January 2018.
- 1.1.3 Construction of a new water mains is required for the transfer of fresh water output from the proposed desalination plant in TKO Area 137 to the existing TKO Fresh Water Primary Service Reservoir (FWPSR) in Tsui Lam as shown in **Figure 1.1**. The new water mains itself is not a DP element under the EIAO but was assessed as part of the Project in the EIA 2015.
- 1.1.4 Change of the design and alignment of the fresh water mains was proposed in early 2019 under the detailed design works to resolve engineering constraints. An environmental review was carried out in early 2019 to assess the environmental impacts arising from the design change. The results of the environmental review are presented in “*Agreement No. CE 8/2015 (WS) First Stage of Desalination Plant at TKO – Investigation, Design and Construction, Environmental Review Report for Fresh Water Mains*” issued to the Environmental Protection Department (EPD) in March 2019 (hereafter also referred to as “ERR March 2019”). The Design Proposal adopted in the ERR March 2019 is also presented in **Figure 1.1**.
- 1.1.5 Recently, the need of further changing the alignment and design of the fresh water mains in the northern section close to the existing TKOFWPSR in Tsui Lam has been identified to resolve traffic constraints. This further change was not considered in the ERR March 2019.

## 1.2 Purpose of this Report

- 1.2.1 The purpose of this Updated Environmental Review Report (ERR) is to review the potential environmental impacts arising from the latest change of the alignment and design of the fresh water mains in Tsui Lam and demonstrate that this change will not constitute material change to the environmental impact of the Project with mitigation measures in place and the Project complies with the requirements described in the Technical Memorandum on EIA Process (EIAO-TM). The proposed alignment adopted in this Updated ERR is presented in **Figure 1.1** for comparison with the alignment adopted in the ERR March 2019.

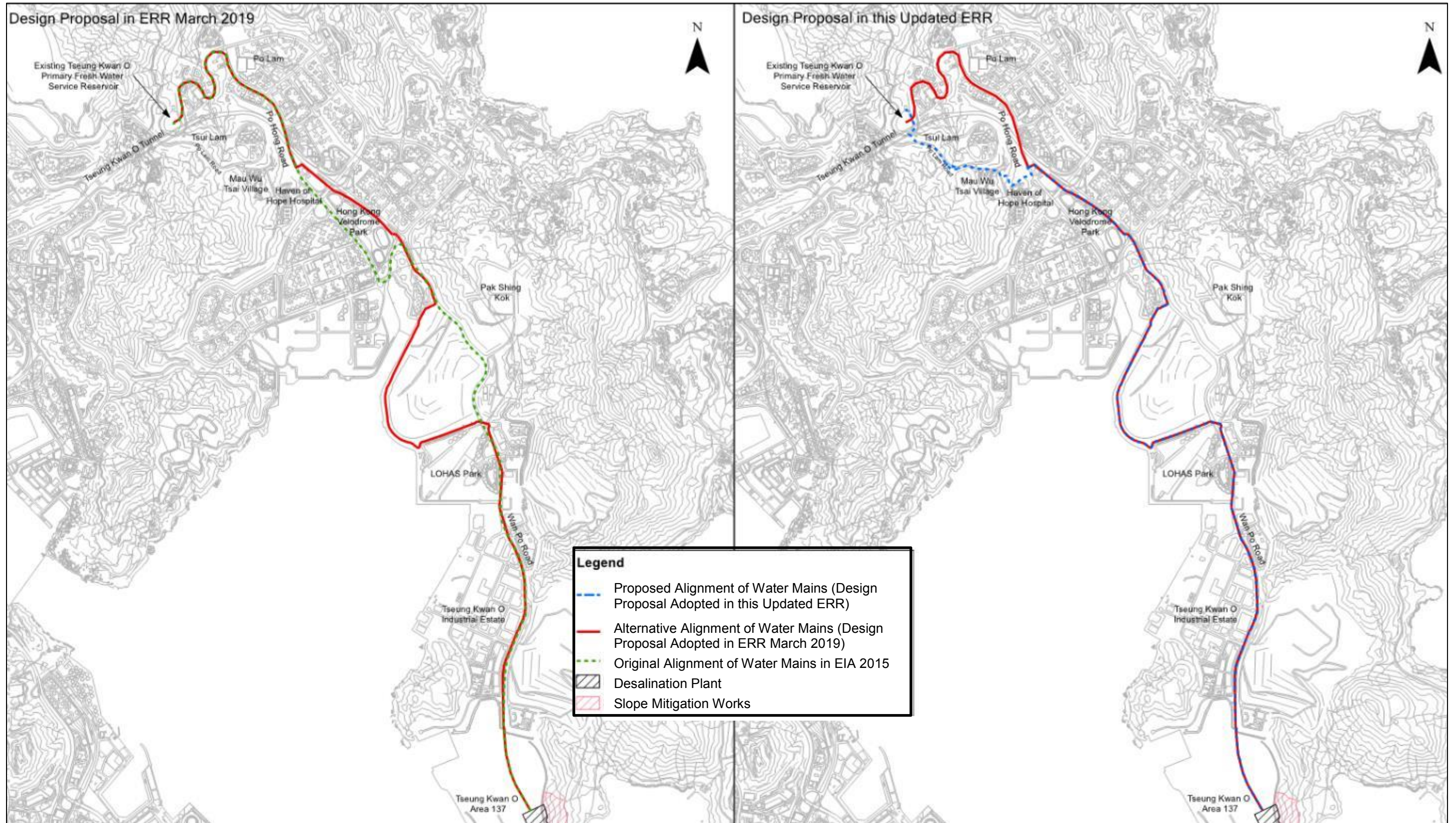
## 1.3 Report Structure

- 1.3.1 The remainder of this Report is organized as follows:
- a) Section 2 presents the details of the proposed change and identifies the potential environmental aspects of concern associated with such change.
  - b) Sections 3 to 7 provide a review on the potential environmental impacts due to the proposed change and propose additional mitigation measures (if required) for compliance with the requirements in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM):

- Section 3 Air Quality Impact Review
  - Section 4 Noise Impact Review
  - Section 5 Water Quality Impact Review
  - Section 6 Review of Waste Management Assessment
  - Section 7 Ecological Impact Review
- c) Section 8 reviews the Environmental Management and Audit (EM&A) requirements.
- d) Section 9 presents the conclusion of this Updated ERR.



Figure 1.1 Proposed Alignment of TKO Fresh Water Mains





## 2 Proposed Changes and Environmental Implications

### 2.1 Original Alignment in EIA Report

- 2.1.1 The approved EIA assumed that the fresh water mains will be laid along existing roads of Wan Po Road, Po Hong Road and Tsui Lam Road as shown in **Figure 1.1**.

### 2.2 Alternative Alignment in ERR March 2019

- 2.2.1 Realignment of the fresh water mains adopted in the ERR March 2019 starts from Wan Po Road in the south and runs through Wan Po Road along the eastern boundary of TKO Industrial Estate and Lohas Park. It then turns west at Lohas Park Road and passes through the Lohas Park Road and then the cycle track along the TKO South Waterfront Promenade (around the restored TKO Stage 1 Landfill). It subsequently runs along the cycle path within the Hong Kong Velodrome Park and ends at Po Hong Road near the Haven of Hope Hospital. The northern section near the TKOFWPSR in Tsui Lam remained the same as that adopted in the EIA 2015.

### 2.3 Proposed Alignment in this Updated ERR

- 2.3.1 The southern alignment from desalination plant to Po Hong Road (namely Section A and Section B) adopted in this Updated ERR is the same as that adopted in the ERR March 2019 as shown in **Figure 1.1**. Deviation from the previous proposal starts at Po Hong Road in Tsui Lam. Zoom-in plot of the new realignment (namely Section C) is given in **Figure 2.1**. The new realignment turns south and runs along a short section of Po Hong Road and then turns west and cuts through a small plantation patch and runs along a local road to the north of Haven of Hope Hospital. It then runs through Po Lam Road South (to the north of Mau Wu Tsai Village) and then to Po Lam Road. Subsequently, it turns north and runs across another plantation patch and finally runs along an existing footpath around the TKOPWPSR.

### 2.4 Construction Approach

#### **Section A (Desalination Plant to Shek Kok Road) and Section B (Shek Kok Road to Po Hong Road)**

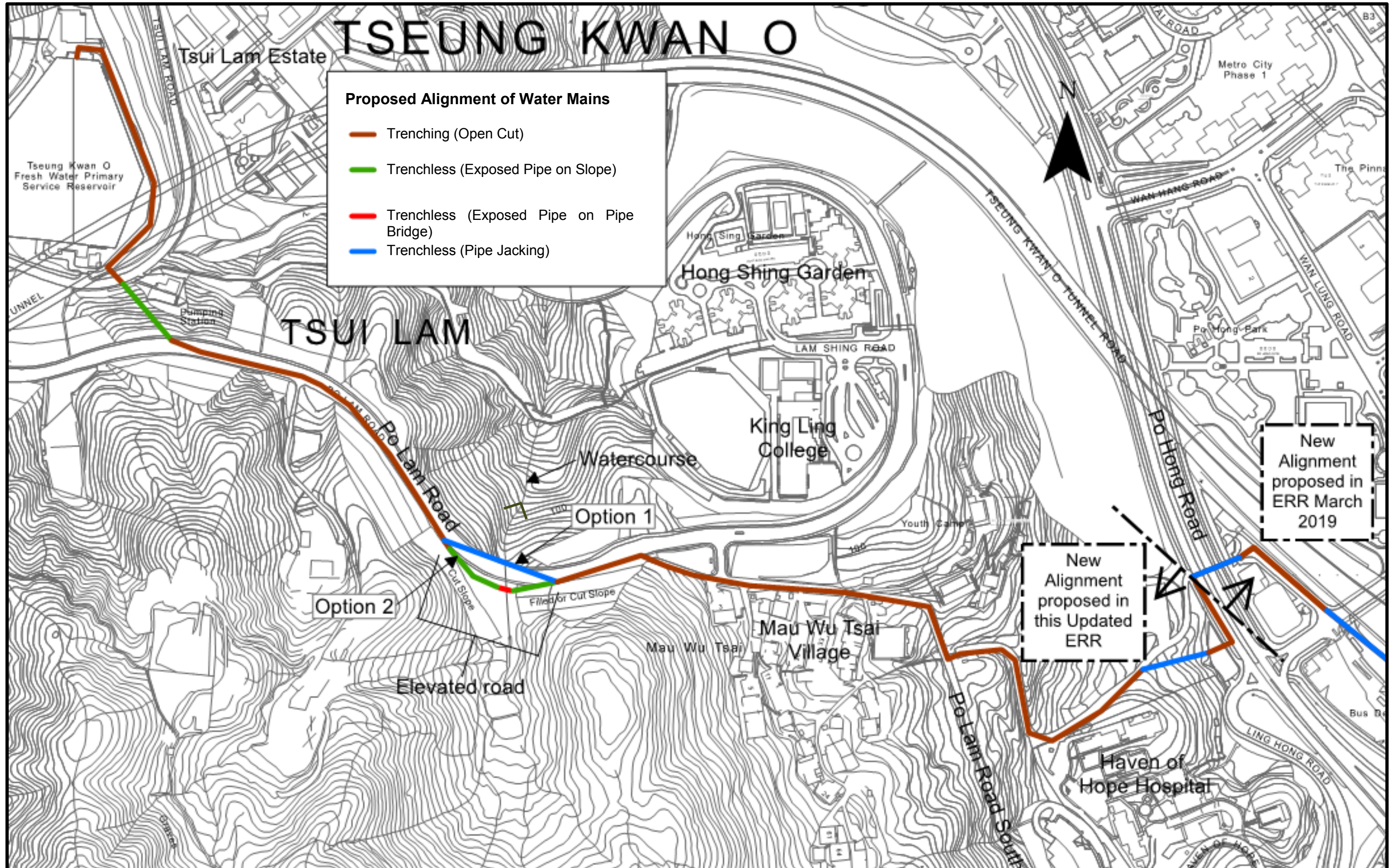
- 2.4.1 The alignment and construction methods for Section A and Section B proposed in the ERR March 2019 remain unchanged. These sections will be constructed in small sections by a combination of trenching (open cut) method and trenchless (pipe jacking) method.

#### **Section C (Po Hong Road to TKOFWPSR in Tsui Lam)**

- 2.4.2 The proposed realignment in the north, namely Section C, is shown in **Figure 2.1**. This alignment would run across three areas of plantation. The western one is located on a slope south of TKOFWPSR, while the eastern one located near Po Hong Road. The third one is in the middle near the elevated section of Po Lam Road with a small watercourse running underneath the road from the south. Laying exposed pipe will be used in the western plantation patch. This method can avoid tree felling and major vegetation clearance and therefore is able to prevent habitat loss. Pipe jacking is proposed for the middle plantation patch (under Option 1) as well as on the eastern plantation patch near Po Hong Road. The whole water main will be installed underground by jacking and therefore can completely avoid vegetation clearance and surface disturbance.
- 2.4.3 The length of the pipe jacking section at Po Lam Road (Option 1) as shown in **Figure 2.1** is tentative but in any case, all surface works areas (jacking pits) would be located within existing roads only. Section plan which shows the typical work arrangement under Option 1 is provided in **Appendix 2A**.



Figure 2.1 Design Proposal of TKO Fresh Water Mains in Tsui Lam Area





2.4.4 Alternatively, laying exposed pipe and pipe bridge will be used for the middle plantation patch to avoid habitat destruction (namely Option 2). The proposed pipe bridge will hold the exposed pipe over the watercourse with supports from two bridge piers on ground surface without any physical attachment to the watercourse. The typical work arrangement near the watercourse under Option 2 is provided in **Appendix 2B**.

**Figure 2.2 Existing Condition at Pipe Bridge Area**



**Figure 2.3 Existing Condition underneath Po Lam Road**



2.4.5 Trenching (open cut) method would be adopted for the remaining alignments, which are all located in urbanized/disturbed areas and along existing roads.

## 2.5 Construction Methods and Sequence

### Trenching (Open Cut) Method

- 2.5.1 The open cut method would be undertaken by concrete breaking, excavation, pipe laying, backfilling, concrete reinstatement, asphalt reinstatement, painting of road marking.

### Trenchless (Pipe Jacking) Method

- 2.5.2 The pipe jacking method would involve similar activities including construction of working pits for excavation, installation of temporary structural supports, pipe jacking by micro-tunnelling, concrete reinstatement, asphalt reinstatement, painting of road marking.

### Trenchless (Exposed Pipe Laying on Pipe Bridge)

- 2.5.3 The steel pipe bridge would be supported by two concrete anchoring piers. Mini-piles would be installed as the foundation of the bridge piers. The works areas of all temporary installations (e.g. temporary work platform) and permanent pipe bridge supports would have at least 2 m clearance from the watercourse. The entire watercourse will be preserved without structural alternation. No permanent and temporary works would be carried out in the watercourse. The sequence of pipe bridge construction are as follows:

1. General site clearance
2. Perform minor excavation at pier locations
3. Erect temporary working platforms (for mini-pile construction)
4. Construct mini-piles (approximate 3 – 4 nos. per pier)
5. Remove temporary working platforms
6. Construct 2 pile caps
7. Construct concrete piers on pile caps
8. Erect and fix prefabricated steel bridge structure on concrete piers
9. Erect and fix the watermain on pipe bridge
10. Reinstatement site condition

### Trenchless (Exposed Pipe Laying on Slopes)

- 2.5.4 The exposed pipe on existing slope would be supported by concrete pipe saddles at regular intervals. The exposed pipe in the middle plantation patch near the elevated road would have direct conflict with a limited number of trees, whilst the exposed pipe in the west south of TKOFWPSR would completely avoid tree removal. The sequence of exposed pipe laying on slope are as follows:

1. General site clearance
2. Perform minor excavation at pipe saddle locations
3. Erect temporary working platforms
4. Erect temporary supports of water mains
5. Deliver water mains on temporary supports
6. Rebar fixing for pipe saddles
7. Construct concrete pipe saddles
8. Erect and fix the watermain on pipe saddles
9. Remove temporary supports of water mains and temporary working platform
10. Reinstatement site condition

## 2.6 Work Programme

- 2.6.1 The southern section of the fresh water mains commenced construction in late 2017. The whole alignment is scheduled for completion in late 2022. The newly realigned section in Tsui Lam proposed in this Updated ERR as shown in **Figure 2.1** is scheduled for commencement in 2020 and completion in 2.5 years.



## 2.7 Environmental Aspects of Concern

- 2.7.1 Since the proposed alignment in Tsui Lam would run across plantation areas and a natural watercourse, ecological impact review including ecological survey has been conducted and the results are presented in Section 7.
- 2.7.2 The proposed alignment mostly runs along vehicle access roads, cycle tracks and footpaths. These public road networks were built as part of the new town development in TKO and are not regarded as land uses with potential contaminated activities. The new alignment in Tsui Lam would run across existing plantation or slope areas, which are also not regarded as land uses with potential contaminated activities. The construction disturbance in watercourse was only observed under the Po Lam Road. No sign of similar disturbance was observed in works areas of exposed pipe and pipe bridge laying located upstream of Po Lam Road. No past industrial land use was previously recorded along the proposed alignment and therefore, no land contamination concern would arise from the proposed change. Land contamination is not further reviewed.
- 2.7.3 The construction works for the water mains will be carried out in a localized area and be constructed section by section. The disturbance from the water mains construction to the surroundings areas or nearby residents will be minimal during construction. During operational phase, all the works areas will be cleaned and reinstated to its original conditions. Under Option 2, the exposed pipe section would be shielded by the nearby topography and elevated road. The residents (e.g. Hong Shing Garden, Mau Wu Tsai Village), schools and road users nearby would have no direct view to this exposed pipe. The exposed pipe section south of TKOFWPSR would be far away from the nearby residents (e.g. over 200m from Tsui Lam Estate and over 500 m from Hong Shing Garden). The exposed pipe is minimal in scale (of only 1.2 m in diameter) and would be shielded by nearby plantation, and therefore can hardly be visible to the residents, schools and road users in Tsui Lam. As such, there will be no visual impacts during construction and operation of the exposed pipe.
- 2.7.4 The plantation area to be occupied by the exposed pipe would be minimal or negligible. Under Option 2, limited number of trees would be in direct conflict with the exposed pipe. None of these trees are registered Old and Valuable Trees. Based on the ecological survey carried out in 2019 (as reported in Section 7), the affected plantation patch is of low value with no plant species of conservation interest. The affected area is not visible to the nearby residents with minimal or negligible landscape value. A detailed tree survey and removal application will be prepared in accordance with the *Development Bureau Technical Circular (Works) No. 7/2015 – Tree Preservation* separately, in which, the precise number of trees to be retained, transplanted, felled and compensated will be confirmed and agreed with the relevant authorities. The alignment of exposed pipe will be positioned/adjusted in such a way that at least 500mm clearance shall be kept from trunks of retained trees to avoid interface problem due to their future growth. Considering that the nos. of trees to be affected would be limited and any tree felling would be compensated within the same plantation habitat where practicable, no permanent landscape impact would be associated with the exposed pipe.
- 2.7.5 The EIA 2015 considered that the fresh water mains in minor scale would not cause any significant landscape and visual impacts during construction and operational phase. No landscape and visual impact assessment was performed for the fresh water mains under the EIA 2015. No change to this EIA conclusion is proposed due to the design change. Landscape and visual impacts are not further reviewed.
- 2.7.6 Construction and operation of the water mains in the southern area are regarded as the potential targets for landfill gas hazard. The land fill gas hazard impact associated with the construction and operation of the water mains has been fully assessed and addressed in the ERR March 2019. The new realignment in Tsui Lam is far away from the landfill sites with no landfill gas hazard issue. Landfill gas hazard impact is not further reviewed in this report.

2.7.7 Construction of the proposed alignment would generate dust, noise, water quality impact (e.g. due to site runoff), waste and ecological impact. The key environmental aspects of the water mains are summarized in **Table 2.1** below.

**Table 2.1 Key Environmental Aspects of Design Change**

Environmental Chapters of EIA 2015	Interaction with Proposed Design Change?	
	Construction Phase	Operational Phase
Air Quality Impact	✓	X
Noise	✓	X
Water Quality Impact	✓	X
Sewerage and Sewage Treatment Implication	X	X
Waste Management	✓	X
Land Contamination	X	X
Ecology (Terrestrial and Aquatic)	✓	X
Fisheries	X	X
Landscape and Visual Impact	X	X
Landfill Gas Hazard	X	X
Hazard to Life	X	X

Notes:

- ✓ – Key environmental implications of the water mains.
- X – No interaction with the proposed design change is identified.

## 3 Air Quality Impact Review

### 3.1 Introduction

3.1.1 This Section reviews the construction phase air quality impact arising from the proposed change of the fresh water mains (see **Section 2**). No air quality impact would arise from operation of the fresh water mains

### 3.2 Environmental Legislation and Criteria

3.2.1 The principal legislation for the management of air quality in Hong Kong is the Air Pollution Control Ordinance (APCO) (Cap 311). A set of Air Quality Objectives (AQOs), effective from 1 January 2014, stipulates statutory ambient limits for air pollutants and the maximum allowable number of exceedances over specific averaging periods. These AQOs are presented in **Table 3.1**.

**Table 3.1** Hong Kong Air Quality Objectives

AIR POLLUTANT	AVERAGING TIME	CONCENTRATION ( $\mu\text{g m}^{-3}$ ) <sup>(a)</sup>	NO. OF EXCEEDANCES ALLOWED PER YEAR
Sulphur Dioxide (SO <sub>2</sub> )	10 minutes	500	3
	24-hours	125	3
Respirable Suspended Particulates (PM10) <sup>(b)</sup>	24-hours	100	9
	Annual	50	-
Fine Suspended Particulates (PM2.5) <sup>(c)</sup>	24-hours	75	9
	Annual	35	-
Nitrogen Dioxide (NO <sub>2</sub> )	1-hour	200	18
	Annual	40	-
Ozone (O <sub>3</sub> )	8-hours	160	9
Carbon Monoxide (CO)	1-hour	30,000	-
	8-hours	10,000	-
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  $\mu\text{m}$  or less

(c) Suspended particles in air with a nominal aerodynamic diameter of 2.5  $\mu\text{m}$  or less

### 3.3 Baseline Condition

#### Existing Prevailing Air Quality

3.3.1 The baseline air quality conditions presented in the approved EIA Report have been updated in this section.

3.3.2 The air quality data collected at EPD's Air Quality Monitoring Station (AQMS) closest to the Project site, namely Tseung Kwan O, were used to establish the baseline condition at the Project site.

3.3.3 Concentrations of key air pollutants measured in Tseung Kwan O AQMS which started operation in March 2016 are presented in **Table 3.2**. It is noticed that full compliance with the AQOs was recorded for all the parameters of concern except only for O<sub>3</sub> in 2017 and 2018.

**Table 3.2 Baseline Air Quality – Tseung Kwan O Air Quality Monitoring Station**

AIR POLLUTANT	AVERAGING TIME	AQO (A)	DATA DESCRIPTION	UNIT	YEAR (B) (C) (D)			MEAN
					2016	2017	2018	
Fine Suspended Particulates (PM 2.5)	24-hour	75 (9)	10th Max.	µg m <sup>-3</sup>	41	43	32	39
	Annual (e)	35	-	-	17	18	15	17
Respirable Suspended Particulates (PM10)	24-hour	100 (9)	10th Max.	µg m <sup>-3</sup>	59	65	53	59
	Annual (e)	50	-	-	27	31	28	29
Sulphur Dioxide (SO <sub>2</sub> )	10-minute	500 (3)	4th Max.	µg m <sup>-3</sup>	40	39	38	39
	24-hour	125 (3)	4th Max.	µg m <sup>-3</sup>	13	15	11	13
Nitrogen Dioxide (NO <sub>2</sub> )	1-hour	200 (18)	19th Max.	µg m <sup>-3</sup>	127	165	135	142
	Annual (e)	40	-	-	29	28	28	28
Carbon Monoxide (CO)	1-hour	30,000	Max.	µg m <sup>-3</sup>	1850	1830	2130	1937
	8-hour	10,000	Max.	µg m <sup>-3</sup>	1673	1574	1838	1695
Ozone (O <sub>3</sub> )	8-hour	160 (9)	10th Max.	µg m <sup>-3</sup>	152	<b>175</b>	<b>169</b>	<b>165</b>

**Notes:** (a) Values in ( ) indicate the number of exceedances allowed per year.

(b) Based on measurements available on EPD website. (<http://epic.epd.gov.hk/EPICDI/air/download/>)

(c) Bolded values represent exceedances of the AQOs.

(d) N/A – Data not available

(e) The data for calculation did not evenly distribute in the year.

### 3.4 Study Area

3.4.1 The air quality impact review area is defined by a distance of 500m from the revised alignment of the water mains. The study area is presented in **Figure 3.1**.

### 3.5 Identification of Air Sensitive Receivers

3.5.1 The latest Outline Zoning Plans (OZP), Outline Development Plan (ODP) and relevant land use plans published by Lands Department have been reviewed. The representative Air Sensitive Receivers (ASRs) in the study area have been updated as shown in **Table 3.3** and **Figure 3.1**.

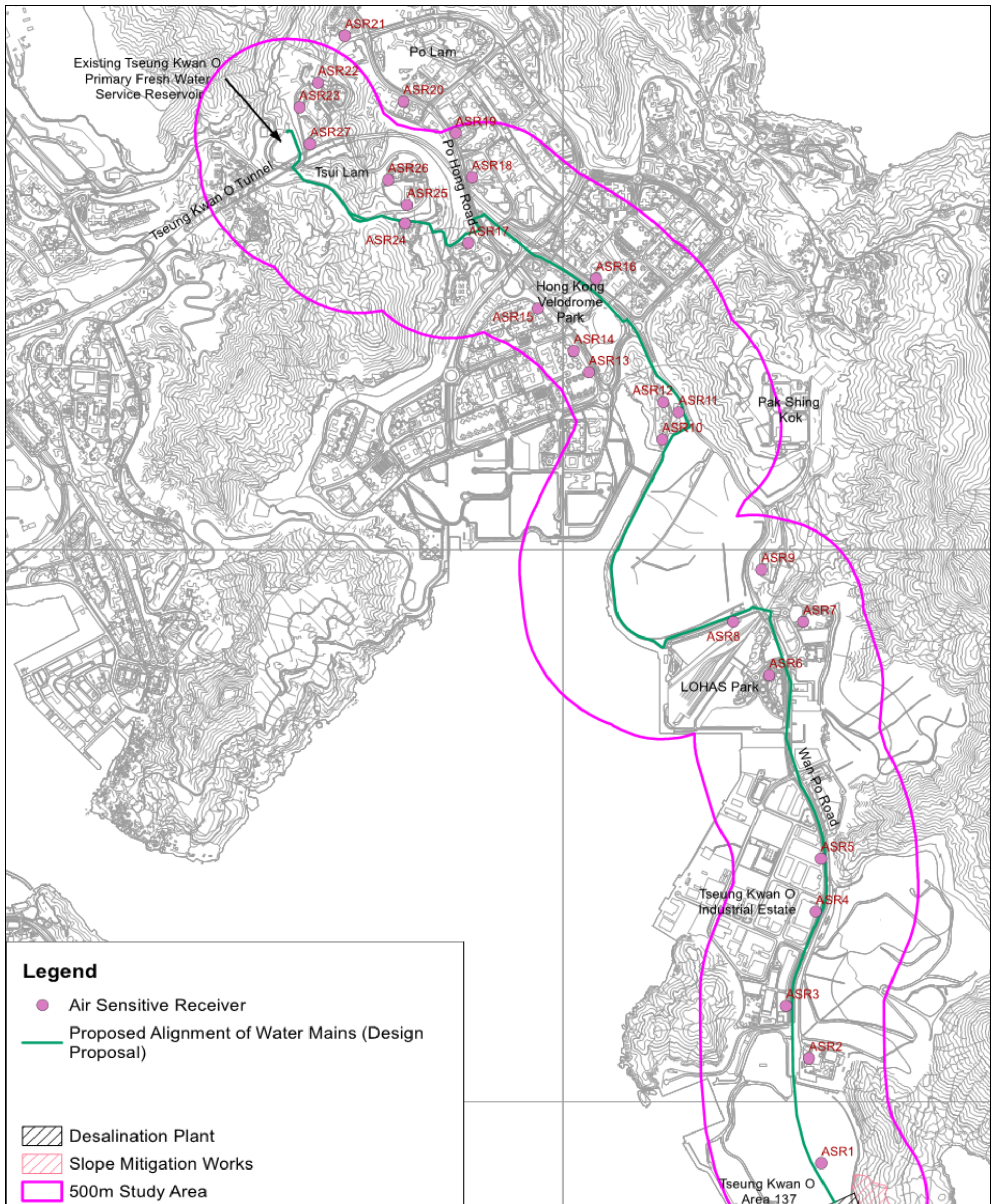
**Table 3.3 Identified Representative Air Sensitive Receivers**

ASR (Figure 3.1)	Description	Type of Use	Approximate Separation Distance from the Nearest Pipe Works (m)		ASR identified for Original Alignment in EIA	ASR identified for Proposed Alignment in this Review
			Original Alignment in EIA	Proposed Alignment in this Review		
ASR1	Office at SENT Landfill Extension	Office	45	45	✓	✓
ASR2	Offices at Existing SENT Landfill	Office	87	89	✓	✓
ASR3	TVB City	Commercial	44	33	✓	✓
ASR4	Apple Daily	Industrial	35	29	✓	✓
ASR5	Next Media Ltd.	Office	26	22	✓	✓
ASR6	LOHAS Park - La Splendur	Residential	101	98	✓	✓
ASR7	The Beaumont	Residential	177	169	✓	✓
ASR8	Hemera – Topaz	Residential	161	32		✓
ASR9	Shaw Tseung Kwan O Film Studios	Industrial	77	208	✓	✓
ASR10	Oscar By the Sea Tower 8	Residential	173	40		✓
ASR11	Creative Secondary School	Education	33	25	✓	✓
ASR12	Oscar By the Sea Tower 1	Residential	78	83	✓	✓

ASR (Figure 3.1)	Description	Type of Use	Approximate Separation Distance from the Nearest Pipe Works (m)		ASR identified for Original Alignment in EIA	ASR identified for Proposed Alignment in this Review
			Original Alignment in EIA	Proposed Alignment in this Review		
ASR13	Tseung Kwan O Plaza Tower 1	Residential	23	328	✓	✓
ASR14	Beverly Garden	Residential	41	306	✓	✓
ASR15	Kwong Ming Court	Residential	38	249	✓	✓
ASR16	Nan Fung Plaza	Residential	304	62		✓
ASR17	Haven of Hope Hospital	Hospital	91	46	✓	✓
ASR18	Po Hong Park	Recreational	58	209	✓	✓
ASR19	Verbena Heights	Residential	46	466	✓	✓
ASR20	Serenity Garden	Residential	16	616	✓	✓
ASR21	Tseung Kwan O Village	Residential	39	593	✓	
ASR22	King Ming Court	Residential	30	299	✓	✓
ASR23	School of Continuing and Professional Studies of the Chinese University of Hong Kong (CUHK)	Education	16	135	✓	✓
ASR24	Mau Wu Tsai Village	Residential	360	14		✓
ASR25	King Ling College	Education	321	85		✓
ASR26	Hong Sing Garden (Block 1)	Residential	386	194		✓
ASR27	Hong Chi Morninghill School Tsui Lam	Education	60	67		✓



Figure 3.1 Representative Air Sensitive Receivers





### 3.6 Potential Sources of Impacts

- 3.6.1 The construction methods for the fresh water mains are described in Section 2. The water mains would be constructed by a combination of trenching (open cut) method and trenchless (pipe jacking and exposed pipe laying) method.
- 3.6.2 The key sources of potential air quality impact from trenching (open cut) works would be the dust generated from excavation, backfilling, materials handling, truck movements and wind erosion from open stockpiling of dusty materials.
- 3.6.3 The key sources of potential air quality impact associated with the trenchless method would be the same. Excavation and backfilling associated with the pipe jacking works would be confined in the working pits at both ends of the trenchless section only. The exposed pipe laying would involve minimal excavation at the pipe saddles and pipe bridge piers only. The amount of excavation, backfilling and dusty material handling required for the trenchless method would be limited and minimal in scale as compared to the trenching (open cut method).

### 3.7 Review of Impacts

- 3.7.1 The open cut method involves soil excavation and backfilling, which may have the potential to cause fugitive dust emissions. Negligible dust emissions are expected from the trenchless method with limited excavation and backfilling works. Under the updated design with a shorter alignment as compared to the original design, about 41,169 m<sup>3</sup> of C&D materials would be generated from the fresh water main construction, which is lower than the value (42,733 m<sup>3</sup>) assumed in the EIA 2015. The fresh water mains will be constructed in small sections (i.e. 40m as assumed in the EIA 2015) and therefore the excavated materials to be handled at each section would be limited. Limited number of construction plants will be deployed for the works.
- 3.7.2 The EIA 2015 concluded that, with the implementation of dust control measures stipulated under the Air Pollution Control (Construction Dust) Regulation together with proper site management and good housekeeping, no adverse air quality impact upon the ASRs would be expected from these construction activities. Following the same conclusion of the EIA 2015, no adverse air quality impact would arise from the proposed design change with mitigation measures in place. As the overall length of the trenching works would be reduced in the revised design as compared to the EIA assumption, the proposed design change would further minimize the overall air quality impact from the Project.

### 3.8 Mitigation Measures

- 3.8.1 The EIA 2015 recommended that dust control measures stipulated in the Air Pollution Control (Construction Dust) Regulations and good site practices should be implemented for the construction of the proposed water mains, where applicable. No changes on these EIA measures are recommended.

### 3.9 Review of Cumulative Impacts

- 3.9.1 Operation of South East New Territories (SENT) Landfill Extension and Fill Bank at TKO Area 137 as well as construction of various residential developments in TKO are located within 500m of the water mains during construction. The construction scale for the water mains is minor and with implementation of dust mitigation measures and good site practices, the associated dust impact would be limited and localized. Therefore, no adverse cumulative dust impact with other concurrent projects is expected from construction of the fresh water mains.

### 3.10 Residual Impacts

- 3.10.1 No unacceptable residual impact is expected from the proposed design change of the water mains with proper implementation of the mitigation measures recommended in the EIA 2015.

### **3.11 Environmental Monitoring and Audit**

- 3.11.1 The EIA 2015 concluded that no adverse fugitive dust impact is anticipated during the construction period and dust monitoring is not necessary. It is recommended in the EIA 2015 to conduct regular environmental site audits to ensure the implementation of the dust control measures and good site practices throughout the construction period. No changes to these environmental audit requirements are proposed under this Updated ERR.

### **3.12 Conclusions**

- 3.12.1 The proposed water mains will be laid in small sections using a combination of trenching (open cut) method and trenchless (pipe jacking and exposed pipe laying) method. The trenching method involves soil excavation, backfilling and dusty material handling, which may have the potential to cause fugitive dust emissions. Negligible dust emissions are expected from the trenchless method as limited amount of excavation, backfilling and dusty material handling would be involved. Since the amount of excavated materials to be generated will be relatively small and the work scale is minor, no adverse fugitive dust impact is envisaged provided that the dust control measures recommended in the EIA 2015 are properly implemented. The findings and conclusion of the EIA 2015 on the air quality aspect would remain valid. As the overall length of the trenching works would be reduced in the revised design as compared to the EIA assumption, the proposed design change would further minimize the overall air quality impact from the Project.

## 4 Noise Impact Review

### 4.1 Introduction

4.1.1 This Section reviews the construction phase noise impact arising from the proposed change of the fresh water mains (see **Section 2**). No noise impact would arise from the operation of the fresh water mains.

### 4.2 Environmental Legislation and Criteria

4.2.1 The legislation and regulation used to assess the construction noise impacts associated with the latest design of the main laying works are the same as those adopted in the EIA 2015.

### 4.3 Description of the Noise Environment

#### Existing Noise Environment

4.3.1 The major existing noise sources identified under the EIA 2015 include the general noise from the existing SENT Landfill, Tseung Kwan O (TKO) Industrial Estate and the traffic noise in the vicinity. These existing noise sources as identified in the EIA 2015 remain valid for the revised alignment of the water mains.

#### Noise Sensitive Receivers

4.3.2 The latest Outline Zoning Plans (OZP), Outline Development Plan (ODP) and relevant land use plans published by Lands Department have been reviewed. The Noise Sensitive Receivers (NSRs) for the revised alignment of the water mains have been updated with reference to the latest information as shown in **Figure 4.1** and **Table 4.1**. Details of the approximate separations between the NSRs and the construction workfronts are indicated in **Appendix 4B**.

