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Our ref: PL-202602011

Date: 11 February 2026

Water Supplies Department
New Works Branch
Consultant Management Division
6/F Sha Tin Government Offices
1 Sheung Wo Che Road
Sha Tin
New Territories

Attention: Mr S. K. Wong

Dear Sirs,

Contract No. 13/WSD/17
Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant
Certification on Updated Vegetation Survey Report for Slope Mitigation Works

Reference is made to the submission of the Updated Vegetation Survey Report (190495/29.2120 Issue 5) by email dated 9 February 2026, we are pleased to inform you that we have no further comment and certified the Updated Vegetation Survey Report for Slope Mitigation Works with Clause 2.7 under the Environmental Permit No. EP-503/2015/B and Further Environmental Permit No. FEP-01/503/2015/B.

Yours Faithfully,
For and on behalf of
Acuity Sustainability Consulting Limited

Toby K. H. Wan
Environmental Team Leader

Acuity Sustainability Consulting Limited
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Our ref: EMA2602/L002
Date: 12 February 2026

Water Supplies Department
New Works Branch
Consultants Management Division
6/F, Sha Tin Government Offices,
1 Sheung Wo Che Road, Sha Tin,
New Territories

By email

Attn: Mr. S K Wong

Provision of Independent Environmental Checker (IEC) Service for Operation of the First Stage of Desalination Plant at Tseung Kwan O (Quotation Ref. No. TKO1/IEC/004)

Verification of Updated Vegetation Survey Report for Slope Mitigation Works

Dear Sirs,

Referring to the Updated Vegetation Survey Report for Slope Mitigation Works (190495/29.2120 Issue 5) as submitted on 9 February 2026, we hereby verify the captioned report for further submission to the Director's Representative of the Project according to Clause 2.7 of the Environmental Permit EP-503/2015/B and Further Environmental Permit FEP-01/503/2015/B.

Should you need any further information or clarification, please feel free to contact the undersigned at 2774 7406 or email at roy.hung@sgs.com.

Yours faithfully,
For and on behalf of **SGS Hong Kong Limited**

Roy Hung
Independent Environmental Checker

Aurecon	(Attn.: Toby Wan)	By E-mail
Binnies	(Attn.: Calvin Leung)	By E-mail

ISSUE 212-5

UPDATED VEGETATION SURVEY REPORT FOR SLOPE MITIGATION WORKS

Agreement No. CE 8/2015 (WS)

First Stage of Desalination Plant at Tseung Kwan O

– Investigation, Design and Construction

BINNIES PROJECT NO. 190495/29.2120

Report Authorized For Issue By:

For and on Behalf of
Binnies Hong Kong Limited

PREPARED FOR

Water Supplies Department

9 FEBRUARY 2026

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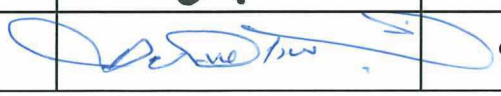
	Name	Signature	Date
Prepared	Calvin Leung		9 February 2026
Checked	Esther Tong		9 February 2026
Reviewed	Augustine Li		9 February 2026

1 Introduction

1.1 Background and Purpose

1.1.1 Water Supplies Department appointed Binnies Hong Kong Limited (BHKL), formerly known as Black & Veatch Hong Kong Limited, to undertake the consultancy "Agreement No. CE 8/2015 (WS) First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design, and Construction" on 16 November 2015.

1.1.2 The purpose of the project is to construct a sea water reverse osmosis (SWRO) 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.

1.1.3 The first stage of the proposed SWRO desalination plant will have a water production capacity of 135,000 cubic meters (m^3) per day with provision for future expansion to the ultimate capacity up to 270,000 m^3 per day when necessary.

1.1.4 The proposed desalination plant is a key supply management initiative under the Total Water Management (TWM) strategy promulgated in 2008. As one of the key supply management initiatives, the desalination plant will help diversify the water supply resources and serve as a new water source to better prepare Hong Kong for uncertainties such as acute climate change and low rainfall. Under the TWM strategy, Hong Kong should broaden its strategic investment in advanced water treatment for desalination of seawater.

1.2 Project Elements

1.2.1 The Project comprises of the following elements:

- Formation of the reserved site of about 8 hectares in TKO Area 137 to provide sufficient space for a desalination plant with an ultimate water production output at 270,000 m^3 per day.
- Design and construction of the desalination plant including:
  - Seawater treatment components using RO technology with a water production output at 135,000 m^3 per day with provision for future expansion of the desalination plant to an ultimate water production output at 270,000 m^3 per day.
  - Associated facilities including the intake pipes, outfall pipes, administration building, laboratory, maintenance workshop, chemical building, chlorine building, sludge filter press building, seawater intake pumping station, fresh water pumping station and power supply facilities, etc. with provision for future expansion of the desalination plant to cater for an ultimate water production output at 270,000 m^3 per day.
  - Provision of all associated civil, structural, architectural, geotechnical, landscaping, marine, electrical and mechanical works, including landscaping, permanent and temporary access, etc.
- Operation and maintenance of the desalination plant for the initial operation period which will start upon commissioning of the plant for 1 year.
- Slope mitigation works in the Country Park Area to mitigate the natural terrain hazards affecting the site.

1.2.2 Fresh water produced by the desalination plant will be transferred via a trunk main to the existing Tseung Kwan O Fresh Water Primary Service Reservoir (TKOFWPSR) and/or other existing fresh water service reservoirs. Detailed design of the trunk main is being carried out by WSD Design Division and the associated main laying works will be procured by WSD.

1.3 Site Description

1.3.1 The proposed site at TKO Area 137 is located on the Clearwater Bay Peninsula. The site is at the southern tip of the TKO Phase III (Area 137) reclamation. The Area 137 reclamation involves reclaiming the sea between the islands of Fat Tong Chau and Tit Cham Chau. The site covers about 10 hectares. The existing land use of the site is public fill area managed by Civil Engineering and Development Department (CEDD). Intake and outfall pipes will be extended to the east and south from the coastline of Tit Cham Chau.

1.3.2 The site boundary of the project is shown in Figure 190495/B/DSR/00-10001, attached in Appendix A. Trunk main to the existing TKOFWPSR and/or other existing fresh water service reservoirs is excluded from our Project scope and is under WSD separate contract.

1.4 Objective of the Updated Vegetation Survey Report ("this report")

1.4.1 According to Condition 2.7 of Environmental Permit No. EP-503/2015/B and FEP-01/503/2015/B, to reduce ecological impact on plant species of conservation importance, including but not limited to *Marsdenia Iachnostoma,* due to the slope mitigation works of the Project, no later than 3 months before the commencement of site clearance works for the slope mitigation works, the Updated Vegetation Survey Report ("this report") shall be submitted to the Director of Environmental Protection for approval.

1.4.2 The Permit Holder shall consult the Director of Agriculture, Fisheries and Conservation (AFCD) in preparing the Updated Vegetation Survey Report prior to the submission to the Director of Environmental Protection for approval.

1.4.3 The first updated vegetation survey for the slope mitigation works was conducted in 2016. The AFCD was consulted during the preparation of the 2016 survey methodology and results. Based on the agreed methodology and findings (as presented in Appendices D and E), an Updated Vegetation Survey Report was prepared and circulated to the AFCD for comments. The AFCD expressed no comment on the report in June 2017. The report was subsequently approved by the Environmental Protection Department (EPD) in August 2017, in accordance with Condition 2.7 of the Environmental Permit.

1.4.4 Since the last survey in 2016, habitat conditions and plant populations have changed due to natural events such as landslides, heavy rainstorms, and ecological succession. Additional vegetation surveys were conducted in 2020, 2021, and 2023 to update the habitat conditions and assess the status of plant species of conservation importance prior to the commencement of the proposed slope mitigation works. The methodologies and survey findings are presented in Appendices F to H. AFCD was consulted during the preparation of these methodologies and survey findings. Relevant correspondence with the AFCD is included in Appendix I.

1.4.5 The Updated Vegetation Survey Report approved in August 2017 ("2017 report") presents the findings of the survey and the potential impacts, if any, which may be caused by the proposed slope mitigation works, and the recommended protection and mitigation measures for the plant species of conservation importance as identified in the 2016 survey. This Report serves as an update to the 2017 report, incorporating the vegetation survey findings from the 2020, 2021, and 2023 surveys. As required under Condition 2.7 of the Environmental Permit, AFCD was consulted during the preparation of this report prior to its submission to the DEP for approval. AFCD has indicated that they have no comments on the report.

1.5 Structure of this Report

1.5.1 The report is structured as follows:

Section 1: Introduction, this section

Section 2: Presents the updated vegetation survey as required in the Environmental Impact Assessment (EIA) Report and Environmental Permit

Section 3: Presents the agreed methodology and extent of the updated vegetation survey at the proposed location of the slope mitigation works within the Country Park

Section 4: Presents the results of the updated vegetation survey

Section 5: Presents the design development of the slope mitigation works and proposed mitigation measures

Section 6: Presents the recommendations of protection/mitigation measures

2 Updated Vegetation Survey

2.1 Environmental Impact Assessment (EIA) Report (Register No. AEIAR-192/2015)

2.1.1 In the Environmental Impact Assessment (EIA) carried out for "Agreement No. CE21/2012 (WS) Desalination Plant at Tseung Kwan O - Feasibility Study", a plant species of conservation importance *Marsdenia lachnostoma* was recorded in the shrubland/grassland habitat along the proposed alignment of the flexible barriers at the lower portion of the natural hill of the Clear Water Bay Country Park. Mitigation measures were recommended to avoid and minimize potential impact on the plant species of conservation importance in the slope mitigation works area.

2.1.2 As said in the EIA, at the detailed design stage prior to the commencement of the slope mitigation works, a vegetation survey shall be carried out at the slope mitigation areas within the Clear Water Bay Country Park to assess the condition and identify the location of each individual of *Marsdenia lachnostoma* and other plant species of conservation importance that may be directly affected by the construction works.

2.2 Environmental Permit No. EP-503/2015/B and Further Environmental Permit No. FEP-01/503/2015/B

2.2.1 To reduce ecological impact on plant species of conservation importance, including but not limited to *Marsdenia Iachnostoma*, due to the slope mitigation works of the Project as shown in Figure 2 of EP-503/2015/B and FEP-01/503/2015/B (appended in Appendix B of this report), the Permit Holder shall, no later than 3 months before commencement of site clearance works for the slope mitigation works, submit 4 hardcopies and 1 electronic copy of the Updated Vegetation Survey Report to the Director of Environmental Protection for Approval. The report shall include:

(i) details of updated vegetation survey including the survey methodology, duration and schedule (discussed in Section 3 below);

(ii) findings of updated vegetation survey, particularly on species, numbers and locations of the plant species of conservation importance including but not limited to *Marsedenia Lachnostoma*, identified within the works area of slope mitigation works (discussed in Section 4 below);

(iii) recommended protection and mitigation measures for the plant species of conservation importance as identified in the updated vegetation survey (discussed in Section 5 below); and

(iv) if transplantation is eventually proposed for the plant species of conservation importance, the transplantation proposal shall include the locations of reception sites for transplanted plants, methodology of transplantation and detailed schedule for post-

transplantation monitoring and maintenance requirements (discussed in Section 6 below).

The Updated Vegetation Survey Report shall be prepared by the Qualified Ecologist as appointed under Condition of EP-503/2015/B and FEP-01/503/2015/B and shall be certified by the ET leader and verified by IEC as conforming to the information and recommendations contained in the approved EIA report (Register No. AEIAR-192/2015). All recommended mitigation measures as set out in the approved Vegetation Survey Report shall be fully and properly implemented. No site clearance works for the slope mitigation works of the Project shall be allowed prior to the approval of the Vegetation Survey Report, as well as completion of any protection/mitigations works or transplantation as proposed in (iii) and (iv) above.

2.2.2 The Permit Holder shall consult the Director of AFCD in preparing the Updated Vegetation Survey Report prior to the submission to the Director of EPD for approval.

3 Survey Methodology

3.1.1 The survey methodology made reference to the technical guidelines of ecological assessment in Annex 16 of EIAO-TM and the relevant Guidance Notes (GN 7/2010 and GN 10/2010). This report is prepared in accordance with the requirements stipulated in Condition 2.7 of EP-503/2015/B and FEP-01/503/2015/B - Submission of Updated Vegetation Survey Report for Slope Mitigation Works.

3.1.2 The updated vegetation survey is to obtain the up-to-date ecological information at the proposed locations of the slope mitigation works prior to the commencement of site clearance works for the slope mitigation works. The methodologies for the vegetation survey conducted in 2016, 2020, 2021 and 2023 are presented in Appendices D, F, G and H respectively. Correspondences with AFCD regarding these vegetation surveys are appended in Appendices C and I. The CVs of the Qualified Ecologist conducting the survey as appointed under Condition 2.3 of EP-503/2015/B and FEP-01/503/2015/B are appended in Appendix J.

3.2 Survey Duration and Schedule

3.2.1 The habitat and vegetation survey was carried out to identify, classify, assess habitat and plant communities and to identify the location of each individual *Marsdenia lachnostoma* and other plant species of conservation importance that may be directly affected by the proposed slope mitigation works.

Survey conducted in 2016

3.2.2 The survey consisted of the habitat and vegetation survey. The surveys were conducted between the months of May and December 2016 to cover the wet and dry seasons within the Works and Study Area. Day-time habitat and vegetation surveys were conducted and presented in Table 3-1.

Table 3-1 Programme of the Vegetation Survey Conducted in 2016

Season	**Wet**					**Transition**	**Dry**	
Month	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Day-time								
Habitat & Vegetation	18/5	22/6	22/7	22/8	26/9		29/11	23/12

Note:
Survey dates are presented in the shaded cells.

Survey Conducted in 2020

3.2.3 Since the conditions of the habitat and plant species of conservation importance may have changed since the last survey was conducted in 2016 and the findings reported in 2017, an updated vegetation survey was carried out in 17 July and 7 August 2020 prior to the commencement of works, using the same survey extent as in 2016. All *Marsdenia lachnostoma*

and any other plant species of conservation importance identified were recorded through direct observation within the survey extend. However, the cliff area with rock slope stabilization works, as well as some dense hillside shrubland and pioneer woodland, were inaccessible during the survey. Observations in these areas were made as far as practicable using a pair of 10 × 42 binoculars.

Survey Conducted in 2021

3.2.4 The contractor has adjusted and proposed a new inspection access for boulder stabilization works. A verification survey was conducted on 28 September 2021 to focus on the proposed inspection access and slope mitigation works areas since last survey was conducted in 2020. The survey covered the proposed alignment for the inspection access for the upper slope boulder stabilization works (Boulder ID nos. B53, B124, B160 and B169) as indicated in Figure 1 of Appendix G.

Survey Conducted in 2023

3.2.5 Based on the survey findings conducted in 2020, the cliff area was growing with pioneer young shrubland, which is not a favorable habitat for *Marsdenia lachnostoma* and *Habenaria linguella*. Landslide incidents within the Clear Water Bay Country Park after heavy rainstorms on 28 June 2021 (Black rainstorm) and 8 Oct 2021 further degraded the habitat of the cliff area which became more exposed and drought. This survey also covered (1) boulder removal/break-off of 6 unstable boulders (ID no. B182, B196, B198, B199, B206 and B207) identified at the natural terrain within the Clear Water Bay Country Park area and (2) rock slope portion includes all the areas proposed to be covered with wire mesh as well as areas in close proximity of proposed dowels and buttresses, since those might affect the vegetation along the toe of natural terrain within the Clear Water Bay Country Park area. The extent of slope mitigation works is shown in Appendix K.

3.2.6 The upper part of the cliff area was assessed by cherry picker and scaffold access. For the areas near the proposed boulder removal/break-off, the survey was conducted along the access route via the scaffold access on the slope face. Observation was assisted by using a pair of 10 x 42 binoculars at these areas. The surveys were conducted on 30 January 2023, 21 February 2023 and 27 March 2023.

4 Survey Results

Survey Conducted in 2016

4.1.1 A total of six habitats were identified in the Study Area, including mixed woodland, shrubland and hillside grassland mosaic, urbanised/disturbed area, wasteland, watercourse and marine habitats (including rocky shore, sandy shore and seawall, which are outside of the scope of this Assignment). The findings are appended in Appendix E – Figure 3.1.

4.1.2 A total of 139 plant species were recorded between May and December 2016 within the study area. Of the 139 plant species recorded, 2 were considered as plant species of conservation importance, including Hairy-throat Condorvine *Marsdenia lachnostom* and Balloon Flower *Platycodon grandiflorus*. Only *Marsdenia lachnostom* was found within the Works Area and within the shrubland and hillside grassland mosaic habitat. Location of the identified plant species of conservation importance are shown in Appendix E - Figure 3.2 and their representative photos are presented in Appendix E - Figure 3.3. Full list of the plant species recorded between May and December 2016 is provided in Appendix E – Annex A.

4.1.3 The summary of the plant species of conservation importance identified in each habitat is presented in Table 4-1.

Table 4-1 Summary of Plant Species of Conservation Importance Identified in 2016

HABITAT TYPE	PLANT SPECIES OF CONSERVATION IMPORTANCE
Mixed Woodland	No plant species of conservation importance identified
Shrubland and Hillside Grassland Mosaic	A total of two species of conservation importance identified, - *Marsdenia lachnostoma* - *Platycodon grandiflorus* *Only Marsdenia lachnostoma* were also recorded within the Works Area
Urbanised/ Disturbed area	No plant species of conservation importance identified
Wasteland	No plant species of conservation importance identified
Watercourse	No plant species of conservation importance identified
Marine	Outside of the scope of this Assignment

4.1.4 In summary, the 2016 survey recorded *Marsdenia lachnostoma* and *Platycodon grandiflorus* and no additional plant species of conservation importance were recorded.

Survey conducted in 2020

4.1.5 Shrubland and hillside grassland mosaic, as well as short bamboo patch was maintained at the upper half of the natural terrain; while the lower half had turned into dense shrubland and pioneer young woodland through natural succession since 2017. Dominant shrubs and trees included *Mallotus paniculatus*, *Macaranga tanarius* var. *tomentosa*, *Rhodomyrtus tomentosa* and *Rhus succedanea*. The thin belt of mixed woodland still existed below the cliff area as per 2017's finding.

4.1.6 Similar to previous survey results, *Marsdenia lachnostoma* was the dominant plant species of conservation importance found within the proposed Works Site. A total of 218 individuals of *Marsdenia lachnostoma* were found and their recorded locations are presented in Figure 2 of Appendix F. Despite more than a double in quantity being observed, distribution pattern and preferred grassland habitat were similar when compared to previous survey result as indicated in Figure 3 of Appendix F. The shrubland-grassland mosaic near lower half of the terrain at southern portion used to have some *Marsdenia lachnostoma*; but it does not occur when such shrubland-grassland mosaic has succeeded into pioneer young woodland as verified in this survey as indicated in Plate 1 of Appendix F. On the other hand, many new individuals were observed along the grassy mountain ridge at this southern portion.

4.1.7 No *Platycodon grandiflorus* was observed within the proposed Works Site, but another herbaceous Orchid, *Habenaria linguella*, with conservation importance was revealed during this 2020 survey. Four nos. of *Habenaria linguella* were observed at the centre of the proposed works site Figure 2 of the Appendix F.

4.1.8 In summary, the 2020 survey recorded *Marsdenia lachnostoma* and *Habenaria linguella* and no additional plant species of conservation importance were recorded.

Survey conducted in 2021

4.1.9 Similar to the observations made in the 2020 survey, shrubland and hillside grassland mosaic is maintained at the upper half of the natural terrain; while the lower half has turned into dense shrubland and pioneer young woodland through natural succession since, as indicated in Plate 1 of Appendix G. However, the invasive/exotic climber *Passiflora foetida*, *Mikania micrantha* and herb *Bidens alba* was conquering the shrubland and hillside grassland mosaic, where *Marsdenia lachnostoma* inhabits.

4.1.10 Similar to previous survey results, *Marsdenia lachnostoma* is the dominant plant species of conservation importance found along the proposed inspection access. By passing through the ground mainly with common vegetation, only 28 nos. of *Marsdenia lachnostoma* were found.

No *Habenaria linguella* was found during this survey (four were recorded in 2020's survey). Their previous localities had also been avoided from the proposed works alignment. Location of the identified plant species of conservation importance are shown in Appendix G - Figure 1

4.1.11 Another species of conservation importance, i.e., one patch of *Gnetum luofuense*), was found at terrain toe near the entrance of the transect. This batch of *Gnetum luofuense* has been fenced off by eye-catching protection zones under supervision of the plant specialist/ecologist to restrict unnecessary/accidental entry after commencement of works. The locations of the identified species of conversation importance are shown in Appendix G.

4.1.12 In summary, the 2021 survey recorded *Marsdenia lachnostoma* and *Gnetum luofuense* and no additional plant species of conservation importance were recorded.

Survey Conducted in 2023

4.1.13 With reference to the previous survey findings recorded in 2020, the cliff area is not favorable for *Marsdenia lachnostoma* and *Habenaria linguella* by binocular scanning. In this survey, no *Marsdenia lachnostoma* and *Habenaria linguella* were found by direct observation. In total, seven patches of *Gnetum luofuense* were found. The locations of the identified species of conservation importance are shown in Appendix B of Appendix H1 (rock slope portion) and Appendix A in Appendix H2 (boulder removal/stabilization work) respectively.

4.1.14 In summary, the 2023 survey recorded *Gnetum luofuense* and no additional plant species of conservation importance were recorded.

Summary

4.1.15 Table 4-2 summarizes the species, quantities, and locations of plant species of conservation importance documented in surveys conducted between 2016 and 2023. Appendix L provides the corresponding location information for these species as recorded in the vegetation surveys.