**Table 4.1 Representative Noise Sensitive Receivers for the Proposed Fresh Water Mains**

NSR (see Figure 4.1)	Description	Type of Use	NSR Assessed in EIA 2015	NSR Assessed in this Review
A86S1 ^	Planned School in Area 86	Educational	✓	
LP1	Lohas Park Phase 2 - Tower 1	Residential	✓	✓
LP2	Lohas Park Phase 2 - Tower 9	Residential	✓	✓
TB1	The Beaumont	Residential	✓	✓
SBIS1	Shrewsbury International School	Education		✓
HMR1	Hemera - Topaz	Residential		✓
A78R1 ^	TKO Area 78 Residential Development	Residential	✓	
PPS1	Papillons	Residential		✓
OS2	Oscar by the Sea - Tower 8	Residential		✓
CSS1	Creative Secondary School	Education	✓	✓
OS1	Oscar by the Sea - Tower 1	Residential	✓	✓
TKOP1	Tseung Kwan O (TKO) Plaza	Residential	✓	
BG1	Beverly Garden	Residential	✓	
STE1	Sheung Tak Estate	Residential	✓	✓
LSTPS1	Leung Sing Tak Primary School	Education	✓	✓
NFP1	Nan Fung Plaza	Residential	✓	✓
SACK1 *	St. Andrew's Catholic Kindergarten	Education	✓	

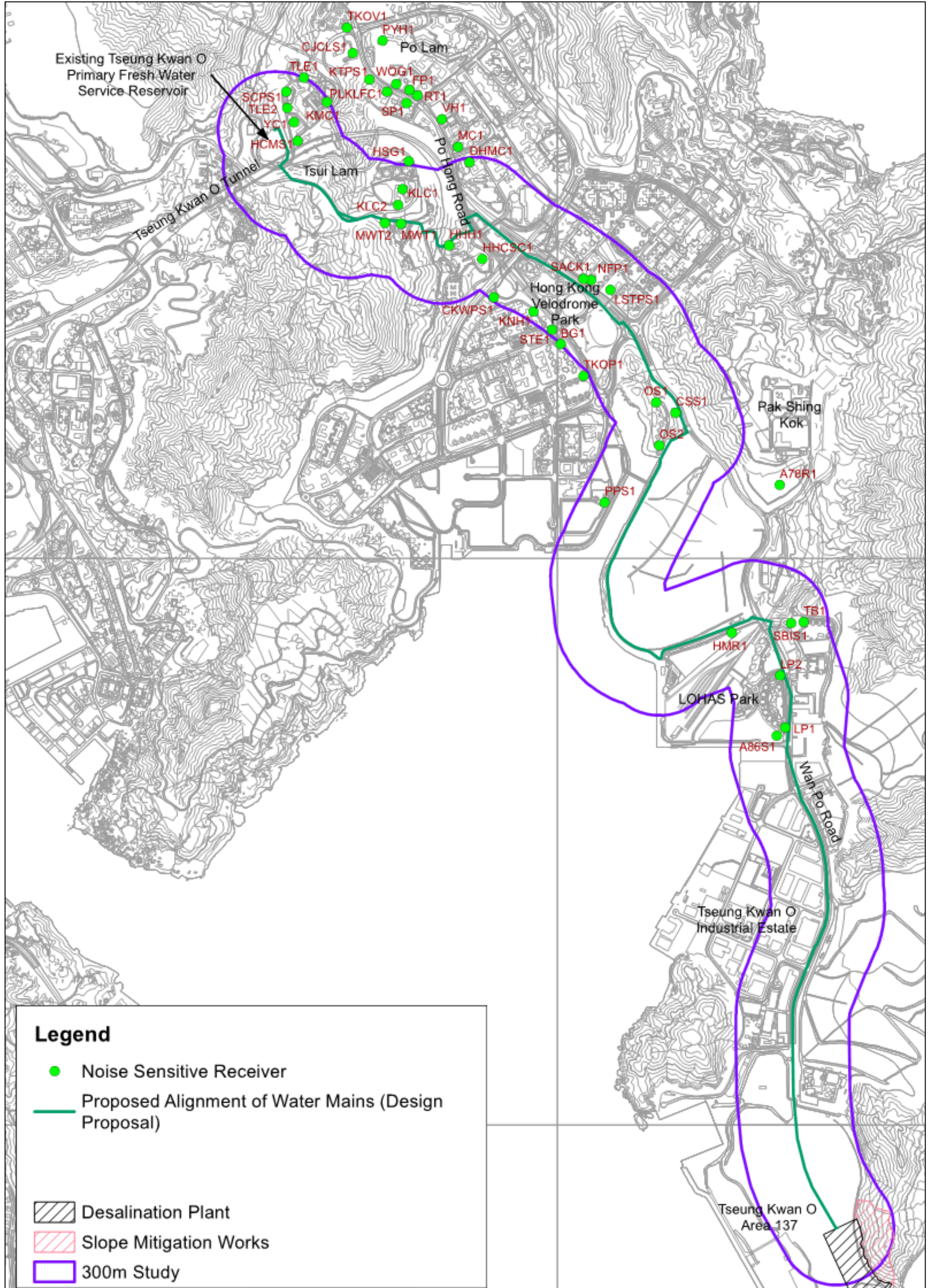
NSR (see Figure 4.1)	Description	Type of Use	NSR Assessed in EIA 2015	NSR Assessed in this Review
KNH1	Kwong Ming Court - Kwong Ning House	Residential	✓	✓
CWKPS1	POH Chan Kwok Wai Primary School	Education	✓	✓
HHCS1	Haven of Hope Christian Service Chapel	Place of Worship	✓	✓
HHH1	Hope of Haven Hospital	Hospital		✓
KLC1 +	King Ling College	Educational	✓	
KLC2 +	King Ling College	Educational		✓
HSG1 ++	Hong Sing Garden	Residential	✓	
MWT1	Mau Wu Tsai Village	Residential		✓
MWT2	Mau Wu Tsai Village	Residential		✓
HCMS1	Hong Chi Morninghill School Tsui Lam	Educational	✓	✓
YC1	Youth College (TKO)	Educational	✓	✓
SCPS1	School of Continuing and Professional Education - CUHK	Educational	✓	✓
TLE1+	Tsui Lam Estate	Residential	✓	
TLE2 +	Tsui Lam Estate	Residential		✓
KMC1 ++	King Ming Court	Residential	✓	
DHMC1 ++	Ma Chan Duen Hey Memorial College	Educational	✓	
MC1	Metro City	Residential	✓	
VH1	Verbena Heights	Residential	✓	
SP1	Serenity Place	Residential	✓	
RT1	Radiant Towers	Residential	✓	
FP1	Finery Park	Residential	✓	
WOG1	Well On Garden	Residential	✓	
PLKLC1	PLK Laws Foundation College	Educational	✓	
KTPS1	TKO Kei Tak Primary School	Educational	✓	
PYH1	Po Lam Estate - Po Yan House	Residential	✓	
CJCLS1	The Church of Jesus Christ of Latter-days Saints	G/IC	✓	
TKOV1	TKO Village No. 271	Residential	✓	
TLC1 #	Village House at Tung Lung Chau	Residential	✓	

## Notes:

- ^ A86S1 and A7BR1 were identified in the EIA 2015 as planned NSRs but they were not considered in the noise impact assessment of the EIA as no confirmed implementation programme was available for these two planned NSRs during the EIA stage (also see Section 4.3.3 below).
- \* Since St. Andrew's Catholic Kindergarten has no direct view to the proposed water mains and has no openable window for ventilation facing the realigned water mains, noise impact on this NSR is not assessed in this review.
- + KLC1 and TLE1 were selected as assessment points of King Ling College and Tsui Lam Estate in the EIA 2015 with respect to the original alignment. The assessment points of Tsui Lam Estate and King Ling College are replaced by KLC2 and TLE2 respectively, which are more representative to the proposed alignment. KLC1 and TLE1 are not further assessed in this review.
- ++ Hong Shing Garden, King Ming Court and Ma Chan Duen Hey Memorial College are within 300 m from the new alignment. They are not assessed in this review since their impact would be adequately addressed by other NSRs in the first layer (e.g. MWT1, MWT2, KLC2, TLE2, YC1, HCMS1) at much closer distances to the new alignment.
- # TLC1 was identified in the EIA 2015 as an existing NSR at Tung Lung Chau (not shown in Figure 4.1). It is not further assessed under this review as it is about 2 km away from the proposed water mains and will not be affected by the associated construction activities.



Figure 4.1 Representative Noise Sensitive Receivers





- 4.3.3 Two planned NSRs (namely A78R1 - TKO Area 78 residential development and A86S1 - planned school in Area 86) were identified in the EIA. These two planned NSRs were not assessed in the EIA 2015 as no implementation program could be found for these developments during the EIA stage. Similar to the situation at the EIA stage, no implementation programme has been identified for these two planned NSRs from latest information. Following the EIA approach, these two planned NSRs are not further considered in this review.
- 4.3.4 St. Andrew's Catholic Kindergarten was assessed in the EIA 2015. Based on the recent site inspection conducted in 2019, St. Andrew's Catholic Kindergarten has no direct view to the proposed water mains and has no openable window for ventilation facing the water mains. Noise impact on this NSR is therefore not assessed in this review.
- 4.3.5 Thirteen NSRs were assessed in the EIA 2015 with respect to the original alignment but are now outside the 300m study area of the proposed alignment (namely TKOP1, BG1, MC1, VH1, RT1, SP1, FP1, WOG1, PLKLFC1, KTPS1, PYH1, TKOV1, CJCLS1). These distant NSRs are not assessed in this review.
- 4.3.6 The assessment points of Tsui Lam Estate and King Ling College (TLE1, KLC1) were adopted in the EIA 2015 with respect to the original alignment. They have been replaced by two new assessment points (TLE2, KLC2), which are more representative to the proposed alignment. TLE1 and KLC1 are not further assessed in this review.
- 4.3.7 Hong Shing Garden, King Ming Court and Ma Chan Duen Hey Memorial College are within 300m from the proposed alignment. They are not assessed in this review as their impact would be adequately addressed by other NSRs in the first layer (e.g. Mau Wu Tsai Village, King Ling College, Tsui Lam Estate, TKO Youth College etc.) at much closer distances to the proposed alignment.
- 4.3.8 Several new NSRs, namely Shrewsbury International School (SBIS1), Hemera – Topaz (HMR1), Papillons (PPS1), Oscar by the Sea - Tower 8 (OS2), Hope of Haven Hospital (HHH1) and Mau Wu Tsai Village (MWT1, MWT2), have been identified. Shrewsbury International School is a new school opened in 2018 after the EIA stage. Other new NSRs are added as they are close to the revised alignment.

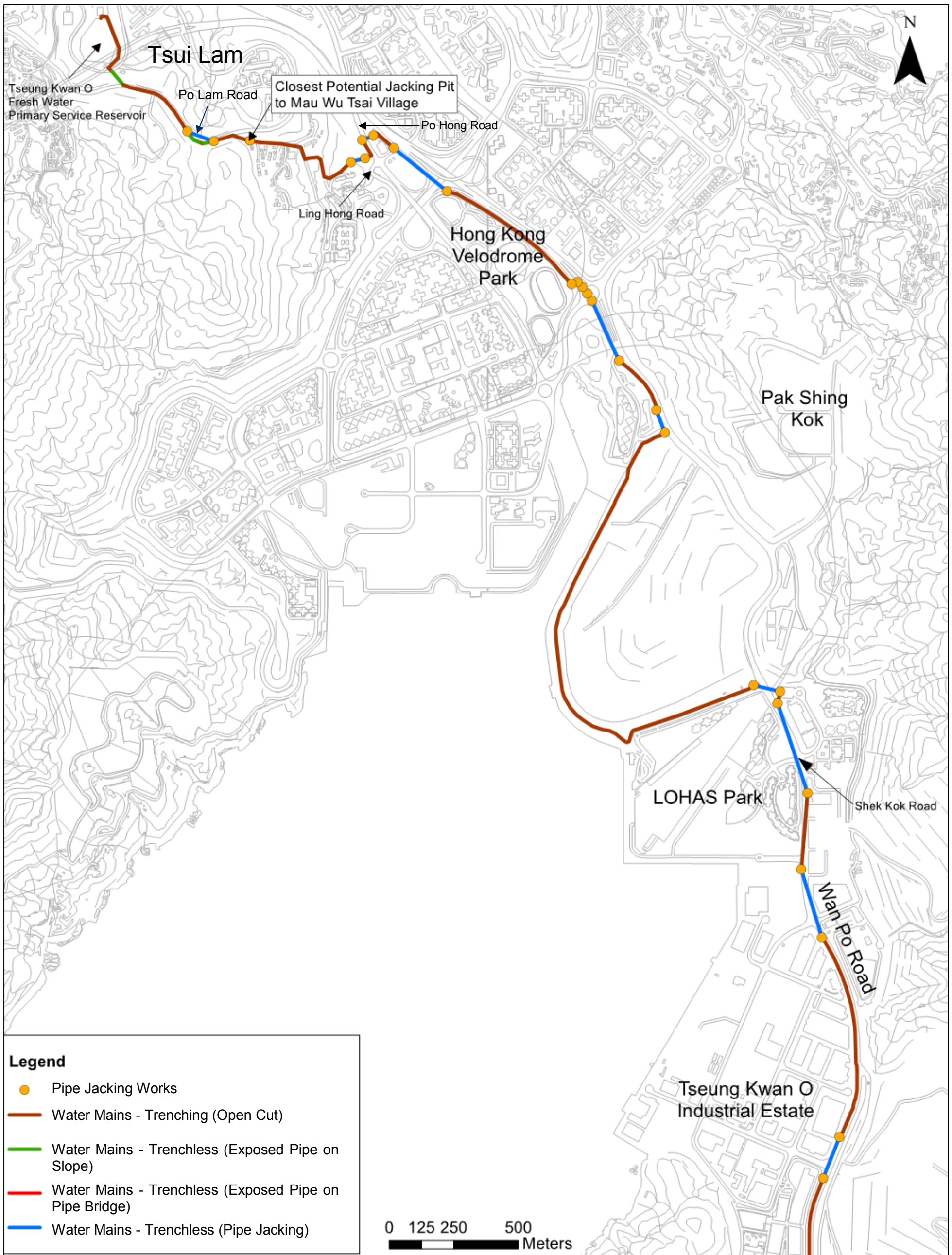
#### 4.4 Potential Concurrent Projects

- 4.4.1 The potential concurrent projects include the TKO desalination plant, Cross Bay Link (CBL), TKO Area 86 Development (Lohas Park), Tseung Kwan O – Lam Tin Tunnel (TKO-LTT) and Trunk Road T2. The distances from the water mains to TKO-LTT and Trunk Road T2 are greater than 3km. Cumulative impact upon the identified NSRs is not anticipated due to large separation distances and hence not considered. The construction of the TKO desalination plant, CBL and TKO Area 86 Development (Lohas Park) are included in the cumulative noise assessment.

#### 4.5 Potential Sources of Impacts

- 4.5.1 The fresh water mains would be constructed by a combination of trenching (open cut) method and trenchless (pipe jacking and exposed pipe) method as described in Section 2. Potential sources of noise impacts would mainly arise from the use of powered mechanical equipment (PME) operating at the construction work sites. Major construction activities for the open cut method and pipe jacking method would include concrete breaking, excavation, pipe laying, pipe jacking, backfilling, concrete reinstatement, asphalt reinstatement, painting of road marking as assumed in the EIA 2015 and ERR March 2019. The updated work plan for the pipe jacking work is shown in **Figure 4.2**.

Figure 4.2 Updated Work Plan for the Realigned Water Mains



- 4.5.2 As mentioned in Section 2.4.3, the length of the trenchless section at Po Lam Road in Tsui Lam is tentative but, in any case, all surface works areas (jacking pits) would be confined within existing roads. To address this uncertainty, a jacking pit is assumed at the closest point to the NSR (Mau Wu Tsai Village) for worst-case assessment as shown in **Figure 4.2**.
- 4.5.3 Construction activities for laying of exposed pipe would be similar to those required for the open cut method including excavation, concreting, pipe laying and backfilling. A pipe bridge would be constructed over a watercourse as shown in **Figure 2.1**, which would involve excavation, mini-pile construction, concreting, pipe laying and backfilling.
- 4.5.4 It is anticipated that the mains will be constructed in segments of up to 40m in length. Construction works will be carried out at most three workfronts concurrently in Section A (Desalination Plant to Shek Kok Road) and at most four workfronts concurrently in Section B (Shek Kok Road to Po Hong Road) following the approach adopted in the ERR March 2019. The noise calculations for NSRs identified along Section A and Section B presented in this review are directly extracted from the ERR March 2019 as there are no changes on the design and construction methods of these two sections since the ERR March 2019.
- 4.5.5 Section C (Po Hong Road to TKPFWPSR) is the new realignment proposed in this review. The noise impact upon the NSRs along Section C has not been assessed in the ERR March 2019. For Section C, construction works would be carried out only at one workfront at a time within 500m. Indicative arrangement of workfronts for noise assessment is shown in **Appendix 4E**.
- 4.5.6 Potential ground-borne noise will arise from the operation of the micro-Tunnel Boring Machine (TBM) under the pipe jacking method.
- 4.5.7 Potential cumulative construction noise will arise from the concurrent activities including the construction of TKO desalination plant, Cross Bay Link (CBL) and the TKO Area 86 Development (Lohas Park).
- 4.5.8 The proposed water mains will not induce noise during operation.

## 4.6 Assessment Methodology

- 4.6.1 The assessment methodology adopted in this review follows that adopted in the EIA 2015 and the ERR March 2019.

### Air-borne Noise

- 4.6.2 The construction noise impact assessment was undertaken in accordance with the procedures outlined in the Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM), which is issued under the Noise Control Ordinance (NCO) and the Technical Memorandum on EIA Process (EIAO-TM). The assessment methodology is summarized as follows:
- Identify the representative NSRs that may be affected by the construction of the water mains;
  - Determine the plant teams for corresponding construction activities, based on the agreed plant inventory;
  - Assign sound power levels (SWLs) to the PME proposed based on the GW-TM and list of SWLs of other commonly used PME;
  - Calculate the correction factors based on the distance between the NSRs and the notional noise source positions of different works areas;
  - Apply corrections in the calculations, such as potential screening effects and acoustic reflection, if any; and



- Predict the construction noise levels at NSRs in the absence of any mitigation measures.

4.6.3 The construction noise assessment was undertaken based on the proposed plant inventory, and appropriate utilization rates of the PME items. The design engineer has reviewed the plant inventory and has confirmed that they are reasonable and practicable for construction of the water mains within the scheduled timeframe. The plant inventory is presented in **Appendix 4A**.

4.6.4 Exposed pipe laying is proposed along some sections in Tsui Lam. The NSRs in Tsui Lam are however closer to the workfronts of open cut or pipe jacking works, whilst the exposed pipes including the pipe bridge are all further away from the NSRs. The plant inventory and SWLs of the exposed pipe laying on slope (which are similar to those for the open cut method) and the pipe bridge construction are presented in **Appendix 4A**. The nearest NSR is located at least 140m away from the exposed pipes and hence the distance attenuation is >51dB(A). Considering the SWLs presented in **Appendix 4A** and the distance attenuation of 51dB(A), there would be no unacceptable noise impact upon the NSRs due to the exposed pipe laying and pipe bridge construction. Therefore, exposed pipe laying and pipe bridge construction are not included in this assessment.

4.6.5 Based on the review of the noise assessment results in the EIA 2015 and the proposed change of the water mains, it is considered that the following mitigation measures (as proposed in the Section 5.7 of the EIA 2015) should be adopted and therefore have been included in the construction noise calculations of this review:

- Use of Quiet PME
- Adoption of movable noise barriers
- Use of Noise Insulating Sheet
- Sequencing of PME Construction Activities
- Use of Noise Enclosure/ Acoustic Shed

*Use of Quiet PME*

4.6.6 The plant inventory adopted in the noise calculations of this review as presented in **Appendix 4A** has incorporated the use of quiet PME recommended in the EIA 2015 due to the proximity of the construction works to the identified NSRs.

*Movable Noise Barriers*

4.6.7 The use of movable barriers could generally provide a 5 dB(A) reduction for movable PME and 10 dB(A) for stationary PME. Movable noise barriers of 3m in height with skid footing should be used and located within a few metres of stationary plant and mobile plant such that the line of sight to the NSR is blocked by the barriers. The length of the barrier should be at least five times greater than its height. With reference to *A Practical Guide for the Reduction of Noise from Construction Works* by EPD, the noise barrier material should have a superficial surface density of at least 7 kg m<sup>-2</sup> and have no openings or gaps.

4.6.8 Following the recommendation of the EIA 2015, the major noise source of movable PMEs, such as saw/groover, wheeled excavator fitted with hydraulic rock breaker, lorry with crane/grab, concrete truck mixer, vibratory poker and excavator/loader (as indicated in **Appendix 4A**), would be located behind the movable barriers, and therefore these barriers could produce at least a 5 dB(A) noise reduction.

*Noise Insulating Sheet*

4.6.9 Noise insulating sheet (or acoustic fabric) would be adopted for PME such as piling machines (as indicated in **Appendix 4A**). The noise insulating sheet should be deployed such that there

would be no opening or gaps on the joints. Following the EIA 2015, a noise reduction of 10 dB(A) for the PME with noise insulating sheet deployed was assumed in this assessment.

#### *Sequencing of PME / Construction Activities*

- 4.6.10 Some construction activities (e.g. excavation/shoring, reinstatement (asphalt), and pipe jacking) will be planned and carried out in sequence, such that items of PME proposed for these activities will not be operated simultaneously. Grouping of PME is considered for these activities following the same approach adopted in the EIA 2015.

#### *Use of Noise Enclosure/ Acoustic Shed*

- 4.6.11 Noise enclosures or acoustic sheds would be used to cover stationary PME such as generators as indicated in **Appendix 4A**. With the adoption of noise enclosures, PMEs could be completely screened, and noise reduction of 15 dB(A) can be achieved according to the EIAO Guidance Note No.9/2010.
- 4.6.12 The use of noise enclosures is considered to mitigate the noise impact arising from sawcutting pavement at some workfronts instead of use of movable noise barrier. Portable/movable noise enclosure made of material with superficial surface density of at least 7 kg m<sup>-2</sup> may be used for screening the noise from operation of the saw/groover, concrete. The workfronts where the portable noise enclosure will be required for sawcutting pavement are indicated in the footnotes of **Appendix 4B**. Locations of specific workfronts are shown in **Appendix 4E**.

#### **Ground-borne Noise**

- 4.6.13 Under the EIA 2015, the ground-borne noise impact upon the NSRs was quantitatively assessed with reference to the TBM employed for Kwai Tsing Tunnel of the West Rail project (with a diameter of 8.7m) as assumed in the EIA for Drainage Improvement in Tsuen Wan, Kwai Chung & Tsing Yi - Tsuen Wan Drainage Tunnel (Register No.: AEIAR-088/2005). This EIA assumption is conservative as the actual size of the cutter head of the TBM to be employed for the proposed water mains would be much smaller (diameter <1.5m). Based on the conservative assumption, the minimum separations between the TBM and different types of NSRs were calculated in the EIA 2015 as extracted in **Table 4.2** below. It was recommended in the EIA 2015 that these minimum separations should be maintained during the construction of the water mains in order to comply with the relevant noise criteria.

**Table 4.2 Minimum Separation between the micro-TBM and NSR to Achieve Noise Compliance**

NSR	Daytime ground-borne noise criteria, dB(A)	Minimum Horizontal Separation (m)
Domestic Premises and Temples	65	5
Educational Institutions (normal period)	60	12
Educational Institutions (during examination period)	50	23

Source: Table 5.6c of the approved EIA Report

- 4.6.14 For reviewing the ground-borne noise impact arising from the new alignment of the water mains, the minimum separations as stated in **Table 4.2** above are used to determine whether adverse ground-borne noise impact is expected.

#### **Cumulative Impact**

- 4.6.15 Following the approach of the EIA 2015, cumulative construction noise impact due to the TKO desalination plant, CBL and TKO Area 86 Development (Lohas Park) is only assessed for one critical NSR, namely LP1, which is closest to the water mains laying works and the identified concurrent projects.

## 4.7 Review of Impacts

### Air-borne Noise

4.7.1 The predicted construction noise levels at the representative NSRs are summarized in **Table 4.3** below. The detailed assessment is shown in **Appendix 4B** (for trenching works) and **Appendix 4C** (for pipe jacking works).

**Table 4.3 Predicted Construction Noise Levels**

ID	Description	Approx. Horizontal Distance to Notional Source Position (m)	Predicted Noise Level <sup>(c)</sup> (Leq <sub>30min</sub> ) dB(A)	Noise Criteria dB(A)
TB1 <sup>(d)</sup>	The Beaumont	290 - 402	37 - 60	75
LP1 <sup>(a) (d)</sup>	Lohas Park - Tower 1	419 - 497	33 - 57	75
LP2 <sup>(d)</sup>	Lohas Park - Tower 9	341 - 359	35 - 58	75
CSS1 <sup>(d)</sup>	Creative Secondary School	24 - 112	55 - 78	70/65 <sup>(b)</sup>
OS1 <sup>(d)</sup>	Oscar by the Sea - Tower 1	84 - 106	48 - 71	75
HMR1 <sup>(d)</sup>	Hemera - Topaz	34 - 76	52 - 75	75
PPS1 <sup>(d)</sup>	Papillons	169 - 189	42 - 65	75
STE1 <sup>(d)</sup>	Sheung Tak Estate	274 - 282	38 - 61	75
LSTPS1 <sup>(d)</sup>	Leung Sing Tak Primary School	91 - 113	47 - 64	70/65 <sup>(b)</sup>
NFP1 <sup>(d)</sup>	Nan Fung Plaza	63 - 101	50 - 66	75
KNH1 <sup>(d)</sup>	Kwong Ming Court - Kwong Ning House	250 - 261	39 - 62	75
CWKPS1 <sup>(d)</sup>	POH Chan Kwok Wai Primary School	293 - 348	37 - 60	70/65 <sup>(b)</sup>
HHSCS1 <sup>(d)</sup>	Haven of Hope Christian Service Chapel	196 - 250	40 - 63	75
OS2 <sup>(d)</sup>	Oscar by the Sea - Tower 8	41 - 84	52 - 75	75
SBIS1 <sup>(d)</sup>	Shrewsbury International School	223 - 335	39 - 62	70/65 <sup>(b)</sup>
HHH1	Hope of Haven Hospital	15	58 - 74	75
KLC2	King Ling College	86	43 - 59	70/65 <sup>(b)</sup>
MWT1	Mau Wu Tsai Village	16	57 - 74	75
MWT2	Mau Wu Tsai Village	21	55 - 73	75
SCPS1	School of Continuing and Professional Education - CUHK	198	35 - 58	70/65 <sup>(b)</sup>
TLE2	Tsui Lam Estate	120	40 - 62	75
YC1	Youth College (TKO)	90	42 - 65	70/65 <sup>(b)</sup>
HCMS1	Hong Chi Morninghill School Tsui Lam	66	45 - 68	75

**Notes:**

- (a) The noise results for LP1 have incorporated the cumulative impact from major concurrent projects.
- (b) Assessment criterion for construction noise impact is 70dB(A) for education institutions (65dB(A) during examinations).
- (c) The ranges of noise levels presented in this table are based on the review of assessment results for trenching works in **Appendix 4B** and pipe jacking works in **Appendix 4C**.
- (d) The noise results for these NSRs are directly extracted from the ERR March 2019. The distance between these NSRs and the water mains as well as the associated construction methods as assumed the ERR March 2019 remain unchanged.

4.7.2 With reference to the noise predictions in the EIA 2015, with the adoption of mitigation measures, exceedances of the EIAO-TM noise criteria were still predicted at six NSRs

(educational use) due to close proximity to the works sites. With the realignment of water mains proposed in this review, exceedance is significantly reduced to occur at only one NSR (namely CSS1 - Creative Secondary School) for educational use.

**Ground-borne noise**

4.7.3 Review of the alternative alignment of the water mains indicated that the minimum separations shown in the **Table 4.2** above can be maintained. It is anticipated that the ground-borne noise generated by the micro-TBM for this Project would be insignificant and unlikely to cause adverse impact on the nearby NSRs.

**Cumulative impact**

4.7.4 The cumulative construction noise impact from major concurrent projects including TKO desalination plant, CBL and Area 86 Development (Lohas Park) is assessed for the most critical NSR (namely LP1). The noise results for LP1 as shown in **Table 4.3** above have considered the cumulative impact from these concurrent projects. The results indicated that the cumulative noise impacts due to the construction of the water mains and other concurrent projects will comply with the EIAO requirements. Details of the cumulative noise impact assessment are presented in **Appendix 4D**.

**4.8 Residual Impacts**

4.8.1 Under the EIA 2015, with the use of practical noise mitigation measures, including the use of quiet PME, movable noise barriers, noise insulation sheet, noise enclosures and sequencing of construction activities, exceedances of the construction noise criteria were predicted at six educational institution NSRs.

4.8.2 With the proposed realignment adopted in this review, the affected NSRs are significantly reduced. Exceedance is only predicted at one education institution NSR during normal school hours and examination periods. The predicted residual impacts and the durations for the new alignment are summarized in **Table 4.4** and **Table 4.5** below.

**Table 4.4 Predicted Residual Construction Noise Impacts from Construction of Water Mains**

ID	DESCRIPTION	PREDICTED RESIDUAL NOISE IMPACT FROM INDIVIDUAL ACTIVITY, dB (A)								
		SAWCUTTING PAVEMENT	BREAKING UP OF PAVEMENT	EXCAVATION /SHORING	PIPE LAYING	BACKFILING	REINSTATEMENT (CONCRETE)	REINSTATEMENT (ASPHALT)	PAINTING OF ROAD MARKING	PIPE JACKING
		DURATION (THE DURATION OF EACH CONSTRUCTION WORK ACTIVITY FOR EACH SEGMENT)								
		1 day	2 days	3 weeks	2 weeks	1 week	1-2 days	1-2 days	Half day	2 weeks
CSS1 (a)	Creative Secondary School	13	4	6	3	7	2	6	-	4

**Note:**

(a) The residual noise impact on CSS1 are directly extracted from the ERR March 2019. The distance between this NSR and the water mains as well as the associated construction methods and required mitigation measures as assumed the ERR March 2019 remain unchanged.

**Table 4.5 Summary of Residual Impact**

ID	DESCRIPTION	RANGE OF EXCEEDANCE, dB(A)	DURATION OF RESIDUAL IMPACT (WEEKS)	
			1 to 4 dB(A)	≥5 dB(A)
CSS1 (a)	Creative Secondary School	2-13	5	5

**Note:**

(a) The levels of residual noise impact on CSS1 are directly extracted from the ERR March 2019. The distance between this NSR and the water mains as well as the associated construction methods and required mitigation measures as assumed the ERR March 2019 remain unchanged.



### **Scheduling of Construction Activities**

- 4.8.3 In view that noise exceedance at a school was predicted for both normal school hours and examination periods, individual construction activities that would cause noise exceedances shall be scheduled outside the examination periods and / or during non-school hours or within long school holidays (e.g. summer holiday, Easter holiday or Christmas holiday, etc.) as required. Scheduling the construction work for this school and other recommended mitigation measures will be required for proper implementation.
- 4.8.4 As such, no residual impacts are anticipated and predicted noise levels at all NSRs are predicted to comply with the EIAO requirements.

## **4.9 Mitigation Measures**

- 4.9.1 The use of practical noise mitigation measures, including the use of quiet PME, movable noise barriers, noise insulation sheet, noise enclosures and sequencing / scheduling of construction activities were considered in the noise impact assessment of the EIA 2015. Review of the proposed change of the water mains indicated that all the noise mitigation measures considered in the EIA Report remain valid and should also be considered for the revised design of the water mains.

## **4.10 Environmental Monitoring and Audit**

- 4.10.1 Noise monitoring was recommended in the EIA 2015 during the construction of the water mains. The same noise monitoring and audit programme should be adopted for the new alignment except that the number of noise monitoring stations should be reduced. The EIA 2015 recommended to carry out noise monitoring at Creative Secondary School (CSS1), PLK Laws Foundation College (PLKLFC1) and School of Continuing and Professional Studies – CUHK (SCPS1). As the new alignment would avoid construction near PLKLFC1 and SCPS1 with large buffer distance, it is recommended to remove these two monitoring stations. Noise monitoring at CSS1 should be maintained. The Environmental Monitoring and Audit (EM&A) Manual should be updated accordingly by the Environmental Team (ET). The updated EM&A Manual should be verified by the Independent Environmental Checker (IEC) and agreed by the Environmental Protection Department (EPD).

## **4.11 Conclusion**

- 4.11.1 Potential sources of noise impacts would mainly arise from the use of PME operating at the construction work sites. With the use of practical mitigation measures considered in the EIA 2015, no adverse noise impact upon the NSRs is predicted from the revised design. In fact, the proposed alignment would be diverted away from the more densely populated areas and schools in Po Lam and therefore significantly reduced the number of affected NSRs in the EIA 2015. The design change would have beneficial effects on the construction noise aspect. There will be no changes to the EM&A programme on the construction noise aspect as presented in the EM&A Manual except that a reduction of noise monitoring locations is proposed.

## 5 Water Quality Impact Review

### 5.1 Introduction

- 5.1.1 This Section reviews the water quality implications from the proposed change of the water mains (refer to **Section 2**).

### 5.2 Legislation Requirements and Guidelines

- 5.2.1 The legislation and criteria applicable to the evaluation of water quality impacts are described in Section 6.2 of the EIA Report. These legislation and criteria are still valid for the revised design of the water mains.

### 5.3 Water Sensitive Receivers

#### Inland Water Sensitive Receivers

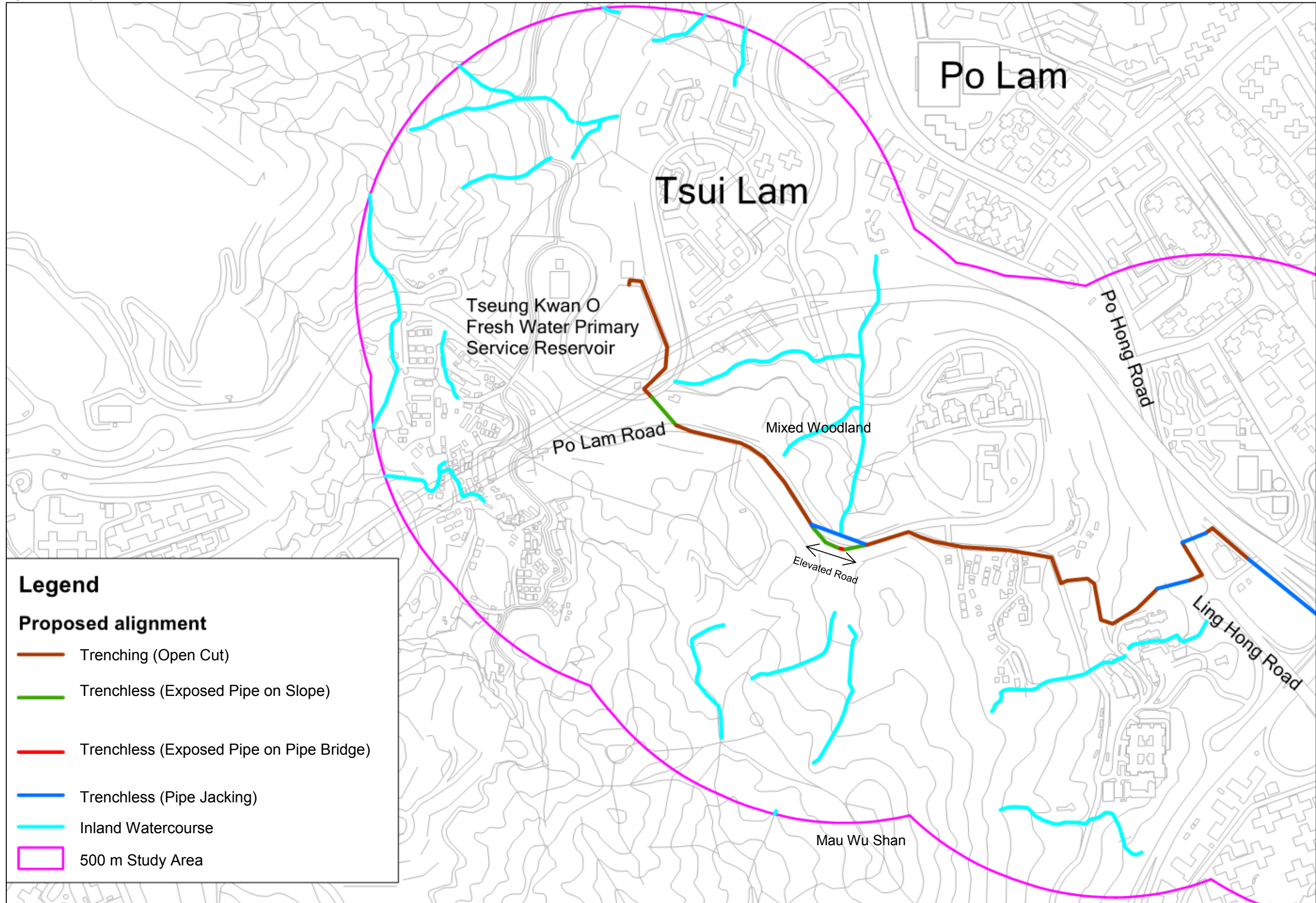
##### Section A and Section B (TKO Desalination Plant to Po Hong Road)

- 5.3.1 Section A and Section B of the fresh water mains runs from the desalination plant in TKO Area 137 to Po Hong Road. The construction sites of these 2 sections are located on reclaimed or developed land with no natural inland water bodies in close vicinity. Any effluent discharged from the construction and operation of the water mains may enter the nearby man-made drainage system and will eventually drain into the marine water. Following the approach of EIA 2015 and ERR March 2019, no land-based Water Sensitive Receivers (WSRs) have been identified for Section A and Section B.

##### Section C (Po Hong Road to TKOFWPSR)

- 5.3.2 Section C runs from Po Hong Road to TKOFWPSR. Major inland water bodies within 500m from Section C are identified and their indicative locations are shown in **Figure 5.1**.
- 5.3.3 The key WSRs for Section C include the watercourse to the north (or downstream) of Po Lam Road. Only one surface watercourse is running at the proposed alignment near the elevated section of Po Lam Road. This surface water runs underneath the elevated road from south to north. As discussed in Sections 2.4.3 and 2.4.4, two alternative construction methods (namely Option 1 and Option 2) are proposed for construction of Section C to avoid this watercourse. Under Option 2, exposed pipe laying method is proposed across this surface water. A pipe bridge would be erected to support the exposed pipe above the surface water with no physical attachment to the watercourse. Alternatively, under Option 1, the water mains near this watercourse would be installed underground by jacking well below the bed of the watercourse, which can also completely avoid the surface water. No permanent and temporary works would be undertaken at the watercourse (details refer to Section 2). The watercourse will not be disturbed both physically (i.e. no structural change) and hydrologically (i.e. no alternation of water flow nor water volume) under both alternative options. Due to too small in size, the section of watercourse found in the proposed alignment was not defined as a habitat of watercourse in the EIA 2015. The relevant habitat map extracted from the EIA 2015 is provided in **Appendix 7A** for ease of reference. Following the same approach, this small surface water is not shown in **Figure 5.1**.
- 5.3.4 No other open or surface water is identified at or near the proposed alignment. Descriptions of the inland watercourses identified in the downstream of the construction sites are provided in **Table 5.1**.

Figure 5.1 Representative Water Sensitive Receivers





**Table 5.1 Descriptions of Water Sensitive Receivers**

WSRs (refer to Figure 5.1)	Closest Horizontal Distance from Project's Surface Works Boundary		Generalized Flow Direction	Height Relative to Project Site
	Option 1	Option 2		
<p>One open water is running underneath the elevated Po Lam Road (Part natural / part channelized)</p> <ul style="list-style-type: none"> <li>• Upstream and downstream of Po Lam Road is seasonal stream</li> <li>• Section underneath Po Lam Road is disturbed or man-made with concrete river bed</li> </ul>	>35m	2m	Surface water generally flows from the south to the north. It flows underneath Po Lam Road and then through a mixed woodland. It then discharges to the underground drainage network in Po Lam and finally flows to Junk Bay (or TKO sea).	Range from about ±140 mPD in upstream to about ±10 mPD in downstream of mixed woodland as compared to the height of jacking pits in Po Lam Road at about ±120 mPD (under Option 1) and exposed water mains outside Po Lam Road at about ±110 mPD (under Option 2)
Other open watercourses are located downstream of the at-grade sections of Po Lam Road (All seasonal streams)	>29m	>29m	Surface water generally flows from the southwest towards the northeast and joins the watercourse running from the elevated Po Lam Road (see above). The combined flow discharges to the underground drainage network in Po Lam and finally to Junk Bay (or TKO sea).	Range from ±110 mPD in upstream to about ±10 mPD in downstream of mixed woodland as compared to the height of water mains along Po Lam Road at about ±120 mPD (under Option 1 and Option 2)

**Marine-based Water Sensitive Receivers**

5.3.5 Based on the review of latest information, the marine-based WSRs presented in the EIA 2015 remain valid.

**5.4 Baseline Conditions**

**Inland Water**

5.4.1 The WSRs near Section C of the fresh water mains are mainly natural streams except for the open watercourse running underneath the elevated Po Lam Road, which is a disturbed channel. Site inspections at these watercourses were conducted in dry days of April, September and October 2019 representing the wet season. It was observed that most of these watercourses were dried out or had a very low flow (with water depth of less than 3 cm) or the water was stagnant. As such, water sampling was considered impractical or not representative. No water samples were collected at the watercourses.

5.4.2 The catchments of these streams mostly are undeveloped areas. In particular, the catchments upstream of Po Lam Road are mainly collecting runoff from the natural hillside of Mau Wu Shan with no major pollution source. In dry season, most of these upstream catchments are expected to be dry or have minimal flow, whereas in the wet seasons, the water flows in these upstream catchments would be rainwater with low pollution levels.

5.4.3 Watercourses downstream of Po Lam Road would collect road runoff and runoff from a natural mixed woodland in addition to the runoff from the natural hillside of Mau Wu Shan. The first flush of any road runoff may contain a limited amount of grits and oil leaked from passing vehicles. No major pollution source is identified in the mixed woodland. The overall pollution level of these downstream waters should be limited except for the section at the elevated Po Lam Road where exposed or disturbed soil surfaces alongside the watercourse were observed during the site inspections. Soil erosions from exposed surfaces would be the potential pollution source in the downstream waters. The key concerns would be the elevation of Suspended Solids (SS) level in the water column. Site observations in dry days of wet season revealed that the water at and immediately downstream of the elevated road was turbid. The

turbid water was however found to be localized. The surface water in other areas or further downstream of the road inside the mixed woodland looked clear.

### **Marine Water**

- 5.4.4 No changes to the environmental settings of the marine water including Junk Bay, Eastern Buffer and Mirs Bay Water Control Zones (WCZs) have been identified after the EIA stage. Implementation of the Harbour Area Treatment Scheme (HATS) Stage 2A in 2015 would mainly affect the central and western Victoria Harbour WCZ as well as the Western Buffer and Southern WCZs. Based on the results available from the approved EIA for HATS Stage 2A, the waters in Junk Bay, Eastern Buffer and Mirs Bay WCZs would not be affected by the HATS Stage 2A implementation. Furthermore, no additional pollution sources have been identified in the Study Area since the completion of the EIA study. Any water quality changes in Junk Bay as a result of the Lam Tin Tunnel (LTT) construction would be temporarily and restored back to normal condition after completion of the LTT construction. The baseline marine water quality data used in the EIA 2015 are still considered representative. No further updates on the baseline marine water quality conditions are necessary for the purpose of this review.

## **5.5 Review of Impacts**

### **Construction Phase**

- 5.5.1 As described in the EIA 2015, the land-based construction activities of the fresh water mains would have the potential to affect water quality through:
- Runoff from construction sites;
  - Sewage effluents from construction workforce;
  - Spillage of chemicals; and
  - Sterilization of water mains prior to commissioning.
- 5.5.2 The above sources of water quality impact remain unchanged for the revised design of the watermains. In addition, construction of the pipe bridge near the watercourse may have a potential to pollute the inland water, if uncontrolled.
- 5.5.3 **Runoff from construction sites** - Site runoff can be generated from erosion of exposed surfaces, stockpiles and material storage areas, particularly during excavation and backfilling works. During a rainstorm event, storm runoff can also be generated from the construction sites. Site runoff may contain SS, chemicals and organic matters. Uncontrolled site runoff can cause blockage of drainage channels and increase the pollution levels in the receiving water environment. However, it is anticipated that no unacceptable water quality impacts would arise from the land-based works if good site practices and mitigation measures recommended in the EIA 2015 are in place and properly implemented.
- 5.5.4 **Sewage Effluents from Construction Workforce** - Sewage will be generated from construction workforce. Different from the construction runoff and chemical spills, sewage is characterized by high levels of biochemical oxygen demand, ammonia and *E. coli*. Appropriate numbers of portable toilets shall be provided by a licensed contractor to serve the construction workers over the construction sites. No direct disposal of sewage into the environment will be allowed. The Contractor shall also be responsible for waste disposal and maintenance practices.
- 5.5.5 **Spillage of Chemicals** - Chemicals, including fuel, solvents, oils and lubricants for use by construction mechanical machinery and equipment, if not properly stored or chemicals accidentally spilled on ground surfaces from construction activities may potentially be carried away by construction and storm runoff, causing pollution to the nearby aquatic environment.

No adverse water quality impacts are expected with proper implementation of the mitigation measures recommended in the EIA 2015.

- 5.5.6 **Sterilization of Water Mains Prior to Commissioning** – As identified in the EIA 2015, the proposed fresh water mains would be cleaned and sterilized. Typically, water mains are sterilized by chlorination. The purpose of chlorination is to eliminate potential pathogens and maintain a sterile / aseptic condition for potable water transfer.
- 5.5.7 The cleaning and sterilization procedures of fresh water mains would be carried out according to the latest version of WSD Departmental Instruction No. 805: Mainlaying - Cleaning and Sterilization of Fresh Water Mains (Section 3.11). General procedures for cleaning and sterilization of potable water mains as outlined in the EIA 2015 remain unchanged.
- 5.5.8 Following the EIA recommendation, the sterilization water would be dechlorinated with Total Residual Chlorine (TRC) level below 1 mg/L before discharge. The cleaning and flushing water would also be treated and desilted to the relevant discharge requirement stipulated in Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) issued under the Water Pollution Control Ordinance (WPCO) before discharging into public sewer. With the implementation of appropriate treatment processes and facilities to control water discharge from sterilized water mains, adverse impact on water quality is not expected. To ensure sterilization water is sufficiently dechlorinated, monitoring of the TRC concentration before discharge is recommended in the EIA. No changes on these EIA recommendations are proposed under this review.
- 5.5.9 **Construction Works near Inland Water** – Under Option 2, construction of the pipe bridge in close vicinity to the watercourse may pollute the inland water due to the potential release of construction wastes. Construction wastes are generally characterized by high concentration of SS. The implementation of measures to control runoff and drainage will be important for the construction works adjacent to the inland water in order to prevent runoff and drainage water with high levels of SS from entering the water environment. However, the construction work scale is minor (the exposed pipe is only 1.2 m in diameter). The key water pollution source such as exposed surface or excavated material involved in the exposed pipe laying would be limited to pipe bridge piers and pipe supports only in minimal scale as compared to the trenching (open cut) method. No significant water quality impact is therefore expected. With the implementation of adequate construction site drainage as specified in the ProPECC PN 1/94 “Construction Site Drainage” and the provision of mitigation measures as described in the ETWB TC (Works) No. 5/2005 “Protection of natural streams/rivers from adverse impacts arising from construction works”, unacceptable water quality impacts would not arise.
- 5.5.10 Under Option 1, all surface construction works (e.g. jacking pits) would be located on existing roads far away from the watercourse. With implementation of the mitigation measures recommended in the EIA 2015, unacceptable water quality impacts would not arise.

### **Operational Phase**

- 5.5.11 No water quality impact would arise from operation of the proposed water mains.

## **5.6 Mitigation Measures**

- 5.6.1 All the proposed mitigation measures for the water mains in the EIA 2015 would remain valid and unchanged and should be applied to the entire water mains alignment where applicable. In addition, the practices outlined in ETWB TC (Works) No. 5/2005 “Protection of natural streams/rivers from adverse impacts arising from construction works” should also be adopted where applicable to minimize the water quality impacts upon the natural watercourse. The following mitigation measures should be adopted for the pipe bridge construction and exposed pipe laying near the watercourse:

- No service shop and maintenance facilities should be located in the construction sites of



the pipe bridge and exposed pipe.

- No maintenance of vehicles and equipment should be undertaken in the construction sites of the pipe bridge and exposed pipe.
- Any soil contaminated with leaked chemicals/oils shall be removed from sites and the void created shall be filled with suitable materials. Washing the chemicals away is not acceptable.
- Any construction plant which causes pollution due to leakage of oil or fuel should be removed off site immediately.
- Temporary stockpile or storage of construction materials e.g. excavated soil / waste / chemicals in the construction sites of the exposed pipe and pipe bridge should be limited to absolute minimum amount, located at a safe location that is practically furthest away from the watercourse and are to be removed from sites at the earliest opportunity.
- Any stockpiling of construction materials and dusty materials, if unavoidable, should be covered with tarpaulin or similar waterproof fabric and secure all temporary covers to stockpiles.
- Suitable containers with tightly closed lips should be used to store chemicals.
- Chemical waste containers in construction sites, if unavoidable, should be suitably labelled, stored in secondary containment and kept below the eye level.
- Avoid disorder and storage of unnecessary materials in working areas.
- Any temporary works site should be isolated from the watercourse, such as by placing of sandbags, to prevent soil or material from slipping into the watercourse.
- Construction effluent, e.g. water used in boring and piling, should as far as practicable be re-circulated after sedimentation. When there is a need for final disposal, the wastewater should be diverted to silt removal facilities and discharged outside the catchments of the natural streams to the north of Po Lam Road.
- Mitigation measures to control site run-off from entering the watercourse and intercept the site runoff to silt removal facilities should be implemented.

## 5.7 Cumulative Impacts

- 5.7.1 No changes to the concurrent projects presented in the EIA 2015 have been identified. With implementation of all the recommended mitigation measures in the EIA 2015 and this review, no adverse water quality impact would arise from the construction of the water mains under the revised design and therefore no cumulative impact with other concurrent projects would be expected.

## 5.8 Residual Impacts

- 5.8.1 No unacceptable residual impact on water quality is anticipated from the construction of the water mains with proper implementation of all the recommended mitigation measures in the EIA 2015 and this review.

## 5.9 Environmental Monitoring and Audit

- 5.9.1 No water quality monitoring was recommended in the EIA 2015 for the construction of the fresh water mains. Water monitoring is not proposed in this review as water sampling may be impractical or not representative due to low flow conditions. Regular site audits were recommended in the EIA 2015 throughout the construction phase. The regular site audits shall also cover the construction sites for exposed pipe laying and pipe bridge construction to ensure the proper implementation of the mitigation measures. No changes on the EIA requirements are proposed.

## 5.10 Conclusion

- 5.10.1 Water quality issues associated with the mains laying works would mainly include the impacts from site runoff, sewage from workforce and accidental spillage. One watercourse is identified at the proposed alignment. Exposed pipe laying on pipe bridge or pipe jacking method is

proposed to completely avoid this watercourse. The watercourse will not be disturbed both physically (i.e. no structural change) and hydrologically (i.e. no alternation of water flow nor water volume). With well-maintained construction site drainage and the implementation of good site practices and mitigation measures as recommended in the EIA 2015 and this review, the water quality impact would be controlled to comply with the WPCO standards. No unacceptable water quality impact would be expected from the proposed design change.

## 6 Review of Waste Management Assessment

### 6.1 Introduction

6.1.1 This Section reviews the waste management implications on construction of the water mains with reference to the proposed design change as described in **Section 2**.

### 6.2 Legislative Requirements and Evaluation Criteria

6.2.1 The legislation and criteria used for waste management assessment in the approved EIA Report have been reviewed and remain valid.

### 6.3 Expected Waste Arising

#### Construction Phase

6.3.1 During the construction phase, the construction activities including site clearance and excavation works will result in the generation of waste. The waste materials to be generated would consist of inert Construction and Demolition (C&D) materials such as soil, rock, concrete and brick and non-inert C&D materials comprising metal, timber, paper and plastic. Chemical and general refuse may also arise from construction activities.

#### *Construction and Demolition (C&D) Materials*

6.3.2 The estimation of C&D materials to be generated from the main laying has been updated in **Table 6.1**. Under the latest design, part of the alignment would be replaced by exposed pipe with smaller amount of excavated materials to be generated as compared to the buried pipes assumed in the EIA 2015. The overall length of the proposed alignment is slightly shorter than the original alignment in the EIA. The overall amount of C&D materials generated from the main laying works have been reduced as compared to that estimated in the EIA 2015.

**Table 6.1 Cut and Fill Requirements of the Water Main Laying (Approximate Quantities)**

Locations	Excavated Materials Generated from Construction Works (m <sup>3</sup> )	Filled Materials Reused on Site (m <sup>3</sup> )	Surplus Excavated Materials (which are Inert C&D Material) Disposed of at Fill Bank as Public Fill (m <sup>3</sup> )	Surplus Excavated Materials (which are Non-Inert C&D Material) Disposed of at Landfill as Construction Waste (m <sup>3</sup> )
Fresh Water Main Laying	41,527 (-1,206)	25,228 (-733)	15,941 (-463)	358 (-10)

Note: Values in blankets represent the reduction of material amount arising from the realignment as compared to the values predicted in the EIA 2015.

6.3.3 Under the updated design, about 41,169 m<sup>3</sup> of inert C&D materials would be generated from the fresh water main construction and 25,228 of which would be reused as filled materials while 15,941 m<sup>3</sup> of which would be disposed of at TKO Area 137 Fill Bank as public fill or other public fill reception facilities. Additional 358 m<sup>3</sup> of non-inert C&D is expected to be generated and to be disposed of at SENT Landfill or its extension.

#### *Chemical Waste*

6.3.4 Same as the findings of the EIA 2015, with respect to the scale of the mains laying works, it is anticipated that the quantity of chemical waste to be generated will be relatively small. The chemical waste will be collected by licensed chemical waste collectors and delivered to the licensed chemical waste treatment facilities (Chemical Waste Treatment Centre (CWTC) in Tsing Yi) for disposal.

6.3.5 With the incorporation of suitable arrangements for the storage, handling, transportation and disposal of chemical wastes under the requirements stated in the Waste Disposal (Chemical Waste) (General) Regulation and the Code of Practice on the Packaging, Labelling and Storage



of Chemical Wastes, no adverse environmental (such as air and odour emissions, noise and wastewater discharge) and health impacts, and hazards will result from the handling, transportation and disposal of chemical waste arising from the water main laying works.

#### *General Refuse*

- 6.3.6 The presence of a construction site with workers and associated site office will result in the generation of general refuse (mainly consists of food waste, aluminum cans, plastic bottles, waste paper and glass bottles) which requires off-site disposal.
- 6.3.7 To reduce the quantity of general refuse to be disposed of at landfill, recyclable materials (i.e. paper, plastic bottles, aluminum cans and glass bottles) should be segregated on-site for off-site recycling, as far as practicable. Adequate number of enclosed waste containers and recycling bins will be provided to avoid over-spillage of waste and/ or recyclable materials.
- 6.3.8 The non-recyclable refuse will be placed in bags and stored in enclosed containers, and disposed of on a daily basis to the West Kowloon Transfer Station/ Sha Tin Transfer Station.
- 6.3.9 With the implementation of the mitigation measures recommended in the EIA 2015, no adverse environmental impacts associated with the storage, handling, transport and disposal of general refuse are expected due to the proposed design change.

#### **Operational Phase**

- 6.3.10 No waste arising is expected during operational phase of the water mains.

### **6.4 Mitigation Measures**

- 6.4.1 The mitigation measures recommended in the EIA 2015 for construction waste management remain valid. No additional waste management measures are proposed for the revised design of the water main.

### **6.5 Residual Impacts**

- 6.5.1 No residual waste management impact is anticipated during the construction and operational phases with proper implementation of all the recommended mitigation measures in the EIA 2015.

### **6.6 Environmental Monitoring and Audit**

- 6.6.1 It was recommended in the EIA Report that regular audits of the waste management practices be carried out during the construction phase to determine if wastes are being managed in accordance with the recommended mitigation measures. The same audit requirements shall be applied for the construction of the water mains under the revised design.

### **6.7 Conclusion**

- 6.7.1 The proposed realignment of the water mains would not affect the types of wastes arising from the construction activities as presented in the EIA 2015. Construction wastes to be generated from the water mains include C&D materials, chemical waste and general refuse. Reduction of C&D waste generation is anticipated since part of the buried water mains as assumed in the EIA 2015 will be replaced by exposed pipes and the overall length of the water mains is shorter as a result of the proposed design change. Mitigation measures recommended in the EIA 2015 on management of construction wastes have been reviewed and remain applicable to the revised design of the water mains. No unacceptable waste impacts are expected with proper implementation of the mitigation measures recommended in the EIA 2015.

## 7 Review of Ecological Impact

### 7.1 Introduction

- 7.1.1 This Section presents a review the ecological impact associated with the realignment of the water mains. Details of the proposed realignment and design changes are presented in **Section 2**.

### 7.2 Alternative Water Mains Alignments

#### **Original Alignment in EIA**

- 7.2.1 The original alignment of the water mains, as stated in the EIA 2015, was proposed along existing vehicle roads or foot paths. The original alignment as extracted from Annex 9A of the EIA 2015 is given in **Appendix 7A**.
- 7.2.2 Since the alignment will be laid on habitats of urbanized/disturbed areas, no ecological impact associated with the construction of the water mains was identified in the EIA 2015.

#### **Proposed Alignment - Section A and Section B (Desalination Plant to Po Hong Road)**

- 7.2.3 The alignment proposed in this review is shown in **Figure 1.1**. Similar to the original alignment in the EIA 2015, both Section A and Section B would be located along existing vehicle roads or foot paths or cycling tracks.
- 7.2.4 Since the proposed alignment will be laid on habitats of urbanized/disturbed areas, no ecological impact associated with the construction of the water mains in Section A and Section B is identified.

#### **Proposed Alignment - Section C (Po Hong Road to TKOFWPSR in Tsui Lam)**

- 7.2.5 The remaining alignment in the north, namely Section C, would run from Po Hong Road to TKOFWPSR in Tsui Lam.
- 7.2.6 During the detailed design of Section C, a potential alternative alignment was considered in late 2018 to resolve traffic constraints in which a section would run into a mixed woodland area to the north of Po Lam Road. This potential alternative alignment is shown in **Figure 7.1** and **Figure 7.2**. An updated ecological survey at this section was therefore conducted in April 2019 to verify the ecological conditions of the potentially affected habitats and to facilitate the review of ecological impact arising from this potential alternative alignment.
- 7.2.7 In order to avoid and minimise ecological impact on the mixed woodland and floral species of conservation interest identified in the updated ecological survey in April 2019, a second practical alternative alignment (i.e. the proposed alignment) is recommended for Section C as shown in **Figure 2.1** and also illustrated in **Figure 7.1** and **Figure 7.2**. This realignment will avoid the mixed woodland and run along mainly existing vehicle roads or foot paths to prevent potential adverse ecological impacts. As stated in Sections 2.4.3 and 2.4.4, two alternative construction methods (namely Option 1 – pipe jacking and Option 2 – exposed pipe on pipe bridge) are proposed for the alignment near the elevated section of Po Lam Road in the middle of Section C to avoid disturbance to a watercourse.. Both options are feasible options and the final option to be adopted will be subject to the final design of the contractor.

### 7.3 Ecological Review and Survey Methodology

- 7.3.1 In order to identify if there are any potential environmental implications on ecological aspect arising from the realignment of water mains, an ecological impact review was conducted in 2019. The review was undertaken by desktop literature review study supplemented with field surveys.
- 7.3.2 An ecological survey methodology paper was prepared for the potential alternative alignment in the mixed woodland to the north of Po Lam Road. The paper was agreed with AFCD in February 2019 prior to commencement of updated ecological surveys in April 2019. The paper agreed in February 2019 is given in **Appendix 7B-1**.
- 7.3.3 As discussed and justified in Section 2 of **Appendix 7B-1**, ecological concerns would only occur along the alignment in the mixed woodland. The remaining alignments from the desalination plant to Po Hong Road (namely Section A and Section B) would be wholly within urbanized/disturbed areas with no ecological issue.
- 7.3.4 Subsequent to the updated ecological surveys conducted in April 2019 and as discussed in Section 7.2.7, a second practical alternative alignment (i.e. the proposed alignment as shown in **Figure 2.1**) was recommended to avoid the mixed woodland. A revised ecological survey methodology paper was thus prepared for the proposed alignment for agreement with AFCD in July 2019. This revised paper issued in July 2019 is attached in **Appendix 7B-2**. Ecological field verification was conducted in October 2019 to cover the potentially affected area of the proposed alignment.

### 7.4 Review of Ecological Baseline Findings

- 7.4.1 According to EIA 2015, ecological resources identified around Section C (from Po Hong Road to TKOFWPSR) include 6 types of habitat and 8 species of conservation interest (including 2 floral species, 4 bird species, 1 butterfly species and 1 crab species) as indicated in Figure 7b of **Appendix 7A**.

#### **Habitats and Vegetation**

- 7.4.2 The 6 habitat types identified in the EIA 2015 included mixed woodland, plantation, watercourse, shrubland-grassland, agricultural land and urbanized/disturbed. The updated surveys conducted in 2019 revealed that the types, condition and distribution of the habitats identified in the EIA 2015 remains valid. Updated habitat map is provided in **Figure 7.1** and **Figure 7.2**, while photographic records of habitats are given in **Appendix 7C** (Table A).



Figure 7.1 Habitat Map and Species of Conservation Interest

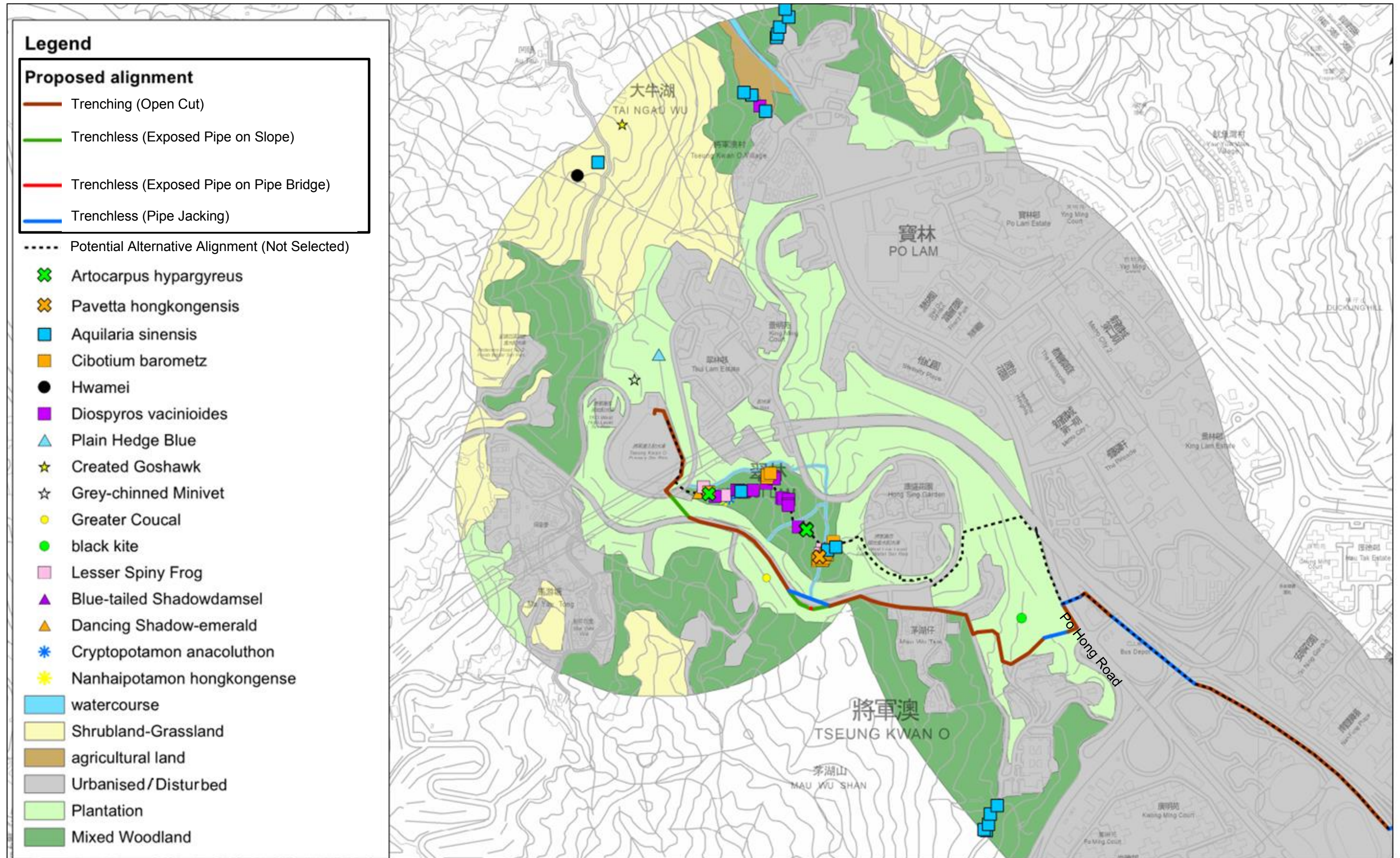
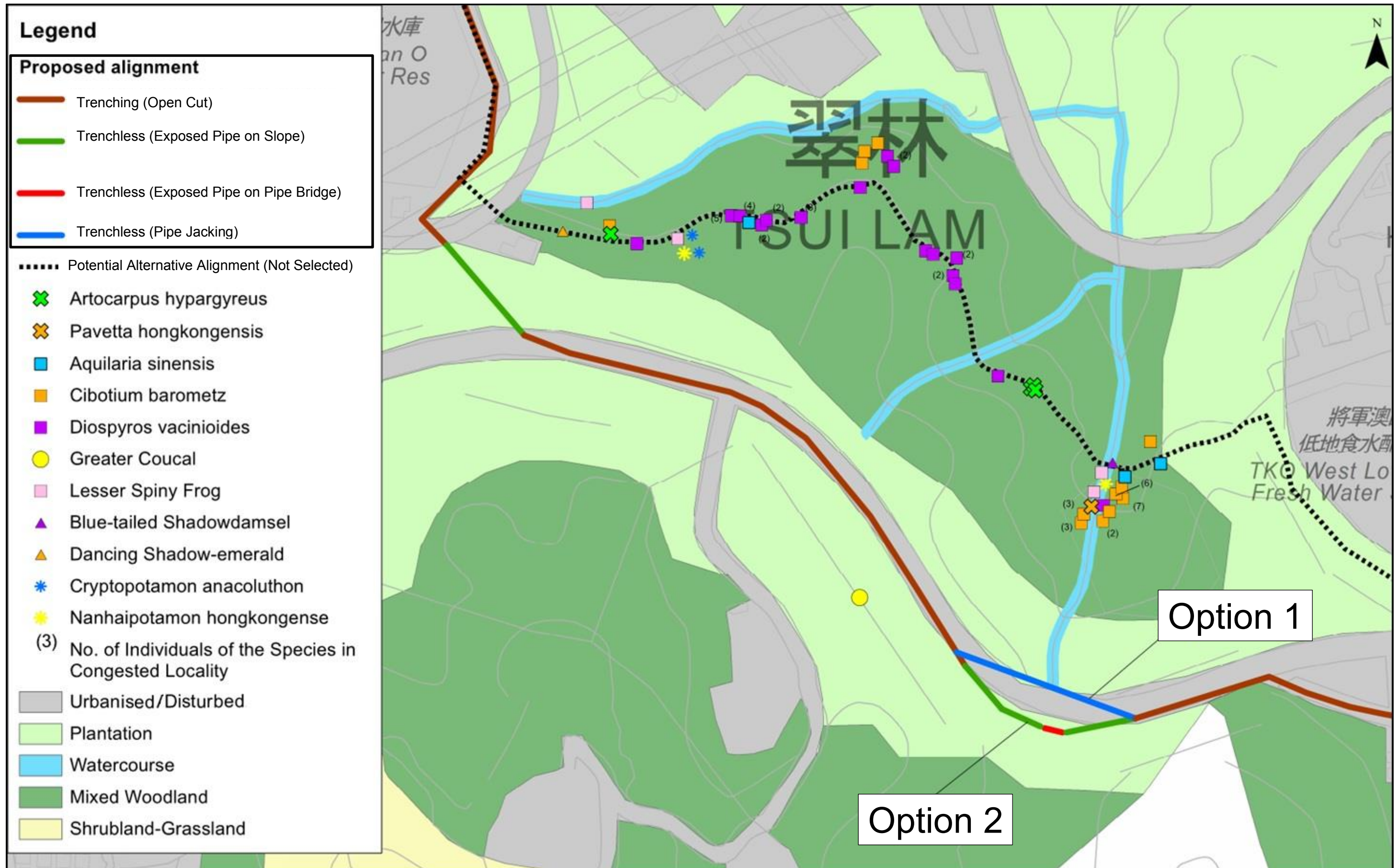




Figure 7.2 Habitat Map and Species of Conservation Interest (Close-up)



## 7.4.3 Types of habitats to be covered by the water mains alignment are summarised below.

**Table 7-1 Habitats Covered by the Water Mains Alignment**

	Original Alignment in EIA 2015 (ha)	Proposed Alignment in this review (ha)	Overall Ecological Value rated in EIA 2015 #
Mixed Woodland	0	0	Low – Moderate
Plantation	0	0.1 under Option 1 ^ 0.2 under Option 2 ^	Low
Watercourse	0	0.01*	Low – Moderate
Urbanised/Disturbed +	Not reported	Not reported	Very Low

Notes: ^ 0.1 ha and 0.2ha refer to the plantation areas fall within the Project limit which is the size of land to be temporarily allocated for the Project to facilitate the construction of exposed pipe or pipe bridge. Not all of these areas would be loss or disturbed. The actual habitat loss due to the installation of exposed pipe supports, pipe bridge piers and temporary platforms would be much smaller.

\* due to too small in size, the section of watercourse found in the proposed alignment was not defined as a habitat of watercourse, but regarded as part of the plantation in the EIA 2015 (**Appendix 7A**);

\* 0.01 ha refers to the area of watercourse above the buried pipe to be constructed by pipe jacking (Option 1) or area of watercourse underneath the pipe bridge (Option 2). Both options have no direct conflict with the watercourse.

# as discussed in Section 7.4.2, no major variations on condition of the habitats were identified between the EIA 2015 and this review, the overall ecological value of the concerned habitats remains valid.

+ The EIA 2015 assumed that the entire water mains would be located in urbanized / disturbed habitat. The size of urbanized /disturbed habitat covered by the water mains was not reported in the EIA 2015. As the construction works would not alter the nature of this type of habitat, following the EIA approach, the urbanized /disturbed area covered by the proposed alignment is not reported in this review.

7.4.4 In the EIA 2015, a total of two floral species of conservation interest were identified at or around the Tsui Lam area, including *Aquilaria sinensis* and *Diospyros vaccinioides* as shown in Figure 7b of **Appendix 7A** According to the updated ecological surveys conducted in 2019, these two species were re-verified on site at similar locations (**Figure 7.1** and **Figure 7.2**) and three additional species of conservation interest were identified, including *Artocarpus hypargyreus*, *Cibotium barometz* and *Pavetta hongkongensis*. A summary of total floral species of conservation interest recorded in the field surveys and those within the works limit of Section C of the proposed alignment are given in **Table 7-2** and **Table 7-3** respectively.

**Table 7-2 Total Records of Floral Species of Conservation Interest at or near Tsui Lam**

Species	EIA 2015	Updated Surveys in 2019	Remarks
<i>Aquilaria sinensis</i>	14	19	
<i>Artocarpus hypargyreus</i>	-	4	Species not recorded in EIA 2015
<i>Cibotium barometz</i>	-	27	Species not recorded in EIA 2015
<i>Diospyros vaccinioides</i>	2	30	
<i>Pavetta hongkongensis</i>	-	1	Species not recorded in EIA 2015

**Table 7-3 Floral Species of Conservation Interest in Works Limits of Proposed Alignment**

Species	Original Alignment in EIA 2015	Proposed Alignment	Remarks
<i>Aquilaria sinensis</i>	0	0	
<i>Artocarpus hypargyreus</i>	-	0	Species not recorded in EIA 2015
<i>Cibotium barometz</i>	-	0	Species not recorded in EIA 2015



Species	Original Alignment in EIA 2015	Proposed Alignment	Remarks
<i>Diospyros vaccinioides</i>	0	0	
<i>Pavetta hongkongensis</i>	-	0	Species not recorded in EIA 2015

7.4.5 Along the proposed alignment under the latest design, no floral species of conservation interest were identified.

7.4.6 Photographic records and list of floral species identified in the updated ecological surveys in April and October 2019 are given in **Appendix 7C** (Table B) and **Appendix 7D** respectively.

### **Fauna**

7.4.7 A total of 7 faunal species of conservation interest were identified in the EIA 2015 at or around the Tsui Lam area, including 5 bird species, 1 butterfly species and 1 crab species as shown in Figure 7b of **Appendix 7A**.

**Table 7-4 Recorded Locality of Faunal Species of Conservation Interest**

Species	EIA 2015	Cumulative Records with Updated Surveys in 2019 *	Remarks
<b><i>Birds</i></b>			
Black Kite <i>Milvus migrans</i>	1	1	
Crested Goshawk <i>Accipiter trivirgatus</i>	1	1	
Greater Coucal <i>Centropus sinensis</i>	1	1	
Grey-chinned Minivet <i>Pericrocotus solaris</i>	1	1	
Chinese Hwamei <i>Garrulax canorus</i>	1	1	
<b><i>Amphibians</i></b>			
Lesser Spiny Frog <i>Quasipaa exilispinosa</i>	-	4	Species not recorded in EIA 2015
<b><i>Butterfly</i></b>			
Plain Hedge Blue <i>Celastrina lavendularis</i>	1	1	
<b><i>Dragonfly</i></b>			
Blue-tailed Shadowdamsel <i>Drepanosticta hongkongensis</i>	-	1	Species not recorded in EIA 2015
Dancing Shadow-emerald <i>Idionyx victor</i>	-	1	Dancing Shadow-emerald was identified in the EIA 2015 but not regarded as species of conservation interest and no record of locality was provided in the EIA 2015
<b><i>Crab</i></b>			
<i>Cryptopotamon anacoluthon</i>	-	2	Species not recorded in EIA 2015
<i>Nanhaipotamon hongkongense</i>	1	2 (incl. 1 previous record and 1 new record)	Previous locality of the species was re-verified in 2019 at the same watercourse indicated in <b>Appendix 8A</b> .

Note: \* unlike plants, faunal species are mobile and therefore, cumulative counting covering both records from EIA 2015 and updated surveys in 2019 is used.

7.4.8 With the additional three species (Lesser Spiny Frog, Blue-tailed Shadowdamsel and *Cryptopotamon anacoluthon*), the updated cumulative records of faunal species of conservation interest found in the Tsui Lam area included 11 species, covering 5 bird species,

1 amphibian species, 1 butterfly species, 2 dragonfly species and 2 crab species (Table 7-4). The updated locality of the faunal species of conservation interest is illustrated in **Figure 7.2**. Photographic records of some species of conservation interest are provided in **Appendix 7C** (Table C).