Table 4-2 Summary of Plant Species of Conservation Importance Identified (2016-2023)

SPECIES	NUMBERS	LOCATIONS
Survey conducted in 2016		
Marsdenia lachnostoma	94	Figure 3.2 in Appendix E
Platycodon grandiflorus	1	Figure 3.2 in Appendix E
Survey conducted in 2020		
Marsdenia lachnostoma	218	Figure 2 in Appendix F
Habenaria linguella	4	Figure 2 in Appendix F
Survey conducted in 2021		
Marsdenia lachnostoma	28	Figure 1 in Appendix G
Gnetum luofuense	1	Figure 1 in Appendix G
Survey conducted in 2023		
Gnetum luofuense	7	Appendix B in Appendix H1 (3 nos.) and Appendix A in Appendix H2 (4 nos.)

5 Design Development

5.1 Original Slope Mitigation Works

5.1.1 The original proposed slope mitigation works planned during the Feasibility Study stage of the Project includes:

(a) Flexible barriers installed along the coastal slope crest within the Country Park and along the slope toe;

(b) Rock slope stabilization works along the toe of the natural terrain within the Clearwater Bay Country Park area; and

(c) Soil nailing above the rock face within the Country Park.

5.1.2 During the updated vegetation survey conducted in 2016, it was noted that species of conservation importance were identified within or were in close proximity to the proposed flexible barriers and soil nails in the Country Park, as indicated in Figure 3.2 of Appendix E.

5.1.3 To minimize the impact on those species of conservation importance, the proposed slope mitigation measures of installing flexible barriers and soil nails within the Country Park were reviewed and the proposed works revised.

5.2 Revised Slope Mitigation Works

5.2.1 The design of slope mitigation works was further reviewed to alleviate the high construction risk after frequent landslides. The consequence to life/property remains low due to the restricted access to slope toe area by fencing. In case of rockfall/landslide event, the debris would be contained at the slope toe area between the rock slope and the flexible barrier. Also, the proposed open channel and its associated maintenance access have been shifted from the soil/rock slope side towards the desalination plant. They are positioned behind and protected by the flexible barrier.

5.2.2 The revised slope mitigation works includes:

(a) Flexible barriers are redesigned and located away from the slope toe of the Clearwater Bay Country Park area, thus no flexible barriers will be installed within the Clearwater Bay Country Park area. Soil nailing works as stated in Section 5.1.1 item (c) is not required and omitted due to the relocation of flexible barriers;

(b) Rock slope stabilization works along the toe of the natural terrain within the Clearwater Bay Country Park area (the design is similar to the Section 5.1.1 item (b) including rock dowel, buttress, & wire mesh); and

(c) Boulder removal/break-off of 10 unstable boulders, identified at the natural terrain within the Clearwater Bay Country Park area.

5.2.3 The revised slope mitigation works scheme is shown in Appendix K. All above-ground elements of the flexible barrier are all located outside the Clear Water Bay Country Park while only a portion of the inclined underground anchors (i.e. installed 3 to 4 m into rock) extend into the Clearwater Bay Country Park. The maximum length of the underground anchors shall be 15 m. No ecological impact on plant species of conservation importance or trees is anticipated, as the inclined anchors will be installed into bedrock below ground level. However, localized trimming of ground vegetation within the works areas of the flexible barrier will be required. As the flexible barrier will be located in close proximity to mixed woodland, the footprint of vegetation clearance will therefore be localized and very limited. With the implementation of proposed good site practices, the ecological impact arising from the construction of flexible barriers is considered insignificant.

5.2.4 Access to the boulders for the boulder removal break-off works will be required, to minimise the disturbance to the existing habitat and vegetation from the works, temporary elevated accesses of 600mm width shall be provided. Three nos. of the temporary elevated accesses with a total length of approximately 400m, ranging from 40m to 290m, extending from temporary working platform for rock slope works will be provided. To facilitate the boulder removal / break-off works, temporary elevated access of 600mm width around each of the 10 nos. of boulders will be provided (total area = 0.006 ha). Temporary working platforms for rock slope works (total area = 0.017ha) will also be provided. The temporary elevated access

and temporary working platform for boulder and rock slope works are indicated in Appendix L.

5.3 Mitigation Measures

Slope Stabilisation Works

5.3.1 Rock stabilization works shall be adjusted to ensure that no tree felling occurs and plant species of conservation importance are not affected. The anchorage for the temporary working platform and access to be erected will be designed to avoid plant species of conservation importance.

5.3.2 Landscaping works will be provided in the form of hydroseeding and/or planting shrub seedlings to reinstate vegetation loss and disturbance at the area of slope stabilization works, with regular monitoring and appropriate maintenance works carried out for a 12-month establishment period. Stone facing to constructed concrete surfaces (such as buttress) at the rock slope will be provided to restore the natural finishes of the slopes.

5.3.3 No unacceptable impact to the habitat loss and disturbance from rock slope stabilization is anticipated.

Boulder Removal/Break–off

5.3.4 The proposed boulder removal works will involve provision of temporary working platform and access of 600mm around the boulder. To avoid direct conflict between the boulder removal and nearby plant species of conservation importance, protection zones/works exclusion zones will be established at least 1m radius from the identified plant species of conservation importance to preserve them on site.

5.3.5 The protection zones/works exclusion zones will be established prior to site clearance and throughout the construction period to separate the identified protected plant individuals from the works.

5.3.6 The temporary working platform and temporary access will be designed to avoid anchorage on the plant species of conservation importance.

5.3.7 With proper implementation of the recommended mitigation measures, no unacceptable impact to the plant species of conservation importance is anticipated.

Recommended Good Site Practices

5.3.8 Prior to the commencement of construction works, the location and condition of the plant species of conservation importance along the direct footprint of the slope mitigation works shall be conducted by a qualified plant ecologist.

5.3.9 Protection zones/works exclusion zones will be established, prior to site clearance and throughout the construction period, at least 1.5m radius and 1.5m height to surround the plant species of conservation importance to preserve them on site. Signage to identify the protection zones/works exclusion zones shall be implemented.

5.3.10 Upon completion of the works, the species of conservation importance that will be potentially affected will be revisited to assess the condition.

5.3.11 Induction training will be provided to all site staff to ensure that every staff will fully understand the preservation method and location of the identified species of conservation importance.

5.3.12 The Environmental Team shall monitor the condition of the plant species of conservation concern within the protection zone/works exclusion zones during the construction period on

a monthly basis with representative photographic record to present the updated conditions of the plant specimens in the monthly monitoring report.

5.3.13 Where vegetation clearance and/or trimming is required, a qualified ecologist/arborist will be appointed to provide on-site supervision and monitoring to ensure no tree canopy or tree roots will be adversely impacted.

5.3.14 Standard good site practice will considerably reduce any potential disturbance from slope works including:

(a) All construction materials shall be stockpiled offsite to minimize the disturbance to areas in particular inside the country park area;

(b) Construction activities will be restricted to the clearly demarcated slope mitigation works areas; and

(c) Boulders works will be carried out by handheld tool to minimize the works area. No excavation works, tree felling and removal of vegetation should be allowed during the boulder removal/break-off works.

6 Recommendation

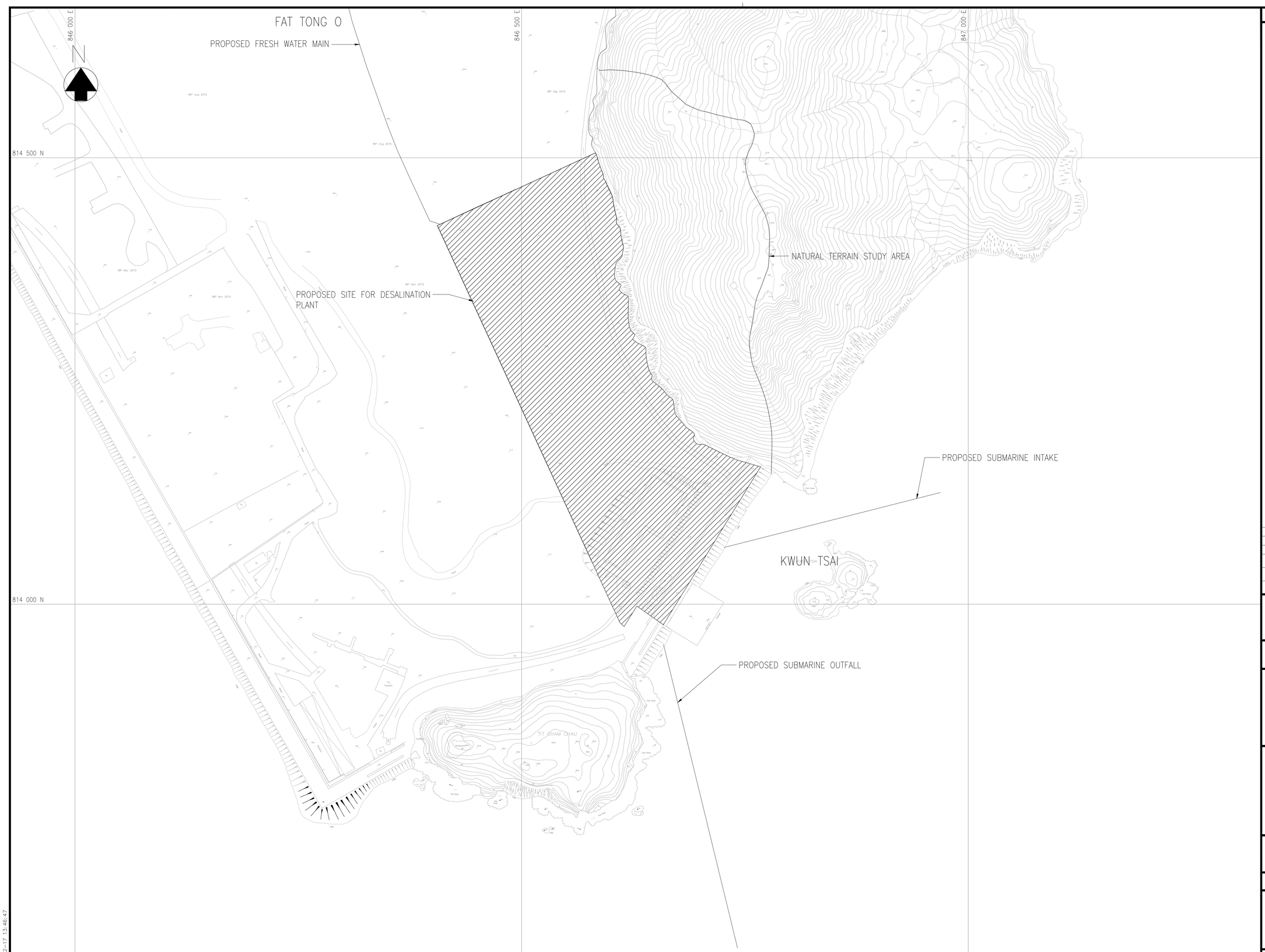
6.1.1 With the implementation of the revised slope mitigation works described in Section 5.2 and the mitigation measures outlined in Section 5.3, all plant species of conservation importance within the Project area have been identified, and appropriate protection zones will be established prior to the commencement of works. The refined design, including the arrangement of slope mitigation works, the temporary elevated access, and the temporary working platform, has been developed to fully avoid direct encroachment upon these species. Through these design refinements and the avoidance measures adopted, no direct conflict between the works and any identified plant species of conservation importance will occur. As a result, there will be no damage, disturbance, or loss of these plants during construction. Given that the revised works footprint does not physically affect any individuals of conservation important species, transplantation is not required, as all such species can be preserved in-situ.

6.1.2 All recommended protection/mitigation measures (Section 5.3) as set out in this report shall be fully and properly implemented on site during the construction stage of this Project. No site clearance works for slope mitigation works of this Project shall be allowed prior to the completion of such protection/mitigation measures on site.

END OF TEXT

APPENDIX A

SITE BOUNDARY OF THE PROJECT



MAP NOS. 12SW11D, 12SW12C,
12SW16B, 12SW16D,
12SW17A, 12SW17C

Revision	Date	Description	Initial
B	12/25	UPDATED SITE BOUNDARY	CL
A	08/16	UPDATED SITE BOUNDARY	KHC

	Designed	Checked	Drawn	Checked
Initial	YLC	CKH	SZ	WLS
Date	11/15	11/15	11/15	11/15

Approved

Agreement No.
CE 8/2015 (WS)

Contract Title
FIRST STAGE OF
DESALINATION PLANT AT
TSEUNG KWAN O – INVESTIGATION,
DESIGN AND CONSTRUCTION

Drawing Title
SITE BOUNDARY

Drawing No.
Appendix A

Revision
B

Scale
A1 1 : 2000
A3 1 : 4000

水 務 署
Water Supplies Department

Binnies Hong Kong Limited
賓尼斯工程顧問有限公司

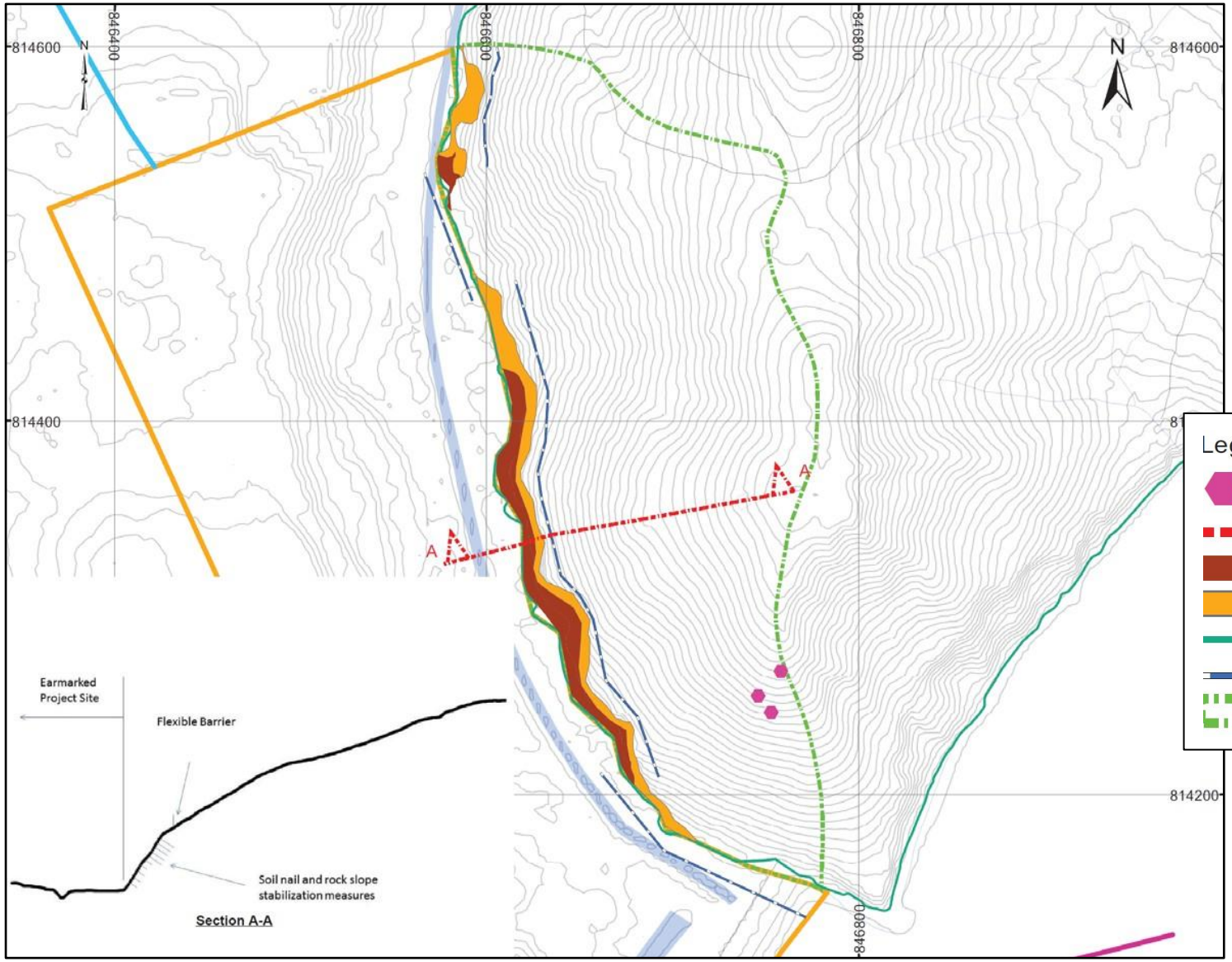
Plot Date = 2025-12-17 13:46:47

CAD filename = Y:\TO Team\Zeon\David\13WSD17\Employer's Drawings_____trust draft\20251203\190495-B-DSR-00-10003_B.dwg

APPENDIX B

SLOPE MITIGATION WORKS AREA OF THE PROJECT

(FIGURE 2 OF ENVIRONMENTAL PERMIT)



Legend 圖例:

- Potential Unstable Boulder 潛在不穩定巨石
- Section A - A 切面圖 A-A
- Rock Slope Stabilization Measures 山坡礫石穩固措施
- Slope Stabilization Measures 斜坡穩定措施
- Country Park Boundary 郊野公園界線
- Proposed Flexible Barrier (Note 1) 柔性泥石防禦網 (註一)
- Study Area for Slope Mitigation Work 斜坡緩解工程的研究範圍

Note (註):

1) Indicative alignment opening will be provided for wildlife passage

指示對準開口將提供野生動物通道

Project Title: Desalination Plant at Tseung Kwan O
工程項目名稱: 將 軍 澳 海 水 化 淡 廠
Slope Mitigation Works within the Clear Water Bay Country Park
位於清水灣郊野公園範圍內的斜坡緩解工程

Plan originated from the Figure 2.3d of approved EIA Report: AEIAR-192/2015
圖則源自已批准環評報告-AEIAR-192/2015 內的圖2.3d

Environmental Protection Department
環境保護署

Environmental Permit No. EP-503/2015/B
環境許可證編號: EP-503/2015/B

Figure 2
圖二

APPENDIX C

NOT USED

APPENDIX D

SURVEY METHODOLOGY IN 2016

METHODOLOGY

First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction: *Pre-construction Ecology Survey & Updated Vegetation Survey for Slope Mitigation Works*

April 2016

Environmental Resources Management
16/F Berkshire House
25 Westlands Road
Quarry Bay, Hong Kong
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First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction: *Pre-construction Ecology Survey & Updated Vegetation Survey for Slope Mitigation Works*

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Survey Methodology of the Pre-construction Ecology Survey & Updated Vegetation Survey for Slope Mitigation Works

Document Code: 0332378 Desal IDC Ecology Methodology_v2.docx

Client:	Project No:
Black & Veatch Hong Kong Limited	0332378
Summary:	Date: 12 April 2016
This document presents the *Survey Methodology of the Pre-construction Ecology Survey & Updated Vegetation Survey for Slope Mitigation Works* for undertaking the First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction.	Approved by:  *Craig A. Reid* *Partner*

2	Revised Methodology	JY	JNG	CAR	12/04/16
1	Methodology	JY	JNG	CAR	24/03/16
Revision	Description	By	Checked	Approved	Date

Distribution

☒ Internal

☒ Government

☒ Confidential

CONTENTS

ANNEXES

1 INTRODUCTION

1.1 BACKGROUND

The Water Supplies Department (WSD) is undertaking a project named "Desalination Plant at Tseung Kwan O" (hereinafter referred to as the "Project"). This Project will have a water production capacity of 135,000 cubic meters (m^3) per day with provision for future expansion to the ultimate capacity up to 270,000 m^3 per day when necessary.

In November 2015, WSD commissioned the study *"First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction"* (Agreement No. CE 8/2015 (WS)) for the investigation, design and construction studies of the Project.

The Project requires an Environmental Permit (EP) from the Hong Kong SAR Government. In relation to this, WSD has prepared an Environmental Impact Assessment (EIA) Report which was submitted to the Director of Environmental Protection (DEP) on 27 May 2015 and was subsequently approved on 4 November 2015 (Register No.: AEIAR-192/2015). The EP (*EP-503/2015*) for the construction and operation of the Project was granted on 4 December 2015.

Condition 2.7 of the EP of the Project specifies that an Updated Vegetation Survey for Slope Mitigation Works shall be carried out to reduce ecological impact on plant species of conservation importance, including but not limited to *Marsdenia lachnostoma*, due to the slope mitigation works of the Project. The Updated Vegetation Survey for Slope Mitigation Works shall be completed before the commencement of site clearance works for the slope mitigation works.

Agreement No. CE 8/2015 (WS) also requires that a Pre-construction Ecology Survey be completed to record the habitat types and the conditions flora and fauna at the proposed location of the slope mitigation works within the Clear Water Bay Country Park area. A Pre-construction Ecology Survey to be completed in accordance with the requirements of *Condition 2.7* of the EP and Agreement No. CE 8/2015 (WS) is consequently required.

1.2 OBJECTIVE & SCOPE OF THIS SURVEY METHODOLOGY

The main purpose of this Pre-construction Ecology Survey is to gather up-to-date ecological information in the proposed location of the slope mitigation works within the Clear Water Bay Country Park area for the Project under Agreement No. CE 8/2015 (WS).

The objectives of the Pre-construction Ecology Survey and Updated Vegetation Survey are as follows:

- To identify the habitat type, species of vegetation, terrestrial mammal, bird, herpetofauna, butterflies and dragonflies, etc. found and their locations, their abundances and general conditions;
- To highlight any species of special interest or conservation importance, particularly on species, numbers and locations of the plant species of conservation importance including but not limited to *Marsdenia lachnostoma*, identified within the proposed location of slope mitigation works;
- To assess the potential impacts on ecology in particular any species of conservation importance caused by the proposed slope mitigation works;
- To propose appropriate protection or mitigation measures for the plant and wildlife species of conservation importance as identified in the survey; and
- To recommend monitoring required to be implemented during the slope mitigation works within the Country Park Area.