## 7.5 Review of Potential Ecological Impact

7.5.1 Most of the proposed alignment in Section C will run within habitat of urbanised/disturbed area, which comprise mainly road access and paved footpaths (**Figure 7.1**). The remaining portion will cover some plantation and very minor proportion of watercourse. The section of watercourse identified at the proposed alignment is too small to be shown as a separate habitat in the EIA 2015 (**Appendix 7A**) and this review (**Figure 7.1**). A photo view of this watercourse is provided in **Appendix 7C** (Table D).

7.5.2 According to the proposed construction method, open trenching will only be used on alignment section running along habitat of urbanised/disturbed area, while non-destructive method (laying exposed pipe, pipe jacking or pipe bridge) will be used on sections along vegetated habitat (i.e. plantation) and watercourse to avoid direct conflict with these habitats.

7.5.3 According to the proposed construction method and the alignment, potential ecological impacts would include:

- Habitat Loss
- Indirect Construction Disturbance to Offsite Habitat and Wildlife

### Habitat Loss

7.5.4 No significant habitat loss is anticipated due to the implementation of the proposed alignment. Minor loss of plantation would occur at the western section and middle section of Section C for laying of exposed pipes, construction of pipe bridge piers on ground surface and construction of working platforms for temporary supports for construction activities.

**Table 7-5 Habitat Loss due to the Proposed Alignment in Section C**

Habitat	Proposed Alignment (Option 1) (ha)	Proposed Alignment (Option 2) (ha)
Mixed Woodland	0.00	0.00
Plantation	0.01 (about 70m <sup>2</sup> )	0.01 (about 150m <sup>2</sup> )
Watercourse	0.00	0.00
Urbanised/Disturbed ^	0.00	0.00

Note: ^ the construction works will not alter the nature of urbanized/disturbed habitat and therefore no habitat loss of this habitat is expected.

7.5.5 The open trenching will only be adopted on habitat of urbanised/disturbed area and the proposed trenching works will not alter the type and size of this habitat throughout both the construction and operation periods.

7.5.6 The proposed alignment will run across three areas of plantation (**Figure 2.1** and **Figure 7.1**). The western one is located on a slope south of TKOFWPSR, while the eastern one located near Po Hong Road. Laying of exposed pipe will be used in area at the western plantation patch. This method can avoid tree felling and major vegetation clearance and therefore is able to prevent habitat loss. Pipe jacking is proposed for the eastern plantation patch. The whole water main will be installed underground by jacking and therefore can completely avoid vegetation clearance and surface disturbance.

7.5.7 In the middle section near Po Lam Road, a short alignment under Option 2 will run through the third plantation patch with a small watercourse flowing from the south. In this section, laying of exposed pipe and pipe bridge will be used for plantation and watercourse respectively to

avoid habitat destruction. The proposed pipe bridge will be erected over the watercourse to hold the exposed pipe with support from two bridge piers on ground surface without any physically attachment to the watercourse. Both habitats can be preserved without structural or ecological alternation.

- 7.5.8 Minor habitat loss of plantation including limited amount of tree felling in the middle plantation patch is anticipated to be caused by the site clearance for the construction and placement of the exposed pipes and temporary working platforms.
- 7.5.9 Although about 0.2ha of plantation would fall within the Project limit (**Table 7-1**) which is the size of land to be temporarily allocated to facilitate the laying of the exposed pipes, the actual habitat loss due to the installation of the structures (i.e. pipe supports, bridge piers and working platforms) on ground surface is minor (**Table 7-5**). The loss of habitat is to be caused by the permanent placement of the on-ground pipes and supporting piers for the pipe bridge of the proposed alignment.
- 7.5.10 Under Option 1, the alignment near the middle plantation patch will be constructed by pipe jacking. All the jacking pits would be located along the existing roads. The relevant plantation patch and the watercourse will be completely avoided by the jacking method.
- 7.5.11 The plantation affected by the proposed alignment is of low ecological value and the affected extent is very limited (0.01ha).
- 7.5.12 No significant adverse ecological impact due to habitat loss is anticipated.

**Table 7-6 Impact Evaluation of Habitat Loss**

	<b>Plantation</b>
Habitat Quality	Low
Species	No rare nor species of conservation interest were identified
Size / Abundance	0.01 ha (70m <sup>2</sup> and 150 m <sup>2</sup> under Option 1 and Option 2 respectively)
Duration	Construction and operation periods
Reversibility	Irreversible
Magnitude	Small
Overall Impact Severity	Insubstantial

### **Indirect Construction Disturbance to Offsite Habitat and Wildlife**

- 7.5.13 Construction activities could cause some disturbance to the wildlife and their habitats sensitive to human activities, noise, dust and site runoff during the construction period. Owing to the small scale of works and limited size of vegetated habitat (i.e. plantation) involved in the proposed alignment, the disturbance would be very minor in extent. In fact, there are no sensitive ecological resources such as species or habitat of conservation interest located within the proposed works area of the water mains.
- 7.5.14 A Greater Coucal was observed in plantation south of the proposed alignment at Po Lam Road. However, it is a highly mobile bird species able to avoid human activities and plantation habitat is rather common in the surrounding. No significant adverse disturbance impact on this species is anticipated.
- 7.5.15 A Black Kite was observed to be flying over a plantation east of Mau Wu Tsai near Po Hong Road. No adverse disturbance to this species is expected as it is also able to fly away from human activities and there are plenty of alternative habitats available in Tsui Lam. Furthermore, this section of alignment would be installed by pipe jacking. All the works, except the jacking points at the two ends, will be located underground.
- 7.5.16 Lesser Spiny Frog and *Nanhaipotamon hongkongense* were identified at a watercourse about 185m downstream. According to the proposed construction method for either Option 1 or Option 2 of the proposed alignment, the upstream of the watercourse will not be affected both



physically (i.e. no structural change) nor hydrologically (i.e. no alternation of water flow nor water volume). Therefore, significant disturbance impact on these two species is not anticipated. Indirect water quality changes due to construction site runoff would be insignificant as excavation and any exposed soil surface associated with the exposed pipe laying and pipe jacking would be limited and minimal in scale. Proper implementation of the water quality mitigation measures in the EIA 2015 and this review will avoid adverse water quality changes in the downstream waters.

### **Operational Phase**

7.5.17 No significant adverse ecological impact would arise from operation of the water mains.

## **7.6 Review of Mitigation Measures**

7.6.1 In the EIA 2015, ecological mitigation measures relevant to the construction of the water mains include:

1. Trenchless construction method was recommended wherever necessary for laying the proposed water mains
2. Appropriate construction practices should be implemented as far as practicable:
  - a. Erect fences along the boundary of the works area before the commencement of works to prevent vehicle movements and encroachment of personnel onto adjacent areas
  - b. Regularly check the work site boundaries to ensure that they are not breached and that damage does not occur to surrounding areas
  - c. Avoid any damage and disturbance, particularly those caused by filling and illegal dumping, to the surrounding habitats through proper management of waste disposal
  - d. Reinstate temporarily affected areas immediately after completion of construction works, through on-site hydro-seeding and tree/shrub seedling planting. The tree/shrub species will be chosen with reference to those in the surrounding area (Annex 9A of the EIA Report)

7.6.2 These two mitigation measures have been reviewed with the updated design information and are discussed in the following paragraphs.

7.6.3 During the course of designing the alternative water mains alignment, updated ecological review findings collected from desktop study and field surveys were taken into account in proposing and fine tuning the alignment route. The basic principle adopted for mitigating ecological impacts, in order of priority, is avoidance, minimisation and compensation.

### **Avoidance**

7.6.4 In order to prevent potential adverse ecological impact on floral and faunal species of conservation interest identified along the potential alternative alignment in the mixed woodland, avoidance measure by means of further re-routing the water mains is proposed. The final alignment is shifted away from the mixed woodland habitat by about 150m in distance which can completely avoid any direct conflict with the mixed woodland.

### **Minimisation**

7.6.5 Adopting trenchless method for laying of water mains as far as practical was recommended in the EIA 2015 and it is considered still valid and applicable in the revised design proposed in this review. In fact, laying exposed pipes, using pipe bridge and pipe jacking are three types of trenchless method proposed for the new alignment running along vegetated habitats to avoid and minimise habitat loss, vegetation damage and construction disturbance to the existing environments.

- 7.6.6 The appropriate construction practices listed in point 2a-d of Section 7.6.1 are also considered valid and applicable the new alignment, which can further ensure the environmental performance of the proposed works.

### **Compensation**

- 7.6.7 As discussed in Section 7.5, the ecological impact of habitat loss is minor, due to the fact that the affected plantation habitat is of low ecological value and the anticipated extent of loss is only 0.01ha under the proposed alignment. No ecological compensation measure is required.

### **Tree Preservation**

- 7.6.8 In addition, as discussed in Section 2.7.4, the alignment of exposed pipe will be positioned/adjusted in such a way that at least 500mm clearance shall be kept from trunks of retained trees to avoid interface problem due to their future growth

## **7.7 Residual Impacts**

- 7.7.1 As stated in Section 7.5, no significant adverse ecological impacts are anticipated. The overall significance of the identified ecological impacts ranges from minor to insubstantial. With the recommended mitigation measures given in Section 7.6, no unacceptable residual ecological impacts are expected.

**Table 7-7 Summary of Residual Impacts**

	<b>Impact Significance (Before Mitigation)</b>	<b>Mitigation Measures</b>	<b>Impact Significance (After Mitigation)</b>
Habitat Loss (Plantation)	Insubstantial	No specific ecological measure is recommended	Insubstantial
Indirect Construction Disturbance	Minor	Appropriate construction practices proposed in the EIA 2015 and this review	Minor *

\* Note: The recommended appropriate construction practices are mainly precautionary, which are to be used to ensure the environmental performance of the proposed works not to cause additional impact on the environments. Therefore, the impact significant is expected to remain the same rating after mitigation.

## **7.8 Environmental Monitoring and Audit (EM&A)**

- 7.8.1 The ecological measures recommended in the EIA 2015 and this review should be checked regularly in routine site inspection throughout the construction period as part of the EM&A procedures. No other specific ecological monitoring is recommended.

## **7.9 Conclusions**

- 7.9.1 The revised alignment of the fresh water mains will mainly run within habitat of urbanised/disturbed area, which comprise mainly road access and paved footpaths. A small portion will cover some plantation and very minor proportion of watercourse. The use of trenchless method including laying exposed pipe, use of pipe bridge and pipe jacking have been fully adopted in the current design to preserve and completely avoid the watercourse and minimize the loss of plantation. Two alternative construction methods (namely Option 1 – pipe jacking and Option 2 – exposed pipe on pipe bridge) are proposed for the alignment near the elevated section of Po Lam Road to avoid disturbance to the watercourse. Both options are feasible methods and have been fully assessed in this Updated ERR to have no unacceptable ecological impact. The final option to be selected will be subject to the final design of the contractor. The plantation affected by the proposed alignment under all the proposed

alternative construction methods is of low ecological value and the maximum affected extent is very limited (0.01ha). No unacceptable ecological impact associated with the revised design of the fresh water mains is expected.

## 8 Environmental Monitoring & Audit Requirements

- 8.1.1 The objectives and requirements of Environmental Monitoring and Audits (EM&A) for the construction and operation of the Project have been summarized in Section 14 of the EIA 2015 and detailed in the standalone EM&A Manual for the Project.
- 8.1.2 Based on the findings of this review, the EM&A requirements proposed in the EIA 2015 would remain applicable to the revised design of the water mains. No changes to the EM&A requirements in the EIA 2015 are proposed except that a reduction of noise monitoring locations is recommended.
- 8.1.3 The EIA 2015 proposed to carry out noise monitoring at Creative Secondary School (CSS1), PLK Laws Foundation College (PLKLFC1) and School of Continuing and Professional Studies – CUHK (SCPS1). As the proposed alignment would avoid construction near PLKLFC1 and SCPS1 with large buffer distance, it is recommended to remove these two monitoring stations. Noise monitoring at CSS1 should be maintained. The EM&A Manual should be updated accordingly by the ET. The updated EM&A Manual should be verified by the IEC and agreed by the EPD.
- 8.1.4 In addition, the site audits recommended in the EM&A Manual shall cover the new alignment and design to ensure that all mitigation measures proposed in the EIA 2015 and this review are properly implemented.



## 9 Summary and Conclusions

- 9.1.1 Construction of the proposed fresh water mains itself is not a DP under the EIAO but was assessed as part of the TKO desalination plant project in the EIA 2015. An environmental review has been conducted for the proposed design change for the fresh water mains, which has been identified after the EIA stage. The potential environmental issues pertinent to the proposed change have been assessed and the required mitigation and EM&A requirements have also been reviewed. The relevant review findings are summarized as follow.

### 9.2 Air Quality

- 9.2.1 The proposed water mains will be laid in small sections using a combination of trenching (open cut) method and trenchless (pipe jacking and exposed pipe laying) method. The trenching method involves soil excavation, backfilling and dusty material handling, which may have the potential to cause fugitive dust emissions. Negligible dust emissions are expected from the trenchless method as limited amount of excavation, backfilling and dusty material handling would be involved. Since the amount of excavated materials to be generated will be relatively small and the work scale is minor, no adverse fugitive dust impact is envisaged provided that the dust control measures recommended in the EIA 2015 are properly implemented. The findings and conclusion of the EIA 2015 on the air quality aspect would remain valid. As the overall length of the trenching works would be reduced in the revised design as compared to the EIA assumption, the proposed design change would further minimize the overall air quality impact from the Project.

### 9.3 Noise

- 9.3.1 Potential sources of noise impacts would mainly arise from the use of PME operating at the construction work sites. With the use of practical mitigation measures considered in the EIA 2015, no adverse noise impact upon the NSRs is predicted from the revised design. In fact, the proposed alignment would be diverted away from the more densely populated areas and schools in Po Lam and therefore significantly reduced the number of affected NSRs in the EIA 2015. The design change would have beneficial effects on the construction noise aspect.

### 9.4 Water Quality

- 9.4.1 Key water quality issues associated with the mains laying works would mainly include the impacts from site runoff, sewage from workforce and accidental spillage. One watercourse is identified at the proposed alignment. Exposed pipe laying on pipe bridge or pipe jacking method is proposed to completely avoid this watercourse. The watercourse will not be disturbed both physically (i.e. no structural change) and hydrologically (i.e. no alternation of water flow nor water volume). With well-maintained construction site drainage and the implementation of good site practices and mitigation measures as recommended in the EIA 2015 and this review, the water quality impact would be controlled to comply with the WPCO standards. No unacceptable water quality impact would be expected from the proposed design change.

### 9.5 Waste Management

- 9.5.1 The proposed realignment of the water mains would not affect the types of wastes arising from the construction activities as presented in the EIA 2015. Construction wastes to be generated from the water mains include C&D materials, chemical waste and general refuse. Reduction of C&D waste generation is anticipated since part of the buried water mains as assumed in the EIA 2015 will be replaced by exposed pipes and the overall length of the water mains is shorter as a result of the proposed design change. Mitigation measures recommended in the EIA 2015 on management of construction wastes have been reviewed and remain applicable to the

revised design of the water mains. No unacceptable waste impacts are expected with proper implementation of the mitigation measures recommended in the EIA 2015.

## **9.6 Ecology**

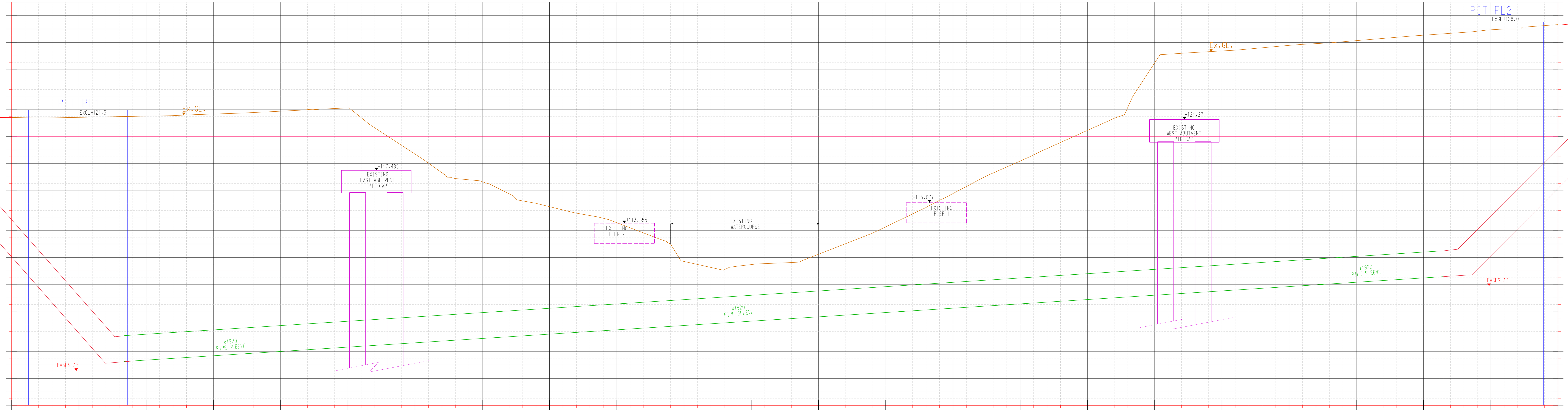
- 9.6.1 The revised alignment of the fresh water mains will mainly run within habitat of urbanised/disturbed area, which comprise mainly road access and paved footpaths. A small portion will cover some plantation and very minor proportion of watercourse. The use of trenchless method including laying exposed pipe, use of pipe bridge and pipe jacking have been fully adopted in the revised design to preserve and completely avoid the watercourse and minimize the loss of plantation. Two alternative construction methods (namely Option 1 – pipe jacking and Option 2 – exposed pipe on pipe bridge) are proposed for the alignment near the elevated section of Po Lam Road to avoid disturbance to the watercourse. Both options are feasible methods and have been fully assessed in this Updated ERR to have no unacceptable ecological impact. The final option to be selected will be subject to the final design of the contractor. The plantation affected by the proposed alignment under all the proposed alternative construction methods is of low ecological value and the maximum affected extent is very limited (0.01ha). No adverse ecological impact associated with the revised design of the fresh water mains is expected.

## **9.7 Conclusion**

- 9.7.1 It is concluded that the proposed change will not constitute material change to the environmental impact of the Project with mitigation measures in place and the Project complies with the requirements described in the Technical Memorandum on EIA Process (EIAO-TM).

**APPENDIX 2A**  
**TYPICAL WORK ARRANGEMENT NEAR THE WATERCOURSE (OPTION 1)**

DATE: 12 DEC 19  
PROFILE OF PIPE SLEEVE FROM PIT PL1 TO PIT PL2.  
SCALE : 1 / 75

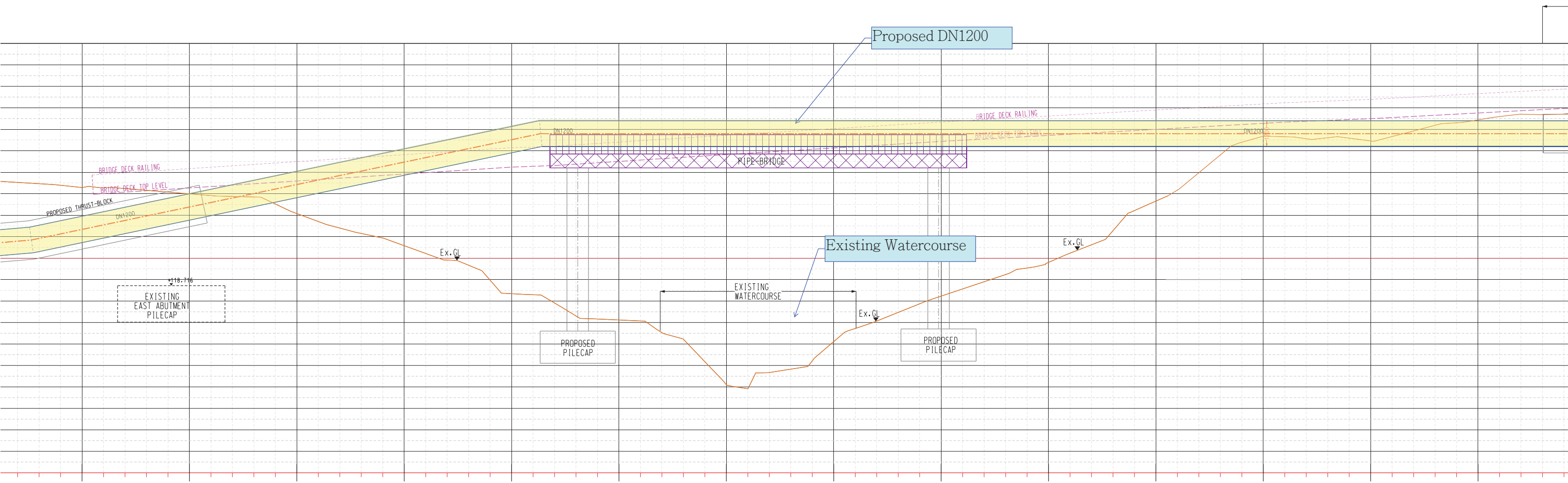


Typical Arrangement for Option 1 - Using Pipe Jacking Method



**APPENDIX 2B**  
**TYPICAL WORK ARRANGEMENT NEAR THE WATERCOURSE (OPTION 2)**

GE.



Typical Arrangement for Option 2 - Exposed Pipe on Pipe Bridge

**APPENDIX 4A**  
**CONSTRUCTION PLANT INVENTORY FOR MAIN LAYING**

## Appendix 4A: Construction Plant Inventory for Water Mains

No.	Activities	Plant [2]	TM Ref./ Other Ref [1]	No. of PME	On-time %	Type of Noise Control	Noise reduction, dB(A)	Unit SWL, dB(A)	SWL, dB(A)	Total SWL, dB(A)
<b>Construction of Buried/Exposed Pipe</b>										
a)	Sawcutting pavement <sup>(4)</sup>	Saw/groover, concrete (petrol)	CNP 203	1	85%	Temporary Noise Barrier	-5	115	109	109
				1	85%	Noise Enclosure	-15	115	99	99
b)	Breaking up of pavement	Wheeled excavator fitted with hydraulic rock breaker	BS D8 12	1	85%	Temporary Noise Barrier	-5	106	100	100
c)	Excavation/Shoring	<u>Group 1</u>								
		Piling, vibrating hammer	EPD/PME/18	1	50%	Acoustic Fabric	-10	115	102	102
		<u>Group 2</u>								
		Dump Truck	BS D9 39	1	50%			103	100	103
		Excavator/loader, wheeled/tracked	BS D3 97	1	85%	Temporary Noise Barrier	-5	105	99	103
			Water pump, submersible (electric)	CNP 283	1	50%			85	82
d)	Pipe laying	Lorry, with crane/grab, 5.5 tonne < gross vehicle weight ≤ 38 tonne	EPD/PME/36	1	85%	Temporary Noise Barrier	-5	105	99	99
e)	Backfilling	<u>Group 1</u>								
		Lorry, with crane/grab, 5.5 tonne < gross vehicle weight ≤ 38 tonne	EPD/PME/36	1	85%	Temporary Noise Barrier	-5	105	99	103
		Compactor, vibratory	CNP 050	1	85%	Temporary Noise Barrier	-5	105	99	
		Piling, diaphragm wall, hydraulic extractor	CNP 163	1	85%	Acoustic Fabric	-10	90	79	
		Excavator (tracked)	EPD-07693	1	85%	Temporary Noise Barrier	-5	99	93	
		<u>Group 2</u>								
		Power Rammer (petrol)	CNP 169	1	85%	Temporary Noise Barrier	-5	108	102	102
f)	Reinstatement (concrete)	Concrete truck mixer	BS D6 35	1	85%	Temporary Noise Barrier	-5	100	94	98
		Poker, vibratory, hand-held	BS D6 40	1	85%	Temporary Noise Barrier	-5	98	92	
		Generator, super silenced, 70dB(A) at 7m	CNP 103	1	85%	Enclosure Type Noise Barrier	-15	95	79	
		Excavator (tracked)	EPD-07693	1	85%	Temporary Noise Barrier	-5	99	93	
g)	Reinstatement (asphalt)	<u>Group 1</u>								
		Roller, vibratory	EPD-06886	1	85%	Temporary Noise Barrier	-5	97	91	91
		<u>Group 2</u>								
		Asphalt paver	BS D8 24	1	85%			101	100	102
		Dump Truck	BS D9 39	1	85%	Temporary Noise Barrier	-5	103	97	
h)	Painting of roading marking	Paint line marker (low pressure)	EPD/PME/22	1	85%		0	87	86	86
<b>Construction at Jacking Pit</b>										
i)	Pipe jacking (for trenchless method)	<u>Group 1</u>								
		Piling, vibrating hammer	EPD/PME/18	1	85%	Acoustic Fabric	-10	115	104	104
		<u>Group 2</u>								
		Excavator/loader, wheeled/tracked	BS D3 97	1	85%	Temporary Noise Barrier	-5	105	99	102
		Dump Truck	BS D9 39	1	85%	Temporary Noise Barrier	-5	103	97	
		Tunnelling machine	[3]	1	85%			88	87	
		Water pump, submersible (electric)	CNP 283	2	85%			85	87	
		Generator, super silenced, 70dB(A) at 7m	CNP 103	2	85%	Enclosure Type Noise Barrier	-15	95	82	
<b>Construction of Pipe Bridge</b>										
j)	Mini pile construction <sup>(5)</sup>	Bored piling rig	CNP166	1	85%			100	99	108
		Dump Truck	BS D9 39	1	85%			103	102	
		Concrete truck mixer	BS D6 35	1	85%			100	99	
		Piling, diaphragm wall, hydraulic extractor	CNP 163	1	85%			90	89	
		Lorry, with crane/grab, 5.5 tonne < gross vehicle weight ≤ 38 tonne	EPD/PME/36	1	85%			105	104	

### Notes:

1 BS - British Standard BS 5228:2009, Part 1 Noise and Vibration Control on Construction and Open Sites

Other Ref. - SWLs refer to other PME documented by the Noise Control Authority (EPD/PME/no.)

([http://www.epd.gov.hk/epd/english/application\\_for\\_licences/guidance/files/OtherSWLe.pdf](http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf))

QPME data from [http://epd.gov.hk/cgi-bin/npg/qpme/search\\_gen.pl](http://epd.gov.hk/cgi-bin/npg/qpme/search_gen.pl)

2 Only 1 group of PME will be operated at the same time for each activity.

3 PME may subject to change upon actual construction. The Contractor may adopt quieter construction method.

4 Noise enclosure will be adopted at the workfronts as identified in Appendix 4E during sawcutting pavement.

5 Nearest noise sensitive receiver is located 170m away (as shown in Figure 4.2) and no noise sensitive receivers has direct view towards the works area.

Noise impact due to construction of pipe bridge is not anticipated, therefore it is not included in the noise calculations. The buffer distances between the pipe bridge and NSRs are not reported in Appendix 4B and Appendix 4C.



**APPENDIX 4B**  
**CONSTRUCTION NOISE CALCULATION FOR MAIN LAYING (TRENCHING)**

NSR ID	NSR Location	EIAO-TM Noise Criteria, dB(A)	Activity	Workfront* (see footnotes and refer to Appendix 4E)	SWL, dB(A)										Predicted CNL, dB(A)											
					Sawcutting pavement	Breaking up of pavement	Excavation /Shoring	Pipe laying	Backfilling	Reinstatement (concrete)	Reinstatement (asphalt)	Painting of road marking	Maximum No. of Workfront	Vertical distance from workfronts, m	Horizontal distance from workfronts, m	Distance from workfronts, m	Corr. For distance, dB(A)	Corr. For Façade, dB(A)	Sawcutting pavement	Breaking up of pavement	Excavation /Shoring	Pipe laying	Backfilling	Reinstatement (concrete)	Reinstatement (asphalt)	Painting of road marking
TB1	The Beaumont	75	Section B	8	109	100	102	99	103	98	102	86	4	14	290	290	-57	3	55	46	48	45	49	44	48	32
				7	109	100	102	99	103	98	102	86	4	14	326	326	-58	3	54	45	47	44	48	43	47	31
				6	109	100	102	99	103	98	102	86	4	14	364	364	-59	3	53	44	46	43	47	42	46	30
				5	109	100	102	99	103	98	102	86	4	14	402	402	-60	3	52	43	45	42	46	41	45	29
LP1	Lohas Park - Tower 1	75	Section A	3	99	100	102	99	103	98	102	86	3	19	419	420	-60	3	42	43	45	42	45	41	45	29
				2	109	100	102	99	103	98	102	86	3	19	458	458	-61	3	51	42	44	41	45	40	44	28
				1	109	100	102	99	103	98	102	86	3	19	497	498	-62	3	50	41	43	40	44	39	43	27
LP2	Lohas Park - Tower 9	75	Section A	8	109	100	102	99	103	98	102	86	3	21	341	341	-59	3	54	45	46	44	47	43	46	31
				7	109	100	102	99	103	98	102	86	3	21	347	347	-59	3	53	44	46	43	47	42	46	30
				6	109	100	102	99	103	98	102	86	3	21	359	360	-59	3	53	44	46	43	47	42	46	30
CSS1	Creative Secondary School	70/65	Section B	13#	109	100	102	99	103	98	102	86	4	0	24	24	-36	3	77	68	69	67	70	66	69	54
				14#	109	100	102	99	103	98	102	86	4	0	42	42	-40	3	72	63	65	62	65	61	65	49
				15#	109	100	102	99	103	98	102	86	4	0	76	76	-46	3	67	58	59	57	60	56	59	44
				16#	109	100	102	99	103	98	102	86	4	0	112	112	-49	3	63	54	56	53	57	52	56	40
OS1	Oscar by the Sea - Tower 1	75	Section B	16	109	100	102	99	103	98	102	86	4	7	84	84	-46	3	66	57	58	56	59	55	59	43
				17	109	100	102	99	103	98	102	86	4	7	87	87	-47	3	65	56	58	55	59	54	58	42
				15	109	100	102	99	103	98	102	86	4	7	96	96	-48	3	65	56	57	55	58	54	57	42
				18	109	100	102	99	103	98	102	86	4	7	106	106	-48	3	64	55	56	54	57	53	57	41
HMR1	Hemera - Topaz	75	Section B	6	109	100	102	99	103	98	102	86	4	32	34	47	-41	3	71	62	64	61	64	60	64	48
				4	109	100	102	99	103	98	102	86	4	32	61	69	-45	3	68	59	60	58	61	56	60	45
				7	109	100	102	99	103	98	102	86	4	32	76	82	-46	3	66	57	59	56	60	55	59	43
STE1	Sheung Tak Estate	75	Section B	27	109	100	102	99	103	98	102	86	4	17	274	274	-57	3	56	47	48	46	49	44	48	33
				28	109	100	102	99	103	98	102	86	4	17	275	276	-57	3	55	46	48	45	49	44	48	32
				26	109	100	102	99	103	98	102	86	4	17	276	276	-57	3	55	46	48	45	49	44	48	32
				29	109	100	102	99	103	98	102	86	4	17	282	282	-57	3	55	46	48	45	49	44	48	32
LSTPS1	Leung Sing Tak Primary School	70/65	Section B	24*	99	100	102	99	103	98	102	86	4	4	91	91	-47	3	55	56	58	55	59	54	58	42
				25*	99	100	102	99	103	98	102	86	4	4	93	93	-47	3	55	56	58	55	58	54	58	42
				23*	99	100	102	99	103	98	102	86	4	4	107	107	-49	3	53	55	56	54	57	53	56	41
				26*	99	100	102	99	103	98	102	86	4	4	113	113	-49	3	53	54	56	53	57	52	56	40
NFP1	Nan Fung Plaza	75	Section B	27*	99	100	102	99	103	98	102	86	4	16	63	65	-44	3	58	59	61	58	62	57	61	45
				26*	99	100	102	99	103	98	102	86	4	16	74	75	-46	3	56	58	59	57	60	56	60	44
				28*	99	100	102	99	103	98	102	86	4	16	77	79	-46	3	56	57	59	56	60	55	59	43
				25*	99	100	102	99	103	98	102	86	4	16	101	103	-48	3	54	55	57	54	58	53	57	41
KNH1	Kwong Ming Court - Kwong Ning House	75	Section B	31	109	100	102	99	103	98	102	86	4	1	250	250	-56	3	56	47	49	46	50	45	49	33
				30	109	100	102	99	103	98	102	86	4	1	253	253	-56	3	56	47	49	46	50	45	49	33
				32	109	100	102	99	103	98	102	86	4	1	253	253	-56	3	56	47	49	46	50	45	49	33
				33	109	100	102	99	103	98	102	86	4	1	261	261	-56	3	56	47	49	46	50	45	49	33
CWKPS1	POH Chan Kwok Wai Primary School	70/65	Section B	35	109	100	102	99	103	98	102	86	4	1	293	293	-57	3	55	46	48	45	48	44	48	32
				34	109	100	102	99	103	98	102	86	4	1	310	310	-58	3	54	45	47	44	48	43	47	31
				33	109	100	102	99	103	98	102	86	4	1	327	327	-58	3	54	45	47	44	48	43	47	31
				32	109	100	102	99	103	98	102	86	4	1	348	348	-59	3	53	44	46	43	47	42	46	30
HHSC1	Haven of Hope Christian Service Chapel	75	Section C	36	109	100	102	99	103	98	102	86	4	14	196	197	-54	3	58	49	51	48	52	47	51	35
				37	109	100	102	99	103	98	102	86	4	14	222	222	-55	3	57	48	50	47	51	46	50	34
				39	109	100	102	99	103	98	102	86	4	14	238	238	-56	3	57	48	49	47	50	46	50	34
				38	109	100	102	99	103	98	102	86	4	14	211	211	-55	3	58	49	50	48	51	47	51	35
OS2	Oscar by the Sea - Tower 8	75	Section B	11	109	100	102	99	103	98	102	86	4	19	41	45	-41	3	71	62	64	61	65	60	64	48
				10	109	100	102	99	103	98	102	86	4	19	51	54	-43	3	70	61	62	60	63	59	62	47
				12	109	100	102	99	103	98	102	86	4	19	65	67	-45	3	68	59	60	58	61	57	60	45
				9	109	100	102	99	103	98	102	86	4	19	84	86	-47	3	66	57	58	56	59	55	58	43

Notes:

\*Indicative arrangement and locations of workfronts are shown in Appendix 4E.

\* Noise Enclosure is adopted for the Saw/groover during the activity - sawcutting pavement at waterfront no. 23 to 29 (see Appendix 4E).

For construction work at workfront no. 13 - 16, individual activities with noise exceedence will be scheduled outside school hours/examination periods (see Section 4.8.3 of main text for details).

# Noise enclosure during sawcutting pavement at the workfront no.13 -16 is not proposed as this noisy activity will be scheduled outside school hours (see above)

SBIS1	Shrewsbury International School	70/65	Section B	8	109	100	102	99	103	98	102	86	4	0	223	223	-55	3	57	48	50	47	51	46	50	34
				7	109	100	102	99	103	98	102	86	4	0	259	259	-56	3	56	47	49	46	50	45	49	33
				6	109	100	102	99	103	98	102	86	4	0	297	297	-57	3	55	46	48	45	48	44	48	32
				5	109	100	102	99	103	98	102	86	4	0	335	335	-59	3	54	45	46	44	47	43	47	31
PPS1	Papillons - Tower 1	75	Section B	40	109	100	102	99	103	98	102	86	4	4	189	189	-54	3	59	50	51	49	52	48	52	36
				41	109	100	102	99	103	98	102	86	4	4	175	175	-53	3	59	50	52	49	53	48		

## Appendix 4A: Construction Plant Inventory for Water Mains

NSR ID	NSR Location	EIAO-TM Noise Criteria, dB(A)	Activity Description	SWL, dB(A)	Vertical distance from workfronts, m	Horizontal distance from workfronts, m	Distance from workfronts, m	Corr. For distance, dB(A)	Corr. For Façade, dB(A)	Predicted CNL, dB(A)
				Pipe jacking						Pipe jacking
TB1	The Beaumont	75	Section B	104	14	170	171	-53	3	54
LP1	Lohas Park - Tower 1	75	Section A	104	19	127	128	-50	3	57
LP2	Lohas Park - Tower 9	75	Section A	104	21	123	125	-50	3	57
CSS1	Creative Secondary School	70/65	Section B	104	0	31	31	-38	3	69
OS1	Oscar by the Sea - Tower 1	75	Section B	104	7	85	85	-47	3	60
HMR1	Hemera - Topaz	75	Section B	104	32	134	138	-51	3	56
STE1	Sheung Tak Estate	75	Section B	104	17	356	357	-59	3	48
LSTPS1	Leung Sing Tak Primary School	70/65	Section B	104	4	184	185	-53	3	54
NFP1	Nan Fung Plaza	75	Section B	104	16	273	274	-57	3	50
KNH1	Kwong Ming Court - Kwong Ning House	75	Section B	104	1	296	296	-57	3	50
CWKPS1	POH Chan Kwok Wai Primary School	70/65	Section B	104	1	284	284	-57	3	50
HHCS1	Haven of Hope Christian Service Chapel	75	Section B	104	14	185	186	-53	3	54
OS2	Oscar by the Sea - Tower 8	75	Section B	104	19	125	126	-50	3	57
SBIS1	Shrewsbury International School	70/65	Section B	104	0	104	104	-48	3	59
PPS1	Papillons - Tower 1	75	Section B	104	4	573	573	-63	3	44
HHH1	Hope of Haven Hospital	75	Section C	104	12	70	71	-45	3	62
KLC2	King Ling College	70/65	Section C	104	0	107	107	-49	3	58
MWT1*	Mau Wu Tsai Village	75	Section C	104	0	93	93	-47	3	60
MWT2*	Mau Wu Tsai Village	75	Section C	104	0	20	20	-34	3	73
SCPS1	School of Continuing and Professional Studies - CUHK	70/65	Section C	104	0	700	700	-65	3	42
TLE2	Tsui Lam Estate	75	Section C	104	0	620	620	-64	3	43
YC1	Youth College (Tseung Kwan O)	70/65	Section C	104	0	531	531	-63	3	44
HCMS1	Hong Chi Morninghill School Tsui Lam	70/65	Section C	104	0	434	434	-61	3	46

Note:

\*Since the location of jacking pits is not confirmed, the noise impact from the closest potential workfront proposed by the engineer (as shown in Figure 4.2) has been assessed for these NSRs as worst case scenario.





Appendix 4B: Construction Noise Calculation for Main laying (Trenching)

NSR ID	NSR Location	EIAO-TM Noise Criteria, dB(A)	Activity	Workfront^ (see footnotes and refer to Appendix 4E)	SWL, dB(A)											Predicted CNL, dB(A)											
					Sawcutting pavement	Breaking up of pavement	Excavation /Shoring	Pipe laying	Backfilling	Reinstatement (concrete)	Reinstatement (asphalt)	Painting of roading marking	Maximum No. of Workfront	Vertical distance from workfronts, m	Horizontal distance from workfronts, m	Distance from workfronts, m	Corr. For distance, dB(A)	Corr. For Façade, dB(A)	Sawcutting pavement	Breaking up of pavement	Excavation /Shoring	Pipe laying	Backfilling	Reinstatement (concrete)	Reinstatement (asphalt)	Painting of roading marking	
TB1	The Beaumont	75	Section B	8	109	100	102	99	103	98	102	86	4	14	290	290	-57	3	55	46	48	45	49	44	48	32	
				7	109	100	102	99	103	98	102	86	4	14	326	326	-58	3	54	45	47	44	48	43	47	31	
				6	109	100	102	99	103	98	102	86	4	14	364	364	-59	3	53	44	46	43	47	42	46	30	
				5	109	100	102	99	103	98	102	86	4	14	402	402	-60	3	52	43	45	42	46	41	45	29	
LP1	Lohas Park - Tower 1	75	Section A	3	99	100	102	99	103	98	102	86	3	19	419	420	-60	3	42	43	45	42	45	41	45	29	
				2	109	100	102	99	103	98	102	86	3	19	458	458	-61	3	51	42	44	41	45	40	44	28	
				1	109	100	102	99	103	98	102	86	3	19	497	498	-62	3	50	41	43	40	44	39	43	27	
																					54	47	49	46	49	45	49
LP2	Lohas Park - Tower 9	75	Section A	8	109	100	102	99	103	98	102	86	3	21	341	341	-59	3	54	45	46	44	47	43	46	31	
				7	109	100	102	99	103	98	102	86	3	21	347	347	-59	3	53	44	46	43	47	42	46	30	
				6	109	100	102	99	103	98	102	86	3	21	359	360	-59	3	53	44	46	43	47	42	46	30	
																					58	49	51	48	52	47	51
CSS1	Creative Secondary School	70/65	Section B	13#	109	100	102	99	103	98	102	86	4	0	24	24	-36	3	77	68	69	67	70	66	69	54	
				14#	109	100	102	99	103	98	102	86	4	0	42	42	-40	3	72	63	65	62	65	61	65	49	
				15#	109	100	102	99	103	98	102	86	4	0	76	76	-46	3	67	58	59	57	60	56	59	44	
				16#	109	100	102	99	103	98	102	86	4	0	112	112	-49	3	63	54	56	53	57	52	56	40	
OS1	Oscar by the Sea - Tower 1	75	Section B															78	69	71	68	72	67	71	55		
				16	109	100	102	99	103	98	102	86	4	7	84	84	-46	3	66	57	58	56	59	55	59	43	
				17	109	100	102	99	103	98	102	86	4	7	87	87	-47	3	65	56	58	55	59	54	58	42	
				15	109	100	102	99	103	98	102	86	4	7	96	96	-48	3	65	56	57	55	58	54	57	42	
HMR1	Hemera - Topaz	75	Section B															71	62	64	61	65	60	64	48		
				5	109	100	102	99	103	98	102	86	4	32	34	47	-41	3	71	62	64	61	64	60	64	48	
				6	109	100	102	99	103	98	102	86	4	32	43	54	-43	3	70	61	62	60	63	59	62	47	
				4	109	100	102	99	103	98	102	86	4	32	61	69	-45	3	68	59	60	58	61	56	60	45	
STE1	Sheung Tak Estate	75	Section B															75	66	68	65	68	64	68	52		
				27	109	100	102	99	103	98	102	86	4	17	274	274	-57	3	56	47	48	46	49	44	48	33	
				28	109	100	102	99	103	98	102	86	4	17	275	276	-57	3	55	46	48	45	49	44	48	32	
				26	109	100	102	99	103	98	102	86	4	17	276	276	-57	3	55	46	48	45	49	44	48	32	
LSTPS1	Leung Sing Tak Primary School	70/65	Section B															61	52	54	51	55	50	54	38		
				24*	99	100	102	99	103	98	102	86	4	4	91	91	-47	3	55	56	58	55	59	54	58	42	
				25*	99	100	102	99	103	98	102	86	4	4	93	93	-47	3	55	56	58	55	58	54	58	42	
				23*	99	100	102	99	103	98	102	86	4	4	107	107	-49	3	53	55	56	54	57	53	56	41	
NFP1	Nan Fung Plaza	75	Section B															60	61	63	60	64	59	63	47		
				26*	99	100	102	99	103	98	102	86	4	16	63	65	-44	3	58	59	61	58	62	57	61	45	
				28*	99	100	102	99	103	98	102	86	4	16	74	75	-46	3	56	58	59	57	60	56	60	44	
				25*	99	100	102	99	103	98	102	86	4	16	77	79	-46	3	56	57	59	56	60	55	59	43	
KNH1	Kwong Ming Court - Kwong Ning House	75	Section B															62	64	65	63	66	61	65	50		
				31	109	100	102	99	103	98	102	86	4	1	250	250	-56	3	56	47	49	46	50	45	49	33	
				30	109	100	102	99	103	98	102	86	4	1	253	253	-56	3	56	47	49	46	50	45	49	33	
				32	109	100	102	99	103	98	102	86	4	1	253	253	-56	3	56	47	49	46	50	45	49	33	
CWKPS1	POH Chan Kwok Wai Primary School	70/65	Section B															62	53	55	52	56	51	55	39		
				35	109	100	102	99	103	98	102	86	4	1	293	293	-57	3	55	46	48	45	48	44	48	32	
				34	109	100	102	99	103	98	102	86	4	1	310	310	-58	3	54	45	47	44	48	43	47	31	
				33	109	100	102	99	103	98	102	86	4	1	327	327	-58	3	54	45	47	44	48	43	47	31	
HHCSC1	Haven of Hope Christian Service Chapel	75	Section c															60	51	53	50	54	49	53	37		
				36	109	100	102	99	103	98	102	86	4	14	196	197	-54	3	58	49	51	48	52	47	51	35	
				37	109	100	102	99	103	98	102	86	4	14	222	222	-55	3	57	48	50	47	51	46	50	34	
				39	109	100	102	99	103	98	102	86	4	14	238	238	-56	3	57	48	49	47	50	46	50	34	
OS2	Oscar by the Sea - Tower 8	75	Section B															64	55	56	54	57	53	56	41		
				11	109	100	102	99	103	98	102	86	4	19	41	45	-41	3	71	62	64	61	65	60	64	48	
				10	109	100	102	99	103	98	102	86	4	19	51	54	-43	3	70	61	62	60	63	59	62	47	
				12	109	100	102	99	103	98	102	86	4	19	65	67	-45	3	68	59	60	58	61	57	60	45	
																		66	57	58	56	59	55	58	43		
				9	109	100	102	99	103	98	102	86	4	19	84	86	-47	3	66	57	58	56	59	55	58	43	
																				75	66	68	65	69	64	68	52

Notes:

^Indicative arrangement and locations of workfronts are shown in Appendix 4E.

\* Noise Enclosure is adopted for the Saw/groover during the activity - sawcutting pavement at waterfront no. 23 to 29 (see Appendix 4E).

For construction work at workfront no. 13 - 16, individual activities with noise exceedance will be scheduled outside school hours/examination periods (see Section 4.8.3 of main text for details).

# Noise enclosure during sawcutting pavement at the workfront no.13-16 is not proposed as this noisy activity will be scheduled outside school hours (see above)

Appendix 4B: Construction Noise Calculation for Main laying (Trenching)

NSR ID	NSR Location	EIAO-TM Noise Criteria, dB(A)	Activity	Workfront^ (see footnotes and refer to Appendix 4E)	SWL, dB(A)										Predicted CNL, dB(A)												
					Sawcutting pavement	Breaking up of pavement	Excavation /Shoring	Pipe laying	Backfilling	Reinstatement (concrete)	Reinstatement (asphalt)	Painting of roading marking	Maximum No. of Workfront	Vertical distance from workfronts, m	Horizontal distance from workfronts, m	Distance from workfronts, m	Corr. For distance, dB(A)	Corr. For Façade, dB(A)	Sawcutting pavement	Breaking up of pavement	Excavation /Shoring	Pipe laying	Backfilling	Reinstatement (concrete)	Reinstatement (asphalt)	Painting of roading marking	
SBIS1	Shrewsbury International School	70/65	Section B	8	109	100	102	99	103	98	102	86	4	0	223	223	-55	3	57	48	50	47	51	46	50	34	
				7	109	100	102	99	103	98	102	86	4	0	259	259	-56	3	56	47	49	46	50	45	49	33	
				6	109	100	102	99	103	98	102	86	4	0	297	297	-57	3	55	46	48	45	48	44	48	48	32
				5	109	100	102	99	103	98	102	86	4	0	335	335	-59	3	54	45	46	44	47	43	47	47	31
PPS1	Papillons - Tower 1	75	Section B	40	109	100	102	99	103	98	102	86	4	4	189	189	-54	3	59	50	51	49	52	48	52	36	
				41	109	100	102	99	103	98	102	86	4	4	175	175	-53	3	59	50	52	49	53	48	52	36	
				42	109	100	102	99	103	98	102	86	4	4	169	169	-53	3	60	51	52	50	53	49	52	37	
				43	109	100	102	99	103	98	102	86	4	4	173	173	-53	3	60	51	52	50	53	48	52	37	
HHH1	Hope of Haven Hospital	75	Section C	45*	99	100	102	99	103	98	102	86	1	0	15	15	-32	3	70	72	73	71	74	70	74	58	
KLC2	King Ling College	70/65	Section C	49*	99	100	102	99	103	98	102	86	1	0	86	86	-47	3	55	57	58	56	59	55	58	43	
MWT1	Mau Wu Tsai Village	75	Section C	49*	99	100	102	99	103	98	102	86	1	0	16	16	-32	3	70	71	73	70	74	69	73	57	
MWT2	Mau Wu Tsai Village	75	Section C	51*	99	100	102	99	103	98	102	86	1	0	21	21	-34	3	68	69	71	68	71	67	71	55	
SCPS1	School of Continuing and Professional Studies - CUHK	70/65	Section C	54	109	100	102	99	103	98	102	86	1	0	198	198	-54	3	58	49	51	48	52	47	51	35	
TLE2	Tsui Lam Estate	75	Section C	54	109	100	102	99	103	98	102	86	1	0	120	120	-50	3	62	54	55	53	56	52	55	40	
YC1	Youth College (Tseung Kwan O)	70/65	Section C	54	109	100	102	99	103	98	102	86	1	0	90	90	-47	3	65	56	58	55	59	54	58	42	
HCMS1	Hong Chi Morninghill School Tsui Lam	70/65	Section C	52	109	100	102	99	103	98	102	86	1	0	66	66	-44	3	68	59	61	58	61	57	61	45	

Notes:

^Indicative arrangement and locations of workfronts are shown in Appendix 4E.

\* Noise Enclosure is adopted for the Saw/groover during the activity - sawcutting pavement at waterfront no. 44 to 51 (see Appendix 4E).

**APPENDIX 4C**  
**CONSTRUCTION NOISE CALCULATION FOR MAIN LAYING (PIPE JACKING)**

## Appendix 4C: Construction Noise Calculation for Main Laying (Pipe Jacking)

NSR ID	NSR Location	EIAO-TM Noise Criteria, dB(A)	Activity Description	SWL, dB(A)	Vertical distance from workfronts, m	Horizontal distance from workfronts, m	Distance from workfronts, m	Corr. For distance, dB(A)	Corr. For Façade, dB(A)	Predicted CNL, dB(A)
				Pipe jacking						Pipe jacking
TB1	The Beaumont	75	Section B	104	14	170	171	-53	3	54
LP1	Lohas Park - Tower 1	75	Section A	104	19	127	128	-50	3	57
LP2	Lohas Park - Tower 9	75	Section A	104	21	123	125	-50	3	57
CSS1	Creative Secondary School	70/65	Section B	104	0	31	31	-38	3	69
OS1	Oscar by the Sea - Tower 1	75	Section B	104	7	85	85	-47	3	60
HMR1	Hemera - Topaz	75	Section B	104	32	134	138	-51	3	56
STE1	Sheung Tak Estate	75	Section B	104	17	356	357	-59	3	48
LSTPS1	Leung Sing Tak Primary School	70/65	Section B	104	4	184	185	-53	3	54
NFP1	Nan Fung Plaza	75	Section B	104	16	273	274	-57	3	50
KNH1	Kwong Ming Court - Kwong Ning House	75	Section B	104	1	296	296	-57	3	50
CWKPS1	POH Chan Kwok Wai Primary School	70/65	Section B	104	1	284	284	-57	3	50
HHCSC1	Haven of Hope Christian Service Chapel	75	Section B	104	14	185	186	-53	3	54
OS2	Oscar by the Sea - Tower 8	75	Section B	104	19	125	126	-50	3	57
SBIS1	Shrewsbury International School	70/65	Section B	104	0	104	104	-48	3	59
PPS1	Papillons - Tower 1	75	Section B	104	4	573	573	-63	3	44
HHH1	Hope of Haven Hospital	75	Section C	104	12	70	71	-45	3	62
KLC2	King Ling College	70/65	Section C	104	0	107	107	-49	3	58
MWT1*	Mau Wu Tsai Village	75	Section C	104	0	93	93	-47	3	60
MWT2*	Mau Wu Tsai Village	75	Section C	104	0	20	20	-34	3	73
SCPS1	School of Continuing and Professional Studies - CUHK	70/65	Section C	104	0	700	700	-65	3	42
TLE2	Tsui Lam Estate	75	Section C	104	0	620	620	-64	3	43
YC1	Youth College (Tseung Kwan O)	70/65	Section C	104	0	531	531	-63	3	44
HCMS1	Hong Chi Morninghill School Tsui Lam	70/65	Section C	104	0	434	434	-61	3	46

Note:

\*Since the location of jacking pits is not confirmed, the noise impact from the closest potential workfront proposed by the engineer (as shown in Figure 4.2) has been assessed for these NSRs as worst case scenario.



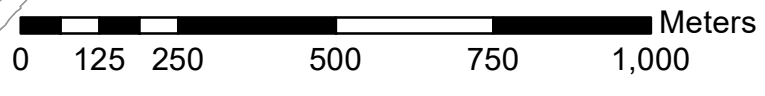
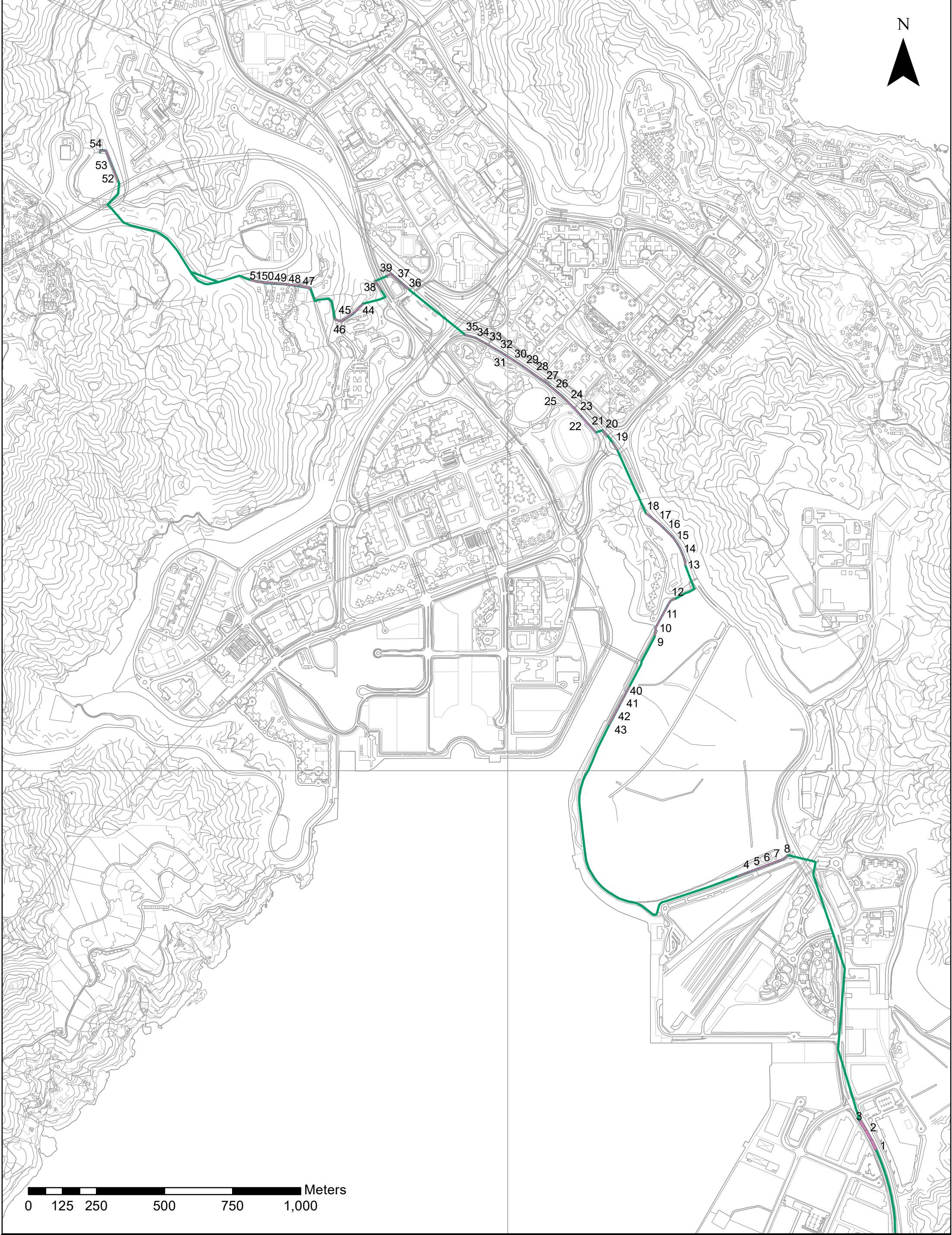
**APPENDIX 4D**  
**CUMULATIVE NOISE ASSESSMENT**



**APPENDIX 4E**  
**INDICATIVE ARRANGEMENT OF WORKFRONTS FOR NOISE ASSESSMENT**







Appendix 4E

Indicative Arrangement of Workfronts  
for Noise Assessment

Agreement No.  
CE 8/2015 (WS)

FIRST STAGE OF DESALINATION  
PLANT AT TSEUNG KWAN O -  
INVESTIGATION, DESIGN AND CONSTRUCTION



水務署  
Water Supplies  
Department

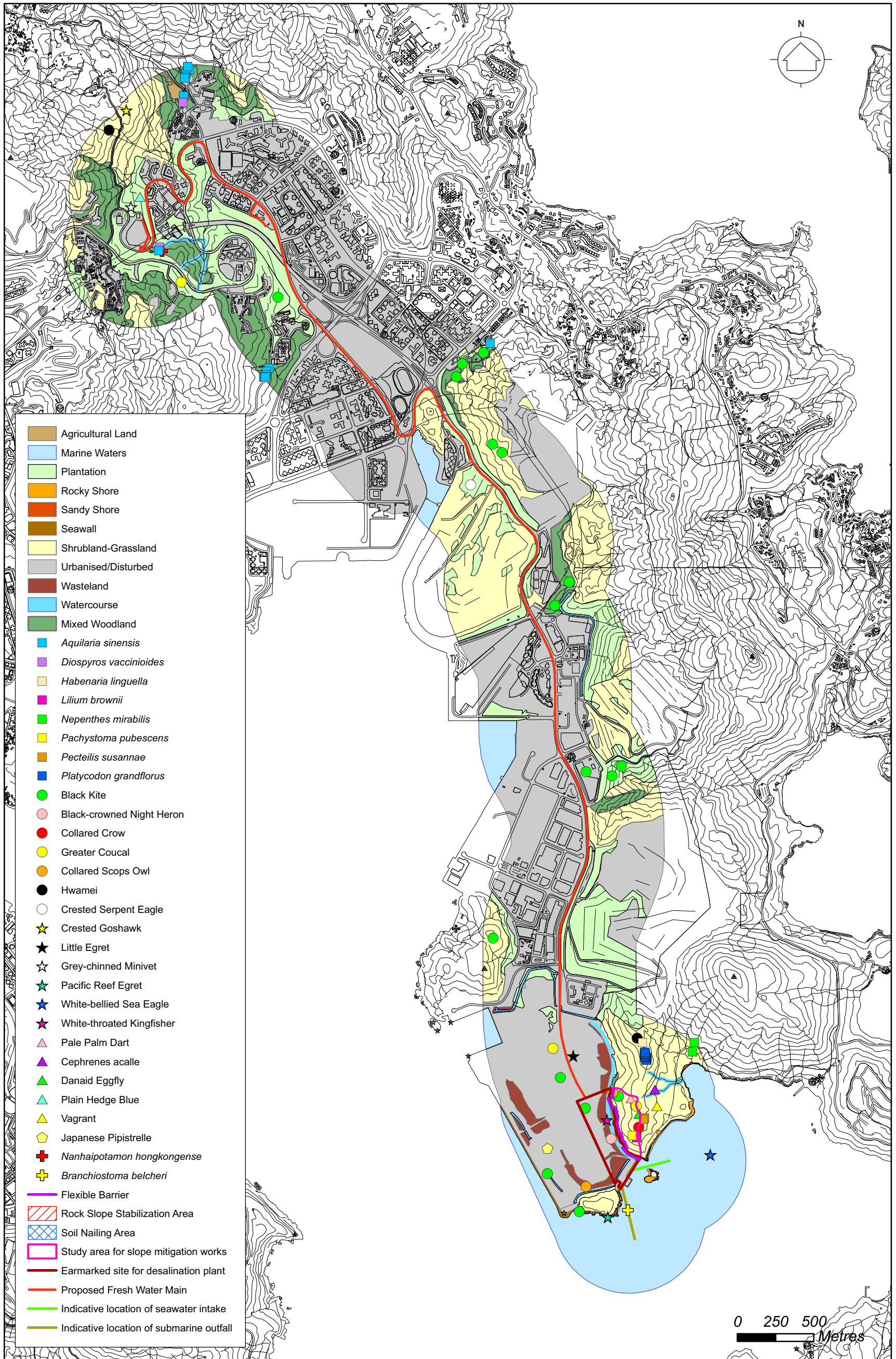


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**APPENDIX 7A**  
**ECOLOGICAL FINDINGS EXTRATED FROM EIA 2015**



HABITATS AND LOCATIONS OF SPECIES OF CONSERVATION IMPORTANCE (OVERVIEW)

水務署  
Water Supplies Department

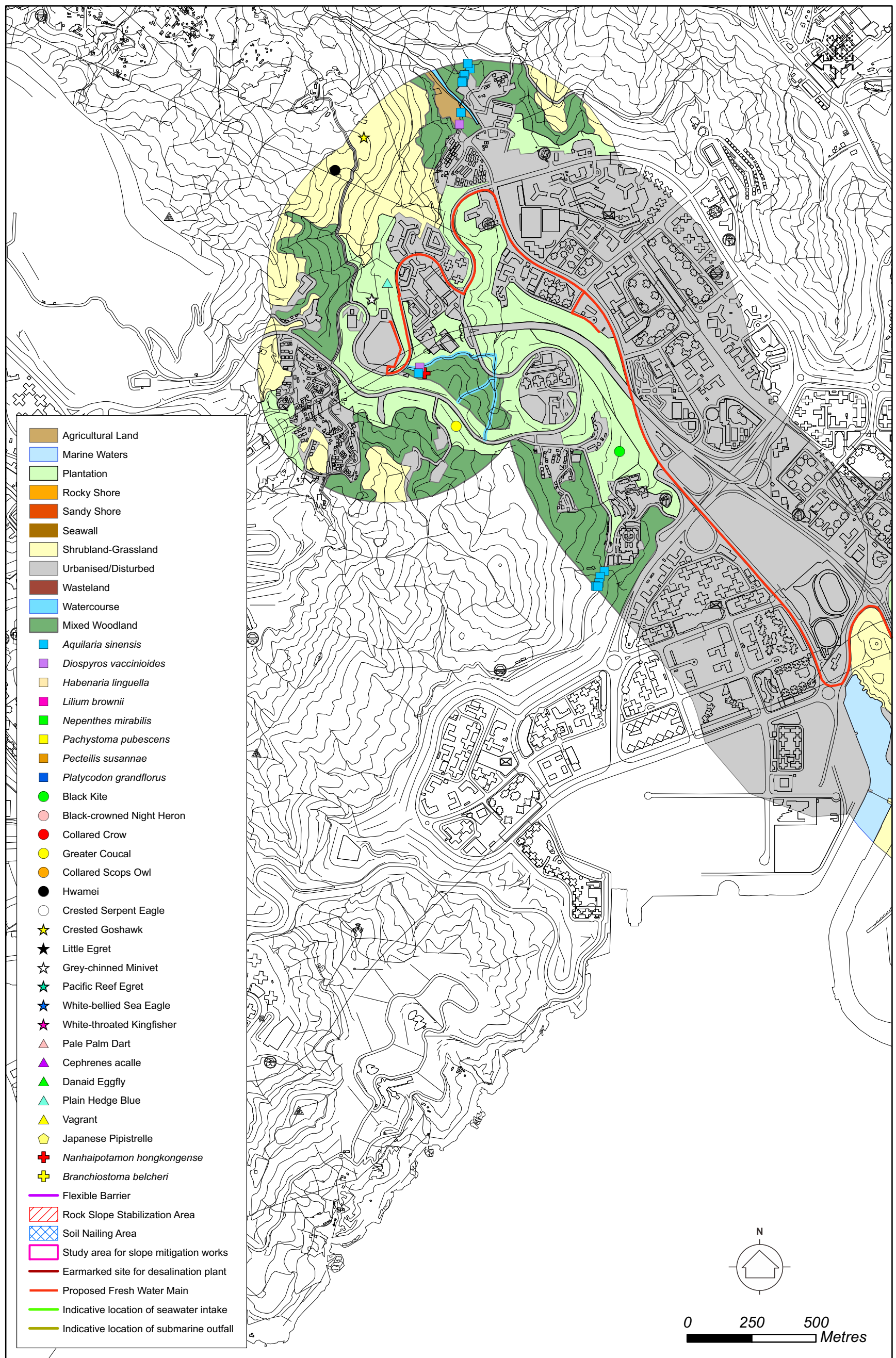
Drawing no.  
FIGURE 7a



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Prepared	Checked
Date	Scale





HABITATS AND LOCATIONS OF SPECIES OF CONSERVATION IMPORTANCE (CLOSE-UP)

水務署  
Water Supplies Department



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Drawing no.  
FIGURE 7b

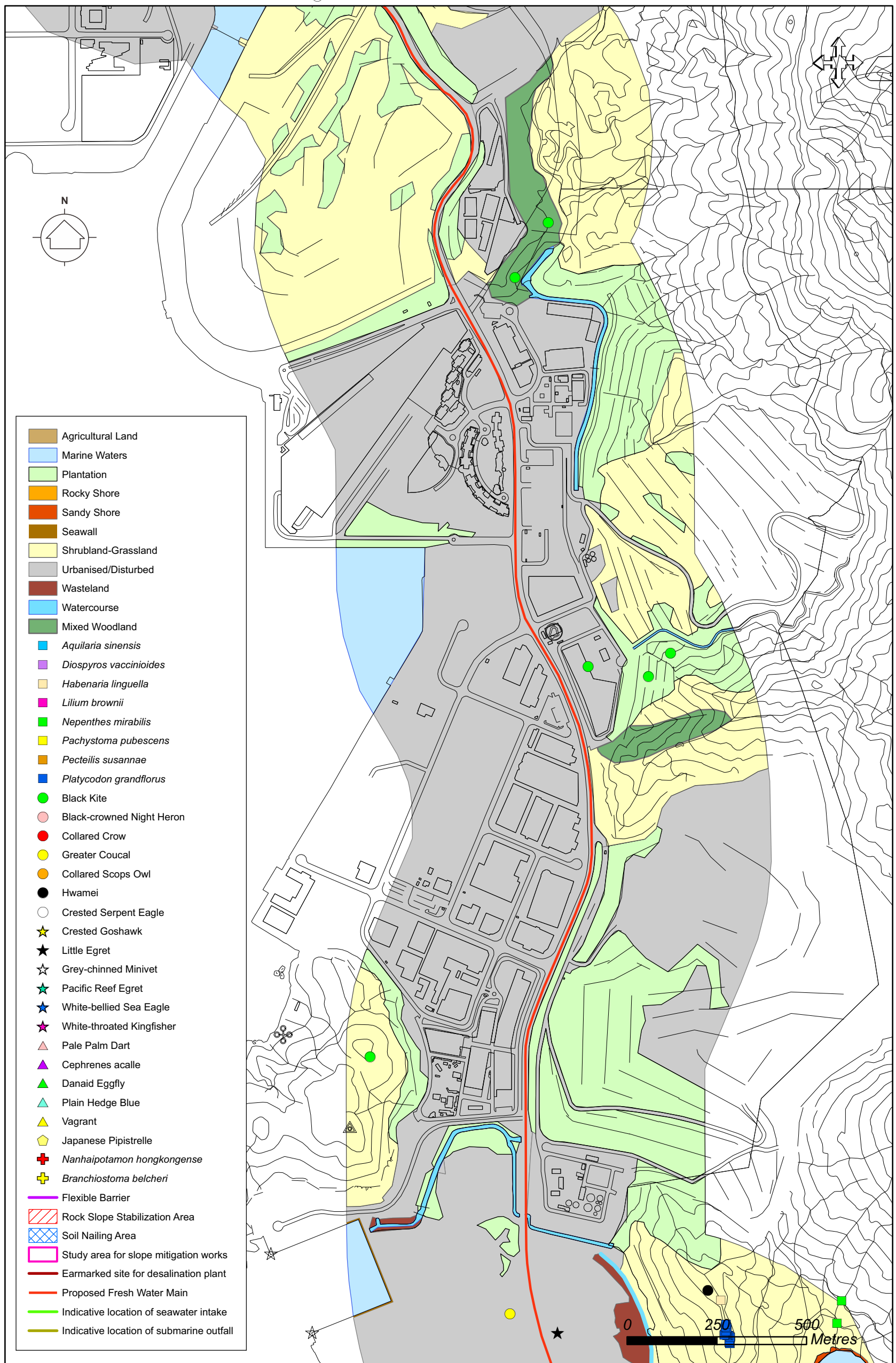
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Date

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HABITATS AND LOCATIONS OF SPECIES OF CONSERVATION IMPORTANCE (CLOSE-UP)

水務署  
Water Supplies Department

BLACK & VEATCH HONG KONG LIMITED  
博威工程顧問有限公司

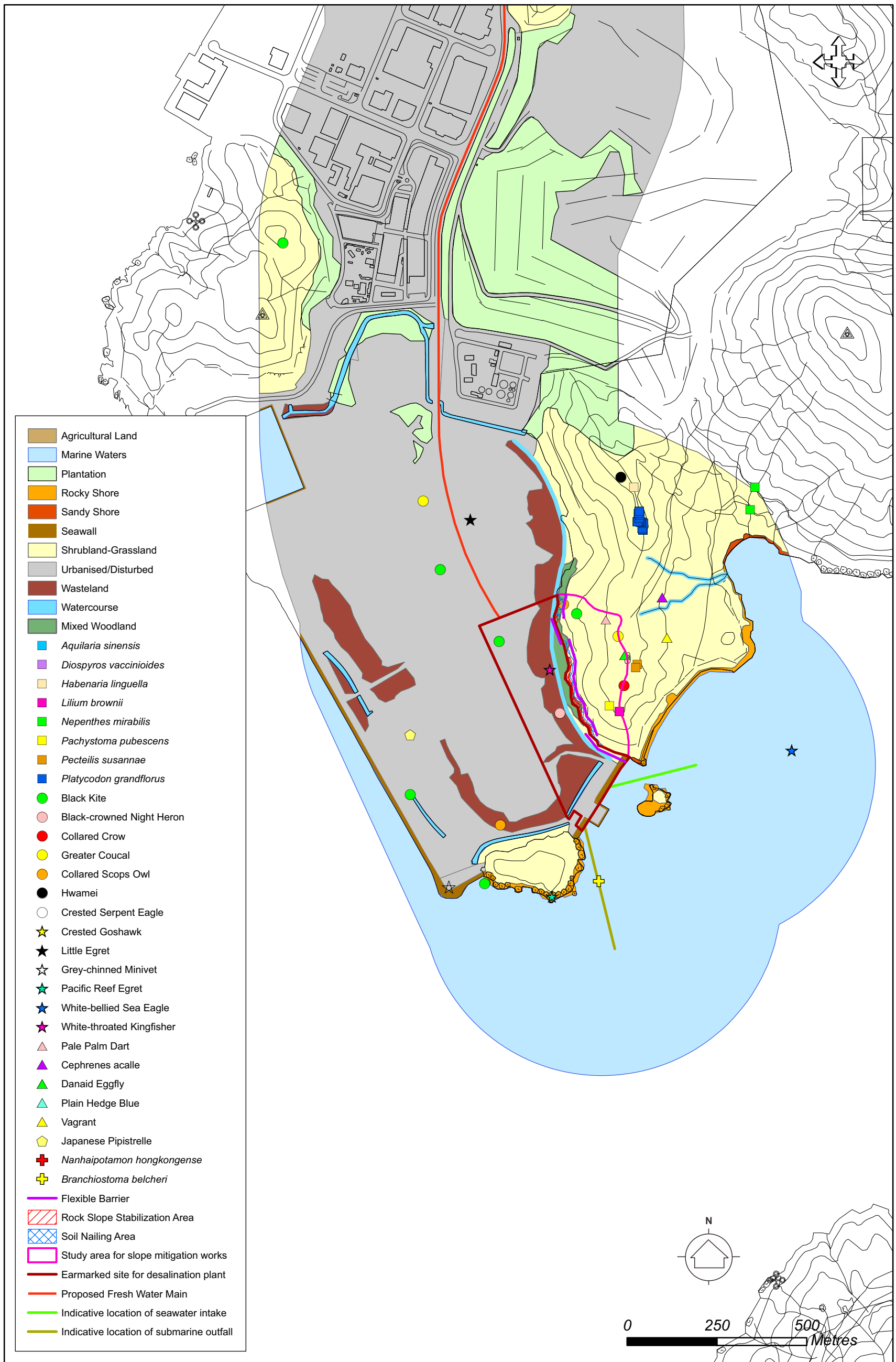
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FIGURE 7c

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Date

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HABITATS AND LOCATIONS OF SPECIES OF CONSERVATION IMPORTANCE (CLOSE-UP)

水務署  
Water Supplies Department

**BV**  
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Drawing no.  
FIGURE 7d

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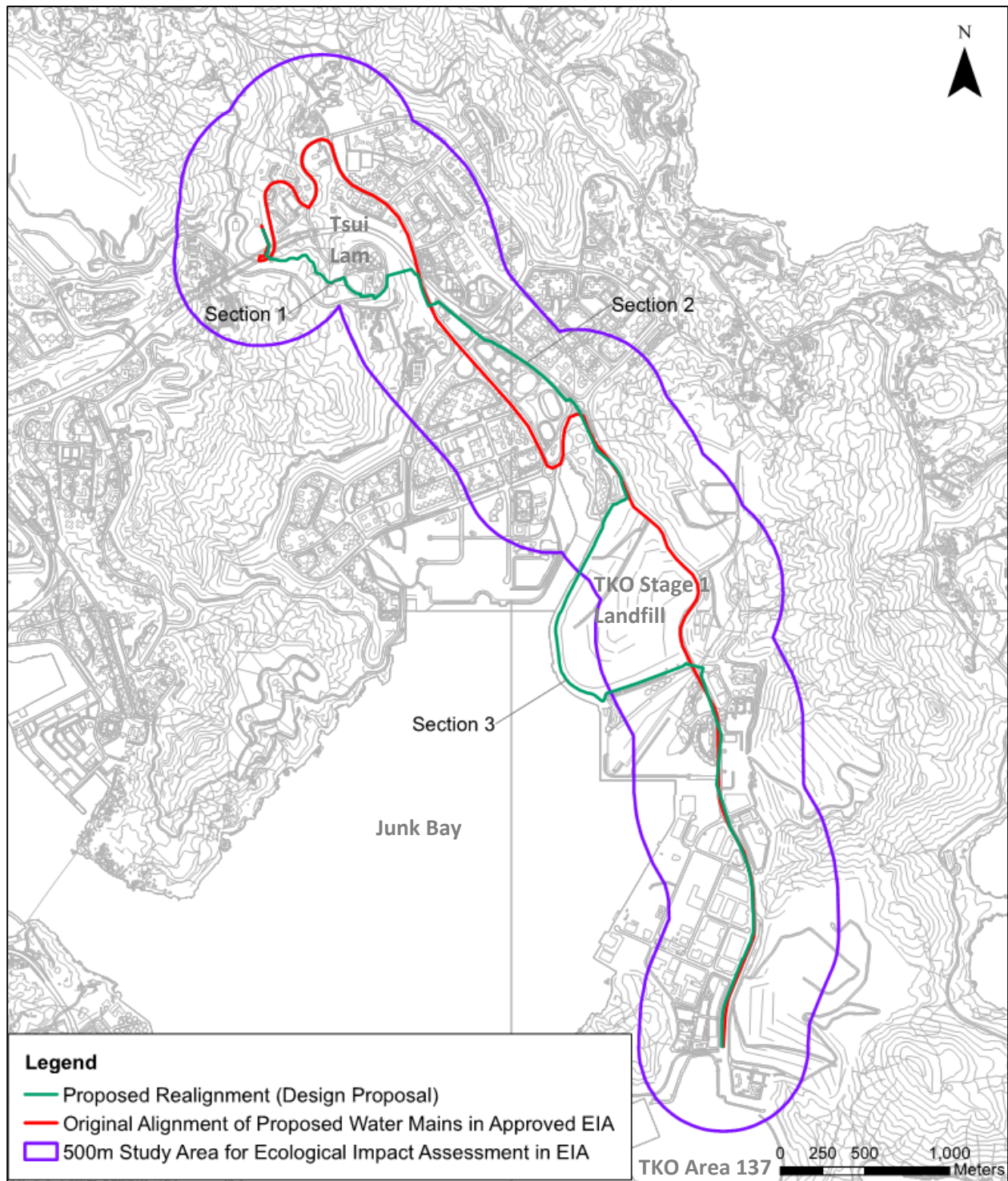
**APPENDIX 7B-1**  
**ECOLOGICAL SURVEY METHODOLOGY PAPER (FEBRUARY 2019)**



**CONSTRUCTION OF WATER MAINS  
FOR THE PROPOSED DESALINATION PLANT AT TSEUNG KWAN O  
Ecological Survey Methodology Paper**

**1 Background**

- 1.1 The Environmental Impact Assessment (EIA) Report for the project “Desalination Plant at Tseung Kwan O (TKO)” was approved on 4 November 2015 under the EIA Ordinance (EIAO) (Register No.: AEIAR-192/2015). The Project will involve the provision of a freshwater main along existing roads of Wan Po Road, Po Hong Road and Tsui Lam Road.
- 1.2 Since the proposed freshwater mains will be laid along existing roads / accesses in disturbed or urbanized areas, no ecological impact associated with the construction of the water mains was identified in the EIA Report.
- 1.3 The design of the proposed water mains has been reviewed under the detailed design stage (after the approval of the EIA study). Due to engineering constraints identified under the detailed design, realignment of three sections of the proposed water mains (Design Proposal) is recommended as shown in **Figure 1** below.
- 1.4 This paper presents the ecological survey methodology for the Design Proposal for agreement with the Agriculture, Fisheries and Conservation Department (AFCD).