This *Survey Methodology* presents the survey plan to achieve the objectives of the Pre-construction Ecology Survey and Updated Vegetation Survey for the slope mitigation works.

1.3 STRUCTURE OF THIS METHOD STATEMENT

Following this introductory section, the remainder of this *Survey Methodology* is presented as follows:

- *Section 2* presents the methodologies for the Pre-construction Ecology Survey, including habitat and vegetation survey, and wildlife survey; and,

- *Section 3* describes the reporting arrangement upon the completion of the ecological surveys.

2 SURVEY METHODOLOGY

2.1 INTRODUCTION

The survey methodology of the Pre-Construction Ecological Survey has made reference to the technical guidelines of ecological assessment in *Annex 16* of *EIAO-TM* and the relevant Guidance Notes (*GN 7/2010* and *GN 10/2010*) as well as the requirements stipulated in *Condition 2.7* of *EP-503/2015*.

Based on the desktop review and findings from the EIA Report, an updated ecological survey is proposed to be conducted in the wet and dry seasons for a duration of at least 6 months between May and December 2016 to provide up-to-date information on existing condition of terrestrial ecological profile within the Study Area, which is 500 m from the slope mitigation works area ("Works Area") (*Figure 2.1*). Study boundary is drawn up with due consideration of the diversity of habitats and presence of species of conservation importance within the terrestrial habitats of the Study Area, in particular the Works Area within the Clear Water Bay Country Park.

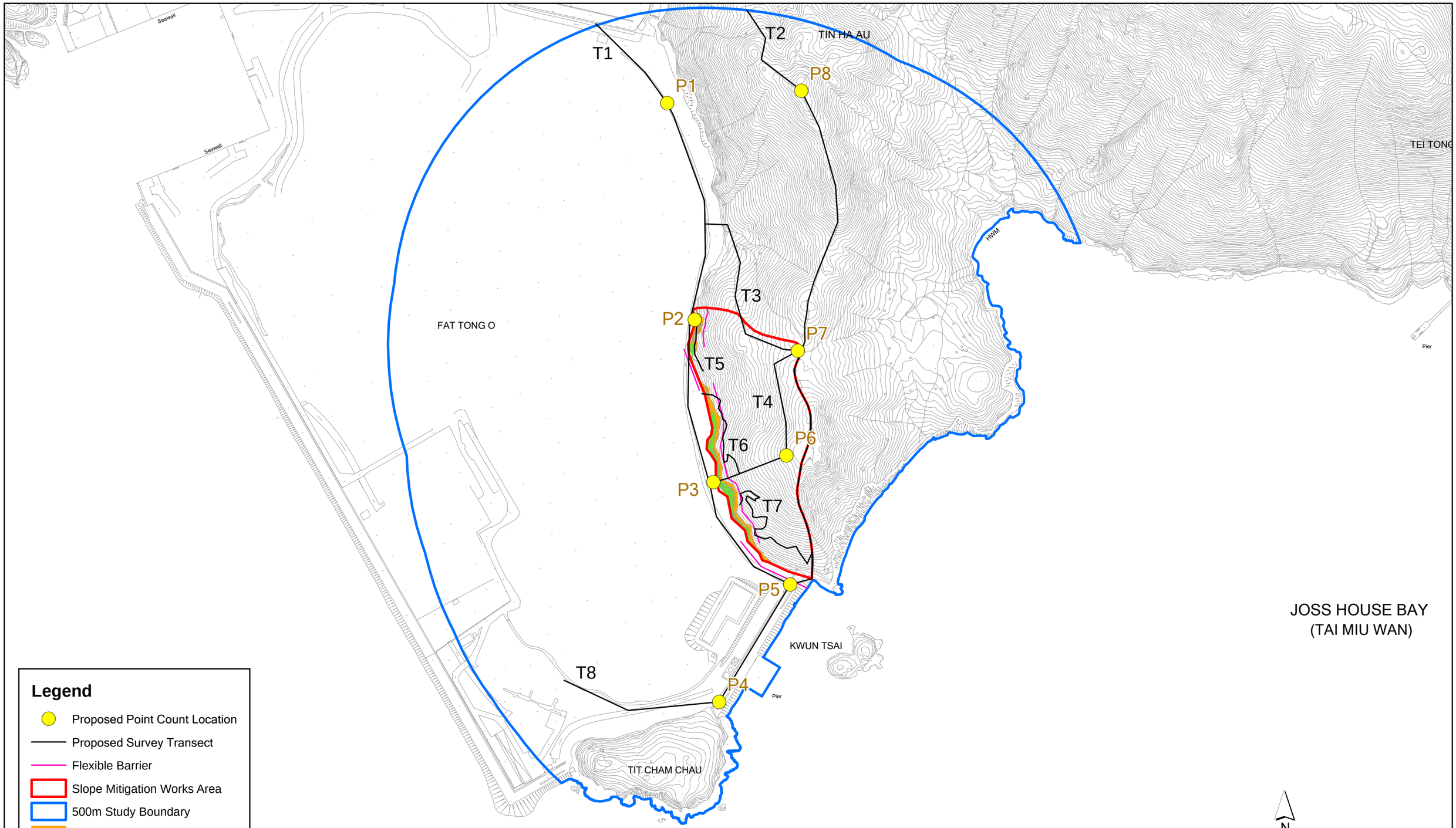
2.1.1 *Habitat & Vegetation Survey*

Field surveys focusing on habitat and vegetation within the Study Area will be performed to establish the general terrestrial ecological profile of the Study Area and Works Area.

A preliminary habitat map of suitable scale will be prepared during the desktop review, which will be used during the ecological survey. The preliminary habitat map will be produced based on government latest aerial photos and findings from the approved EIA Report, which will be verified by field ground-truthing to generate the final habitat map. Representative areas of each habitat type and the proposed slope mitigation works area will be surveyed on foot.

As part of the Updated Vegetation Survey, plant species within each habitat type of the Study Area will be identified, and their relative abundance will be recorded with special attention to rare or protected species. Species, number and locations of plant species of conservation importance, including but not limited to *Marsdenia lachnostoma*, will be recorded in accordance with requirements stated in the *EP Condition 2.7*. According to the approved EIA Report (Register No.: AEIAR-192/2015), the Updated Vegetation Survey will be carried out at the slope mitigation areas within the Clear Water Bay Country Park to assess the condition and identify the location of each individual of *Marsdenia lachnostoma* and other flora species of conservation interest that may be directly affected by the construction works.

Nomenclature and conservation status of the plant species followed those documented in the AFCD's biodiversity database as well as Xing et al., (2000)



Legend

- Proposed Point Count Location
- Proposed Survey Transect
- Flexible Barrier
- Slope Mitigation Works Area
- 500m Study Boundary
- Soil Nailing
- Rock Slope Stabilization

Figure 2.1

Study Area for Pre-construction Ecology Survey

File: T:\GIS\CONTRACT\0332378\Mxd\0332378_SA_for_PreConstruction_Eco_Survey.mxd
Date: 12/4/2016

Environmental Resources Management

ERM

[1], Wu and Lee (2000) [2], Siu (2000) [3], Yip et al., (2010) [4] and Hong Kong Herbarium (2016) [5].

2.1.2 Wildlife Survey

Terrestrial Mammal

All sightings, tracks, and signs of mammals (including scats, footprints) of terrestrial mammals will be actively searched along survey transects in day- and night-time surveys. Night surveys will be conducted to survey nocturnal mammal species. Visual inspection will be conducted at potential usage area for bats (e.g. vegetation with fruits and/or a complex growth form) during night survey. The survey transects cover all representative habitats recorded within the Study Area. Nomenclature for mammals followed Shek (2006) [6]. Whilst quantification of abundance of mammals in the Study Area is not required, due to the difficulties in translating sights and tracks (e.g. burrows) to actual abundance, a list of mammals recorded during the surveys will be provided.

Avifauna

The presence and abundance of bird species at various habitats shall be recorded visually and aurally during day- and night-time surveys. Birds in each habitat type within the Study Area will be surveyed quantitatively at each habitat type using transect count and/or point count method based on on-site condition. In each survey location, survey transects will be established according to site conditions and also subject to accessibility. For transect count or point count methods, all birds seen or heard within 30m from either sides of the sampling transect/point will be counted and identified to species where possible. Signs of breeding (e.g. nests, recently fledged juveniles), if any, within the Study Area will also be recorded. Bird species encountered outside transects but within the Study Area will also be recorded to produce a complete species list. Night surveys will be conducted to survey nocturnal bird species. The locations of any bird species of conservation importance will be recorded. Observations will be made using binoculars (at least 8x) and photographic records will be taken, if possible. Ornithological nomenclature followed List of Hong Kong Birds (2013) of Hong Kong Bird Watching Society [7] or the most updated checklist.

(1) Xing FW, Ng SC, Chau LKC (2000) Gymnosperms and angiosperms of Hong Kong. Memoirs of the Hong Kong Natural History Society 23: 21-136

(2) Wu SH, Lee TC (2000) Pteridophytes of Hong Kong. Memoirs of the Hong Kong Natural History Society: 23:5-20

(3) Siu LPG (2000) Orchidaceae of Hong Kong. Memoirs of the Hong Kong Natural History Society: 23:137-148

(4) Yip JY., Yip JKL, Liu EKY, Ngar YN and Lai PCC (2010) A Floristic Survey of Marshes in Hong Kong. Hong Kong Biodiversity. Agriculture, Fisheries and Conservation Department Newsletter, 19: 7-16.

(5) Hong Kong Herbarium (2016) Available at: http://herbarium.gov.hk/Introduction.aspx

(6) Shek, C.T. (2006) A Field Guide to the Terrestrial Mammals of Hong Kong.

(7) Hong Kong Bird Watching Society List of Hong Kong Birds, (2012). Hong Kong Bird Watching Society: http://www.hkbws.org.hk/web/eng/download_eng.htm

Herpetofauna

Herpetofauna surveys will be conducted qualitatively through direct observation and active searching in all habitat types along survey transects established during avifauna survey (including day- and night-time), and also in potential hiding places such as among leaf litter, inside holes, under stones and logs within the Study Area. Particular attention shall be given to streams and watercourses, if any. Since reptile and amphibian are mostly nocturnal, night surveys will be carried out. Auditory detection of species-specific calls will also be used to survey frogs and toads. During the surveys, all reptiles and amphibians sighted and heard will be recorded. Nomenclature and status used for reptiles followed Karsen et al., (1998) [(1)] and Chan et al., (2006) [(2)] while those of amphibians followed Chan et al., (2005) [(3)].

Odonate (i.e. Dragonflies & Damselflies) & Butterfly

Odonates and butterflies in different habitats of the Study Area will be surveyed quantitatively in daytime using transect count and/or point count method based on on-site situation. The survey transects follow those adopted for avifauna survey and cover representative habitats within the Study Area. Odonates and butterflies encountered outside survey transects but within the Study Area will also be recorded in order to produce a complete species list. Odonates and butterflies seen within 30m from either sides of the sampling transect/point will be identified and counted. Relative abundance of odonates and butterflies in each type of habitat will be estimated. Nomenclature for butterflies followed Chan et al., (2011) [(4)] and odonates nomenclature followed Tam et al., (2011) [(5)].

Aquatic Fauna

Aquatic fauna survey, including freshwater macro-invertebrates and fishes, in accessible channel, stream (both perennial and seasonal) and associated riparian habitats identified within the Study Area will be conducted by direct observation and active searching. Organisms will be recorded and identified to the lowest possible taxon, and their relative abundances will be reported. Nomenclature for fish followed Lee et al., (2004) [(6)], while those for the macro-invertebrates followed Dudgeon (1999) [(7)].

(1) Karsen SJ, Lau MWN, Bogadek A (1998) Hong Kong Amphibians and Reptiles. Urban Council, Hong Kong

(2) Chan, K.F., Cheung, K.S., Ho, C.Y., Lam, F.N, Tang, W.S., Tse, M.L. (2006) A Field Guide to the Venomous Land Snakes of Hong Kong.

(3) Chan KF, Cheung KS, Ho CY, Lam FN, Tang WS, Lau WN, Bogadek A (2005) Field Guide to the Amphibians of Hong Kong.

(4) Chan ACH, Cheung JKH, Sze PWC, Wong AKC, Wong EYH and Yau EYW (2011) A Review of the Local Restrictedness of Hong Kong Butterflies. Hong Kong Biodiversity Newsletter of Agriculture, Fisheries and Conservation Department (21): 1 - 12.

(5) Tam TW, Leung KK, Kwan BSP, Wu KKY, Tang SSH, So IWY, Cheng JCY, Yuen EFM, Tsang YM, Hui WL (2011) The Dragonflies of Hong Kong.

(6) Lee LF, Lam KS, Ng KY, Chan KT and Young LC (2004) Field Guide to the Freshwater Fish of Hong Kong.

(7) Dudgeon D (1999) Tropical Asian Streams: Zoobenthos, Ecology and Conservation.

2.2 *PROPOSED SURVEY SCHEDULE*

The Pre-construction Ecological Survey will be conducted at least twice in wet season and dry season. The tentative survey schedule is presented in *Table 2.1*.

Table 2.1 Tentative Survey Schedule for Pre-construction Ecological Survey

Season	**Wet**					**Transition**	**Dry**	
Month	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Day-time								
Habitat & Vegetation	✓	✓	✓	✓	✓		✓	✓
Terrestrial Mammal	✓		✓		✓		✓	✓
Avifauna	✓		✓		✓		✓	✓
Herpetofauna	✓		✓		✓		✓	✓
Odonata & Butterfly	✓		✓		✓		✓	✓
Aquatic Fauna	✓		✓		✓		✓	✓
Night-time								
Terrestrial Mammal		✓		✓			✓	✓
Avifauna		✓		✓			✓	✓
Herpetofauna		✓		✓			✓	✓

3 REPORTING

Following the approval of this *Methodology*, the *Pre-Construction Ecology Survey* will be undertaken tentatively between May and December 2016.

Upon the completion of all field surveys, the scope, methodology and details of survey findings will be documented in the *Pre-construction Ecology Survey for Slope Mitigation Works Report* to demonstrate comprehensive knowledge and updated ecological condition in the Study Area.

In addition, an *Updated Vegetation Survey Report for Slope Mitigation Works* will be prepared in accordance with *EP Condition 2.7* by the Qualified Ecologist (*Annex A*) (1), in which the recommended protection and mitigation measures for the plant species of conservation importance identified within the slope mitigation works area will be proposed as appropriate. In accordance with the approved EIA Report, mitigation measures shall aim to preserve individuals of *Marsdenia lachnostoma* in its totality. Also all individuals of *Marsdenia lachnostoma* within the slope mitigation areas shall be retained in-situ, by positioning the alignment of flexible barriers at a minimum 1.5m in a radius away from these individuals

The reports will be certified by the Environmental Team Leader and verified by the Independent Environmental Checker as conforming to the information and recommendations contained in the approved EIA report.

(1) In accordance with *EP Condition 2.3*, "The Permit Holder shall appoint a Qualified Ecologist who has at least 5 years of relevant experience to be responsible for carrying out the updated vegetation survey for slope mitigation works and preparing submission for the Project as required under *EP Condition 2.7*".

Annex A

CV of Qualified Ecologist

Terence Fong

Ecologist

Terence Fong is Partner responsible for overseeing ecological impact assessments, landscape and visual impact assessment, and permitting works for development projects. He has over fifteen years experience and has managed, designed and supervised numerous habitat/ biodiversity baseline surveys and IFC compliant Biodiversity Impact Assessments in the Asia Pacific region including: Kalimantan and Java (Indonesia), Vladivostok (Russia), Brunei, Philippines, Vietnam, Thailand, Saudi Arabia, Myanmar, Laos, Singapore, Korea, China, Hong Kong and Taiwan.

Terence has been involved in and managed numerous local and overseas EIAs for examining the impacts of developments (including power plant, housing, port, mining, landfill, highways, railways, pipelines and cables) on ecological resources, particularly sensitive habitats, such as:

- Riparian vegetation
- Migratory bird habitats;
- Marshes and wetland bird habitats;
- Raptor nesting and foraging areas;
- Montane and lowland forest;
- Endemic amphibian habitats;
- Butterfly and larval host plants;
- Protection freshwater fish habitats;
- Orchid and pitcher plant habitats;
- Seagrass beds;
- Mangroves and horseshoe crab habitats;
- Coral reefs;
- Fish nursery ground.

Terence has been invited by the PRC Environmental State Protection Administration, to be one of the experts to participant in the Project "Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand", whereas the project is funded by UNEP/GEF, and appointed by UNEP as the Final Evaluator for one of the Demonstrate Site. The Project involves six components, coral, mangrove, seagrass, wetland, land-based pollution and over-exploitation of fisheries.

As Terence is specialized in terrestrial and wetland ecology and EIA, he has been invited to give lectures in different universities in Hong Kong since 1998, and also invited by East Asian Seas Regional Coordinating Unit, UNEP (United Nations Environment Programme) to attend "The International Symposium on Protection and Management of Coastal Marine Ecosystems" and present on specialized in wetland and coastal ecology. Terence is recently appointed by The University of Hong Kong as Assistant Professor (part-time) and teaching "Ecology and Landscape Sciences" and "Ecology and Design", and Adjunct Professor (part-time) leading an EIA course for MSc programme in The City University of Hong Kong.

Fields of Competence

- Environmental Impact Assessment/Planning
- Habitat Assessment
- Renewable Energy
- Natural Resources and Conservation

Education

- MPhil, Wetland Ecology The University of Hong Kong, 1998
- BSc (Hons), Environmental Science, University of Hong Kong, 1993
- Certificate of Tropical Marine Invertebrate, 1995 Bermuda Biological Station for Research, Bermuda

Professional Affiliations & Registrations

- Adjunct Professor (part-time), The City University of Hong Kong
- Assistant Professor (part-time), The University of Hong Kong
- China-Hong Kong co-ordinator and trainer of Global Reef Check survey
- Councillor of the Marine Conservation Society, Hong Kong
- Co-opt Council Member of the Marine Biological Association of Hong Kong

Languages

- English
- Chinese (Cantonese & Mandarin)

Key Projects

Biodiversity Review for Yang Gong Windfarm Project in China (Confidential Client), 2015. Mr Fong provided technical review of the EIA Report.

Biodiversity Impact Assessment for a 100MW Photovoltaic Power Project in Jiangsu Province, China (Confidential Client), 2014. The Project involves building a solar photovoltaic system with total area of approximately 418 hectares. ERM was commissioned to conduct a detailed Biodiversity Impact Assessment and recommend feasible and practical mitigation measures for the Project. Mr Fong is the Project Director.

A Proposed Wind Farm Development, Jilin Province, China (Confidential Client), 2009-2010. ERM assessed the environmental and social management of the wind farm using Chinese regulatory, IFC performance standards and Equator Principles to identify potential environmental and social impacts of the project. ERM also assisted to implement IFC requirement including bird monitoring and staff training. Mr Fong was responsible for the design and conducting bird monitoring, as well as reassessment of bird collision risk due to the updated information.

Environmental Impact Assessment for Development of a 100MW Wind Farm in Hong Kong (Hong Kong Electric Co.), 2008-2014. ERM was commissioned to conduct the EIA for 2 alternative offshore wind farm locations in Hong Kong. Key issues for the project included impact to seabirds and migratory birds as well as impacts to two species of resident marine cetaceans. Mr Fong was responsible for the design of ecological baseline surveys including habitat mapping, seabird, marine mammal, intertidal, benthic and coral, and technical review of the ecological impact assessment and fisheries impact assessment for the Project during EIA stage. The EIA was approved, with conditions, by the Advisory Council on the Environment in April 2010. As part of the ongoing work, a Fisheries Review and Consultation Programme (FRCP) is being implemented to consult with the fishery sector and determine whether there is scope for fishing operations to be conducted within the development area and to explore the possibility of enhancing fishery resources there. In addition, Mr Fong also provided technical support and attended Stakeholder Liaison Group meetings.

Hong Kong Offshore Wind Farm in Southeastern Waters (CAPCO), Hong Kong, 2009-2014. ERM were commissioned to implement certain conditions of approval of the EIA for a wind farm in southeastern waters of Hong Kong. Mr. Fong led the work on one such condition, to develop a fisheries enhancement plan (FEP) in consultation with the fishery sector and the Hong Kong government, incorporating such measures as the deployment of artificial reefs. The FEP will ensure the views of fishermen are heard, addressed and utilized. In addition, Mr Fong provided technical support and attended Stakeholder Liaison Group meetings.

Offshore Wind Farm Pilot EIA (Unitech Engineering Inc.), Taiwan, 2013-2014. ERM was engaged to conduct bird collision risk assessment for an offshore wind farm pilot EIA which built upon Taiwan regulatory approvals. Mr Fong provided technical input on the bird collision risk assessment.

Environmental Assessment for the Town Island Renewable Energy Supply (CLP Power), Hong Kong, 2009-2010. CLP proposed to establish permanent Renewable Energy including photovoltaic arrays, two 6kW wind turbines, underground cabling system and associated equipment for a residential drug rehabilitation facility. The key concerns of the project include ecology, tree felling, visual and landscape, and electric and magnetic field. Mr Fong was responsible for the design of ecological baseline surveys and technical review of the ecological impact assessment (including bird collision risk assessment) for the Project.

Environmental Assessment for the Town Island Renewable Energy Supply (CLP Power), Hong Kong, 2009-2010. CLP proposed to establish permanent Renewable Energy including photovoltaic arrays, two 6kW wind turbines, underground cabling system and associated equipment for a residential drug rehabilitation facility. The project involved 6 months avifauna surveys. Mr Fong was responsible for the design of ecological baseline surveys and technical review of the ecological impact assessment for the Project.

Environmental, Social and Health Impact Assessment of a Proposed 380 MW Hydropower Project, (Confidential Client), Philippines, 2014-2015. ERM is presently conducting the ESHIA for a hydropower facility in Luzon Province in the Philippines. ERM is also tasked with supervising the local consultants who are responsible for obtaining the Environmental Compliance Certificate. Key issues include dam safety, changes in seasonal flooding patterns, habitat loss and ecological flow assessment. Terence is the Project Director.

Coc San Hydropower Project: Environmental and Social Impact Assessment Study, Vietnam (Colben Energy (Vietnam) Joint Stock Company and Viet Hydro Pte. Ltd.), 2013. ERM were commissioned to conduct the ESIA for the development of a hydroelectric project in Trung Chai Commune, Sa Pa

District and Coc San Commune, Bat Xat District, close to the Chinese border in northern Vietnam. The Coc San Hydropower Project (HPP) will utilise the waters of the Dum River (Ngoi Dum) to potentially generate 134.2 GWh of energy per year from an installed capacity of 29.7 MW. The study involved detailed biodiversity field surveys including habitat mapping, vegetation and wildlife surveys and social baseline surveys. Terence was the Project Manager and Biodiversity Specialist responsible for overseeing the EIA, biodiversity baseline survey design and technical review of the EIA and recommendations for mitigation measures and monitoring requirements.

Nam Ngiep 1 Hydropower Project: Biodiversity Offset Assessment & Environmental Flow Assessment, Laos, (Kansai Electric Power Company Inc.), 2013. Nam Ngiep 1 Hydropower Project (NNHP1) Project involves construction and operation of a 290MW hydroelectric power generation facility on a build-operate-transfer basis at the Nam Ngiep River. The Project site is in the provinces of Vientiane and Bolikhamxay, Lao PDR with the majority of generated power exported to Thailand and some for domestic supply. ERM were commissioned to the conduct biodiversity offset assessment including undertaking comprehensive baseline biodiversity surveys, assessing biodiversity impact and suitability of a biodiversity offset, as well as its design of measures. The scope of works also included technical review of environmental flow assessment. Terence was the Biodiversity Specialist of the study.

Nam Sane 3 Hydro-Power Plant Environmental Impact Assessment Study, (Rohas) Laos, 2008. ERM were commissioned to conduct the EIA for the development of a hydroelectric project in a remote region of Xieng Khouang province in Laos. The study involved detailed biodiversity field survey including habitat mapping, vegetation and wildlife surveys to gather baseline information as well as conducting stakeholder consultation meetings with various NGOs and government departments. Mr Fong was responsible for biodiversity baseline survey design and technical review of the ecological impact assessment and recommendations for mitigation measures and monitoring requirements.

Biodiversity Impact Assessment for Downtown Line Stages 2 & 3 Alignment (Land Transport Authority), Singapore, 2009. The biodiversity impact assessment forms part of the EIA study for the Downtown Line Stages 2 & 3 Alignment. Mr Fong was responsible for the design and coordination of the terrestrial biodiversity baseline surveys including habitat mapping, vegetation and wildlife, surveys, and the biodiversity assessment.

Scoping Environmental Impact Assessment of the Mount Faber Development (Sentosa Development Corporation), Singapore, 2007. Sentosa Development Corporation (SDC) intended to develop 65 hectares of land at the foothill of Mount Faber, which include low intensity developments such as themed leisure experiences, unique accommodations and transport nodes connecting the precinct to the Mount Faber Ridge top, a cluster of attractions that leverage on the natural landscape and terrain. Mr Fong was responsible for biodiversity and ecological assessment.

EIA for Marina Bay Sands in Singapore (Venetian Macau Limited) 2007. Mr Fong was responsible for the design and coordination of the terrestrial and marine biodiversity baseline surveys including habitat mapping, vegetation, wildlife, coastal and benthic surveys. The biodiversity assessment evaluated the biodiversity and ecological conditions of the site and identified the potential impacts due the development.

The Baroque on Lamma (Confidential Client) 2010-2012. ERM has been commissioned to undertake the EIA and planning applications for a marina development off southeast Lamma Island. Key issues for the EIAs include impacts of sensitive habitats for Romer's Tree Frog, birds, finless porpoise, green turtle, and fisheries. ERM is therefore responsible for the design of ecological baseline surveys including habitat mapping, terrestrial wildlife, marine mammal, intertidal, benthic and coral. Mr Fong is the Ecology Team Leader responsible for co-ordinating and organizing ecological field surveys, identifying potential environmental constraints of the proposed project, providing appropriate mitigation measures and preparing the ecological and LVIA sections of the EIA Report.

Pilot Project for Public - Private Conservation Scheme, Sha Lo Tung Valley, Tai Po (Sha Lo Tung Development Company), 2005-2009. The Pilot Project is proposed to be one of the pilot projects under the scheme of Public-Private Partnership (PPP) further to HKSAR government's Nature Conservation Policy. This Project establishes the framework for a public-private partnership to conserve the Sha Lo Tung Valley in Tai Po which is well known dragonfly heaven and of ecological significance. Endorsement of the Project will ensure long-term active conservation management of the ecologically sensitive areas currently located on private land owned by the Sha Lo Tung Development Company. The Project will provide a source of funds to sustain conservation action of the ecological sensitive area. This balance between development and conservation expectations, will enable the Valley to become a unique nature

attraction and educational resource for both locals and tourists, which can be achieved quickly and without Government funding. Mr Fong was the Project Manager responsible for the environmental impacts assessment due to the proposed development outside the Sha Lo Tung Valley, as well as the development of Conservation Management Plan.

2008 Update of Terrestrial Habitat Mapping and Ranking Based on Conservation Value (Sustainable Development Division of the Environment Bureau, HKSAR), Hong Kong, 2008-2009. The main objectives of the Study are to update the findings of the previous Habitat Mapping Studies (in 2000, 2003, 2005 and 2007) to review and update the existing terrestrial habitat and ecological baseline database (including the maps contained in the Computer-Aided Sustainability Evaluation Tool (CASET)) and maintain the data integrity through (a) remote sensing analysis using up-to-date satellite images; (b) desktop truthing using orthophotos; and (c) field truthing surveys including for freshwater/brackish wetland, natural watercourse, rocky shore, sandy shore, mangrove and intertidal mudflats in Hong Kong, amongst others. Mr. Fong was the Project Manager and habitat mapping specialist on this project, having also been the Project Manage or deputy for the previous 2006-7 and 2002-2003 Habitat Mapping Projects that ERM were commissioned for as well as the original 2000 Project whereby the Habitat Map baseline was established.

Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand, for UNEP/GEF, 2002-2008. Mr Fong was invited by the PRC Environmental State Protection Administration to work along-side other international experts from the project region. The project involves six components: coral, mangrove, seagrass, wetland, land-based pollution and over-exploitation of fisheries, and aims to develop Demonstration Sites for each component. As one of the experts, Mr Fong was responsible for conducting ecological surveys, proposing suitable demonstration sites and collaborating with local government, community stakeholders and academics, etc to preserve and manage the area properly. Due to the lack of ecologists in Mainland China, Mr Fong instructed some training courses for the South China Sea Institute of Oceanology. Mr Fong also appointed by UNEP as the Final Evaluator for one of the Demonstrate Site.

Environmental Consultancy Services (Confidential Theme Park Group), 2014-2015. ERM has been commissioned by a theme park group to provide consultancy services around its environmental permitting, advising on what is permissible within the limits of the current permit and what would require an application for a variation. Mr. Fong has been a key advisor on all environmental and strategic elements, also leading the ecological and LVIA inputs to any reporting.

Environmental Consultancy Services (Confidential Theme Park Group), 2013-2014. ERM has been commissioned by a theme park in Hong Kong to provide consultancy services around its environmental permitting, particularly with regards to the scope of existing permits and any requirement for additional permit applications for proposed new developments. Mr. Fong, with his detailed knowledge of the environmental legislation and permitting processes, was key strategic advisor for this Project, particularly with regards to LVIA and biodiversity inputs.

Infrastructure for Penny's Bay Development – Contract 1: Vegetation Transplantation (China State), 2002–2005. ERM has been commissioned to conduct vegetation survey and transplantation works for two restricted sedge species impacted by the development of Penny's Bay. Mr Fong was the Project Manager and was responsible for preparation of transplantation proposal, supervision of the overall transplantation procedures. The plants have been transplanted to Sze Pak Wan and monitored for three years before handover to AFCD.

Detailed Design for Wetland Recreation, Kowloon and Canton Railway Corporation (KCRC), Hong Kong, 2000-2004. Mr Fong was the Deputy Project Manager of this study. Its overall objective is to compensate for the loss of ecologically-rich wetland habitat in the Kam Tin Valley through a habitat creation programme based on the guiding principles established in the HCMP. As the ecology of the Kam Tin Valley has been disrupted through the West Rail project, the guiding principles should facilitate the early establishment of ecological resources on commissioning of the re-created wetland habitat. With this overall objective in mind, broad principles will be applied for the expeditious wetland design and creation process.

Agreement No. CE 8/2015 (WS)

First Stage of Desalination Plant at Tseung Kwan O

Investigation, Design, Construction

Pre-construction Ecology Survey for Slope Mitigation Works

Survey Methodology

Response to Comments

Page

1. Comment from AFCD, email dated 11 April 2016.

Comments	Responses
I refer to your email dated 26.3.2016 regarding the captioned subject. Please find our further comment below:-	
The EP condition 2.7 requires an updated vegetation survey covering species, numbers and locations of the plant species of conservation importance, including but not limited to *Marsdenia lachnostoma*, identified within the works area of slope mitigation works. In addition, according to the approved EIA Report (EIA-229/2015), the mitigation measures are to preserve individuals of *Marsdenia lachnostoma* in its totality (Section 9.5.2c). The EIA Report also suggests that all individuals of *Marsdenia lachnostoma* within the slope mitigation areas shall be retained in-situ, by positioning the alignment of flexible barriers at a minimum 1.5m in a radius away from these individuals (Section 9.7). Furthermore, it is suggested that a vegetation survey shall be carried out at the slope mitigation areas within the Clear Water Bay Country Park to assess the condition and identify the location of each individual of *Marsdenia lachnostoma* and other flora species of conservation interest that may be directly affected by the construction works (Section 9.10).	Noted. We will follow the EP condition and EIA report mitigation measures to preserve individuals *Marsdenia lachnostoma* in its totality. Vegetation survey will be carried out at the slope mitigation areas within the Clear Water Bay Country Park to assess the condition and identify the location of each individual of *Marsdenia lachnostoma* and other flora species of conservation interest that may be directly affected by the construction works, all individuals of *Marsdenia lachnostoma* within the slope mitigation areas shall be retained in-situ, by positioning the alignment of flexible barriers at a minimum 1.5m in a radius away from these individuals.
In view of the above, it seems that the proposed survey transect as suggested in Figure 2.1 of the Detailed Survey Methodology may not be adequate to fulfill the intention of assessing the condition of each/all individual(s) of *Marsdenia lachnostoma*. A thorough survey within the slope mitigation works boundary and its vicinity should be conducted.	We have added more transects to cover the works area for flexible barriers and shown in Figure 2.1. The areas for soil nailing and rock stabilization (mainly cliff areas) are however inaccessible and so transects could not be added.

2. Comment from AFCD, email dated 21 April 2016.

Comments	Responses
I refer to your email dated 12.4.2016 regarding the captioned subject. Please be informed that I have no further comment please.	Noted with thanks.
While we have no further comment on the revised methodology, as stated in our previous comment, the consultant should note the purposes of the updated vegetation survey on plant species of conservation importance as stipulated in the EP condition 2.7. For inaccessible areas, observation from nearest transect/survey points to assist the survey should be performed as far as practicable.	Agreed. Observations from nearest transect/survey points to assist the survey for inaccessible areas will be performed as far as practicable.

APPENDIX E

SURVEY RESULT BY ERM IN 2017

FINAL REPORT

First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction: *Updated Vegetation Survey for Slope Mitigation Works*

June 2017

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First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction: *Updated Vegetation Survey for Slope Mitigation Works*

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Final Report for the Updated Vegetation Survey for Slope Mitigation Works

Document Code: 0332378_Final Report for Updated Vegetation Survey for Slope Mitigation Works.docx

Client:	Project No:
Black & Veatch Hong Kong Limited	0332378
Summary: This document presents the *Final Report of the Updated Vegetation Survey for Slope Mitigation Works* for the First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction.	Date: 30 June 2017 Approved by:  *Craig A. Reid* *Partner* *Terence Fong* *Partner*

Revision	Description	By	Checked	Approved	Date
1	Final	PT	TF	TF	16/06/17
0	Draft	VAR	JNG	CAR/ TF	20/02/17

Distribution

☒ Internal

☒ Government

☒ Confidential

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

The Water Supplies Department (WSD) is undertaking a project named "Desalination Plant at Tseung Kwan O" (hereinafter referred to as the "Project"). This Project will have a water production capacity of 135,000 cubic meters (m^3) per day with provision for future expansion to the ultimate capacity up to 270,000 m^3 per day when necessary.

In November 2015, WSD commissioned the study *"First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction"* (Agreement No. CE 8/2015 (WS)) for the investigation, design and construction studies of the Project.

The Project requires an Environmental Permit (EP) from the Hong Kong SAR Government. In relation to this, WSD has prepared an Environmental Impact Assessment (EIA) Report which was submitted to the Director of Environmental Protection (DEP) on 27 May 2015 and was subsequently approved on 4 November 2015 (Register No.: AEIAR-192/2015). The EP (*EP-503/2015*) for the construction and operation of the Project was granted on 4 December 2015.

Condition 2.7 of the EP of the Project specifies that an Updated Vegetation Survey for Slope Mitigation Works shall be carried out to reduce ecological impact on plant species of conservation importance, including but not limited to *Marsdenia lachnostoma*, due to the slope mitigation works of the Project. The Updated Vegetation Survey for Slope Mitigation Works shall be completed before the commencement of site clearance works for the slope mitigation works.

An Updated Vegetation Survey (hereinafter "the Assignment") to be carried out in accordance with the requirements of *Condition 2.7* of the EP is consequently required.

1.2 OBJECTIVE & SCOPE OF THIS ASSIGNMENT

The main purpose of this Updated Vegetation Survey is to gather up-to-date ecological information in the proposed location of the slope mitigation works within the Clearwater Bay Country Park area for the Project under Agreement No. CE 8/2015 (WS).

According to Condition 2.7 of EP, the Updated Vegetation Survey shall include:

- details of updated vegetation survey including the survey methodology, duration and schedule;

- findings of the updated vegetation survey, particularly on species, numbers and locations of the plants species of conservation importance including but not limited to *Marsdenia lachnostoma*, identified within the works area of slope mitigation works.

- recommended protection and mitigation measures for the plant species of conservation importance as identified in the updated vegetation survey; and

- if transplantation is eventually proposed for the plant species of conservation importance, the transplantation proposal shall include the locations of reception sites for transplanted plants, methodology of transplantation and detailed schedule for post-transplantation monitoring and maintenance requirements.

1.3 PURPOSE OF THE REPORT

According to Condition 2.7 of EP, the Updated Vegetation Survey Report shall be prepared by the Qualified Ecologist as appointed under Condition 2.3 and shall be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the approved EIA report (Register No. AEIAR-192/2015).

The Updated Vegetation Survey of Slope Mitigation Works ("the Report") summarizes the survey methodology and the findings of surveys between May and December 2016. Based on the survey findings, recommended mitigation measures are proposed to conserve the recorded plant species of conservation importance as identified in the Updated Vegetation Survey.

All recommended mitigation measures as set out in the approved Vegetation Survey Report shall be fully and properly implemented on site during the construction stage. No site clearance works for the slope mitigation works of the Project shall be allowed prior to the approval of the Vegetation Survey Report, as well as completion of any protection/mitigation works or transplantation.

1.4 STRUCTURE OF THIS REPORT

Following this introductory section, the remainder of this *Final Report* is presented as follows:

- *Section 2* presents the methodologies for the Updated Vegetation Survey of Slope Mitigation Works as agreed by AFCD;

- *Section 3* describes the findings of the surveys completed between May and December 2016; and

- *Section 4* presents the potential impacts and recommended mitigation measures for the plant species of conservation importance as identified in the surveys.

2 SURVEY METHODOLOGY

2.1 INTRODUCTION

The survey methodology of this Assignment has made reference to the technical guidelines of ecological assessment in *Annex 16* of *EIAO-TM* and the relevant Guidance Notes (*GN 7/2010* and *GN 10/2010*) as well as the requirements stipulated in *Condition 2.7* of *EP-503/2015*.

Based on the desktop review and findings from the EIA Report, an updated vegetation survey is proposed to be conducted in the wet and dry seasons for a duration of at least 6 months between May and December 2016 to provide up-to-date information on existing condition of terrestrial ecological profile within the Study Area, which is 500 m from the slope mitigation works area ("Works Area") (*Figure 2.1*) (1). Study boundary is drawn up with due consideration of the diversity of habitats and presence of species of conservation importance within the terrestrial habitats of the Study Area, in particular the Works Area within the Clearwater Bay Country Park.

2.2 HABITAT & VEGETATION SURVEY

Field surveys focusing on habitat and vegetation within the Study Area were conducted to establish the general terrestrial ecological profile of the Study Area and Works Area.

A habitat map showing the Study Area was compiled based on the government latest aerial photos and findings from the approved EIA report (Register No.: AEIAR-192/2015), with aid of field ground truthing. Representative areas of each habitat type and the proposed Works Area were surveyed on foot.

According to the approved EIA Report (Register No.: AEIAR-192/2015) and *Condition 2.7* of the Environmental Permit (EP) (EP-503/2015), the Updated Vegetation Survey was carried out at the slope mitigation areas within the Clearwater Bay Country Park in order to assess the existing condition and identify the location of each individual of *Marsdenia lachnostoma* and other plant species of conservation importance that may be directly affected by the slope mitigation works.

As part of the Updated Vegetation Survey, plant species within each habitat type of the Study Area were identified, and their relative abundance was recorded with special attention to rare or protected species. Species, number and locations of plant species of conservation importance, including but not limited to *Marsdenia lachnostoma*, were recorded in accordance with

(1) Surveys have been done along all identified accessible paths throughout the site (verification by ground-truthing), including survey transects conducted in the previous EIA study. Survey over the slope, especially at the horizontal interface between mixed woodland in the slope toe and the shrubland and hillside grassland mosaic, was conducted along the temporary accesses which only available since July 2016.

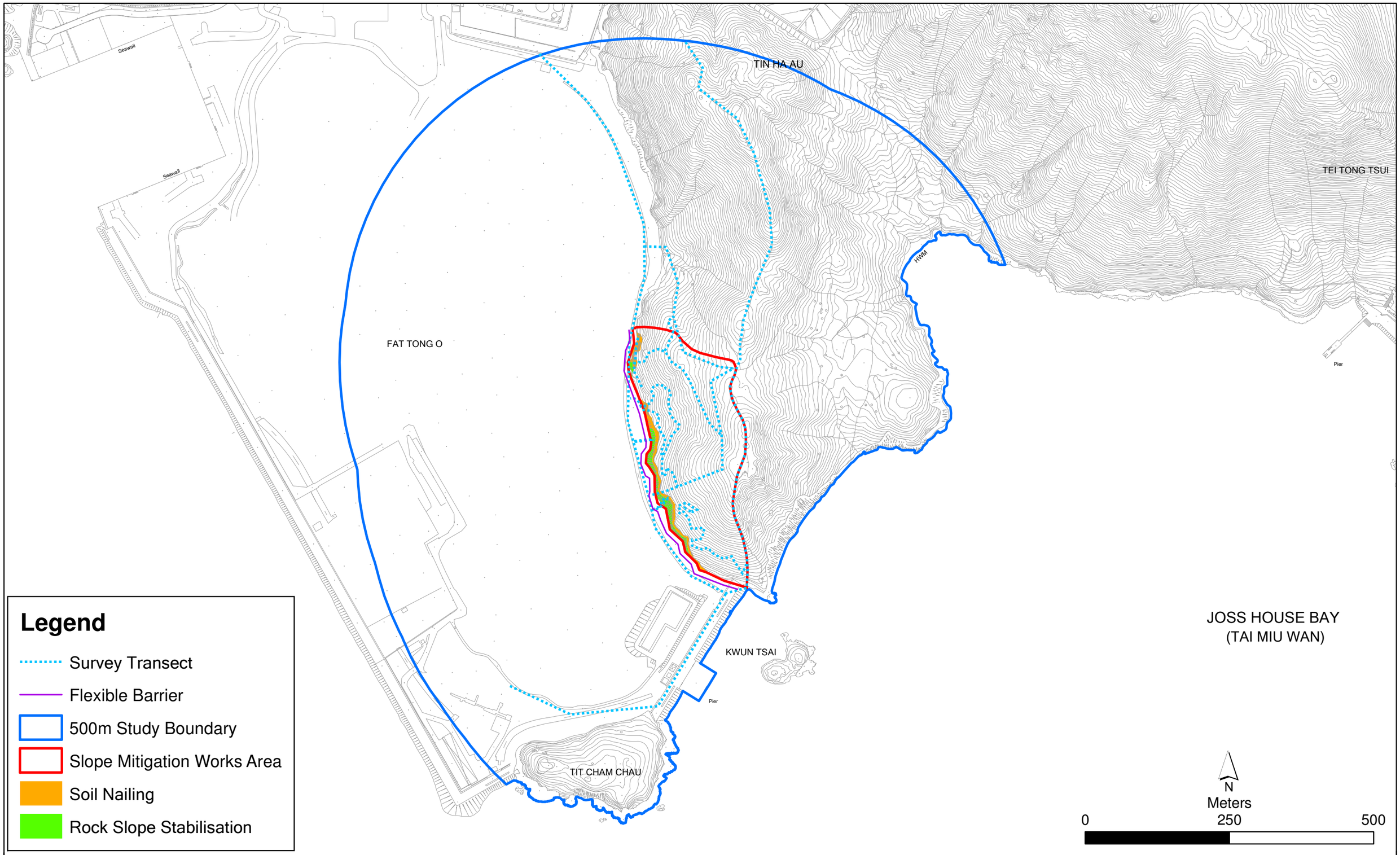

Figure 2.1

Study Area for Pre-construction Ecology Survey and Updated Vegetation Survey

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Date: 13/7/2017

Environmental Resources Management

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requirements stated in the *EP Condition 2.7*. Since there are multiple above-ground shoots or rhizomes for each individual of scandent shrubs and herbaceous plants, each plant species of conservation importance are counted in terms of group, which refers to cluster of individuals growing together at the same location. Nomenclature and conservation status of the plant species followed those documented in the AFCD's biodiversity database as well as Xing et al., (2000) (1), Wu and Lee (2000) (2), Siu (2000) (3), Yip et al., (2010) (4) and Hong Kong Herbarium (2016) (5).