*Figure 1: Location Plan of the Proposed Realignment*

## 2 Review of EIA Information

### Realigned Section 1

- 2.1 Realigned Section 1 starts from Tseung Kwan O Freshwater Primary Service Reservoir (TKOFPSR) near Tsui Lam Estate and is to be ended at the Po Hong Road on the West of Po Hong Park.

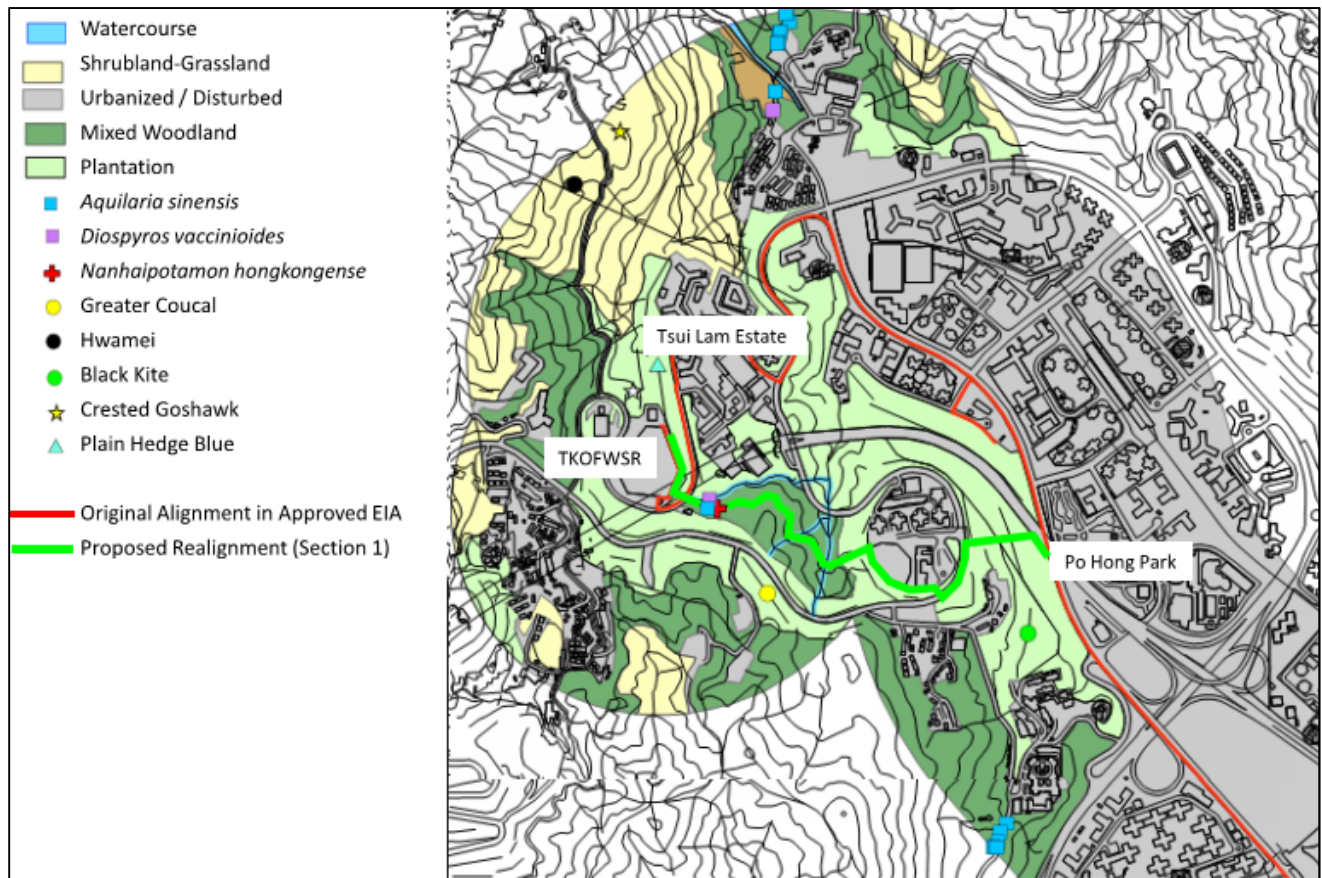


Figure 2: Habitats and Species of Conservation Importance extracted from the EIA – Section 1

2.2 As shown in **Figure 2**, the realigned Section 1 in Tsui Lam would be laid within the natural habitat between TKOFWSR and Po Hong Park. Although the direct impact zone (i.e. the construction works areas) of this realigned section is covered by the ecological survey area of the approved EIA, additional ecological survey is proposed for ecological impact assessment in view that this realigned section would no longer be laid along existing roads / accesses and would encounter a mixed woodland and three watercourses,

#### Realigned Section 2

2.3 Realigned Section 2 starts from the Po Hong Road near the Telephone Exchange and is to be ended at the junction of Wan Po Road and Chiu Shun Road.



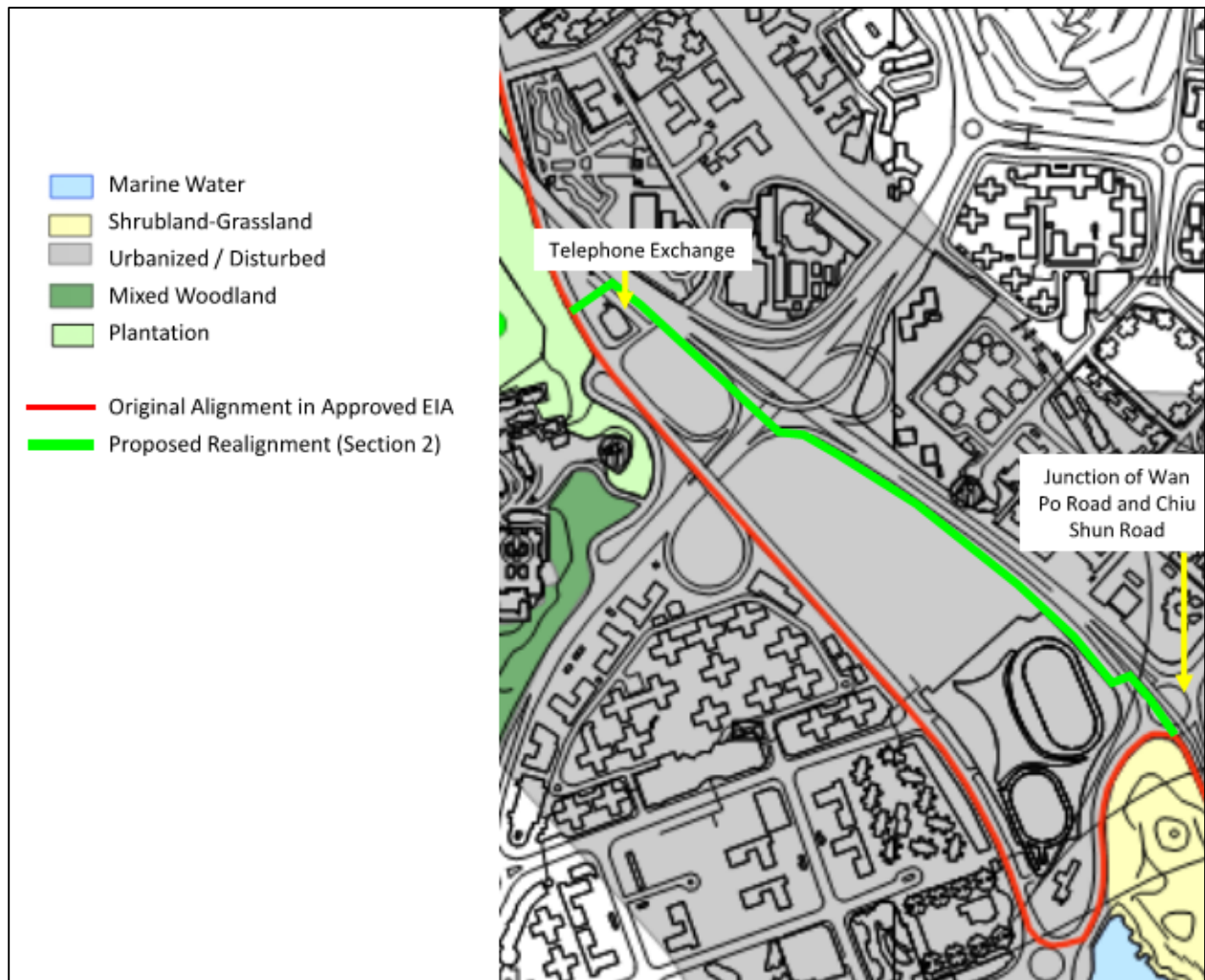


Figure 3: Habitat Map extracted from the EIA – Section 2

- 2.4 As shown in **Figure 3**, the whole section of the realigned Section 2 would be laid within disturbed / urbanized area. The water main laying is considered small in scale and similar to the EIA findings for the original water mains alignment, no ecological impact would be expected.

#### Realigned Section 3

- 2.5 The realigned Section 3 basically runs along the cycle track on the Tseung Kwan O South Waterfront Promenade located on the restored Tseung Kwan O Stage I Landfill. Although part of the section along the waterfront is outside the ecological assessment area of the EIA as shown in **Figure 4**, this waterfront section will be laid along the cycle track with very low ecological value as indicated in **Figure 5**.



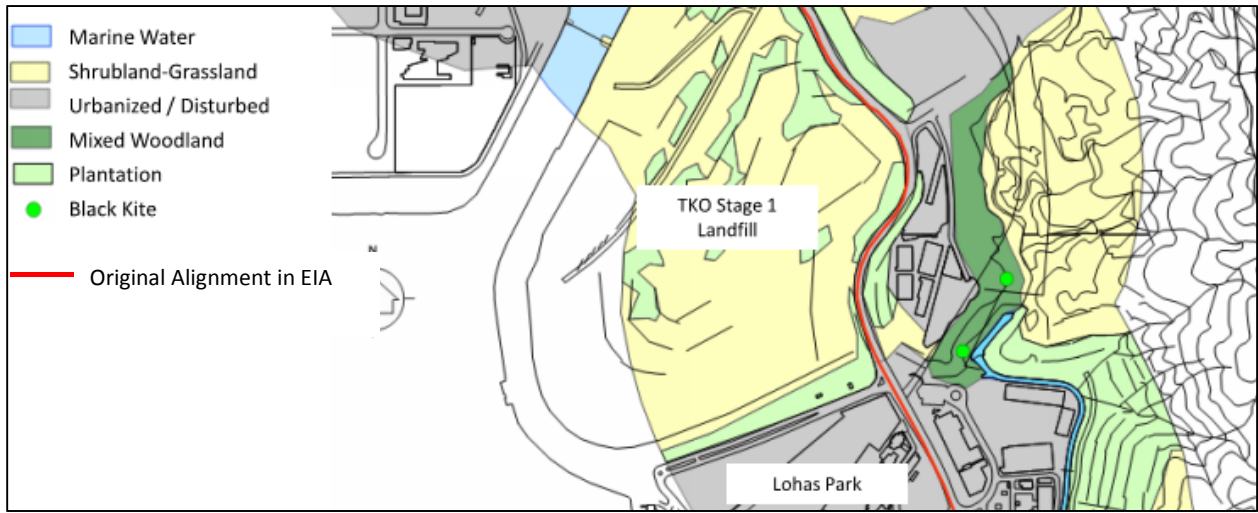


Figure 4: Habitat Map extracted from the EIA –Section 3

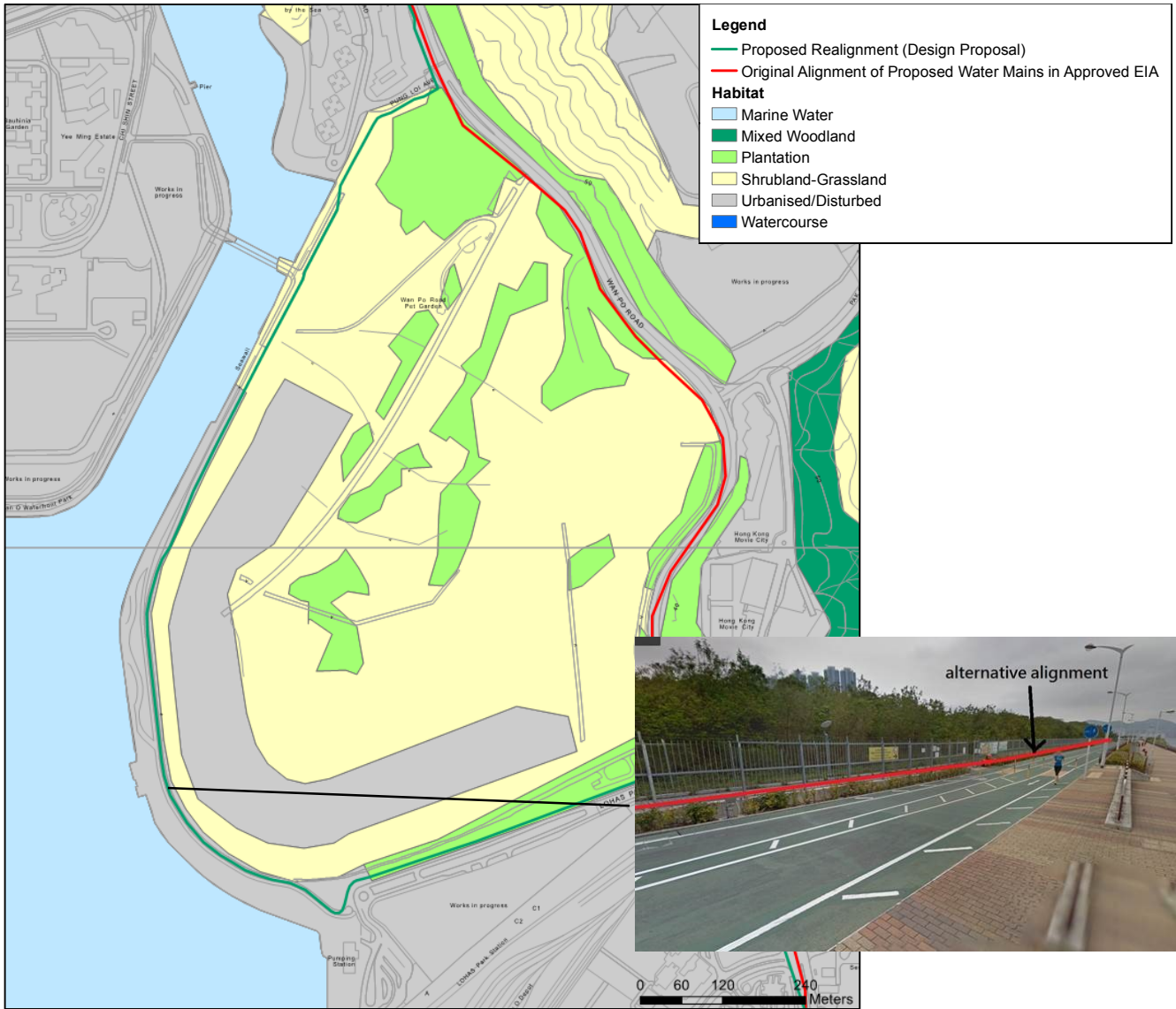


Figure 5: Updated Habitat surrounding Realigned Section 3

- 2.6 Similar to the findings of the EIA for the original alignment, ecological impact is not expected from this realignment within disturbed / developed land. Ecological survey is not proposed for the realigned Section 3.

### **3 Ecological Survey Methodology for Realigned Section 1**

- 3.1 The direct impact zone (or works areas) of the realigned Section 1 is covered by the ecological survey area of the approved EIA study. As the realigned Section 1 would run through mixed woodland and some watercourses, instead of urbanized areas in the original alignment, additional survey at these ecologically sensitive areas are recommended, which aims to verify and update the ecological conditions. As the proposed project works will be small in scale and the associated impact is expected to be localized, ecological survey beyond the EIA study area is not proposed.

#### Habitat and Vegetation Survey

- 3.2 Most updated aerial photos will be studied to update the habitat map of the approved EIA Report as shown in **Figure 2** above.
- 3.3 Ground truthing study will be conducted on-site to verify and delineate the habitat type that was identified or missing during the desktop study. All ecological resources within habitats will be recorded.
- 3.4 Vegetation surveys will be undertaken by conducting survey walks covering the whole area of each habitat as far as accessible and special attention will be paid on species of conservation importance and habitats within the proposed works area of the Project where the vegetation will be directly impacted.
- 3.5 All the flora species with their relative abundance will be recorded through visual observation during vegetation surveys. Nomenclature for plant species follows AFCD's online Hong Kong Plant Database ([http://www.herbarium.gov.hk/Search\\_Form.aspx](http://www.herbarium.gov.hk/Search_Form.aspx)).

#### Mammal Survey

- 3.6 Surveys of mammals will be conducted along proposed transects (**Figure 6**) by direct observation and active searching of traits such as scats, footprints and feeding signs within the proposed survey area during daytime and night surveys. All ad hoc records of sightings, tracks and sign of mammals will be identified and recorded. Bat surveys will be carried out by direct counting at potential roosting ground and foraging ground. Species, abundance and their feeding/foraging behaviours will be identified and recorded. Nomenclature for mammals follows *A Field Guide to the Terrestrial Mammals of Hong Kong* (Shek, 2006).

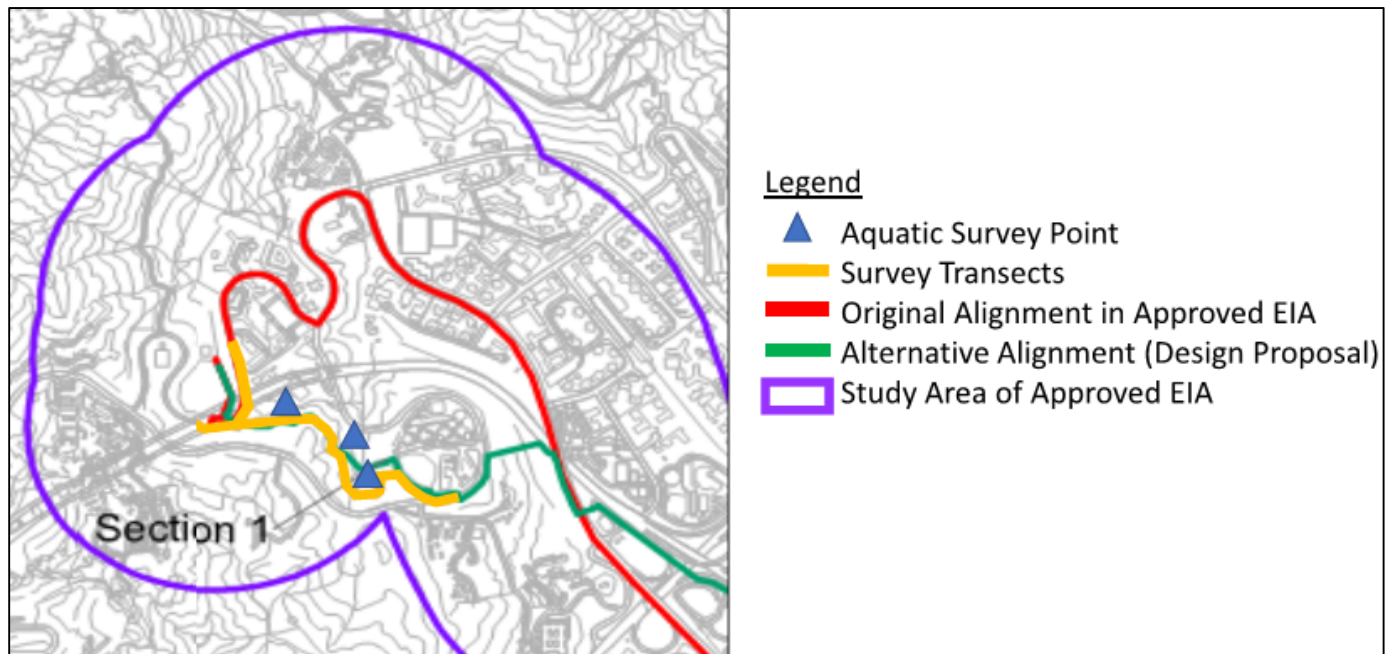


Figure 6: Proposed Survey Locations

#### Bird Survey

- 3.7 Birds communities along the proposed transects in **Figure 6** will be identified and counted with an aid of a pair of binoculars.
- 3.8 Bird surveys will be conducted at early morning to collect representative data for most of the bird species, while nighttime survey will be conducted for nocturnal birds. All birds seen or heard during the survey will be identified and counted. Ornithological nomenclature and status follow *The Avifauna of Hong Kong* (Carey et al., 2001).

#### Dragonflies and Butterflies Survey

- 3.9 Butterflies and dragonflies surveys will be carried out using the same transect routes as for the bird survey within the study area. All butterflies and dragonflies observed during the transect survey will be identified and counted with an aid of a pair of binoculars. Hand netting will be used for collecting specimens where it is necessary to confirm the species identification, and the live specimen will be released *in-situ* after identification.
- 3.10 Nomenclature, general distribution and status of dragonflies refer to *The Hong Kong Dragonflies* (Tam et al., 2011); those of butterflies follow *Hong Kong Butterflies* (Lo and Hui, 2005) and *A Review of the Local Restrictedness of Hong Kong Butterflies* (Chan et al., 2011).

#### Herpetofauna Survey

- 3.11 Surveys of herpetofauna will be conducted along the proposed transects through active searching and detection of the mating calls during daytime and nighttime surveys. Daytime surveys for herpetofauna will be carried out in line with mammal and insect surveys. Nighttime surveys will be carried out in wet season when this fauna group is more active. The Nomenclature to be used in this report for amphibians and reptiles follows *A Field Guide to the Amphibians of Hong Kong* (Chan et al., 2005) and *Hong Kong Amphibian and Reptiles* (Karsen et al., 1998) respectively.

### Aquatic Fauna Survey

- 3.12 The Aquatic fauna survey will include freshwater fish and stream invertebrates. Freshwater fish surveys will be conducted in wet season during their active stage at aquatic habitats.
- 3.13 Direct bank side counting will be adopted at vantage observation points for at least 10 minutes period. For aquatic habitats with deeper water, turbulent areas, turbid water or watercourse with dense riparian and aquatic vegetation, pot trapping and hand netting methods will be used for collecting sample for identification if safe access to the watercourse is available. Live specimens will be released *in-situ* after identification. Nomenclature of freshwater fishes follows Field Guide to the Freshwater Fish of Hong Kong (Lee et al., 2004).
- 3.14 Stream invertebrate surveys will also be conducted in line with the freshwater fish survey to search for insects, crabs, shrimps, snails and bivalves. As stated in above, survey method of direct counting and dip netting will only be adopted wherever safe access is possible.
- 3.15 Collected specimens will be identified to Family level or as far as possible, supplemented by morphospecies when necessary. Live specimens will be released *in-situ* after identification. Nomenclature of stream invertebrates follows *Hong Kong Field Guides 2: Hillstreams* (Dudgeon, 2003). Survey points for aquatic fauna survey are indicated in Figure 6.

### Proposed Survey Schedule

- 3.16 As the concerned area has already been covered by the recently completed EIA, an one-off survey in wet season is proposed for the purpose of the Ecological Review. Permission from AFCD will be acquired before undertaking the hand netting survey.
- 3.17 Further extension of the survey duration would be considered if significant changes in ecological baseline conditions are identified during the proposed additional survey and agreement will be made with AFCD before its implementation. The tentative schedules for habitat/vegetation surveys and fauna surveys are presented in **Table 3.1** and **3.2** respectively.

**Table 3.1: Tentative Schedule of Habitat and Vegetation Surveys**

Survey Time	2019
	APR
Habitat & Vegetation Survey	✓

✓ One-off survey in wet season

**Table 3.2: Tentative Schedule of Fauna Surveys**

Survey Time	Fauna Group	2019
		APR
Day Survey	Mammal	✓
	Bird	✓
	Herpetofauna	✓
	Butterfly & Dragonfly	✓
	Aquatic fauna	✓
Night Survey	Mammal	✓
	Birds	✓
	Herpetofauna	✓

✓ One-off survey in wet season

END OF TEXT

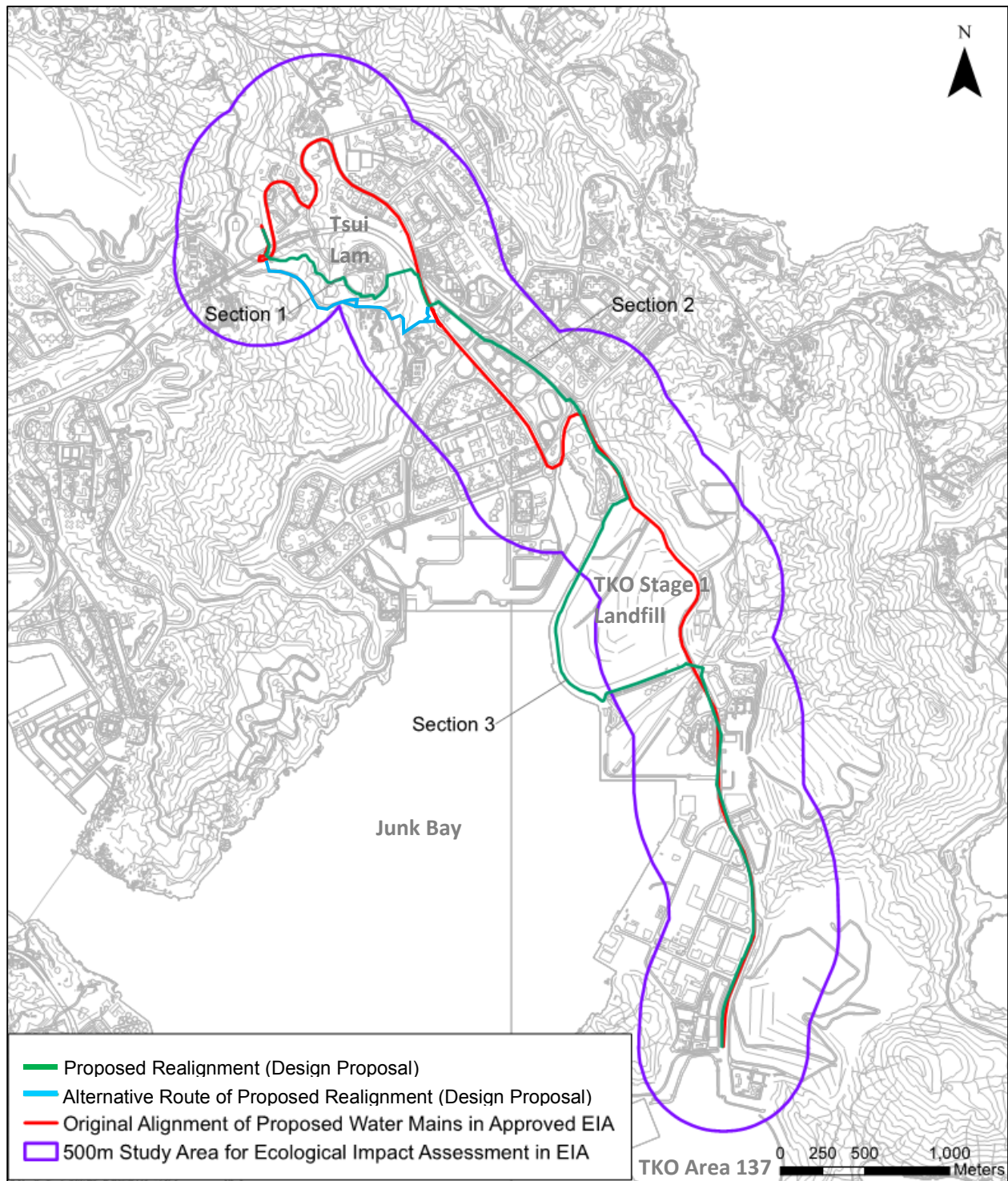


**APPENDIX 7B-2**  
**ECOLOGICAL SURVEY METHODOLOGY PAPER (JULY 2019)**

**CONSTRUCTION OF WATER MAINS  
FOR THE PROPOSED DESALINATION PLANT AT TSEUNG KWAN O  
Ecological Survey Methodology Paper**

**1 Background**

- 1.1 The Environmental Impact Assessment (EIA) Report for the project “Desalination Plant at Tseung Kwan O (TKO)” was approved on 4 November 2015 under the EIA Ordinance (EIAO) (Register No.: AEIAR-192/2015). The Project will involve the provision of a freshwater main along existing roads of Wan Po Road, Po Hong Road and Tsui Lam Road.
- 1.2 Since the proposed freshwater mains will be laid along existing roads / accesses in disturbed or urbanized areas, no ecological impact associated with the construction of the water mains was identified in the EIA Report.
- 1.3 The design of the proposed water mains has been reviewed under the detailed design stage (after the approval of the EIA study). Due to engineering constraints identified under the detailed design, realignment of three sections of the proposed water mains (Design Proposal) is recommended as shown in **Figure 1** below.
- 1.4 This paper presents the ecological survey methodology for the Design Proposal for agreement with the Agriculture, Fisheries and Conservation Department (AFCD).



**Figure 1: Location Plan of the Proposed Realignment**

## 2 Review of EIA Information

### Realigned Section 1

**2.1** Realigned Section 1 starts from Tseung Kwan O Freshwater Primary Service Reservoir (TKOFPSR) near Tsui Lam Estate and is to be ended at the Po Hong Road on the West of Po Hong Park. **Two alternative routes are being considered for the realigned Section 1.**

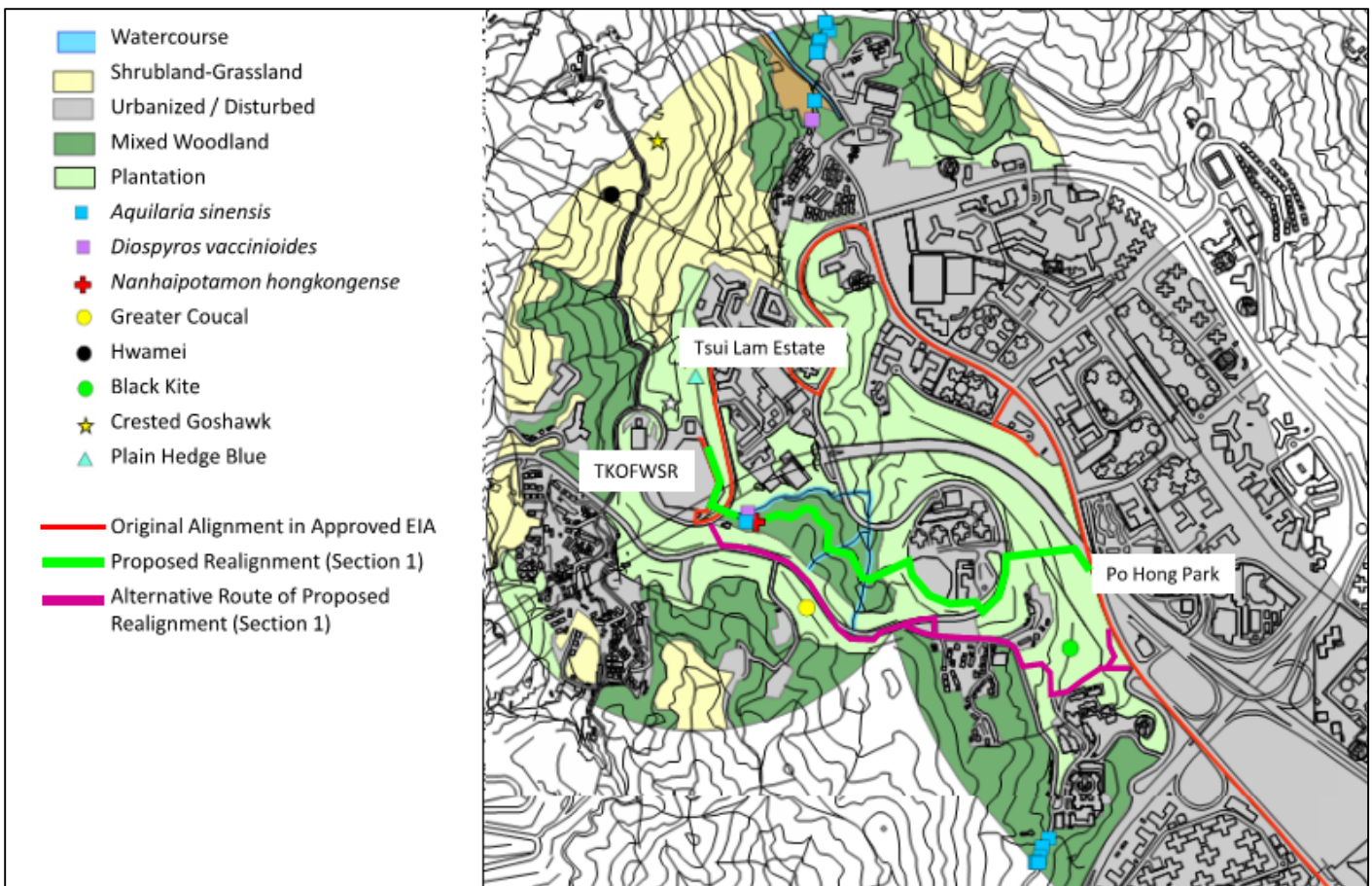


Figure 2: Habitats and Species of Conservation Importance extracted from the EIA – Section 1

2.2 As shown in **Figure 2**, the realigned Section 1 in Tsui Lam would be laid within the natural habitat between TKOFWSR and Po Hong Park. Although the direct impact zone (i.e. the construction works areas) of this realigned section is covered by the ecological survey area of the approved EIA, additional ecological survey is proposed for ecological impact assessment in view that this realigned section would no longer be laid along existing roads / accesses and would encounter a mixed woodland and three watercourses.

2.3 An alternative route of the proposed realignment is also being considered for Section 1. Three separate sections (in the eastern end, the middle and the western end) of this alternative route would encroach on the plantation habitat. The remaining sections of this alternative route would run through an existing road.

Realigned Section 2

2.4 Realigned Section 2 starts from the Po Hong Road near the Telephone Exchange and is to be ended at the junction of Wan Po Road and Chiu Shun Road.