2.3 SURVEY EFFORT

The entire surveying period for this Assignment is from May to December 2016. Over this period, a total of seven surveys have been conducted in accordance with the approved survey methodology (6). The overall survey programme is summarized in *Table 2.1*.

Table 2.1 Programme of the Updated Vegetation Survey

Season	**Wet**					**Transition**	**Dry**	
Month	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Day-time								
Habitat & Vegetation	18/5	22/6	22/7	22/8	20/9		29/11	23/12

Note:
Survey dates are presented in the shaded cells.

(1) Xing FW, Ng SC, Chau LKC (2000) Gymnosperms and angiosperms of Hong Kong. Memoirs of the Hong Kong Natural History Society 23: 21-136

(2) Wu SH, Lee TC (2000) Pteridophytes of Hong Kong. Memoirs of the Hong Kong Natural History Society: 23:5-20

(3) Siu LPG (2000) Orchidaceae of Hong Kong. Memoirs of the Hong Kong Natural History Society: 23:137-148

(4) Yip JY., Yip JKL, Liu EKY, Ngar YN and Lai PCC (2010) A Floristic Survey of Marshes in Hong Kong. Hong Kong Biodiversity. Agriculture, Fisheries and Conservation Department Newsletter, 19: 7-16.

(5) Hong Kong Herbarium (2016) Available at: http://herbarium.gov.hk/Introduction.aspx

(6) The methodology was submitted to AFCD for review and comment via email on 4 March 2016. Subsequently, AFCD replied with no further comment on the methodology on 21 April 2016

3 SURVEY RESULTS

3.1 HABITAT & VEGETATION

A total of six habitats were identified in the Study Area, including mixed woodland, shrubland and hillside grassland mosaic, urbanised/ disturbed area, wasteland, watercourse and marine habitats (including rocky shore, sandy shore and seawall, which are outside of the scope of this Assignment). A map showing the terrestrial habitat types is presented in *Figure 3.1*. The total area of terrestrial habitat is summarised in *Table 3.1* and the representative photos of identified terrestrial habitats are shown in *Figure 3.1*.

A total of 139 plant species were recorded between May and December 2016 within the study area. Of the 139 plant species recorded, two were considered as plant species of conservation importance, including Hairy-throat Condorvine *Marsdenia lachnostoma* and Balloon Flower *Platycodon grandiflorus*. Only *Marsdenia lachnostom* was found within the Works Area and within the shrubland and hillside grassland mosaic habitat. Location of the identified plant species of conservation importance are shown in *Figure 3.2* and their representative photos are presented in *Figure 3.3*. Full list of the plant species recorded between May and December 2016 is provided in *Annex A*.

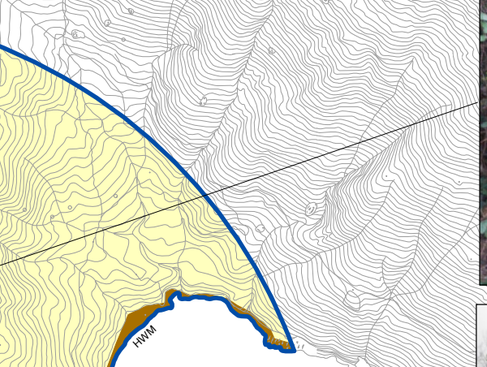
Table 3.1 Estimated Habitat Area within the Study Area and Proposed Works Area

Habitat	Area within the Study Area		Area within the Works Area	
	hectares (ha)	% total	hectares	% total
Mixed woodland	~ 1.2	1.2%	~ 0.3	5%
Shrubland and hillside grassland mosaic	~ 43.1	44.1%	~ 5.6	95%
Urbanised / disturbed area	~ 44.3	45.3%	0.0	0%
Wasteland	~ 8.1	8.3%	0.0	0%
Watercourse	~ 1.0 (length = 1.6km)	1.0%	0.0	0%
Total	~ 97.7	100%	~ 5.9	100%

3.1.1 Mixed Woodland

Mixed woodland of about 1.2 ha in size was recorded within the Study Area. It was found at the toe of the Works Area and in close proximity with shrubland and hillside grassland mosaic.

The habitat had a canopy height of between 8 - 10 meters. The mixed woodland was composed of a low diversity of exotic tree species including *Acacia auriculiformis* and *Leucaena leucocephala*, and native trees including *Celtis sinensis*, *Ficus hispida*, *Litsea glutinosa*, *Schefflera heptaphylla*, and *Sterculia lanceolata*. Understorey of the woodland was occupied by young tree



TIN HA AU

FAT TONG O

KWUN TSAI

TIT CHAM CHAU

HWM

Pier

Legend

- 500m Study Boundary
- Flexible Barrier
- Slope Mitigation Works Area
- Soil Nailing
- Rock Slope Stabilisation

Habitat

- Rocky Shore
- Sandy Shore
- Seawall
- Shrubland and Hillside Grassland Mosaic
- Urbanised/Disturbed Area
- Wasteland
- Watercourse
- Mixed Woodland

JOSS HOUSE BAY
(TAI MIU WAN)

N

Meters

0 250 500

Figure 3.1

Habitat Map With Respect to Original Slope Mitigation Works Design

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Date: 12/5/2017

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Legend

- 500m Study Boundary
- Survey Transect
- Flexible Barrier
- Slope Mitigation Works Area
- Soil Nailing
- Rock Slope Stabilisation

Habitat

- Rocky Shore
- Sandy Shore
- Seawall
- Shrubland and Hillside Grassland Mosaic
- Urbanised/Disturbed Area
- Wasteland
- Watercourse
- Mixed Woodland

Plant

- *Marsdenia lachnostoma*
- *Platycodon grandiflorus*

TIN HA AU

FAT TONG O

HWM

KWUN TSAI

Pier

TIT CHAM CHAU

N

Meters

0 250 500

Figure 3.2

Study Area for Updated Vegetation Survey – Species of Conservation Importance (Original Slope Mitigation Works)

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Date: 13/7/2017

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Marsdenia lachnostoma

Platycodon grandiflorus

Figure 3.3

Representative Photos of Plant Species of Conservation Importance

DATE: 28/04/2017

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seedlings, shrubs and herbaceous vines, including *Alocasia macrorrhizos*, *Alpinia zerumbet*, *Ficus hirta*, *Lophatherum gracile*, *Miscanthus floridulus*, *Mussaenda pubescens*, *Psychotria asiatica* and exotic *Mikania micrantha*. No plant species of conservation importance was identified in this habitat.

3.1.2 Shrubland and Hillside Grassland Mosaic

Natural shrubland and hillside grassland mosaic is the second largest habitat in terms of area within the Study Area (approximately 43.1 ha, comprising 44.1% of the total Study Area). This habitat is simple in community structure and scattered with sparse trees/ tall shrubs. Common shrubland species recorded in this habitat included *Litsea glutinosa*, *Rhodomyrtus tomentosa*, with understorey comprised of *Dicranopteris pedata*, *Embelia laeta* and *Gnetum luofuense*. Two species of conservation importance, *Marsdenia lachnostoma*, *Platycodon grandiflorus*, were recorded in this habitat, and only *Marsdenia lachnostoma* recorded within the Works Area.

3.1.3 Urbanised/ Disturbed area

Urbanised/Disturbed area, the largest habitat in terms of area within the Study Area, included existing landfill, fill bank, roads, and other existing developments. Plant species recorded were mainly composed of low diversity of herbaceous plants namely *Imperata cylindrica* and weedy vegetation including *Bidens alba*.

3.1.4 Wasteland

Wasteland was recorded along the fringe of the Project Site outside of the Works Area and as patches inside the existing fill bank. This habitat was densely vegetated with herbaceous plants including *Miscanthus floridulus* and *Alternanthera paronychioides* and weedy vegetation including *Leucaena leucocephala*, *Bidens alba* and *Mikania micrantha*.

3.1.5 Watercourse

Watercourse identified within the Study Area is a man-made channel and ditches without riparian vegetation community.

3.1.6 Plant Species of Conservation Importance

Within the Study Area, a total of two plant species of conservation importance were recorded, including Hairy-throat Condorvine *Marsdenia lachnostoma* and Balloon Flower *Platycodon grandiflorus.*

Throughout the surveys between May and December 2016, a total of 94 groups of *Marsdenia lachnostoma* and 1 group of *Platycodon grandiflorus* were recorded (*Figure 3.2*). Most of them are located within the slope mitigation works area, except for the *Platycodon grandiflorus* and 4 groups of *Marsdenia lachnostoma.*

Hairy-throat Condorvine *Marsdenia lachnostoma* is an endemic plant of Guangdong that is listed in the Rare and Precious Plants in Hong Kong and listed as "Critically Endangered" in China Plant Red Data Book (1) (2). Locally it is only distributed in shrublands and young woodlands with sparse tree canopy in North Point, Ma On Shan, Sai Kung and Tung Lung Chau. The 94 groups of *Marsdenia lachnostoma* were all recorded at the shrubland and hillside grassland mosaic within the Works Area.

Balloon Flower *Platycodon grandiflorus* was recorded in the current survey, which is in line with the record in the approved EIA report (AEIAR-192/2015). This plant species is a restricted species found only in sunny grassy slopes and shrublands of Hong Kong (1). Populations of this plant species are only recorded in Hong Kong Island, Castle Peak and Long Ke, where a Site of Special Scientific Interest (SSSI) was designated in Castle Peak since 1980 to protect a population of this plant species. Balloon Flower is protected under Cap. 96 locally for conservation and to avoid further exploitation due to its medicinal and ornamental value. During the survey in September 2016, six (6) groups of Balloon Flower were recorded flowering with immature fruits on an exposed ridge close to point count location P7, where is a shrubland and hillside grassland mosaic habitat outside of the Works Area.

3.2 *SPECIES OF CONSERVATION IMPORTANCE WITHIN THE WORKS AREA*

During the surveys between May and December 2016, one plant species and seven fauna species recorded within the Works Area are of conservation importance, and they are summarised in *Table 3.2*.

Table 3.2 Plant Species of Conservation Importance Recorded Within the Works Area

Name	Locations	Protection Status(2)	Distribution	Rarity	Location along Direct Footprint of Proposed Flexible Barrier, Soil Nailing and Rock Slope Stabilisation Area
Hairy-throat Condorvine *Marsdenia lachnostoma*	Shrubland and hillside grassland mosaic	Listed as "Critically Endangered" in the Rare and Precious Plants of Hong Kong and "Critically Endangered" in China Plant Red Data Book	Shrubland	Very rare	Near flexible barrier at Location P3

(1) http://herbarium.gov.hk/PublicationsPreface.aspx?BookNameId=1&ContentId=73&SectionId=3
(2) Hong Kong Plant Database. [Available from: http://herbarium.gov.hk/Search_Form.aspx]

The Updated Vegetation Survey of Slope Mitigation Works were carried out between May and December 2016 in accordance with the approved methodology set out in *Section 2*.

One plant species of conservation importance was found within the Works Area, namely Hairy-throat Condorvine *Marsdenia lachnostoma*. It was distributed within the shrubland /hillside grassland mosaic habitat within the Works Area. It is worth noting that several groups of *Marsdenia lachnostoma* were recorded in the close proximity of the proposed flexible barrier as shown on *Figure 3.2*.

4.1 POTENTIAL IMPACTS TO THE PLANT SPECIES OF CONSERVATION IMPORTANCE BASED ON ORIGINAL SCHEME

The original proposed slope mitigation works including installation of flexible barriers, boulder stabilisation and rock slope stabilisation was proposed to be carried out within the mixed woodland and shrubland-grassland mosaic habitat along the toe of natural terrain within the Clearwater Bay Country Park area and its close proximity. The flexible barriers were originally proposed to be located at the east of the rock slope stabilisation to preserve all recorded flora species of conservation importance and minimise potential impacts to the existing vegetation as far as possible. However, the proposed temporary fencing is located in proximity of several groups of *Marsdenia lachnostoma,* and may cause impact to the woodland and shrubland-grassland mosaic habitat in Clearwater Bay Country Park:

- Permanent loss or temporary disturbance of the woodland and shrubland-grassland mosaic habitat; and,
- Permanent loss or temporary disturbance of *Marsdenia lachnostoma* .

In order to further minimise the potential impacts, a revised scheme of slope mitigation works has been proposed, as detailed in *Section 4.2* below.

4.2 REVISED SCHEME OF SLOPE MITIGATION WORKS

The survey findings showed that several groups of *Marsdenia lachnostoma* were recorded in the close proximity of the proposed flexible barrier. Therefore, the design of the slope mitigation works, in particular the alignment of flexible barrier, is further adjusted such that no plant species of conservation importance will be affected and tree felling is also avoided. The schemes of slope mitigation works, as shown in Figure 4.1, include:

(i) Boulder removal/ break-off works for 15 unstable boulders identified on the natural terrain within the Clearwater Bay Country Park area;

(ii) Rock slope stabilisation along the toe of natural terrain within the Clearwater Bay Country Park area; and,

(iii) Flexible barrier at 7m away from the slope toe of the Clearwater Bay Country Park.

4.2.1 Boulder Removal

A total of 15 high risk and potentially unstable boulders (ranged between 1.0m – 2.5m in diameter) located at the toe and near the hill top of natural terrain within the Clearwater Bay Country Park will be removed or broken-off in place (*Figure 4.1*). Unstable boulder capable for removal will be lifted up and removed by mobile crane directly. Where removal of boulder is not feasible, the unstable boulder will be broken off into small pieces (about 300mm) in place manually by hand-held electrical jack hammer. Boulder pieces will then be deposited in place or transported off site. Five temporary elevated accesses of 600mm in width and with a total length of approximately 433m, ranging from 9m to 290m around the unstable boulder, will be provided. Temporary elevated access for boulder removal work (surround each boulder with 600mm width) for 15 nos. of boulders will also be provided (total area = 0.006 ha). Three unstable boulders are located at the close proximity of area with relatively higher density of the plant species of conservation importance *Marsdenia lachnostoma* in the shrubland and hillside grassland mosaic habitat to the southeast of location P3 (*Figure 4.2*). To avoid direct conflict between the boulder removal and nearby plant species of conservation importance, protection zones/ works exclusion zones will be established at least 1m radius from the identified plant species of conservation importance in order to preserve them on site. The protection zone (s)/ works exclusion zone(s) will be established prior to site clearance and throughout the construction period to separate the identified protected plant individuals from any potential works. The temporary working platform and temporary elevated access will also be designed to avoid its anchorage on the plant species of conservation importance. Potential ecological impact due to the site clearance and temporary elevated access is expected to low, as the impacts will be temporary and all species of conservation importance will be avoided with protection. Further mitigation measures are presented in *Section 4.3*. With proper implementation of the recommended mitigation measures, no unacceptable impact to the plant species of conservation importance is anticipated.

4.2.2 Rock Slope Stabilisation

Rock slope stabilisation, including the use of Rock bolt, buttress/ dentition and wire mesh, will be undertaken to stabilize the toe of natural rock slope at the shrubland and hillside grassland mosaic habitat (a total area of 0.12 ha) and small portion of mixed woodland (about 0.08 ha) within the Clearwater Bay Country Park (*Figure 4.2*). The rock slope stabilisation works are described in *Table 4.1* and indicated on *Figure 4.1*. The rock stabilisation works has been adjusted such that no tree felling will be required and plant species of conservation importance will be affected. Two temporary working platforms for rock slope works (~0.02ha and ~0.26ha respectively) will be provided. Landscaping works will be provided in form of hydroseeding and/or planting shrub seedlings to reinstate vegetation loss and disturbance at the area of rock slope stabilisation (see *Section 4.3)*. Stone facing to

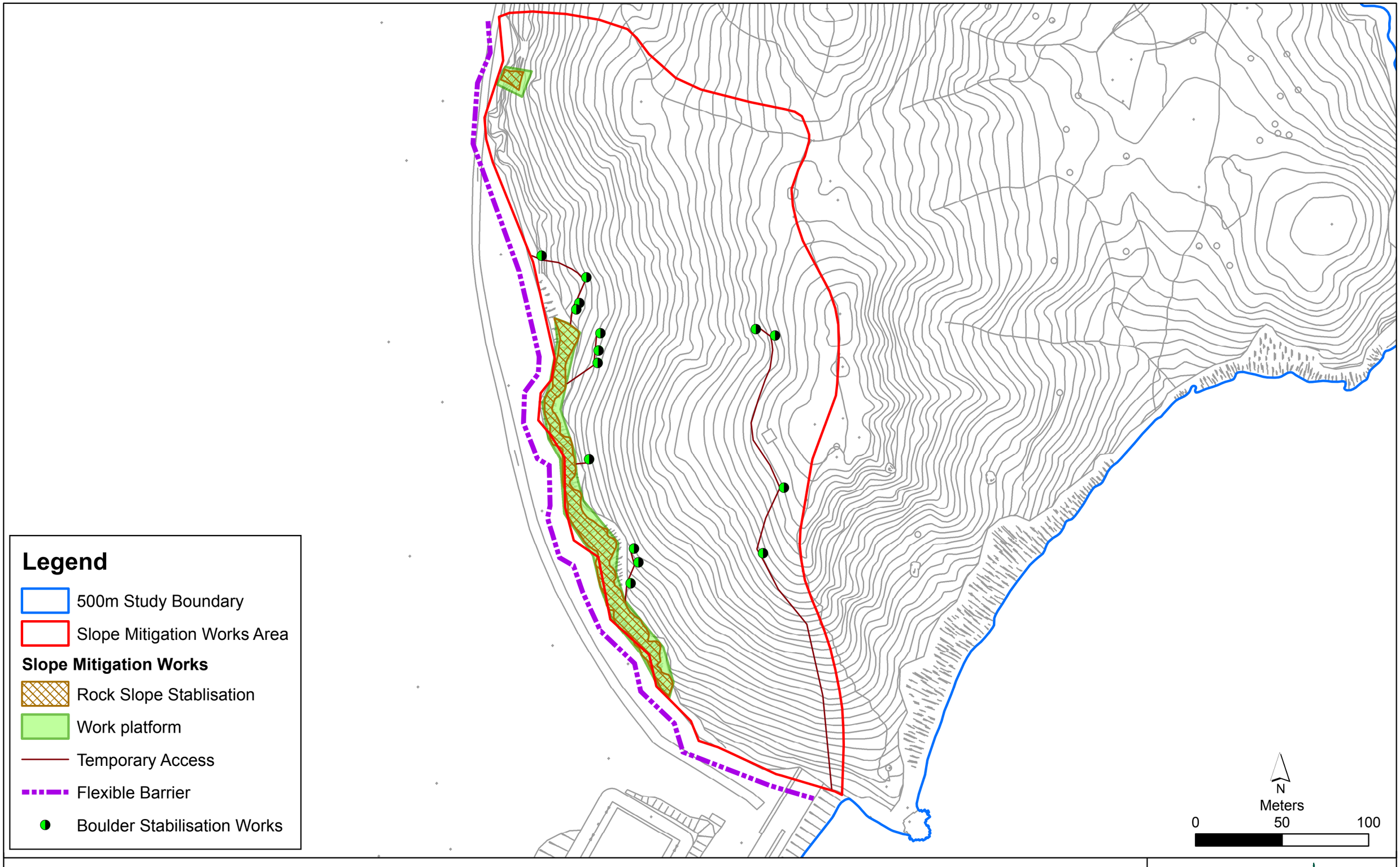

Figure 4.1

Revised Scheme of Slope Mitigation Works

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Date: 27/4/2017

Environmental Resources Management

ERM

Legend

500m Study Boundary

Slope Mitigation Works

Rock Slope Stabilisation

Work platform

Slope Mitigation Works Area

Flexible Barrier

Temporary Access

Boulder Stabilisation Works

Habitat

Rocky

Sandy

Shrubland and Hillside Grassland

Urbanised/Disturbed

Mixed

Plant

Marsdenia lachnostoma

N

Meters

0 50 100

Figure 4.2

Species of Conservation Importance in the Revised Scheme of Slope Mitigation Works

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Date: 14/7/2017

Environmental Resources Management

ERM

constructed concrete surfaces (such as buttress wall and dentition) at the rock slope will be provided to restore the natural finishes of the slopes. No unacceptable impact to the habitat loss and disturbance from rock slope stabilisation is anticipated.

Table 4.1 General Scope of Rock Slope Stabilisation Works

Type of Rock Slope Stabilisation Works	Description	Surface Area/ Quantity within the Rock Slope Stabilisation Works
Rock bolt	Drilling works will be involved with each drillhole of size around 200mm. Each of completed rock bolt head will be 400mm x 400mm.	A total of 53 rock bolts
Buttress/ Dentition	Buttress involves dowel bar construction by drilling and sprayed concrete to backfill the slot	Buttress will be constructed at four locations comprising a total area of 300 m^2 within the mixed woodland. Dentition will be constructed at two locations comprising a total area of 40 m^2.
Wire mesh	Wire mesh (about 250m in length; mesh size of 2.2mm in diameter) will be installed along the toe of rock slope by mobile crane and construction of steel hook anchor on surface (16mm diameter x 300mm anchor head or 25mm diameter x 1000mm anchor head).	Wire mesh covers a total of 7,800m^2 of rock slope surface within the shrubland and hillside grassland mosaic habitats and small portion of mixed woodland

4.2.3 Flexible Barrier

As a relatively high density of plant species of conservation importance were located near the toe of the natural terrain within the Clearwater Bay Country Park, the flexible barrier (about 500m long and 4m high) has been adjusted to construct in bays at the mixed woodland with a setback of at least 7m from the toe of the Clearwater Bay Country Park (*Figure 4.2*). The locations and footprint of the proposed flexible barrier have been adjusted to avoid tree felling and no plant species of conservation importance will be affected.

Localised trimming of the ground vegetation within the works areas of the flexible barrier will be needed. Due to the flexible barrier will be located in or nearby disturbed habitat, and footprint of vegetation clearance and would be localised and very limited, potential unacceptable ecological impacts resulting from the possible vegetation clearance and minor excavation is not anticipated.

4.3 RECOMMENDED MITIGATION MEASURES

Apart from the mitigation measures stated in the approved EIA Report, addition measures to further minimise the potential impacts on loss/ disturbance of habitat and the plant species of conservation importance in the close proximity of the slope mitigation works during pre-construction and construction phases are presented as follows:

4.3.1 Avoidance

- The locations of plant species of conservation importance have been mapped and subsequently taken into account for setting the alignment of the flexible barriers and no species of conservation importance will be close to the proposed alignment (see *Section 4.2.3* and *Figure 4.2*). The alignment of flexible barrier along the slope toe area will be constructed at least 7m away from the toe of Clearwater Bay Country Park. As such, the proposed flexible barrier will not affect plant species of conservation importance. Tree felling is also avoided.

- Prior to the commencement of construction works, the location and condition of plant species of conservation importance along the direct footprint of the slope mitigation works shall be conducted by a qualified plant ecologist. Protection zones/ works exclusion zones will then be established at least 1m radius from the identified plant species of conservation importance in order to preserve them on site. The protection zone (s)/ works exclusion zone(s) will be established prior to site clearance and throughout the construction period to separate the identified protected plant individuals from any potential works. Protection fences of at least 1m height with 1m radius will be established to surround plant species of conservation importance identified in the survey in group or individually. A sign identifying the protection zone (s)/ works exclusion zone(s) shall be attached to the fence and flagging tape shall be attached to the identified groups or individuals to visualize their locations. Upon completion of the works, the species of conservation importance that will be potentially affected by the construction works will be revisited to assess the condition.

- Introduction and training will be provided to all site staff to ensure that every staff will fully understand the preservation method and the location of the identified species of conservation importance.

- The Environmental Team shall monitor the condition of plant species of conservation concern within the protection zone(s)/ works exclusion zone(s) during the construction period on a monthly basis. The monthly monitoring report, as part of the Environmental Monitoring & Audit (EM&A) Report, shall include representative photographic record to present the updated conditions of the plant specimens.

4.3.2 Minimization

- The survey findings showed a relatively high density of *Marsdenia lachnostoma* at the southern portion of the Works Area (i.e. near point count location no. P3), where boulder removal and rock slope stabilisation works will be carried out. The footprint of slope mitigation works will be minimised during the construction as far as practicable. For example, working platform and temporary elevated access to be erected in front of the coastal slope will be temporary in nature and anchorage will be designed to avoid the plant species of conservation importance.

- Where vegetation clearance and/or trimming is required, a qualified ecologist/ arborist will be appointed to provide on-site supervision and monitoring of any vegetation clearance and tree trimming works to ensure no trees' canopy or tree roots will be adversely impacted due to malpractice of vegetation clearance and trimming. AFCD's consent should be granted before conducting any vegetation clearance and/ or trimming within country park area.

- Standard good site practice will considerably reduce any potential disturbance from slope works, including habitats within the Clearwater Bay Country Park, in particular,

    - All construction materials shall be stockpiled offsite to minimise the disturbance to areas in particular inside the country park area.

    - Construction activities will be restricted to the clearly demarcated slope mitigation works area.

    - The boulder works will be carried out by handheld tool to minimise the size of works area within the Clearwater Bay Country Park. No excavation work, tree felling and removal of vegetation should be allowed during boulder removal/ break-off work.

4.3.3 Restoration

- Landscaping works will be provided in form of hydroseeding and planting of native shrub seedlings (e.g. *Glochidion eriocarpum* and *Rhaphiolepis indica*) to reinstate vegetation in all temporarily disturbed areas where feasible, in particular rock slope stabilization. Stone facing to constructed concrete surfaces (such as buttress wall and dentition) at the rock slope will be provided to restore the natural finishes of the slopes. Given that the slope mitigation works area is in close proximity of mixed woodland, it is anticipated that the vegetation temporarily disturbed during construction phase will recover progressively by natural succession.

- Upon completion of the hydroseedling and planting of native shrub seedlings, the appointed landscape contractor shall carry out regular monitoring and appropriate maintenance (e.g. replacement for unsatisfactory plant specimens) for a 12-month establishment period.

5 CONCLUSION

An Updated Vegetation Survey were carried out between May and December 2016 in accordance with the approved survey methodology as presented in *Section 2*.

The terrestrial habitats identified within the 500 m Study Area include mixed woodland, shrubland and hillside grassland mosaic, urbanised/ disturbed area, wasteland and watercourse. All of the habitats are of very low or low ecological value, except for mixed woodland and shrubland/grassland, of low to moderate and moderate ecological value, respectively. Apart from this, the slope mitigation works area is located within the Clearwater Bay Country Park, where is the recognized site of conservation importance.

Based on the survey findings, the alignment of flexible barrier is further adjusted to locate outside of the Clearwater Bay Country Park to avoid direct conflict with plant species of conservation importance. In addition, mitigation measures to minimise the potential impact of habitat loss and disturbance to plant species of conservation importance have been proposed to manage the potential ecological impact to acceptable level. With the implementation of the proposed mitigation measures, no adverse residual impact due to the slope mitigation works is anticipated.

APPENDIX F

SURVEY METHODOLOGY AND RESULT IN 2020

Acuity Sustainability Consulting Ltd

Review Report of Updated Vegetation Survey for Slope Mitigation Works – July - August 2020

WSD Contract No. 13/WSD/17 - Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

Updated Vegetation Survey Report (UVSR) with Focus on Plant Species of Conservation Importance for Slope Mitigation Works

20th August 2020

Prepared by:

Mr. Pak-Ho WAN

Qualified Ecologist/ Plant Specialist

Review Report of Updated Vegetation Survey for Slope Mitigation Works with Focus on Plant Species of Conservation Importance for Slope Mitigation Works – WSD Contract No. 13/WSD/17 Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

1. INTRODUCTION

1.1. Acuity Sustainability Consulting Ltd was appointed by the project contractor China State Construction Engineering (Hong Kong) Limited to engage a qualified plant ecologist to conduct an updated review vegetation survey with focus on plant species of conservation importance before commencement of slope mitigation works; in accordance with section 5.3.8 of previous *Updated Vegetation Survey Report for Slope Mitigation Works* (issue 212-2) dated July 2017 submitted by Black & Veatch Hong Kong Limited (referred as 2017's report hereafter). Two plant species of conservation importance, i.e. *Marsdenia lachnostoma* and *Platycodon grandiflorus,* were recorded previously in shrubland and hillside grassland mosaic. Only *Marsdenia lachnostoma* (a total of 94 groups) were found within the proposed Work Site; while *Platycodon grandiflorus* (one group) was found outside proposed Work Site but within 500m assessment area (**Figure 1**).

1.2. Since the proposed Work Site for slope mitigation works locates within Clear Water Bay Country Park, while conditions of the habitat and plant species of conservation importance may have changed since last survey results in 2017, a vegetation survey is necessary right before commencement of works to obtain up-to-date information on site habitat; locations, abundance and condition of recorded (and any additional) plant species of conservation importance. Such information helps formulating any changes in previously proposed environmental mitigation measures before site clearance and setting works limit for slope upgrading works.

1.3. Focus will be made on plant species of conservation importance within proposed Works Site but not the whole plant community containing common species. Information presented by a tree survey report/ Tree Preservation and Removal Proposal (TPRP) is out of the scope of this updated vegetation survey report.

2. METHODOLOGY

2.1 Habitat and Vegetation

2.2.1 Survey extent within proposed Works Site is the same as that reported in 2017. All *Marsdenia lachnostoma* and any other plant species of conservation importance found were recorded by direct observation on 17 July and 7 August 2020. Cliff area with rock slope stabilization works and some dense hillside shrubland and pioneer woodland were inaccessible. Observation was made as far as practical by using a pair of 10 x 42 binoculars at these areas.

2.2.2 All found plant species of conservation importance were tagged temporarily by colour ribbon and pin-pointed with a GPS by the contractor's survey team. This facilitates the setting up of protection zones and access routing at the next stage. Nomenclature for plant species follows AFCD's Hong Kong Herbarium Database. Local commonness of recorded plant species of conservation importance in Hong Kong follows Corlett et al. (2000) and Hong Kong Plant Database managed by the Hong Kong Herbarium. Conservation status follows AFCD (2003), IUCN Red List (2020) and relevant legislations, including Forests and Countryside Ordinance (Cap. 96) and Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

3. RESULTS

3.1 Habitat

Shrubland and hillside grassland mosaic, as well as short bamboo patch was maintained at the upper half of the natural terrain; while the lower half has turned into dense shrubland and pioneer young woodland through natural succession since 2017 (**Plate 1**; **Figure 2**). Dominant shrubs and trees included *Mallotus paniculatus, Macaranga tanarius* var. *tomentosa, Rhodomyrtus tomentosa* and *Rhus succedanea*. The thin belt of mixed woodland still existed below the cliff area as 2017's finding.

3.2 Species of Conservation Importance

3.2.1 Similar to previous survey result, *Marsdenia lachnostoma* is the dominant plant species of conservation importance found within the proposed Works Site. A total of 218 groups/vines were found. Despite more than a double in quantity was observed compared to the 94 groups recorded in 2017, the distribution pattern and preferred grassland habitat remained similar (**Figure 3**). The shrubland-grassland mosaic near the lower half of the terrain at the southern portion previously supported *Marsdenia lachnostoma*; however, it no longer occurs there as the habitat has succeeded into pioneer young woodland (**Plate 1**). Conversely, numerous new individuals were observed along the grassy mountain ridge at this southern portion.

3.2.2 Again, no *Platycodon grandiflorus* was observed within the proposed Works Site, but four individuals of another herbaceous orchid, *Habenaria linguella*, with conservation importance were recorded during the current survey (Reference No. 097, 099, 100, and 101).

3.2.3 *Marsdenia lachnostoma* is listed as a rare and precious plant of Hong Kong (AFCD, 2003). Hong Kong is the only known locality within China, which gives it a Critically Endangered (CR) status. Even locally it is regarded as very rare as per Corlett et al., (2000), with known local distribution at North Point, Ma On Shan, Sai Kung and Tung Lung Chau (AFCD, 2020).

3.2.4 Four *Habenaria linguella* were observed at about center of the proposed Works Site (**Figure 2**). This Orchid is protected under Forestry Regulations under the Forests and Countryside Ordinance (Cap 96) and Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). It is locally restricted to moist grassy slope at Hong Kong Island, Tai Mo Shan, Ma On Shan, Pat Sin Leng, Fanling, Yuen Long, Lantau Island (Corlett et al., 2000; AFCD, 2020).

3.2.5 Photographic records of all 222 surveyed individuals (comprising 218 individuals of *Marsdenia lachnostoma* and 4 individuals of *Habenaria linguella*) are illustrated in **Appendix A**.

3.2.6 Although understory observation was difficult to made at the inaccessible cliff area with proposed boulder removal works and rock slope stabilization works; such dense shrubland, pioneer young woodland, or mixed woodland are no longer favourable habitat preferred by *Marsdenia lachnostoma*. Moreover, this area was not colonized by *Marsdenia lachnostoma* in 2017's survey even when it was still penetrable (**Figure 1**).

4. RECOMMENDATIONS

4.1. All recorded individuals of plant species of conservation importance should be retained *in-situ* as far as possible. Since majority of plant species of conservation importance were growing at the upper half of the proposed Works Site, where actually does not involve any construction activities, except proposed boulder break-off works at boulder B53, B124, B160 and B169 (**Figure 2**); fencing/ hoarding/ wire mesh may be erected along exact works bounadry required for boulder removal works and rock slope stabilization works. This restricts unnecessary/ accidental entry to this plant protection zone outside the works limit.

4.2. The contractor should prepare a method statement of proposed works, including an update boulder assessment, exact works area required, alignment of temporary working platform and staircase access for staff and equipment mobilization, etc. The method statement should seek approval by AFCD and other relevant authorities. This would outline which *Marsdenia lachnostoma* would locate within works limit that require pin-point protection zones.

4.3. The pin-point protection zones within works limit shall fence off either individually or in small group (for plants that grow closely together) to prevent those individuals of plant species of conservation importance from being damaged or disturbed during construction work. Plastic or bamboo fence of at least 1.5m high are recommended to form the plant protection zone, with 1m in radius from the protected plant(s). For those individuals in

close vicinity of existing trees to be retained, they can be protected together by the tree protection zone (TPZ).

4.4. Minimum site clearance of common shrubs and undersized trees from the dense shrubland and young pioneer woodland for building access alignment to the upper terrain would avoid direct ecological impact to the *Marsdenia lachnostoma* and *Habenaria linguella* growing along the mountain ridge as per their current distribution (**Figure 2**). Such woodland thinning may contribute positive impact to maintain favourable habitat for colonization of this *Marsdenia lachnostoma* population.

4.5. Preserved species of conservation importance should be monitored monthly by a plant specialist to ensure their condition (including photographic records) throughout the construction phase.

4.6. All construction activities shall be restricted to the approved works boundary. No working platform, equipment, waste or soil shall be placed or dumped into/ near the plant protection zone/ TPZ, as well as the natural terrain outside the Work Site. Runoff and discharge shall be controlled by common good practice. Vegetation clearance and access should be avoided in plant protection zone/ TPZ.

4.7. During implementation of soft landscape works, native ground covering species should be considered over any exotic and invasive species such as *Wedelia trilobata* (三裂葉蟛蜞菊). Despite high tolerance to various site conditions with even poor soil, *Wedelia trilobata* (三裂葉蟛蜞菊) is one of the 100 most invasive species listed by IUCN Invasive Species Specialist Group (ISSG). It may quickly invade adjacent areas when the site is disturbed (e.g. hazard mitigation works) and therefore is not recommend to be used in wild area/ country parks (GEO, 2011).

4.8. Shall any individual of *Marsdenia lachnostoma* and *Habenaria linguella* are considered as highly vulnerable against impacts arise from construction activities (mainly the boulder break-off works); or have direct conflict with finalized best available works design, transplantation can be adopted for these herbaceous species. Targets to be transplanted can be replanted in same natural terrain outside exact works boundary; or kept *ex-situ* in pots at secured Works Area/ nursery nearby until replanting is feasible when construction activities have completed. All transplanted individuals should be under care (by landscape contractor/ trained site staff) and monitoring (by plant specialist) during construction phase. Transplantation plan shall be approved by AFCD before commencement.

4.9. Hydroseeding is proposed as soft landscape works to provide rapid greening effect at bare area. Open space makes the site receive more heat and loss in soil moisture, and consequently more susceptible to invasion of exotic or undesirable weed species, such as *Bidens alba* (白花鬼針草), *Lantana camara* (馬纓丹), *Leucaena leucocephala* (銀合歡), *Mikania micrantha* (薇甘菊) and *Melinis repens* (紅毛草). This would increase maintenance burden of weeding and keep clearing regenerated native seedlings, including those of *Marsdenia lachnostoma* and other plant species of conservation importance. Any invasive plants detected during construction phase should be uprooted, packed and removed from the work site (including *Leucaena leucocephala* (銀合歡) trees detected during tree survey).

4.10. Any protection and preservation measures for species of conservation importance, existing vegetation and retained trees stated in the Works Plan/ Construction Drawings submitted by the Engineer shall be strictly followed.

4.11. The abovementioned protection measures for retained trees and species of conservation importance should be formulated and implemented throughout different stages of the project with supervision by competent personnel following Guidelines on Tree Preservation during Development (April 2015) issued by GLTMS of DEVB. Any additional woodland thinning practice for sustaining favourable habitats for *Marsdenia lachnostoma* shall also be approved by AFCD.

REFERENCES

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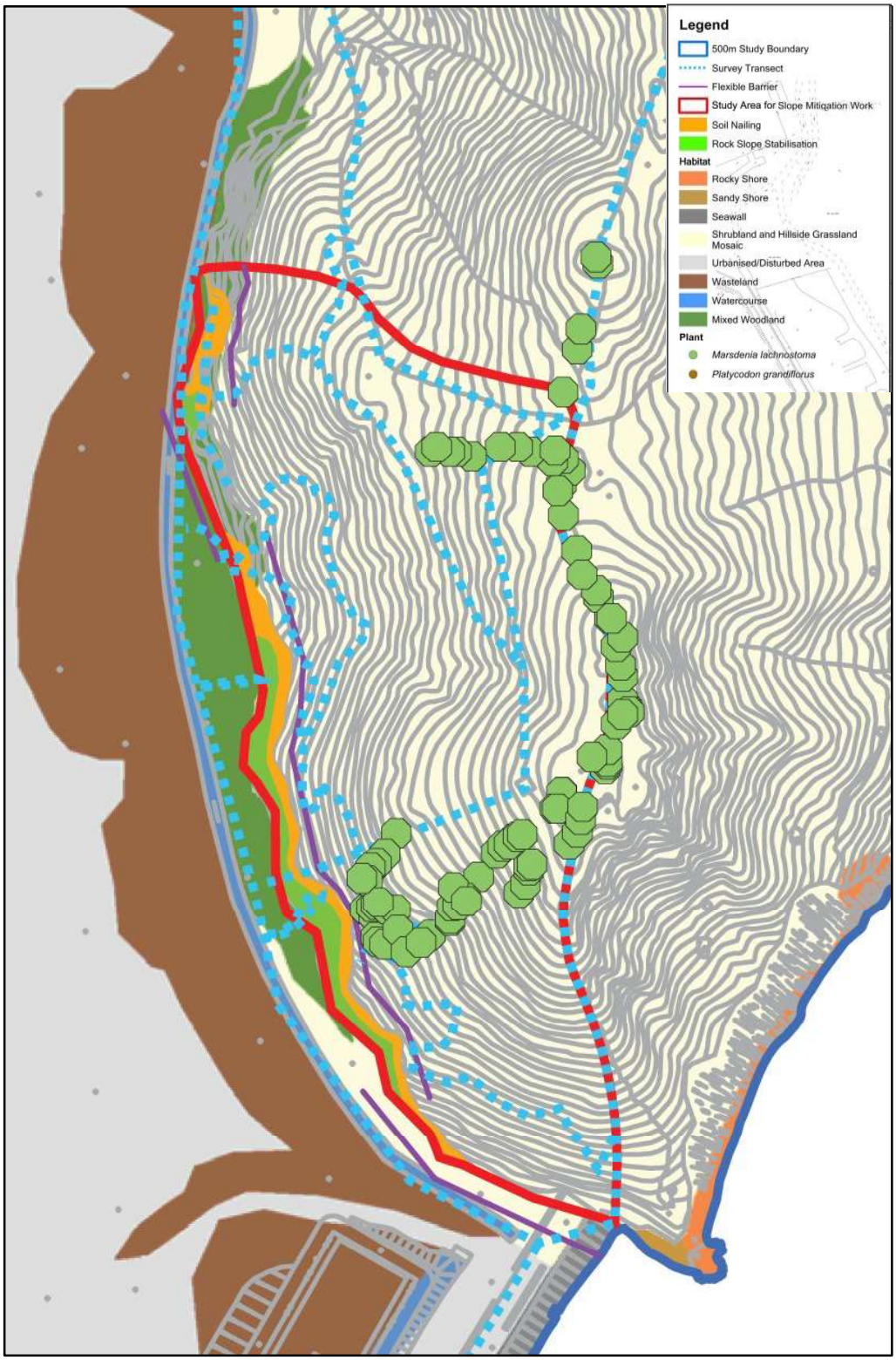
Corlett, R.T., Xing, F.W., Ng, S.C., Chau, L.K.C. & Wong, L.M.Y. (2000) Hong Kong vascular plants: Distribution and status. Memoirs of the Hong Kong Natural History Society, 23, 1-157.

GEO (2011) Technical Guidelines on Landscape Treatment for Slopes Publication No. 1/2011. HKSAR. Hong Kong

Figure 1. Survey extent and localities of previously recorded plant species of conservation (*Marsdenia lachnostoma;* green dot) within the Study Area (i.e. within red boundary).



Extracted from Appendix E of previous *Updated Vegetation Survey Report for Slope Mitigation Works* (issue 212-2) dated July 2017.