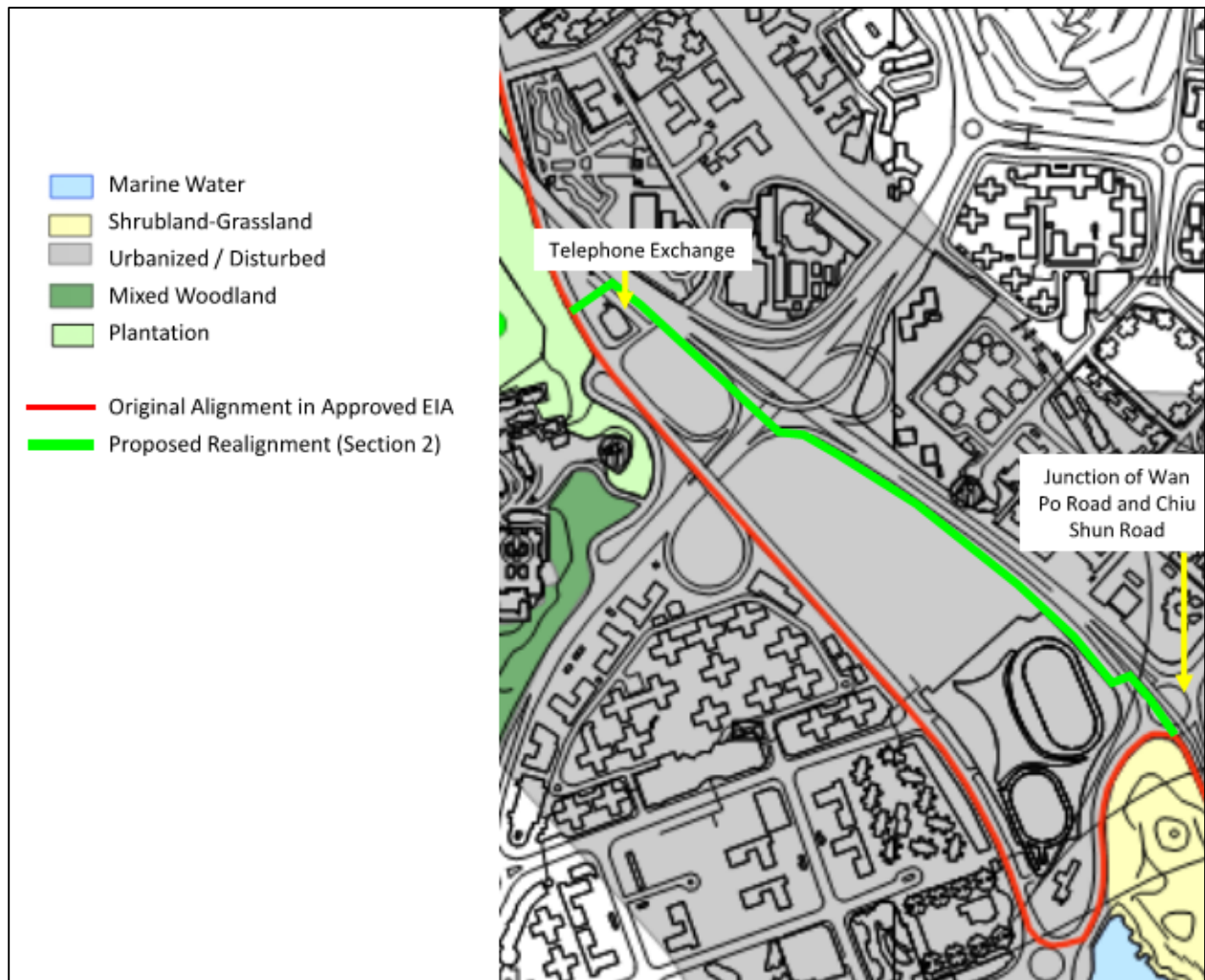


Figure 3: Habitat Map extracted from the EIA – Section 2

- 2.5 As shown in **Figure 3**, the whole section of the realigned Section 2 would be laid within disturbed / urbanized area. The water main laying is considered small in scale and similar to the EIA findings for the original water mains alignment, no ecological impact would be expected.

#### Realigned Section 3

- 2.6 The realigned Section 3 basically runs along the cycle track on the Tseung Kwan O South Waterfront Promenade located on the restored Tseung Kwan O Stage I Landfill. Although part of the section along the waterfront is outside the ecological assessment area of the EIA as shown in **Figure 4**, this waterfront section will be laid along the cycle track with very low ecological value as indicated in **Figure 5**.



Figure 4: Habitat Map extracted from the EIA –Section 3

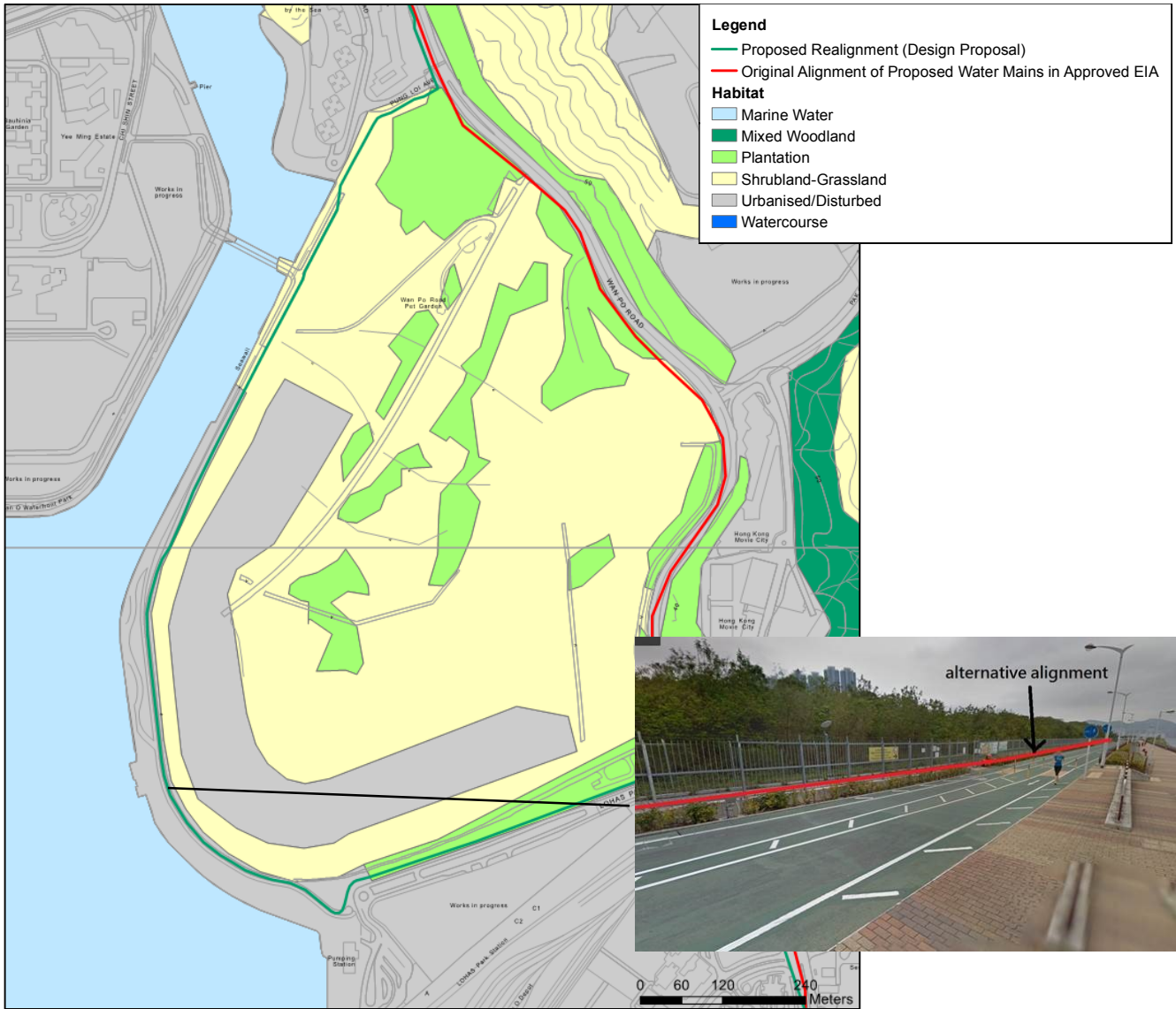


Figure 5: Updated Habitat surrounding Realigned Section 3

- 2.7 Similar to the findings of the EIA for the original alignment, ecological impact is not expected from this realignment within disturbed / developed land. Ecological survey is not proposed for the realigned Section 3.

### **3 Ecological Survey Methodology for Realigned Section 1**

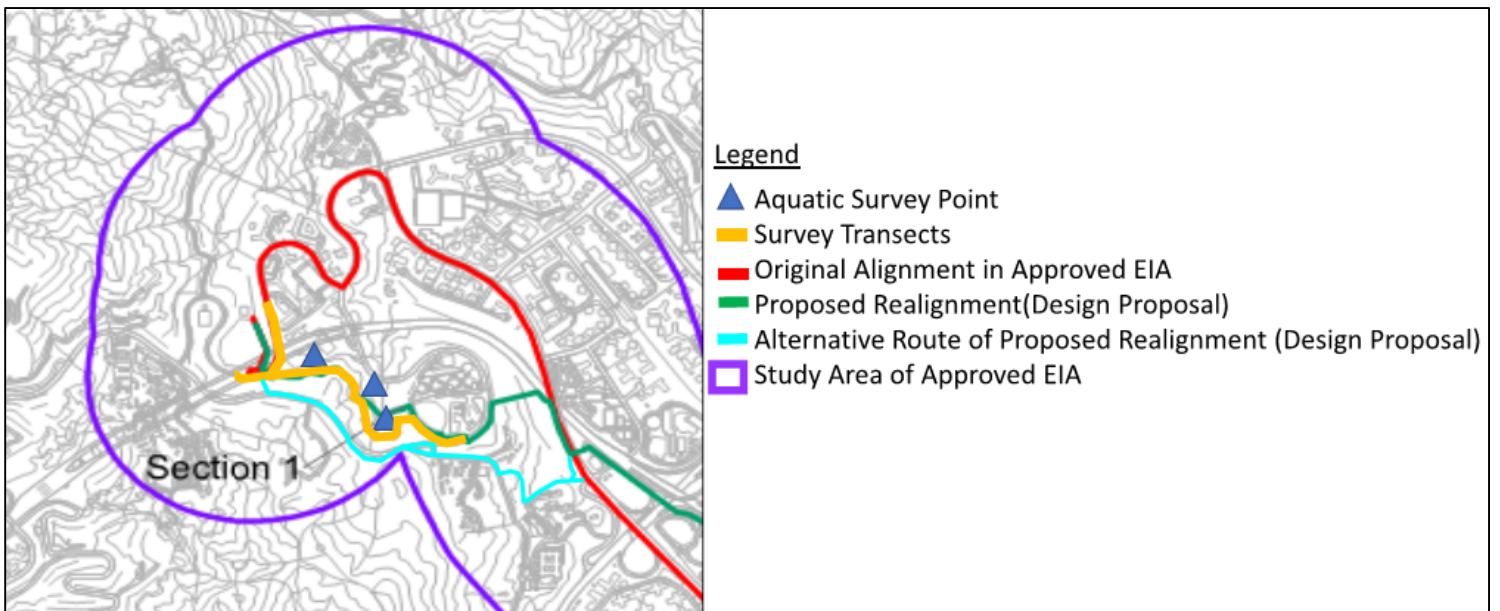
- 3.1 The direct impact zone (or works areas) of the realigned Section 1 is covered by the ecological survey area of the approved EIA study. As the realigned Section 1 would run through mixed woodland and some watercourses, instead of urbanized areas in the original alignment, additional survey at these ecologically sensitive areas are recommended, which aims to verify and update the ecological conditions. As the proposed project works will be small in scale and the associated impact is expected to be localized, ecological survey beyond the EIA study area is not proposed.

#### Habitat and Vegetation Survey

- 3.2 Most updated aerial photos will be studied to update the habitat map of the approved EIA Report as shown in **Figure 2** above.
- 3.3 Ground truthing study will be conducted on-site to verify and delineate the habitat type that was identified or missing during the desktop study. All ecological resources within habitats will be recorded.
- 3.4 Vegetation surveys will be undertaken by conducting survey walks covering the whole area of each habitat as far as accessible and special attention will be paid on species of conservation importance and habitats within the proposed works area of the Project where the vegetation will be directly impacted.
- 3.5 All the flora species with their relative abundance will be recorded through visual observation during vegetation surveys. Nomenclature for plant species follows AFCD's online Hong Kong Plant Database ([http://www.herbarium.gov.hk/Search\\_Form.aspx](http://www.herbarium.gov.hk/Search_Form.aspx)).

#### Mammal Survey

- 3.6 Surveys of mammals will be conducted along proposed transects (**Figure 6**) by direct observation and active searching of traits such as scats, footprints and feeding signs within the proposed survey area during daytime and night surveys. All ad hoc records of sightings, tracks and sign of mammals will be identified and recorded. Bat surveys will be carried out by direct counting at potential roosting ground and foraging ground. Species, abundance and their feeding/foraging behaviours will be identified and recorded. Nomenclature for mammals follows *A Field Guide to the Terrestrial Mammals of Hong Kong* (Shek, 2006).



**Figure 6: Proposed Survey Locations**

Bird Survey

- 3.7 Birds communities along the proposed transects in **Figure 6** will be identified and counted with an aid of a pair of binoculars.
- 3.8 Bird surveys will be conducted at early morning to collect representative data for most of the bird species, while nighttime survey will be conducted for nocturnal birds. All birds seen or heard during the survey will be identified and counted. Ornithological nomenclature and status follow *The Avifauna of Hong Kong* (Carey et al., 2001).

Dragonflies and Butterflies Survey

- 3.9 Butterflies and dragonflies surveys will be carried out using the same transect routes as for the bird survey within the study area. All butterflies and dragonflies observed during the transect survey will be identified and counted with an aid of a pair of binoculars. Hand netting will be used for collecting specimens where it is necessary to confirm the species identification, and the live specimen will be released *in-situ* after identification.
- 3.10 Nomenclature, general distribution and status of dragonflies refer to *The Hong Kong Dragonflies* (Tam et al., 2011); those of butterflies follow *Hong Kong Butterflies* (Lo and Hui, 2005) and *A Review of the Local Restrictedness of Hong Kong Butterflies* (Chan et al., 2011).

Herpetofauna Survey

- 3.11 Surveys of herpetofauna will be conducted along the proposed transects through active searching and detection of the mating calls during daytime and nighttime surveys. Daytime surveys for herpetofauna will be carried out in line with mammal and insect surveys. Nighttime surveys will be carried out in wet season when this fauna group is more active. The Nomenclature to be used in this report for amphibians and reptiles follows *A Field Guide to the Amphibians of Hong Kong* (Chan et al., 2005) and *Hong Kong Amphibian and Reptiles* (Karsen et al., 1998) respectively.



### Aquatic Fauna Survey

- 3.12 The Aquatic fauna survey will include freshwater fish and stream invertebrates. Freshwater fish surveys will be conducted in wet season during their active stage at aquatic habitats.
- 3.13 Direct bank side counting will be adopted at vantage observation points for at least 10 minutes period. For aquatic habitats with deeper water, turbulent areas, turbid water or watercourse with dense riparian and aquatic vegetation, pot trapping and hand netting methods will be used for collecting sample for identification if safe access to the watercourse is available. Live specimens will be released *in-situ* after identification. Nomenclature of freshwater fishes follows Field Guide to the Freshwater Fish of Hong Kong (Lee et al., 2004).
- 3.14 Stream invertebrate surveys will also be conducted in line with the freshwater fish survey to search for insects, crabs, shrimps, snails and bivalves. As stated in above, survey method of direct counting and dip netting will only be adopted wherever safe access is possible.
- 3.15 Collected specimens will be identified to Family level or as far as possible, supplemented by morphospecies when necessary. Live specimens will be released *in-situ* after identification. Nomenclature of stream invertebrates follows *Hong Kong Field Guides 2: Hillstreams* (Dudgeon, 2003). Survey points for aquatic fauna survey are indicated in Figure 6.

### Proposed Survey Schedule

- 3.16 As the concerned area has already been covered by the recently completed EIA, an one-off survey in wet season is proposed for the purpose of the Ecological Review. Permission from AFCD will be acquired before undertaking the hand netting survey.
- 3.17 Further extension of the survey duration would be considered if significant changes in ecological baseline conditions are identified during the proposed additional survey and agreement will be made with AFCD before its implementation. The tentative schedules for habitat/vegetation surveys and fauna surveys are presented in **Table 3.1** and **3.2** respectively.

**Table 3.1: Tentative Schedule of Habitat and Vegetation Surveys**

Survey Time	2019
	APR
Habitat & Vegetation Survey	✓

✓ One-off survey in wet season

**Table 3.2: Tentative Schedule of Fauna Surveys**

Survey Time	Fauna Group	2019
		APR
Day Survey	Mammal	✓
	Bird	✓
	Herpetofauna	✓
	Butterfly & Dragonfly	✓
	Aquatic fauna	✓
Night Survey	Mammal	✓
	Birds	✓
	Herpetofauna	✓

✓ One-off survey in wet season

**END OF TEXT**

**APPENDIX 7C**  
**PHOTOS**

# Appendix 7C - Photographic Records

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Table A Habitats






 A photograph showing a dense, lush green woodland with various tree species and undergrowth.	 A photograph of a paved road with a metal guardrail, bordered by a dense, uniform plantation of trees.
<p>Plate A1 Mixed Woodland</p>	<p>Plate A2 Plantation</p>
 A photograph of a field with a mix of tall grasses and shrubs, typical of a shrubland-grassland habitat.	 A photograph of a field with a large, rectangular structure covered in a fine mesh net, likely used for agricultural purposes.
<p>Plate A3 Shrubland-Grassland</p>	<p>Plate A4 Agricultural Land</p>
 A photograph of a rocky watercourse with a small stream flowing over the stones.	 A photograph of an urbanized area with buildings, a car, and a road, indicating a disturbed habitat.
<p>Plate A5 Watercourse</p>	<p>Plate A6 Urbanized /Disturbed</p>



## Appendix 7C - Photographic Records

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Table B Floral Species of Conservation Interest

	
<p>Plate B1 <i>Artocarpus hypargyreus</i></p>	<p>Plate B2 <i>Aquilaria sinensis</i></p>
	
<p>Plate B3 <i>Cibotium barometz</i></p>	<p>Plate B4 <i>Diospyros vaccinioides</i></p>
	
<p>Plate B5 <i>Pavetta hongkongensis</i></p>	



## Appendix 7C - Photographic Records

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Table C Faunal Species of Conservation Interest

	
Plate C1 Lesser Spiny Frog ( <i>Quasipaa exilispinosa</i> )	
	
Plate C2 Tadpole of Lesser Spiny Frog ( <i>Quasipaa exilispinosa</i> )	Plate C3 <i>Cryptopotamon anacoluthon</i>
	
Plate C4 <i>Nanhaipotamon hongkongense</i>	Plate C5 Blue-tailed Shadowdamsel ( <i>Drepanosticta hongkongensis</i> )

## Appendix 7C - Photographic Records

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**Table D Other Information**

 A photograph showing a section of a watercourse. A large, dark, cylindrical log is positioned horizontally across the stream, supported by several wooden planks. The water is shallow and flows over rocks and debris. The surrounding area is lush with green vegetation, including ferns and other plants.	
<p>Plate D1 The section of watercourse to be affected by option 1 of the preferred option alignment. It was not indicated as a separate habitat in previous EcoIA</p>	

## **APPENDIX 7D**

### **PLANT LIST**

# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Acacia auriculiformis</i>	No	T	-		+	+	+			+	++	
<i>Acacia confusa</i>	No	T	-	++	+	+++				+++	+++	
<i>Acacia mangium</i>	No	T	-								+	
<i>Acalypha wilkesiana</i>	No	S	-							+		
<i>Acorus gramineus</i>	Yes	H	-									
<i>Acronychia pedunculata</i>	Yes	T	-		++	++	++	+				
<i>Adiantum flabellulatum</i>	Yes	H	-		+	+		+				
<i>Adiantum philippense</i>	Yes	H	-			+						
<i>Adina pilulifera</i>	Yes	T, S	-			+		+				
<i>Adinandra millettii</i>	Yes	T, S	-				+					
<i>Agave angustifolia</i>	No	H	-							+		
<i>Aglaiia odorata</i>	No	S	-							+		
<i>Alangium chinense</i>	Yes	T	-	+	++	+++		+			+	
<i>Albizia lebbek</i>	No	T	-		+					+	+	
<i>Aleurites moluccana</i>	No	T	-		+	+					++	
<i>Allamanda cathartica</i>	No	S	-							++		
<i>Allium fistulosum</i>	No	H	-						+			Yes
<i>Alocasia macrorrhizos</i>	Yes	H	-	+	+	++					++	
<i>Alpinia officinarum</i>	Yes	H	-			+	++					
<i>Alpinia zerumbet</i>	Yes	H	-		+	+	+				+	
<i>Alternanthera philoxeroides</i>	No	H	-									
<i>Alternanthera sessilis</i>	Yes	H	-									
<i>Alyxia sinensis</i>	Yes	C	-		+	+	+	+				
<i>Ampelopsis heterophylla</i>	Yes	C	-				+					
<i>Antidesma ghaesembilla</i>	Yes	T, S	-				+					
<i>Antirhea chinensis</i>	Yes	S	-			+						Yes
<i>Aporosa dioica</i>	Yes	T	-	+	++	+++	++	+			++	
<i>Aquilaria sinensis</i>	Yes	T	C586, RP, I(VU)		+	+	+					
<i>Araucaria heterophylla</i>	No	T	-							+		
<i>Archidendron lucidum</i>	Yes	T	-		+	+						Yes
<i>Archidendron clypearia</i>	Yes	T	-			+						
<i>Archontophoenix alexandrae</i>	No	T	-							++		
<i>Ardisia crenata</i>	Yes	S	-		+	++						Yes
<i>Ardisia quinquegona</i>	Yes	S	-		+	+		+				
<i>Artocarpus heterophyllus</i>	No	T	-		+	+			++		+	
<i>Artocarpus hypargyreus</i>	Yes	T	RP, I(VU)		+	+						Yes



# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Arundinella setosa</i>	Yes	H	-				+++					
<i>Asparagus cochinchinensis</i>	Yes	C	-									
<i>Aster baccharoides</i>	Yes	H	-				++					
<i>Atalantia buxifolia</i>	Yes	S	-				+					
<i>Averrhoa carambola</i>	No	T	-									
<i>Baeckea frutescens</i>	Yes	S	-				+++					
<i>Bambusa sp.</i>	-	B	-								+	
<i>Bambusa vulgaris</i>	No	B	-			+				+		
<i>Bauhinia blakeana</i>	Yes	T	-		+					+++	+	
<i>Bauhinia championii</i>	Yes	C	-		+							
<i>Bauhinia purpurea</i>	No	T	-	+							+	
<i>Bauhinia variegata</i>	No	T	-		+					+++		
<i>Bidens alba</i>	No	H	-	+	+	++	++	++		+++	++	
<i>Bischofia javanica</i>	Yes	T	-		+	++					++	
<i>Blechnum orientale</i>	Yes	H	-	+	+	++	++	++				
<i>Boehmeria nivea</i>	No	S	-	+	+			++				
<i>Bombax ceiba</i>	No	T	-							++		
<i>Bougainvillea spectabilis</i>	No	S	-							++		
<i>Breynia fruticosa</i>	Yes	S	-	+	+	++	+++	+			++	
<i>Bridelia tomentosa</i>	Yes	T, S	-		++		+++	+		+	++	
<i>Brucea javanica</i>	Yes	S	-				+					
<i>Byttneria grandifolia</i>	Yes	C	-		+	+		+				
<i>Caesalpinia crista</i>	Yes	C	-		+	+						Yes
<i>Calliandra haematocephala</i>	No	S	-							++		
<i>Callistemon viminalis</i>	No	T	-		+							Yes
<i>Canarium pimela</i>	No	T	-		+	+						Yes
<i>Carica papaya</i>	No	T	-							+		
<i>Caryota mitis</i>	No	S	-		+					++	+	
<i>Caryota mitis</i>	No	S	-		+	+						Yes
<i>Cassia fistula</i>	No	T	-							++		
<i>Castanopsis fissa</i>	Yes	T	-		++	++	++				++	
<i>Casuarina equisetifolia</i>	No	T	-		+	++	++			++	+++	
<i>Cayratia corniculata</i>	Yes	C	-			+						
<i>Celastrus hindsii</i>	Yes	C	-		+	+		+				Yes
<i>Celtis sinensis</i>	Yes	T	-	+	+	+++	++	+	+	++	+++	
<i>Centella asiatica</i>	Yes	H	-		+	+	+	+	+			

# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Cerbera manghas</i>	Yes	T	-				+					
<i>Cheilosoria tenuifolia</i>	Yes	H	-				+					
<i>Chloris barbata</i>	Yes	H	-									
<i>Choerospondias axillaris</i>	Yes	T	-				+					
<i>Chukrasia tabularis</i>	No	T	-							+		
<i>Cibotium barometz</i>	Yes	H	C586, RP			+						Yes
<i>Cinnamomum burmannii</i>	Yes	T	-	+	+	+					+	Yes
<i>Cinnamomum camphora</i>	Yes	T	-	++	+	++		++		+++	+	
<i>Cinnamomum parthenoxylon</i>	Yes	T	-		+	++	+				++	
<i>Citrus maxima</i>	No	T	-						++	+		
<i>Clausena lansium</i>	No	T	-	+	+	+				+		
<i>Cleistocalyx nervosum</i>	Yes	T	-	+	+	+		++				
<i>Clerodendrum cyrtophyllum</i>	Yes	S	-		+	+						Yes
<i>Clerodendrum fortunatum</i>	Yes	S	-		+	+	+++	+				
<i>Clerodendrum inerme</i>	Yes	S	-									
<i>Clerodendrum japonicum</i>	No	S	-								++	
<i>Cocculus orbiculatus</i>	Yes	C	-		+						+	
<i>Colocasia esculenta</i>	No	H	-			+			+			
<i>Commelina communis</i>	Yes	H	-					+				
<i>Cordia dichotoma</i>	Yes	T	-		+							Yes
<i>Crateva unilocularis</i>	No	T	-							+		
<i>Cratogeomys cochinchinense</i>	Yes	T	-	++	+	+++	++					
<i>Cyclosorus parasiticus</i>	Yes	H	-		+	+		+			++	
<i>Cymbopogon goeringii</i>	Yes	H	-				+++					
<i>Cynodon dactylon</i>	Yes	H	-				++					
<i>Cyperus diffusus</i>	Yes	H	-				+					
<i>Cyperus involucratus</i>	No	H	-					+				
<i>Cyrtococcum patens</i>	Yes	H	-	+							++	
<i>Dalbergia benthamii</i>	Yes	C	-	+	+	+	++	+			+	
<i>Dalbergia hancei</i>	Yes	C	-				+++					
<i>Daphniphyllum calycinum</i>	Yes	S	-		+	+	++	+				
<i>Delonix regia</i>	No	T	-		+					++		
<i>Dendropanax proteus</i>	Yes	S	-				+					
<i>Desmodium heterocarpon</i>	Yes	H	-				+					
<i>Desmos chinensis</i>	Yes	S	-		++	+++		++				
<i>Dianella ensifolia</i>	Yes	H	-		+	+	+++					

# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Dicranopteris pedata</i>	Yes	H	-		+	+++	+++					
<i>Dimocarpus longan</i>	No	T	-	+	+	+		+	+	+	+	
<i>Diospyros eriantha</i>	Yes	S,T	-		+	+						Yes
<i>Diospyros vaccinioides</i>	Yes	S	I(CE)		++	+						
<i>Diplospora dubia</i>	Yes	S	-									
<i>Duhaldea cappa</i>	Yes	H	-				++					
<i>Duranta erecta</i>	No	S	-		+						++	
<i>Dyopsis lutescens</i>	No	S	-							++		
<i>Elaeocarpus balanse</i>	No	T	-							++		
<i>Elaeocarpus chinensis</i>	Yes	T, S	-		+	++		+				
<i>Elephantopus scaber</i>	Yes	H	-									
<i>Elephantopus tomentosus</i>	Yes	H	-	+			++					
<i>Eleusine indica</i>	Yes	H	-	+								
<i>Embelia laeta</i>	Yes	S	-				+					
<i>Emilia sonchifolia</i>	Yes	H	-				++					
<i>Epipremnum aureum</i>	No	C	-	+		++						
<i>Eriobotrya fragrans</i>	Yes	T, S	-									
<i>Eriosema chinense</i>	Yes	H	-				++					
<i>Erythrina variegata</i>	No	T	-							++		
<i>Eucalyptus citriodora</i>	No	T	-		+	+					++	
<i>Eucalyptus robusta</i>	No	T	-		++	++					++	
<i>Eucalyptus sp.</i>	No	T	-		++	++					++	
<i>Eucalyptus tereticornis</i>	No	T	-				++				++	
<i>Eurya nitida</i>	Yes	S	-			++					+	
<i>Evolvulus alsinoides</i>	Yes	H	-				+					
<i>Ficus benjamina</i>	No	T	-							+++		
<i>Ficus elastica</i>	No	T	-		+	+					++	
<i>Ficus hirta</i>	Yes	S	-		+		+++					
<i>Ficus hispida</i>	Yes	S	-	+	+	++		++		+	++	
<i>Ficus microcarpa</i>	Yes	T	-	+	++					+++	+++	
<i>Ficus subpisocarpa</i>	Yes	T	-									
<i>Ficus variegata</i>	Yes	T	-	+	+						+	
<i>Ficus variolosa</i>	Yes	S	-		+	++	++					
<i>Ficus virens</i>	Yes	T	-		+	++					+	
<i>Ficus fistulosa</i>	Yes	T	-		+	+		++				
<i>Gahnia tristis</i>	Yes	H	-		+	+	++	+				

# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Garcinia oblongifolia</i>	Yes	T	-		+	++		+			+	
<i>Garcinia subelliptica</i>	No	T	-							+		
<i>Gardenia jasminoides</i>	Yes	S	-		+	+	++					
<i>Glochidion eriocarpum</i>	Yes	S	-		+	++	++	+			++	
<i>Glochidion lanceolarium</i>	Yes	T	-		+	+	++				+	
<i>Glochidion wrightii</i>	Yes	S	-		+	+						Yes
<i>Gymnanthera oblonga</i>	Yes	C	-									
<i>Hedyotis uncinella</i>	Yes	H	-				++					
<i>Hedyotis hedyotideae</i>	Yes	C	-		+	+					++	
<i>Helicteres angustifolia</i>	Yes	S	-				++					
<i>Hibiscus rosa-sinensis</i>	No	S	-							++		
<i>Hibiscus tiliaceus</i>	Yes	T, S	-		+						+	Yes
<i>Homalium cochinchinense</i>	Yes	T	-									
<i>Hygrophila salicifolia</i>	Yes	H	-									
<i>Ilex asprella</i>	Yes	S	-	+	++	++	+++	+				
<i>Ilex pubescens</i>	Yes	S	-		++	+	+++	++			+	
<i>Imperata cylindrica</i>	Yes	H	-				+					
<i>Indocalamus sp.</i>	Yes	B	-		+	+	++					
<i>Ipomoea batatas</i>	No	C	-						+			Yes
<i>Ipomoea cairica</i>	No	C	-	+				+	++		++	
<i>Ipomoea triloba</i>	No	C	-			++			+			
<i>Ischaemum aristatum</i>	Yes	H	-				+++					
<i>Itea chinensis</i>	Yes	T	-		+	++	+++					
<i>Ixora chinensis</i>	Yes	S	-			+						
<i>Ixora stricta</i>	No	S	-							++		
<i>Juniperus chinensis</i>	No	T	-							+		
<i>Justicia gendarussa</i>	Yes	S	-		++			+				Yes
<i>Kalanchoe blossfeldiana</i>	No	H	-		+						+	Yes
<i>Kalanchoe pinnata</i>	No	H	-				+					
<i>Khaya senegalensis</i>	No	T	-		+							Yes
<i>Lagerstroemia speciosa</i>	No	T	-							+++		
<i>Lantana camara</i>	No	S	-	+		++				+	++	
<i>Lepidosperma chinense</i>	Yes	H	-				+++					
<i>Leucaena leucocephala</i>	No	T	-	+	+	++	++		+	++	++	
<i>Ligustrum sinense</i>	Yes	S	-	+	+	+++				+	++	
<i>Lindsaea orbiculata</i>	Yes	H	-		+							Yes



# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Liquidambar formosana</i>	Yes	T	-				+					
<i>Liriope spicata</i>	Yes	H	-		+	+		+				
<i>Litchi chinensis</i>	No	T	-			+						
<i>Litsea cubeba</i>	Yes	T	-			++	+++					
<i>Litsea glutinosa</i>	Yes	T	-	+	+	+++	++				+	
<i>Litsea monopetala</i>	Yes	T	-			++						
<i>Litsea rotundifolia</i>	Yes	S	-		++	++		++			++	
<i>Livistona chinensis</i>	No	T	-		+					++		
<i>Lophatherum gracile</i>	Yes	H	-	+	+	++					++	
<i>Lophostemon confertus</i>	No	T	-				++			++	+++	
<i>Loropetalum chinense</i>	No	S	-							+		
<i>Lygodium japonicum</i>	Yes	C	-	+	+	++		+				
<i>Macaranga tanarius</i>	Yes	T	-	+	++	++	++	++	+	+++	++	
<i>Machilus velutina</i>	Yes	T	-		+	+						
<i>Machilus chekiangensis</i>	Yes	T	-	+	++	++	+	+			+	
<i>Maesa perlaris</i>	Yes	S	-		+	++		+			+	
<i>Magnolia grandiflora</i>	No	T	-							+		
<i>Mallotus paniculatus</i>	Yes	T	-	+	++	++	+	++			+	
<i>Malvastrum coromandelianum</i>	Yes	S	-	+								Yes
<i>Mangifera indica</i>	No	T	-		+	+			++	+		
<i>Melaleuca cajuputi</i>	No	T	-		+	+				+++		
<i>Melastoma dodecandrum</i>	Yes	S	-				++					
<i>Melastoma sanguineum</i>	Yes	S	-	+	+	+	+++					
<i>Melia azedarach</i>	No	T	-		+					++	+	
<i>Melicope pteleifolia</i>	Yes	S	-		+	+						
<i>Melodinus suaveolens</i>	Yes	C	-			++	++					
<i>Michelia x alba</i>	No	T	-							++		
<i>Microcos nervosa</i>	Yes	S	-		++	+++	+	+				
<i>Microstegium ciliatum</i>	Yes	H	-	+	+	++	+	++	+++		++	
<i>Mikania micrantha</i>	No	C	-	++	++	++	+	++	++	+++	++	
<i>Millettia nitida</i>	Yes	C	-		+	+	+					
<i>Millettia speciosa</i>	Yes	C	-				++					
<i>Mimosa pudica</i>	No	H	-				+					
<i>Miscanthus floridulus</i>	Yes	H	-	+	+	++	++		+			
<i>Miscanthus sinensis</i>	Yes	H	-			++	+++					
<i>Morella rubra</i>	Yes	T	-				++					

# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Morinda parvifolia</i>	Yes	C	-				++					
<i>Morinda umbellata</i>	Yes	C	-				+					
<i>Morus alba</i>	No	T	-						++			
<i>Murraya paniculata</i>	No	S	-	+	+	+				+	+	
<i>Musa x paradisiaca</i>	No	H	-					+	+	+	+	
<i>Mussaenda erosa</i>	Yes	C	-			+						
<i>Mussaenda pubescens</i>	Yes	C	-		+	+	+	+				
<i>Nephrolepis auriculata</i>	Yes	H	-								+	
<i>Neyraudia reynaudiana</i>	Yes	H	-				+++	++	+			
<i>Ophiopogon jaburan</i>	No	H	-		+							Yes
<i>Osbeckia chinensis</i>	Yes	H	-				+					
<i>Osmunda vachellii</i>	Yes	H	-				+					
<i>Oxalis debilis</i>	No	H	-	+	+		+		+	+	+	
<i>Oxalis corniculata</i>	Yes	H	-							+	+	
<i>Paederia scandens</i>	Yes	C	-	+	+		++		++	+	+	
<i>Palhinhaea cernua</i>	Yes	H	-				+					
<i>Pandanus sp.</i>	Yes	H	-			+						
<i>Pandanus tectorius</i>	Yes	S	-				+					
<i>Panicum brevifolium</i>	Yes	H	-		+						+	Yes
<i>Panicum maximum</i>	No	H	-	++	++		+	+	++	+++	++	
<i>Panicum repens</i>	Yes	H	-					+				
<i>Parthenocissus dalzielii</i>	No	C	-	+			+				+	
<i>Passiflora foetida</i>	No	C	-				+					
<i>Passiflora suberosa</i>	No	C	-		+					+	+	Yes
<i>Pavetta hongkongensis</i>	Yes	S	C96			+						Yes
<i>Pennisetum polystachion</i>	No	H	-				+					
<i>Pennisetum purpureum</i>	Yes	H	-					+	+		+	
<i>Pericampylus glaucus</i>	Yes	C	-	+								Yes
<i>Perilla frutescens</i>	No	H	-			+						
<i>Persicaria chinensis</i>	Yes	C	-		+				++			Yes
<i>Philodendron selloum</i>	No	H	-		+					+		Yes
<i>Phoenix loureiroi</i>	Yes	S	-				++					
<i>Phyllanthus cochinchinensis</i>	Yes	S	-			++	+++					
<i>Phyllanthus emblica</i>	Yes	T, S	-				++					
<i>Phyllanthus reticulatus</i>	Yes	S	-	+	+							Yes
<i>Phyllodium pulchellum</i>	Yes	S	-				++					

# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Plumeria rubra</i>	No	T	-							++		
<i>Podocarpus macrophyllus</i>	Yes	T	-		+					+		
<i>Polyspora axillaris</i>	Yes	T, S	-		+		+++				+	Yes
<i>Pothos chinensis</i>	Yes	C	-			+						Yes
<i>Pronephrium simplex</i>	Yes	H	-			+						Yes
<i>Psidium guajava</i>	No	T	-						++			
<i>Psychotria asiatica</i>	Yes	S	-	++	++	+++	+++	+			+	
<i>Psychotria serpens</i>	Yes	C	-				++					
<i>Pteridium aquilinum</i>	Yes	H	-				+					
<i>Pteris biaurita</i>	Yes	H	-			+						
<i>Pteris fauriei</i>	Yes	H	-	+	+			+				Yes
<i>Pteris semipinnata</i>	Yes	H	-		+	+		+			++	
<i>Pueraria phaseoloides</i>	Yes	C	-	+	+	+	++		+			
<i>Pyrrosia adnascens</i>	Yes	H	-			+						
<i>Reevesia thyrsoides</i>	Yes	T	-		+	+						
<i>Rhaphiolepis indica</i>	Yes	S	-		+		+++					
<i>Rhapis excelsa</i>	No	S	-				+					
<i>Rhododendron pulchrum</i>	No	S	-							++		
<i>Rhodomyrtus tomentosa</i>	Yes	S	-				+++					
<i>Rhus hypoleuca</i>	Yes	T, S	-				+					
<i>Rhus succedanea</i>	Yes	T, S	-		+	++	++					
<i>Rhynchospora rubra</i>	Yes	H	-				+					
<i>Rourea minor</i>	Yes	C	-		+	+						Yes
<i>Roystonea regia</i>	No	T	-							++		
<i>Rubus parvifolius</i>	Yes	C	-				+					
<i>Rubus reflexus</i>	Yes	S	-	+	+	++					+	
<i>Sageretia thea</i>	Yes	S	-	+								Yes
<i>Sansevieria trifasciata</i>	No	H	-							+		
<i>Sapindus saponaria</i>	Yes	T	-								+	Yes
<i>Sapium discolor</i>	Yes	T	-		+	++	++				+	
<i>Sapium sebiferum</i>	Yes	T	-				+					
<i>Sarcandra glabra</i>	Yes	S	-		+		+					
<i>Schefflera arboricola</i>	No	S	-							+++		
<i>Schefflera heptaphylla</i>	Yes	T	-	++	++	+++	++	+			+	
<i>Schima superba</i>	Yes	T	-		++	++		+				
<i>Scleria ciliaris</i>	Yes	H	-	+	+	+					+	Yes

# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Scolopia chinensis</i>	Yes	T, S	-			+						Yes
<i>Scoparia dulcis</i>	No	H	-					+				
<i>Scutellaria indica</i>	Yes	H	-				+					
<i>Senna siamea</i>	No	T	-							++		
<i>Senna surattensis</i>	No	T	-							++		
<i>Setaria geniculata</i>	Yes	H	-				+					
<i>Sida rhombifolia</i>	Yes	S	-	+	+							Yes
<i>Smilax china</i>	Yes	C	-				++					
<i>Smilax glabra</i>	Yes	C	-				+					
<i>Solanum nigrum</i>	Yes	H	-				+					
<i>Solanum torvum</i>	No	S	-		+					+		
<i>Sonchus arvensis</i>	Yes	H	-				+					
<i>Spermacoce stricta</i>	Yes	H	-	+								Yes
<i>Sporobolus fertilis</i>	Yes	H	-	+	+				+			Yes
<i>Stachytarpheta jamaicensis</i>	No	S	-		+		+				+	
<i>Sterculia lanceolata</i>	Yes	T	-	+	++	+++	++	++			++	
<i>Strophanthus divaricatus</i>	Yes	C	-	+	+		++					
<i>Symplocos glauca</i>	Yes	T	-		+	+	+	+				
<i>Symplocos lancifolia</i>	Yes	T	-			+						
<i>Syzygium hancei</i>	Yes	T	-			+						
<i>Syzygium jambos</i>	No	T	-	+	+	++		+			++	
<i>Syzygium levinei</i>	Yes	T	-			+						
<i>Tadehagi triquetrum</i>	Yes	S	-				++					
<i>Tetracera asiatica</i>	Yes	C	-			++	+					
<i>Tetradium glabrifolium</i>	Yes	T	-			++						
<i>Thunbergia grandiflora</i>	No	C	-		+							Yes
<i>Tradescantia spathacea</i>	No	H	-							+		
<i>Trema orientalis</i>	Yes	T	-				+					
<i>Tridax procumbens</i>	No	H	-						+			
<i>Tylophora ovata</i>	Yes	C	-	+	+	+	++					
<i>Uraria crinita</i>	Yes	H	-				+					
<i>Uvaria macrophylla</i>	Yes	C	-			++						
<i>Ventilago leiocarpa</i>	Yes	C	-			+						Yes
<i>Vernicia montana</i>	No	T			+					+	+	
<i>Vernonia cinerea</i>	Yes	H	-	+			+					
<i>Viburnum odoratissimum</i>	Yes	T	-		+	++		+			+	



# Plant List

Species	Native to HK	Habit	Protection & Conservation Status	Preferred Option	First Option	Mixed Woodland	Shrubland-Grassland	Watercourse	Agricultural Land	Urbanised/Disturbed	Plantation	Record new to the EIA
<i>Vigna unguiculata</i>	No	C	-						+			
<i>Wedelia trilobata</i>	No	H	-	+	+		+		+		++	
<i>Wikstroemia indica</i>	Yes	S	-				++		+			
<i>Youngia japonica</i>	Yes	H	-		+					++	+	
<i>Zanthoxylum avicennae</i>	Yes	T	-	+	+	++	++	+			+	
<i>Zanthoxylum nitidum</i>	Yes	C	-				+					
<i>Zanthoxylum scandens</i>	Yes	S	-		+							Yes

## Notes:

Relative Abundance:

+++ = High Abundance, plants common in the habitat; ++ = Medium Abundance, plants occasionally occur in the habitat; + = Low Abundance, plants uncommon in the habitat

Native to Hong Kong: Yes = Native species; No = Exotic species

Habit: T = Tree; S = Shrub / Sub-shrub; C = Climber; H = Herb; B = Bamboo

Protection & Conservation Status:

C96 = Listed under Cap. 96

C586 = Scheduled under Cap. 586

RP = Listed in AFCD's *Rare and Precious Plants of Hong Kong* (<http://www.herbarium.gov.hk/PublicationsPreface.aspx?BookNameId=1>)

I(VU) = ranked as Vulnerable under IUCN Red List

I(CE) = ranked as Critically Endangered under IUCN Red List

- = no particular status

Record new to the previous EIA: to indicate whether the species had been identified in the approved EIA. "Yes" refers to species not recorded in the EIA.

**APPENDIX 7E**  
**LIST OF FAUNAL SPECIES**

Table A1 List of Mammal Species

Common Name	Species Name	Chinese Name	Distribution in Hong Kong <sup>1</sup>	Conservation Status	Preferred Option (Option 1 &2)	First Option			Offsite Habitats			
					PL <sup>2</sup>	WL <sup>2</sup>	PL	UA	WL	PL	UA	
Eurasian Wild Pig	<i>Sus scrofa</i>	野豬	Very Common	-								1 (Sign)

Notes:

1. Commonness as per AFCD database. Available at <https://www.afcd.gov.hk/english/conservation/hkbiodiversity/data>

2. Habitat: WL: Mixed Woodland, PL: Plantation, UA: Urban Area

Table A2 List of Bird Species

Common Name	Scientific Name	Chinese Name	Distribution in Hong Kong <sup>1</sup>	Status in Hong Kong <sup>2</sup>	Conservation Status	Preferred Option (Option 1 &2)	First Option			Offsite Habitats			
						PL <sup>3</sup>	WL	PL	UA	WL	PL	SG	UA
Black-collared Starling	<i>Gracupica nigricollis</i>	黑領椋鳥	Common	R	-				2			2	3
Blue Whistling Thrush	<i>Myophonus caeruleus</i>	紫嘯鶇	Common	R	-		1						
Chinese Bulbul	<i>Pycnonotus sinensis</i>	白頭鶇	Abundant	R	-		2					3	1
Cinereous Tit	<i>Parus cinereus</i>	蒼背山雀	Common	R	-		1	1					
Common Tailorbird	<i>Orthotomus sutorius</i>	長尾縫葉鶇	Common	R	-	2	1	1		2			
Crested Myna	<i>Acridotheres cristatellus</i>	八哥	Common	R	-				2			2	1
Hainan Blue Flycatcher	<i>Cyornis hainanus</i>	海南藍仙鶇	Uncommon	Su, M	-					1			
Japanese White-eye	<i>Zosterops japonicus</i>	暗綠繡眼鳥	Abundant	R	-		2	1		3	2		3
Large-billed Crow	<i>Corvus macrorhynchos</i>	大嘴烏鴉	Common	R	-					2			
Oriental Magpie Robin	<i>Copsychus saularis</i>	鵲鶇	Abundant	R	-		1	1					
Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	紅耳鶇	Abundant	R	-	2	3	3	2	3	2	3	2
Scarlet Minivet	<i>Pericrocotus speciosus</i>	赤紅山椒鳥	Common	R	-		2						
Spotted Dove	<i>Spilopelia chinensis</i>	珠頸斑鳩	Abundant	R	-	2	2	1		1		2	2
White Wagtail	<i>Motacilla alba</i>	白鶇鶇	Common	W,M	-								1

Notes:

All wild birds are protected under Wild Animals Protection Ordinance (Cap. 170)

1. Commonness as per AFCD database. Available at <https://www.afcd.gov.hk/english/conservation/hk biodiversity/database/search.php>

2. Status according to Viney et al. (2005) The Birds of Hong Kong and South China (8th Edition):

3. Habitat: WL: Mixed Woodland; PL: Plantation; SG: Shrubland-Grassland, UA: Urban Area



- Table A3 List of Herpetofauna Species

Common Name	Species Name	Chinese Name	Distribution in Hong Kong <sup>1</sup>	Conservation Status <sup>2</sup>	Preferred Option (Option 1 &2)	First Option	Offsite Habitats
					WC <sup>3</sup>	WC	WC
Asiatic Painted Frog	<i>Kaloula pulchra</i>	花狹口蛙	Widely distributed in Hong Kong.	-			6 adults
Brown Tree Frog	<i>Polypedates megacephalus</i>	斑腿泛樹蛙	Widely distributed throughout Hong Kong.	-			10 tadpoles
Lesser Spiny Frog	<i>Quasipaa exilispinosa</i>	小棘蛙	Occurs throughout the territory.	Potential Global Concern (Fellowes <i>et al.</i> 2002); Vulnerable (IUCN 2019)		2 adults & 3 tadpoles	3 adults & 2 tadpoles

Notes:

1. Distribution in Hong Kong as per AFCD database. Available at <https://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.php>

2. Conservation concern according to Fellowes *et al.* (2002) Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. In Hodgkiss, I.J. (ed.).

Memoirs of the Hong Kong Natural History Society, No. 19, Hong Kong. pp.123-159.

IUCN (2019): IUCN Red List

3. Habitat: WC: Watercourse

- Table A4 List of Butterfly Species

Common Name	Scientific Name	Chinese Name	Family	Distribution & Conservation Status <sup>1</sup>	Preferred Option (Option 1 &2)	First Option			Offsite Habitats				
					PL <sup>2</sup>	WL	PL	UA	WL	PL	SG	UA	
Banded Tree Brown	<i>Lethe confusa</i>	白帶黛眼蝶	Nymphalidae	Common		1				1			
Blue Tiger	<i>Tirumala limniace</i>	青斑蝶	Nymphalidae	Common						1			
Blue-spotted Crow	<i>Euploea midamus</i>	藍點紫斑蝶	Nymphalidae	Very Common	1								1
Ceylon Blue Glassy Tiger	<i>Ideopsis similis</i>	擬旖斑蝶	Nymphalidae	Very Common							1		1
Common Archduke	<i>Lexias pardalis</i>	小豹律蛺蝶	Nymphalidae	North Lantau, NW New Territories	1								
Common Five-ring	<i>Ypthima baldus</i>	矍眼蝶	Nymphalidae	Very Common		1	1			2			
Common Mapwing	<i>Cyrestis thyodamas</i>	網絲蛺蝶	Nymphalidae	Common						1			
Common Sailer	<i>Neptis hylas</i>	中環蛺蝶	Nymphalidae	Very Common		1				1	1		
Dark Evening Brown	<i>Melanitis phedima</i>	睇暮眼蝶	Nymphalidae	Uncommon		1							
Glassy Tiger	<i>Parantica aglea</i>	絹斑蝶	Nymphalidae	Common						1			
Large Faun	<i>Faunis eumeus</i>	串珠環蝶	Nymphalidae	Common						1			
Common Bluebottle	<i>Graphium sarpedon</i>	青鳳蝶	Papilionidae	Very Common						1			
Common Mime	<i>Chilasa clytia</i>	斑鳳蝶	Papilionidae	Common		1							
Red Helen	<i>Papilio helenus</i>	玉斑鳳蝶	Papilionidae	Very Common		1						1	
Spangle	<i>Papilio protenor</i>	藍鳳蝶	Papilionidae	Very Common						1			
Common Grass Yellow	<i>Eurema hecabe</i>	寬邊黃粉蝶	Pieridae	Very Common	1	1	1				1	1	1
Red-base Jezebel	<i>Delias pasithoe</i>	報喜斑粉蝶	Pieridae	Very Common		1				2	1	1	
Plum Judy	<i>Abisara echerius</i>	蛇目褐蛺蝶	Riodinidae	Very Common		1				1			
Punchinello	<i>Zemeros flegyas</i>	波蛺蝶	Riodinidae	Common		1							

Notes:

1. Commonness as per AFCDB database. Available at <https://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.php>

2. Habitat: WL: Mixed Woodland; PL: Plantation; SG: Shrubland-Grassland,UA: Urban Area

Table A5 List of Odonate Species

Common Name	Scientific Name	Chinese Name	Distribution in Hong Kong <sup>1</sup>	Conservation Status <sup>2</sup>	Preferred Option (Option 1 &2)	First Option				Offsite Habitats		
					WC <sup>2</sup>	WL	PL	UA	WL	PL	UA	
Blue-tailed Shadowdamsel	<i>Drepanosticta hongkongensis</i>	香港鎌扁螳	Common	Global Concern (Fellowes <i>et al.</i> 2002)	1							
Common Blue Skimmer	<i>Orthetrum glaucum</i>	黑尾灰蜻	Abundant		1 (larva)				1			
Dancing Shadow-emerald	<i>Idionyx victor</i>	威異偽蜻	Common	Local Concern (Fellowes <i>et al.</i> 2002)			13 (in 1 group)					
Wandering Glider	<i>Pantala flavescens</i>	黃蜻	Abundant				20	4		30	6	10

Notes:

1. Commonness as per AFCD database. Available at <https://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.php>

2. Conservation concern according to Fellowes *et al.* (2002) Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. In Hodgkiss, I.J. (ed.). Memoirs of the Hong Kong Natural History Society, No. 19, Hong Kong. pp.123-159.

3. Habitat: WC: Watercourse; WL: Mixed Woodland; PL: Plantation; UA: Urban Area

- Table A6 List of Aquatic Fauna Species

Family	Common Name	Scientific Name	Chinese Name	Distribution & Conservation Status <sup>1</sup>	Preferred Option (Option 1 &2)	First Option	Offsite Habitats
					WC <sup>2</sup>	WC	WC
Atyidae	Bee shrimp	<i>Caridina cantonensis</i>	廣東米蝦	-	40	40	60
Cyprinidae	Goldfish	<i>Carassius auratus</i>	鯽	Uncommon, exotic			1
Gastropoda	-	<i>Sulcospira hainanensis</i>	海南溝蜷	Common	15		
Gerridae	Water Strider	<i>Ptilomera tigrina</i>	水黽	Common	1	3	7
Notonectidae	Backswimmer	<i>Enithares sp.</i>	仰泳蝽	Common	1	4	6
Potamidae	Freshwater Crab	<i>Cryptopotamon anacoluthon</i>	鰓刺溪蟹	Potential Global Concern (Fellowes <i>et al.</i> 2002); Vulnerable (IUCN 2019)		1	1
Potamidae	Freshwater Crab	<i>Nanhaipotamon hongkongense</i>	香港南海溪蟹	Potential Global Concern (Fellowes <i>et al.</i> 2002)		1	2

Notes:

1. Distribution as per Dudgeon (2003) Hillstreams; Lee et al. (2004) Field Guide to the Freshwater Fish of Hong Kong;

AFCD database. Available at <http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp?lang=en>

2. Habitat: WC: Watercourse



Attachment C  
Supporting Document for  
Variation of Environmental Permit -  
Supplementary Information to  
Updated Environmental Review Report  
for Fresh Water Mains

## **1. Introduction**

This Paper provides supplementary information to “Agreement No. CE 8/2015 (WS) First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction, Updated Environmental Review Report for Fresh Water Mains” (the ERR 2020).

After completion of the ERR 2020, further re-alignment of the fresh water mains was proposed to address traffic and engineering constraints. Based on the final alignment of the fresh water main provided by the Water Services Department (WSD), four sections of the final alignment are deviated from the information presented in the ERR 2020 as illustrated in **Annex 1** to **Annex 4** of this document. The associated environmental implications are addressed in **Section 2**. An overview of the final alignment of the fresh water main as compared to the original alignment presented in the approved EIA report is shown in **Annex 5**.

## **2. Environmental Implications due to Further Deviations of the Alignment After Completion of ERR 2020**

### **2.1 Introduction**

The construction works of the final alignment of the fresh water mains have been completed. Construction phase environmental impacts are not applicable and not considered in this review. Review of landscape and visual implications during operational phase are presented in the section below.

### **2.2 Landscape and Visual Implications**

During operational phase, the deviated sections of the water mains will all be located underground, and the associated works areas had been cleaned and reinstated to its original conditions. As such, no visual impacts would arise from the proposed deviations.

A detailed tree survey and removal application have been prepared for the fresh water main separately, in which, the precise number of trees to be retained, transplanted, felled and compensated have been confirmed and agreed with the relevant authorities. No registered Old and Valuable Trees would be affected by the water main construction. Since any tree felling would be compensated within the same or similar habitat in TKO where practicable, no permanent landscape impact would arise.

Based on the detailed tree survey, 178 existing trees would unavoidably be removed due to the laying of the entire water mains. For the remaining Project areas in Clear Water Country Park and the site of the desalination plant, alternative design (e.g. relocation of slope mitigation works) has been adopted to avoid most of the existing trees and only 9 existing trees would unavoidably be removed. Thus, 187 existing trees would be removed under the entire Project. None of the trees affected by the water mains are Old and Valuable Trees. Total 218 trees would be compensated

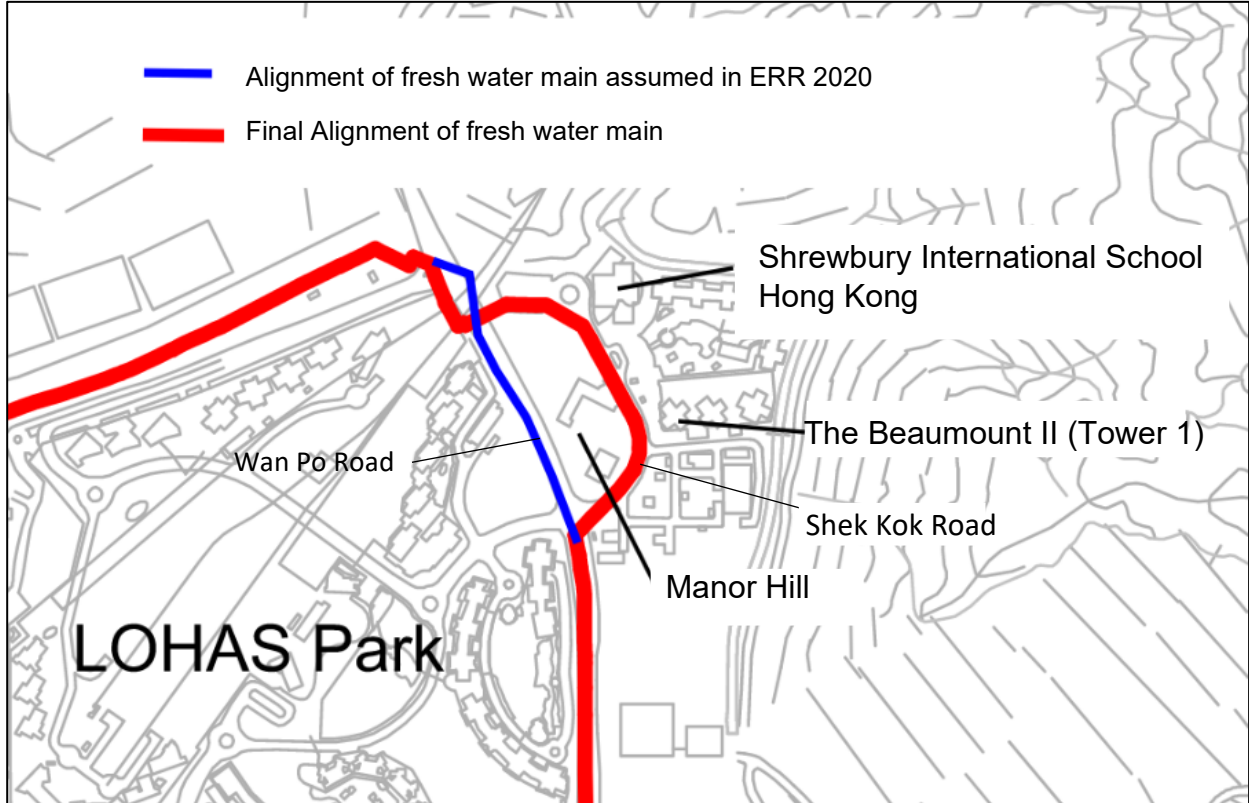
within the same / nearby habitats in TKO. As similar to the approach mentioned in the ERR 2020, any tree removal would be carried out following the prevailing mechanism and procedure, e.g. in accordance with the latest technical circular on tree preservation by the Development Bureau. The approved EIA report identified that about 200 trees would be felled under the entire Project including the trees located within the slope mitigation works area in Clear Water Bay Country Park.. Thus, the overall number of trees to be felled under the proposed design of the Project (i.e. 187 trees) would be smaller than that assumed in the approved EIA report (i.e. 200 trees). No unacceptable landscape impact would occur.

### **2.3 Summary**

No unacceptable environmental impact would be caused by the final alignment of the water main provided all the mitigation measures recommended in the EIA report for Tseung Kwan O Desalination Plant and the ERR 2020 are properly implemented.

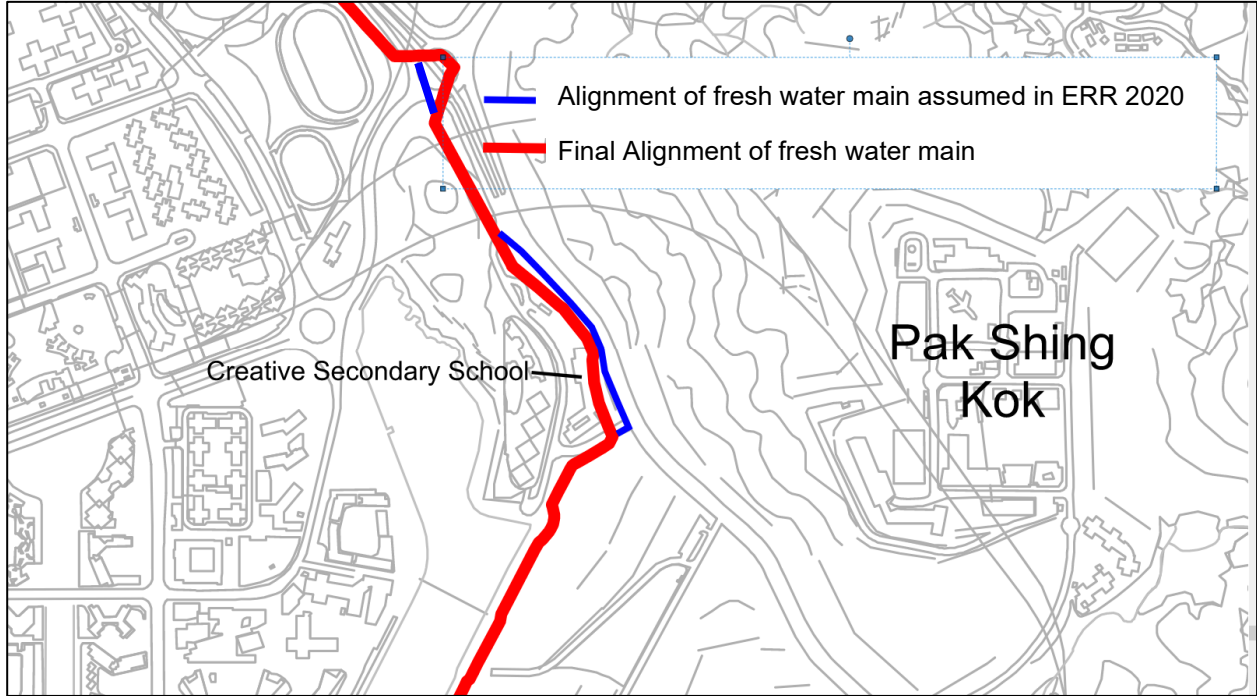
### Annex 1 – Deviation of Fresh Water Main Alignment No. 1

The final alignment of the fresh water main runs through Shek Kok Road, which was not considered in the ERR 2020 as illustrated in the figure below.



**Annex 2 – Deviation of Fresh Water Main Alignment No. 2**

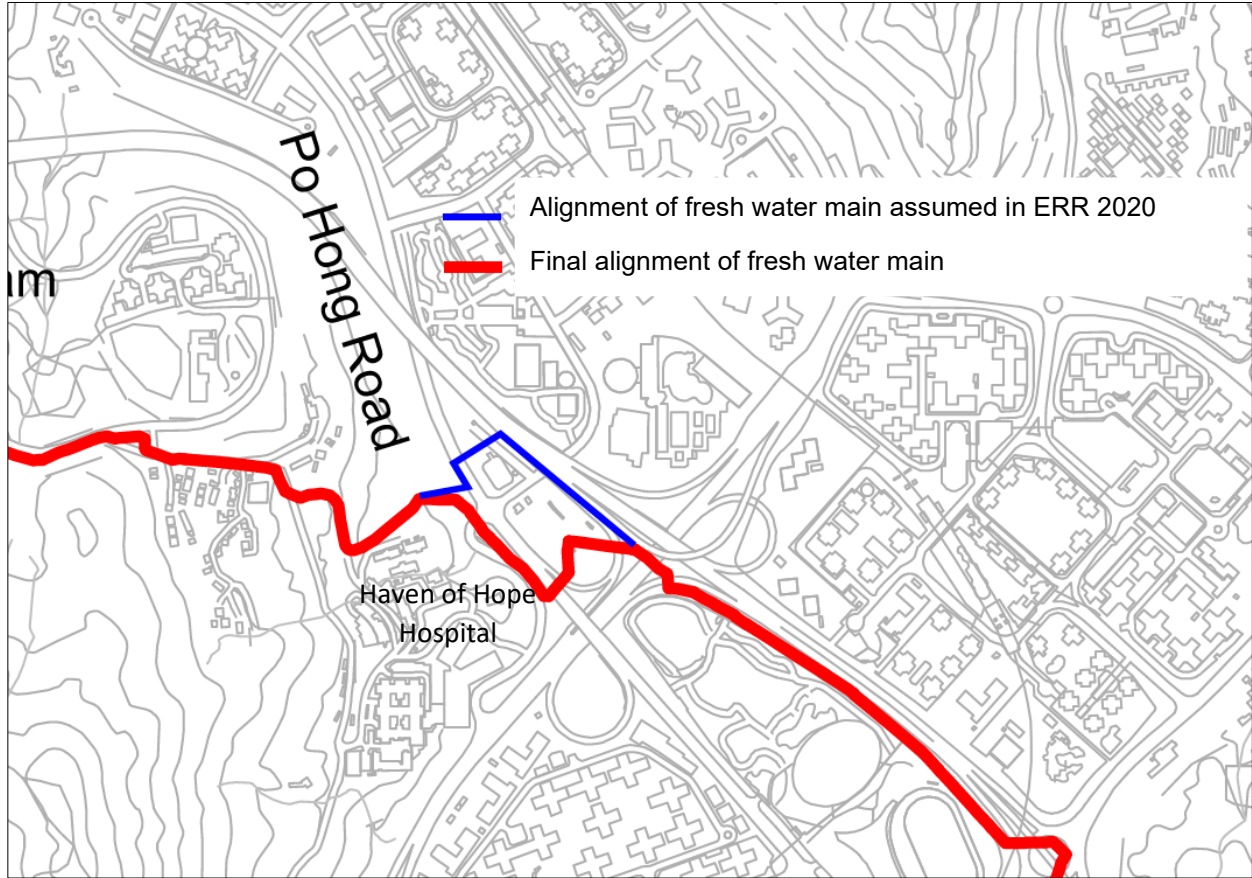
The final alignment of the fresh water main runs closer to the Creative Secondary School, which was not considered in the ERR 2020 as illustrated in the figure below.





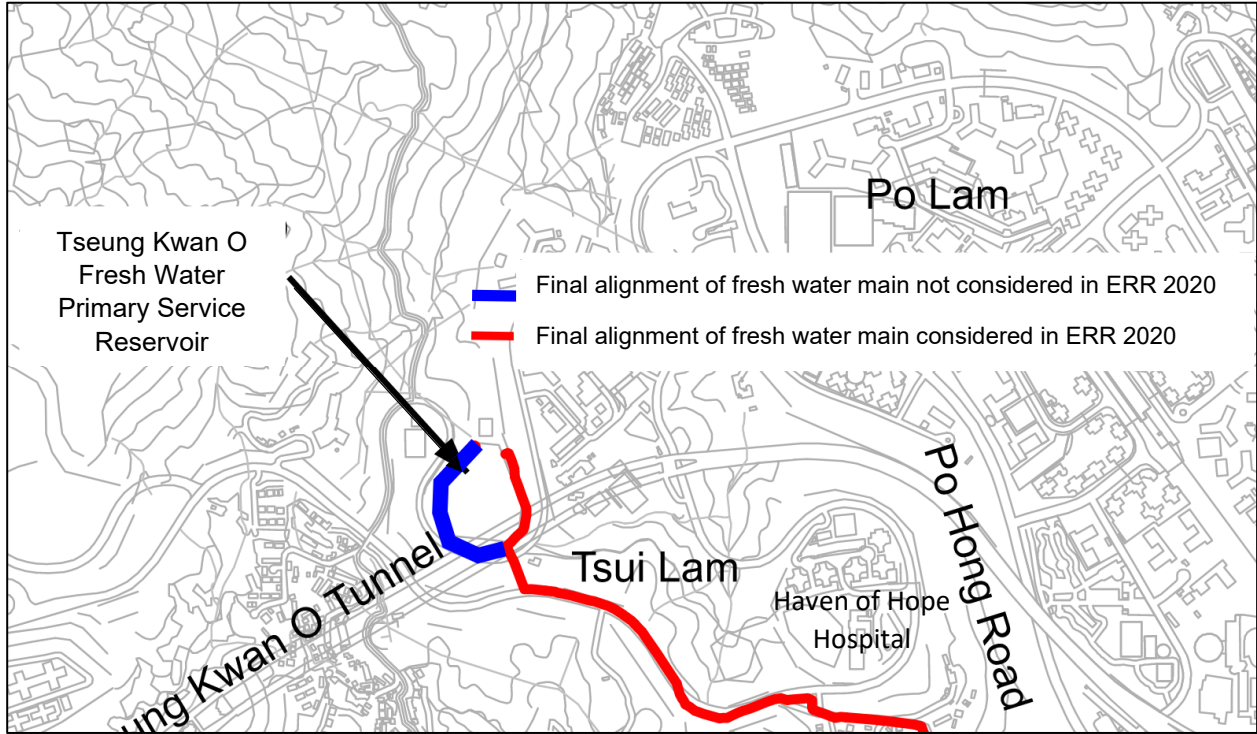
### Annex 3 – Deviation of Fresh Water Main Alignment No. 3

The final alignment of the fresh water main runs closer to the Haven of Hope Hospital, which was not considered in the ERR 2020 as illustrated in the figure below.

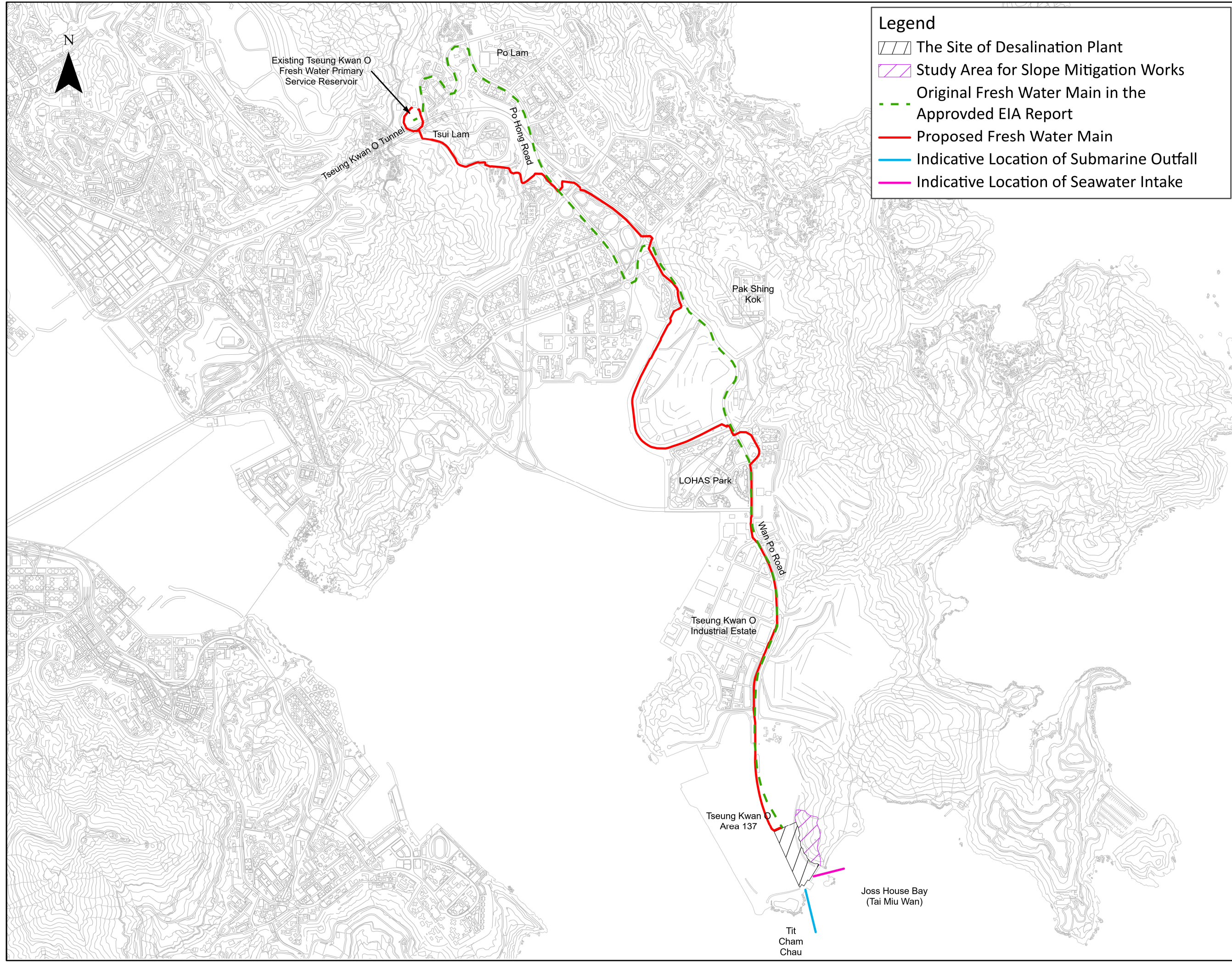


### Annex 4 – Deviation of Fresh Water Main Alignment No. 4

The final alignment of the fresh water main runs along the footpath on both sides of the Tseung Kwan O Fresh Water Primary Service Reservoir, which was not considered in the ERR 2020 as illustrated in the figure below.







**Legend**

- The Site of Desalination Plant
- Study Area for Slope Mitigation Works
- Original Fresh Water Main in the Approved EIA Report
- Proposed Fresh Water Main
- Indicative Location of Submarine Outfall
- Indicative Location of Seawater Intake

Revision	Description			
	Designed	Reviewed	Drawn	Checked
Initial	-	-	-	-
Date	-	-	-	-
Approved				

Agreement No. **CE 21/2012 (WS)**

Project Title  
**First Stage of Desalination Plant at Tseung Kwan O - Investigation, Design and Construction**

Figure Title  
**Comparison of Original and Proposed Alignment of Fresh Water Main**

Drawing No.	Annex 5	Revision	-
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Scale  
**A3: 1:28,000**

Client



水務署  
Water Supplies Department

Consultant



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