Figure 2. Indicative localities of plant species of conservation (*Marsdenia lachnostoma* and *Habenaria linguella*) detected within the proposed Works Site during current vegetation survey. Note: Due to the high density of the population, plants growing in close proximity or clusters are represented by a single indicative dot on the map.

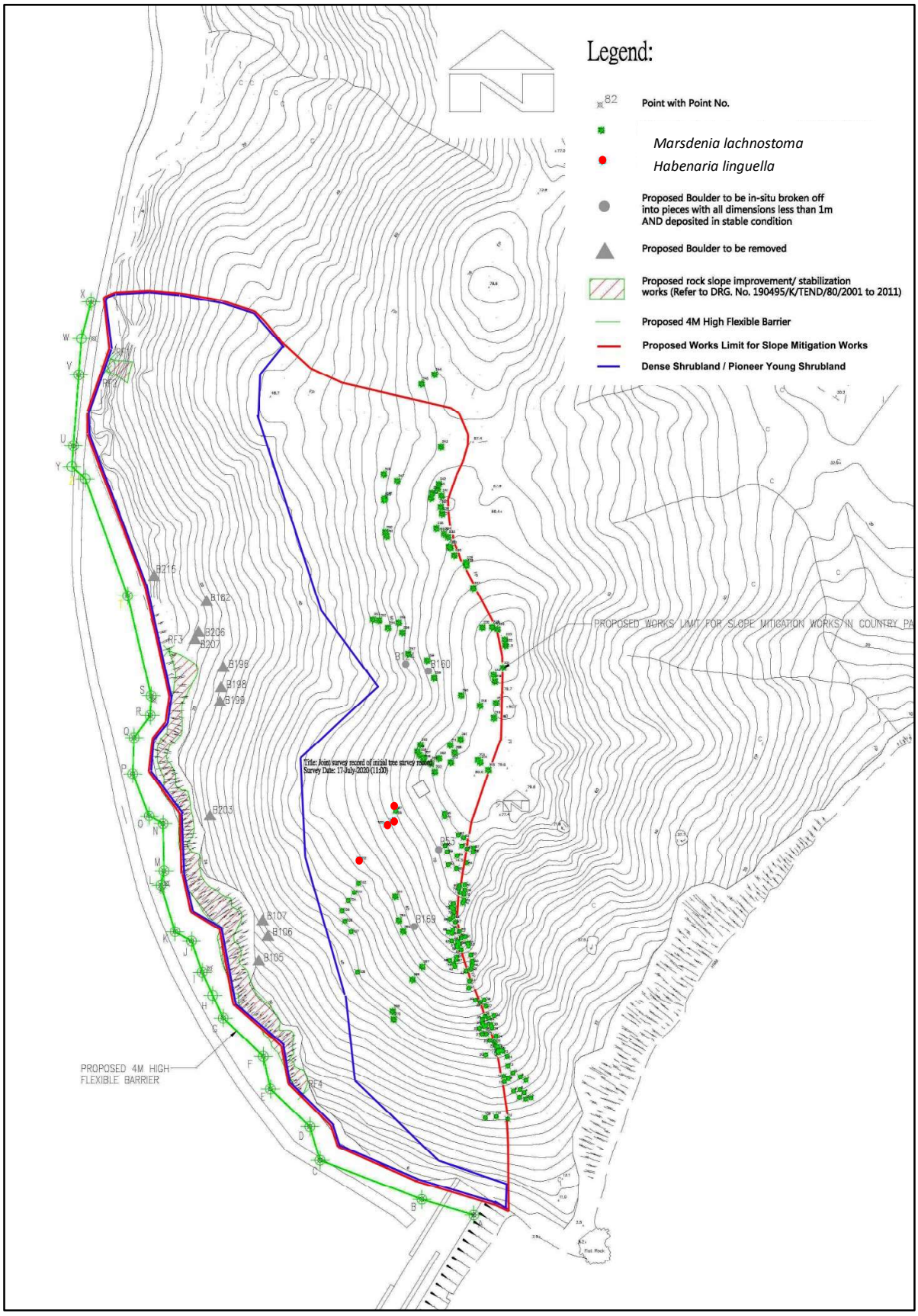


Figure 3. Comparsion of plant species of conservation observed during current vegetation survey against survey results in 2017 (overlaying of Figure 1 & 2). No more *Marsdenia lachnostoma* occurred in yellow framed area when such shrubland-grassland mosaic has succeed into pioneer young woodland as verified in current survey. Many new individuals have dispersed along the grassy mountain ridge as indicated by the black frame. Green circle denotes *Marsdenia lachnostoma* presented in the 2017 report, while green dots represent current survey findings (where one dot may represent a cluster of individuals).

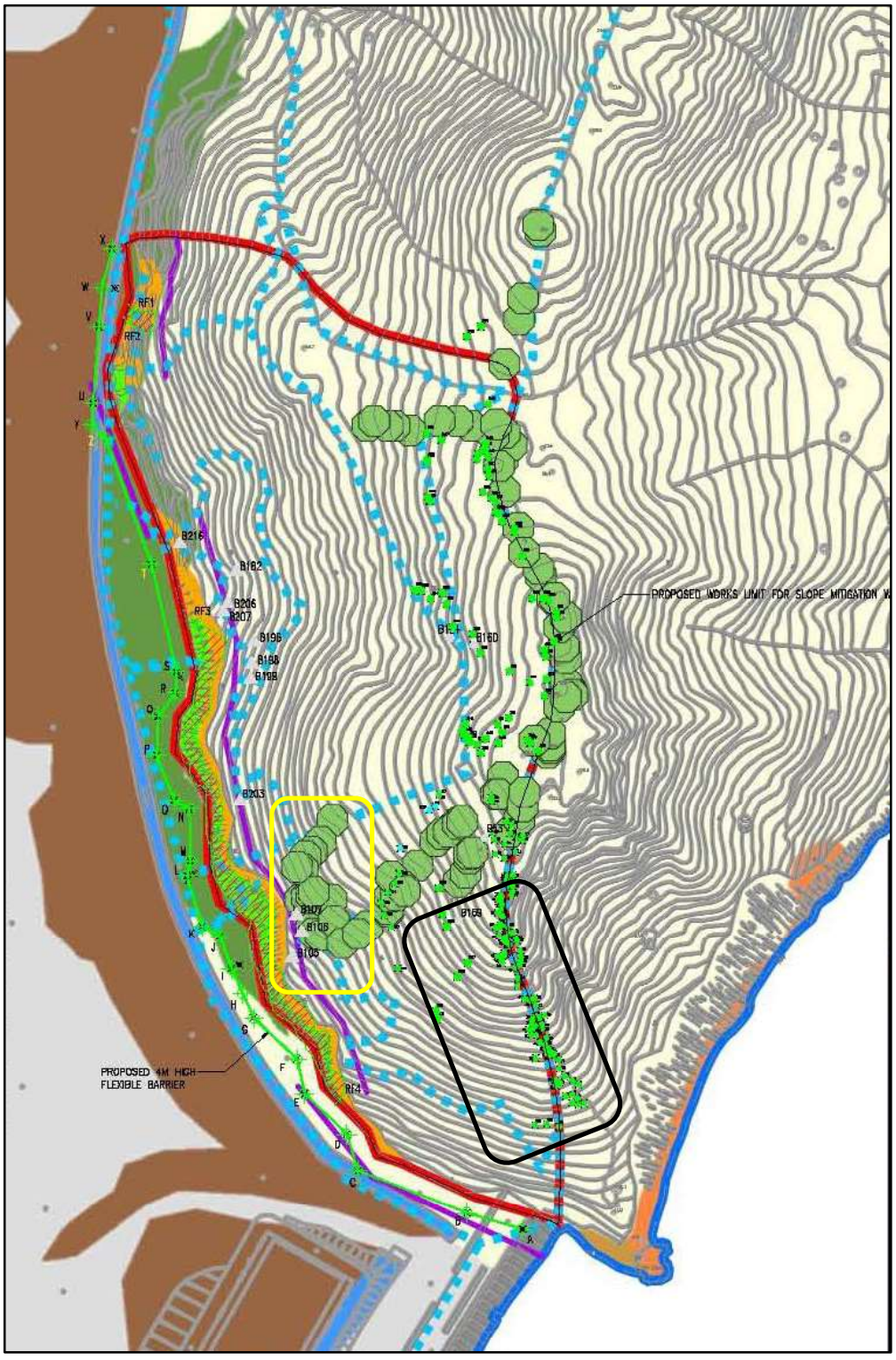


Plate 1. General view and habitat of the proposed Works Site. Close-up of hillside shrubland-grassland mosaic and short bamboo patch at the upper half of the natural terrain (indicative by red triangle).

Plate 1 cont'd. General view and habitat of the proposed Works Site, of which the lower half has turned into dense shrubland (indicated by the survey team hidden in tall shrubs on top right) and pioneer young woodland (bottom) through natural succession. Mixed woodland located along the terrain toe (top left).

Plate 2. Boulders at upper slopes of the terrain, where *Marsdenia lachnostoma* were found in close vicinity (an example with colour ribbon at bottom left).

Appendix A

Photographic records of all groups/ individuals of
plant species of conservation importance detected within proposed Works Site

Reference No.: 001

Reference No.: 002

Reference No.: 003

Reference No.: 004

Reference No.: 005

Reference No.: 006

Reference No.: 007

Reference No.: 008

Reference No.: 009

Reference No.: 010

Reference No.: 011

Reference No.: 012A

Reference No.: 012B

Reference No.: 012C

Reference No.: 013A

Reference No.: 013B

Reference No.: 014A

Reference No.: 014B

Reference No.: 015A

Reference No.: 015B

Reference No.: 016

Reference No.: 017

Reference No.: 018

Reference No.: 019A

Reference No.: 019B

Reference No.: 020

Reference No.: 021

Reference No.: 022

Reference No.: 023

Reference No.: 024A

Reference No.: 024B

Reference No.: 025

Reference No.: 026

Reference No.: 027

Reference No.: 028

Reference No.: 029

Reference No.: 030A

Reference No.: 030B

Reference No.: 031

Reference No.: 032

Reference No.: 033

Reference No.: 034A

Reference No.: 034B

Reference No.: 035

Reference No.: 036

Reference No.: 037

Reference No.: 038

Reference No.: 039

Reference No.: 040

Reference No.: 041

Reference No.: 042A

Reference No.: 042B

Reference No.: 043

Reference No.: 044

Reference No.: 045

Reference No.: 046

Reference No.: 047

Reference No.: 048

Reference No.: 049

Reference No.: 050

Reference No.: 051A

Reference No.: 051B

Reference No.: 052A

Reference No.: 052B

Reference No.: 053

Reference No.: 054

Reference No.: 055

Reference No.: 056

Reference No.: 057

Reference No.: 058

Reference No.: 059

Reference No.: 060

Reference No.: 061

Reference No.: 062A

Reference No.: 062B

Reference No.: 062C

Reference No.: 062D

Reference No.: 062E

Reference No.: 063

Reference No.: 064A

Reference No.: 064B

Reference No.: 065

Reference No.: 066A

Reference No.: 066B

Reference No.: 067

Reference No.: 068

Reference No.: 069

Reference No.: 070A

Reference No.: 070B

Reference No.: 070C

Reference No.: 071

Reference No.: 072A

Reference No.: 072B

Reference No.: 072C

Reference No.: 073A

Reference No.: 073B

Reference No.: 074A

Reference No.: 074B

Reference No.: 075

Reference No.: 076

Reference No.: 077

Reference No.: 078A

Reference No.: 078B

Reference No.: 078C

Reference No.: 079A

Reference No.: 079B

Reference No.: 079C

Reference No.: 080

Reference No.: 081

Reference No.: 082

Reference No.: 083

Reference No.: 084

Reference No.: 085

Reference No.: 086A

Reference No.: 086B

Reference No.: 087A

Reference No.: 087B

Reference No.: 087C

Reference No.: 088A

Reference No.: 088B

Reference No.: 088C

Reference No.: 088D

Reference No.: 089

Reference No.: 090

Reference No.: 091

Reference No.: 092

Reference No.: 093

Reference No.: 094

Reference No.: 095

Reference No.: 096A

Reference No.: 096B

Reference No.: 097

Reference No.: 098

Reference No.: 099

Reference No.: 100

Reference No.: 101

Reference No.: 102A

Reference No.: 102B

Reference No.: 103A

Reference No.: 103B

Reference No.: 104

Reference No.: 105

Reference No.: 106

Reference No.: 107

Reference No.: 108

Reference No.: 109

Reference No.: 110A

Reference No.: 110B

Reference No.: 111

Reference No.: 202A

Reference No.: 202B

Reference No.: 203

Reference No.: 204

Reference No.: 205

Reference No.: 206

Reference No.: 207

Reference No.: 208A

Reference No.: 208B

Reference No.: 209

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Reference No.: 239A

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Reference No.: 260

Reference No.: 261

Reference No.: 262

Reference No.: 263

Reference No.: 264

Reference No.: 265

Reference No.: 266

Reference No.: 267

Reference No.: 268

Reference No.: 269

APPENDIX G

SURVEY METHODOLOGY AND RESULT IN 2021

Acuity Sustainability Consulting Ltd

Verification Survey of Plant Species of Conservation Importance before Commencement of Works – September 2021

WSD Contract No. 13/WSD/17 - Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

Vegetation Survey Report with Focus along Proposed Inspection Access of Proposed Boulder Stabilization Works

20th October 2021

Prepared by:

Mr. Pak-Ho WAN

Qualified Ecologist/ Plant Specialist

Verification Survey of Plant Species of Conservation Importance before Commencement of Works – WSD Contract No. 13/WSD/17 Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

1. INTRODUCTION

1.1. Based on the previous Updated Vegetation Survey Report dated 20 August 2020, two plant species of conservation importance, i.e., a total of 218 individuals of *Marsdenia lachnostoma* and four individuals of *Habenaria linguella,* were recorded within the proposed Works Site. Currently, the project contractor China State Construction Engineering (Hong Kong) Limited has adjusted and proposed a new inspection access for the boulder stabilization works in order to minimize the impact to recorded plant species of conservation importance (**Figure 1**).

1.2. Acuity Sustainability Consulting Ltd was appointed to engage a qualified plant ecologist to conduct a verification survey on plant species of conservation importance along the proposed inspection access before commencement of slope mitigation works.

1.3. Since the proposed Work Site for slope mitigation works locates within Clear Water Bay Country Park, while conditions of the habitat and plant species of conservation importance may have changed since last survey results conducted in 2020, a verification survey is necessary right before commencement of works to obtain up-to-date information on site habitat; locations, abundance and condition of plant species of conservation importance. Such information helps formulating any changes in previously proposed environmental mitigation measures before site clearance.

1.4. Focus will be made on plant species of conservation importance along the newly proposed inspection access; while the last transect section with high abundance of *Marsdenia lachnostoma* and *Habenaria linguella* is set away from the works limit by an avoidance apporach. Information presented by a vegetation/ tree survey report/ Tree Preservation and Removal Proposal (TPRP) is out of the scope of this verification survey report.

2. METHODOLOGY

2.1 Habitat and Vegetation

2.2.1 All *Marsdenia lachnostoma* and any other plant species of conservation importance found were recorded by active searching along the proposed inspection access on 28 September 2021 (**Figure 1**).

2.2.2 Each found individual/ patch (for those grow closely with each other) of plant species of conservation importance was marked by a bamboo stick. A tag number was assigned to each waterproof tag, which was tied on the stick marker rather than the fragile vines of *Marsdenia lachnostoma* or other herbaceous species of conservation importance. Each tagged marker was pin-pointed with a GPS by the contractor's survey team. This facilitates the setting up of protection zones by the workers (**Plate 2**).

2.2.3 Nomenclature for plant species follows AFCD's Hong Kong Herbarium Database. Local commonness of recorded plant species of conservation importance in Hong Kong follows Corlett et al. (2000) and Hong Kong Plant Database managed by the Hong Kong Herbarium. Conservation status follows AFCD (2003), IUCN Red List (2021) and relevant legislations, including Forests and Countryside Ordinance (Cap. 96) and Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

3. RESULTS

3.1 Habitat

Similar to 2020's observation, shrubland and hillside grassland mosaic is maintained at the upper half of the natural terrain; while the lower half has turned into dense shrubland and pioneer young woodland through natural succession since (**Plate 1**). However, the invasive/ exotic climber *Passiflora foetida* (龍珠果), *Mikania micrantha* (薇甘菊) and herb *Bidens alba* (白花鬼針草) was conquering the shrubland and hillside grassland mosaic, where *Marsdenia lachnostoma* inhabits

3.2 Species of Conservation Importance

3.2.1 Similar to previous survey result, *Marsdenia lachnostoma* is the dominant plant species of conservation importance found along the proposed inspection access. By passing through the ground mainly with common vegetation, only 28 nos. of *Marsdenia lachnostoma* were found. They were enclosed in 17 protection zones (some are growing closely and are protected by a single zone).

3.2.2 More than 87% of the 218 *Marsdenia lachnostoma* found during 2020's survey can be avoided from the proposed inspection access.

3.2.3 *Marsdenia lachnostoma* is listed as a rare and precious plant of Hong Kong (AFCD, 2003). Hong Kong is the only known locality within China, which gives it a Critically Endangered (CR) status. Even locally it is regarded as very rare as per Corlett et al., (2000), with known local distribution at North Point, Ma On Shan, Sai Kung and Tung Lung Chau (AFCD, 2020).

3.2.4 No *Habenaria linguella* was found during this survey (four were recorded in 2020's survey). Since they can be very difficult to observe among dense vegetation when they have no flowers/ fruits. Their previous localities would also be avoided from the proposed works alognment.

3.2.5 This Orchid is protected under Forestry Regulations under the Forests and Countryside Ordinance (Cap 96) and Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). It is locally restricted to moist grassy slope at Hong Kong Island, Tai Mo Shan, Ma On Shan, Pat Sin Leng, Fanling, Yuen Long, Lantau Island (Corlett et al., 2000; AFCD, 2021).

3.2.6 Another species of conservation importance, i.e., one patch of *Gnetum luofuense* (羅浮買麻藤), was found at terrain toe near the entrance of the transect. This climber is very common in Hong Kong while it is listed as Near Threatened (NT) internationally under IUCN Red List, due to potential decline in population caused by habitat loss (IUCN, 2021).

3.2.7 Localities of all found individuals/ patches of plant species of conservation importance are indicated in **Figure 1**, with their photographic records illustrated in **Plate 3**.

4. PROTECTION MEASURES & CONCLUSION

4.1. All 29 individuals of plant species of conservation importance (28 nos. of *Marsdenia lachnostoma* and one patch of *Gnetum luofuense*) found along the proposed inspection access have been fenced off by 18 eye-catching protection zones under supervision of the plant specialist/ ecologist. This restricts unnecessary/ accidental entry after commencement of works.

4.2. The currently proposed inspection access has been considered in balance of accessibility (site safety), practical work distance for workers and equipment mobilization, meeting a minimum number of plant species of conservation importance, and minor trimming of dense vegetation of common species.

4.3. Preserved and protected species of conservation importance should be monitored monthly by a plant specialist to ensure their condition (including photographic records) throughout the construction phase.

4.4. Any weathering or collapse of protection fence; and lost tag shall be rectified promptly.

4.5. All construction activities shall be restricted to the approved inspection access. No working platform, equipment, waste or soil shall be placed or dumped into/ near the plant protection zone, as well as the natural terrain outside the Work Site. Runoff and discharge shall be controlled by common good practice. Vegetation clearance should be avoided in plant protection zone, except removal of invasive species.

4.6. In case of any fine-tune of proposed works, the contractor should update the method statement and seek AFCD's approval.

4.7. Shall any individual of *Marsdenia lachnostoma* and other plant species of conservation importance are considered as highly vulnerable against impacts arise from construction activities (mainly the boulder break-off works); transplantation can be adopted for these herbaceous species. Targets to be transplanted can be replanted in same natural terrain outside exact works boundary; or kept *ex-situ* in pots at secured Works Area/ nursery nearby until replanting is feasible when construction activities have completed. All transplanted individuals should be under care (by landscape contractor/ trained site staff) and monitoring (by plant specialist) during construction phase. Transplantation plan shall be approved by AFCD before commencement.

4.8. Invasion of exotic or undesirable weed species, especially *Bidens alba* (白花鬼針草), *Passiflora foetida* (龍珠果) and *Mikania micrantha* (薇甘菊), are degrading the habitat quality and complete space and resources with the *Marsdenia lachnostoma* population. Any invasive plants detected during construction phase should be uprooted, packed and removed properly during the construction phase. This contributes positively to maintain the habitat quality for the preserved *Marsdenia lachnostoma* and other plant species of conservation importance.

4.9. Attention shall also be paid to *Leucaena leucocephala* (銀合歡) seedlings and saplings at terrain toe/ cliff area, which shall be removed. The tree survey shall have recommended to remove all mature *L. leucocephala* trees.

4.10. Any protection and preservation measures for species of conservation importance, existing vegetation and retained trees stated in the Works Plan/ Construction Drawings submitted by the Engineer shall be strictly followed.

4.11. The abovementioned protection measures for species of conservation importance should be formulated and implemented throughout different stages of the project with supervision by competent personnel following Guidelines on Tree Preservation during Development (April 2015) issued by GLTMS of DEVB. Any additional woodland thinning practice for sustaining favourable habitats for *Marsdenia lachnostoma* shall under further discussion and agreement with AFCD.

4.12. In conclusion, the currently proposed inspection access would pass though only 28 nos., or 12.8% of *Marsdenia lachnostoma* when compared to 2020's finding of 218 *Marsdenia lachnostoma* found along the ridge transect. They are protected by 18 eye-catching protection zones. With implementation of the abovementioned protection measures and monitoring, minor and acceptable works impact is anticipated from the proposed boulder stabilization works along proposed inspection access.

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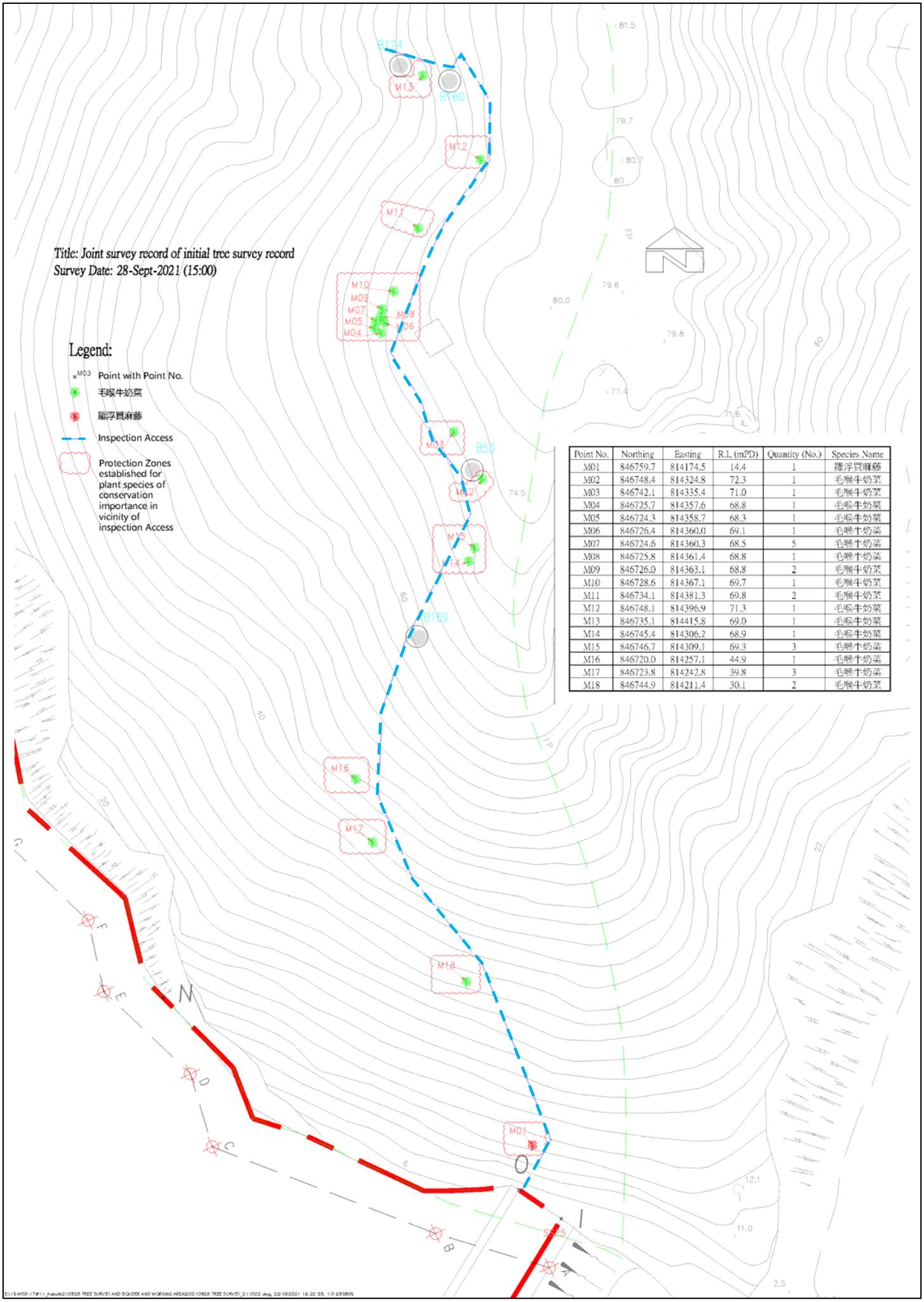
AFCD (2003) Rare and Precious Plants of Hong Kong. AFCD, Friends of the Country Parks and Cosmos Books Ltd. Hong Kong.

AFCD (2021) Hong Kong Herbarium Database. https://www.herbarium.gov.hk Accessed on 15 October 2020.

Corlett, R.T., Xing, F.W., Ng, S.C., Chau, L.K.C. & Wong, L.M.Y. (2000) Hong Kong vascular plants: Distribution and status. Memoirs of the Hong Kong Natural History Society, 23, 1-157.

Figure 1. Indicative localities of plant species of conservation importance (*Marsdenia lachnostoma* and *Gnetum luofuense*) found along the proposed inspection access. They are fenced off by 18 protection zones (M01 – M18). One dot may represent more than one individual if they are close to each other.



Point No.	Northing	Easting	R.L (mPD)	Quantity (No.)	Species Name
M01	846759.7	814174.5	14.4	1	羅浮買麻藤
M02	846748.4	814324.8	72.3	1	毛喉牛奶菜
M03	846742.1	814335.4	71.0	1	毛喉牛奶菜
M04	846725.7	814357.6	68.8	1	毛喉牛奶菜
M05	846724.3	814358.7	68.3	1	毛喉牛奶菜
M06	846726.4	814360.0	69.1	1	毛喉牛奶菜
M07	846724.6	814360.3	68.5	5	毛喉牛奶菜
M08	846725.8	814361.4	68.8	1	毛喉牛奶菜
M09	846726.0	814363.1	68.8	2	毛喉牛奶菜
M10	846728.6	814367.1	69.7	1	毛喉牛奶菜
M11	846734.1	814381.3	69.8	2	毛喉牛奶菜
M12	846748.1	814396.9	71.3	1	毛喉牛奶菜
M13	846735.1	814415.8	69.0	1	毛喉牛奶菜
M14	846745.4	814306.2	68.9	1	毛喉牛奶菜
M15	846746.7	814309.1	69.3	3	毛喉牛奶菜
M16	846720.0	814257.1	44.9	1	毛喉牛奶菜
M17	846723.8	814242.8	39.8	3	毛喉牛奶菜
M18	846744.9	814211.4	30.1	2	毛喉牛奶菜

Plate 1. General view and habitat of the proposed Works Site and inspection access of boulder stabilization works.

Plate 2. Work flow of setting up an eye-catching protection zone and setting GPS for plant species of conservation importance.

For the small vines of *Marsdenia lachnostoma*

For the larger patch of *Gnetum luofuense* | Taking GPS

Plate 3. Photographic records of all groups/ individuals of plant species of conservation importance found along proposed inspection access during current verification survey.

M01

M02

M03

M04

M05

M06

M07

M08

M09


28/09/2021


28/09/2021

M10


28/09/2021


M11
28/09/2021

M11


28/09/2021


28/09/2021

M12

M13

M14

M15

M16

M17

M18

APPENDIX H1

SURVEY METHODOLOGY AND RESULT IN 2023 FOR ROCK SLOPE PORTION

Report of Vegetation Survey for Rock Slope Portion of Slope Mitigation Works

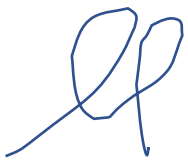
Contract No. 13/WSD/17

Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

Report of Vegetation Survey for Rock Slope Portion of Slope Mitigation Works

Document No.

ASCL	/	200168078	/	VMR	/	0
Publisher		Project Code		Sequential No.		Revision Index

	Prepared by:
Name	Melody Cheng
Position	Qualified Plant Ecologist
Signature	
Date:	20 April 2023

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Verification Survey of Plant Species of Conservation Importance before Commencement of Slope Mitigation Works – WSD Contract No. 13/WSD/17 Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

1. INTRODUCTION

1.1 Acuity Sustainability Consulting Limited was appointed by the project contractor Acciona Agua, Jardine Engineering Corp, China State Joint Venture (AJCJV) to engage a qualified plant ecologist to conduct a vegetation check with focus on plant species of conservation importance before commencement of rock slope stabilization works, in accordance with the recommended good site practices in section 5.3.8 of previous Updated Vegetation Survey Report for Slope Mitigation Works (issue 212-2) dated July 2017 submitted by Black & Veatch Hong Kong Limited.

1.2 According to Condition 2.7 of the Environmental Permit (FEP-503/2015/A) of the Project specifies that an Updated Vegetation Survey for Slope Mitigation Works shall be carried out to reduce ecological impact on plant species of conservation importance, including but not limited to *Marsdenia lachnostoma*, due to the slope mitigation works of the Project. The Updated Vegetation Survey for Slope Mitigation Works has been conducted and the report submitted in July 2017 by Black & Veatch Hong Kong Limited. The vegetation survey report was further updated by the project contractor on 20th August 2020.

1.3 Previous verification survey in concerned area was conducted by binocular scanning in 2020 where the slope was inaccessible. The result shows the cliff area is growing with pioneer young shrubland, which is not favorable habitat for *Marsdenia lachnostoma* and *Habenaria linguella*.

1.4 Landslide incidents at latest chainage no. CH1140, CH1215, CH1225, CH1280, CH1310, CH1330, CH1360, within Country Park after heavy rainstorms on 28 June 2021 (Black rainstorm) and 8 Oct 2021 further degraded the habitat of the cliff area where became more exposed and drought.

1.5 Currently, the project contractor Acciona Agua, Jardine Engineering Corp, China State Joint Venture (AJCJV) provided the cherry picker and made available for direct observation for rock slope stabilization works.

1.6 The survey area included all the proposed wire mesh areas as well as the proximity of proposed dowels, buttresses and dentitions, those may affect the vegetation along the toe of natural terrain within the Clearwater Bay Country Park area. The extent of slope mitigation works is shown in **Appendix B**.

2. METHODOLOGY

2.1 Actively searched and recorded for *Marsdenia lachnostoma* and any other plant species of conservation importance along the toe of the natural terrain on 27 March 2023. The upper part of the cliff area was assessed by cherry picker (**Figure 1**) and scaffold access. Observation was assisted by using a pair of 10 x 42 binoculars at these areas.

2.2 Each found individual/ patch (for those grow closely with each other) of plant species of conservation importance was identified with a GPS by the contractor's survey team. Photographic records of groups/ individuals of plant species of conservation importance are illustrated in **Appendix B**.

2.3 Nomenclature for plant species follows AFCD's Hong Kong Herbarium Database. Local commonness of recorded plant species of conservation importance in Hong Kong follows Corlett et al. (2000) and Hong Kong Plant Database managed by the Hong Kong Herbarium. Conservation status follows AFCD (2003), IUCN Red List (2021) and relevant legislations, including Forests and Countryside Ordinance (Cap. 96) and Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

2.4 Based on the survey findings, recommended protection measures are proposed to conserve the recorded plant species of conservation importance as identified in the survey.

3. RESULTS

3.1 With reference to the previous survey result in Updated Vegetation Survey Report dated 20th August 2020, stated the habitat is not favorable for *Marsdenia lachnostoma* and *Habenaria linguella*. In this survey, no *Marsdenia lachnostoma* and *Habenaria linguella* were found.

3.2 Another species of conservation importance, three patches of *Gnetum luofuense (*羅浮買麻藤) were found nearby CH 1110, CH 1260 and CH 1265. This climber is very common in Hong Kong while it is listed as Near Threatened (NT) internationally under IUCN Red List, due to potential decline in population caused by habitat loss (IUCN, 2023).

3.3 Full list of the plant species recorded in 27 March 2023 is provided in **Table 1**.

4. PROTECTION MEASURES & CONCLUSION

4.1 All individuals of *Gnetum luofuense* within the slope mitigation areas shall be retained in-situ, by positioning the geotechnical works at a minimum 1.5m in a radius away from these individuals.

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AFCD (2003) Rare and Precious Plants of Hong Kong (Online Version). https://www.herbarium.gov.hk/en/publications/books/book2/index.html assessed on 13 April 2023.

AFCD (2021) Hong Kong Biodiversity Information Hub. https://bih.gov.hk/en/species-database/index.html assessed on 13 April 2023.

AFCD (2021) Hong Kong Herbarium Database. https://www.herbarium.gov.hk assessed on 13 April 2023.

Black & Veatch Hong Kong Limited (2017) Updated Vegetation Survey Report for Slope Mitigation Works (issue 212-2).

The IUCN Red List of Threatened Species. Version 2022-2 (2023) https://www.iucnredlist.org/species/194922/8919354 assessed on 13 April 2023.

Appendix A

Figure 1 The upper part of the cliff area was assessed by cherry picker.

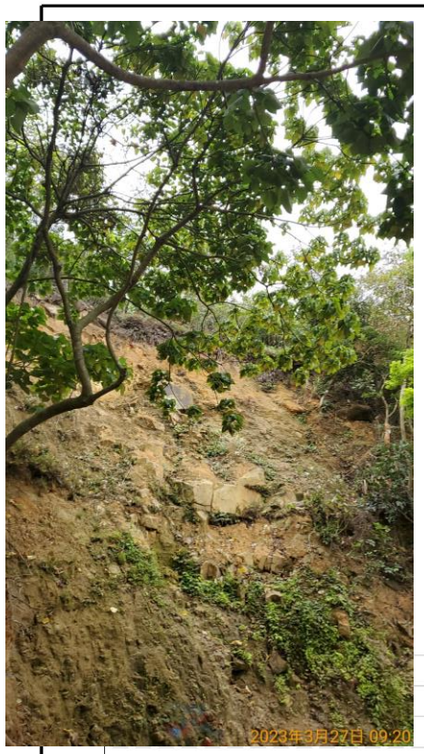
Table 1 Full List of Plant Species Recorded.

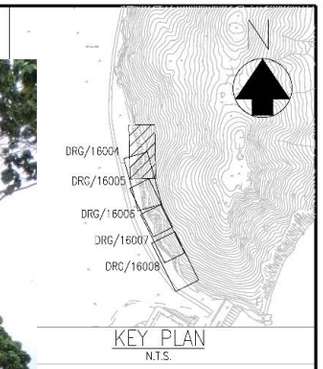
Species Name	Chinese Name	Origin	Growth Form	Conservation Status
Acacia confusa	台灣相思	Exotic	Tree	common
Adiantum flabellulatum	扇葉鐵線蕨	Native	Herb	very common
Alocasia odora	海芋	Native	Herb	common
Alpinia zerumbet	豔山薑	Native	Herb	very common
Atalantia buxifolia	酒餅簕	Native	shrub	common
Alternanthera sessilis	蝦鉗菜	Native	Herb	common
Aucuba chinensis	桃葉珊瑚	Native	shrub	common
Blechnum orientale	烏毛蕨	Native	Herb	very common
Cajanus scarabaeoides	蔓草蟲豆	Native	Climber	Common
Centella asiatica	積雪草	Native	Herb	very common
Dianella ensifolia	山菅蘭	Native	Herb	very common
Dicranopteris pedata	芒萁	Native	Herb	common
Emilia sonchifolia	一點紅	Native	Climber	very common
Ficus hispida	對葉榕	Native	Tree	very common
Ficus subpisocarpa	筆管榕	Native	Tree	common
Gardenia jasminoides	梔子	Exotic	shrub	common
Glochidion zeylanicum	香港算盤子	Native	shrub	common
Gnetum luofuense	羅浮買麻藤	Native	Climber	Near Threatened (NT) internationally under IUCN Red List
Gymnanthera oblonga	海島藤	Native	Climber	common
Ipomoea nil	牽牛	Exotic	Herb	common
Ipomoea triloba	三裂葉薯	Exotic	Herb	common
Lantana camara	馬纓丹	Exotic	shrub	very common
Leucaena leucocephala	銀合歡	Exotic	Tree	common
Liriope spicata	山麥冬	Native	Herb	very common
Litsea glutinosa	潺槁樹	Native	Tree	common
Lygodium japonicum	海金沙	Native	Herb	very common
Macaranga tanarius	血桐	Native	Tree	very common
Mallotus paniculatus	白楸	Native	Tree	common
Mikania micrantha	薇甘菊	Exotic	Climber	common
Millettia speciosa	美麗崖豆藤	Native	Climber	common
Momordica charantia L. var. abbreviata	短角苦瓜	Exotic	Climber	common
Mussaenda pubescens	玉葉金花	Native	Climber	common
Nephrolepis auriculata	腎蕨	Native	Herb	common
Paederia scandens	雞矢藤	Native	Climber	very common
Psychotria asiatica	九節	Native	shrub	common
Pteris linearis	線羽鳳尾蕨	Native	Herb	common
Pteris semipinnata	半邊旗	Native	Herb	common
Pueraria phaseoloides	三裂葉野葛	Native	Herb	very common
Rhodomyrtus tomentosa	桃金娘	Native	shrub	very common

Species Name	Chinese Name	Origin	Growth Form	Conservation Status
Sapium sebiferum	烏桕	Native	Tree	common
Schefflera heptaphylla	鵝掌柴	Native	Tree	common
Smilax china	菝葜	Native	Climber	very common
Toxocarpus wightianus	弓果藤	Native	Climber	common
Trema tomentosa	山黃麻	Native	Tree	common
Vernonia cinerea	夜香牛	Native	Herb	very common
Wedelia trilobata	三裂葉蟛蜞菊	Exotic	Herb	common
Youngia japonica	黃鵪菜	Native	Herb	very common
Zanthoxylum avicennae	簕欓花椒	Native	Tree	common
Zehneria japonica	老鼠拉冬瓜	Native	Climber	common

Notes: “Commonness” follows Hong Kong Biodiversity Online, approved EIA Report (Register No. AEIAR-192/2015) and Updated Vegetation Survey Report for Slope Mitigation Works (issue 212-2).

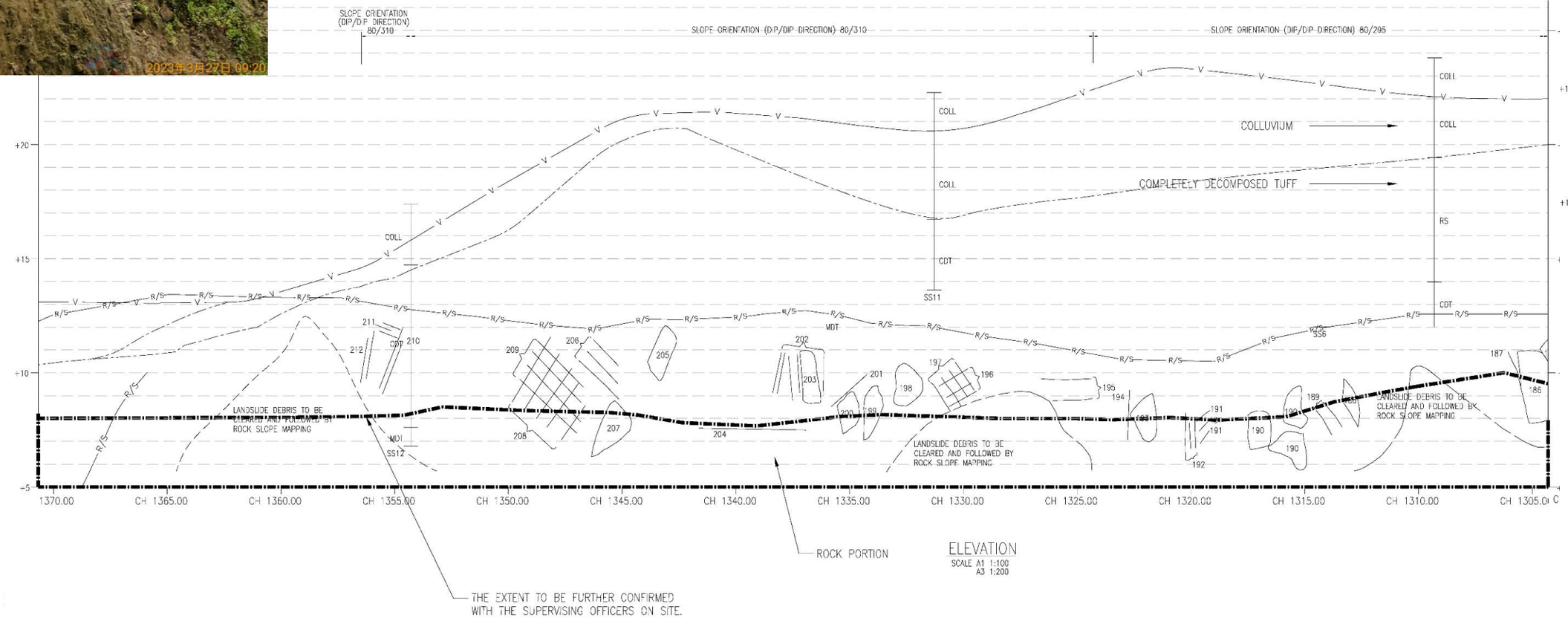
Appendix B





LEGEND:

- GEOLOGICAL PROFILE (ESTIMATED)
- V — BREAK SLOPE FACE (ESTIMATED)
- R/S — ROCK/SOIL INTERFACE (ESTIMATED)
- LANDSLIDE DEBRIS TO BE CLEARED AND FOLLOWING BY ROCK SLOPE MAPPING (INDICATIVE)
- 126 — MEASURED ROCK JOINT AND ROCK JOINT NUMBER
- PROPOSED ROCK DOWEL
- POTENTIAL UNSTABLE ROCK BLOCK AS OBSERVED ON SITE WITH PROPOSED SCALING (INDICATIVE)
- PROPOSED DENTITION (WITH STONE FACING)
- PROPOSED BUTTRESS (WITH STONE FACING)
- PROPOSED WIRE MESH COVER AFTER GENERAL SCALING (WITH OPENING TO TREES TO BE RETAINED) (INDICATIVE)



ELEVATION
SCALE A1 1:100
A3 1:200

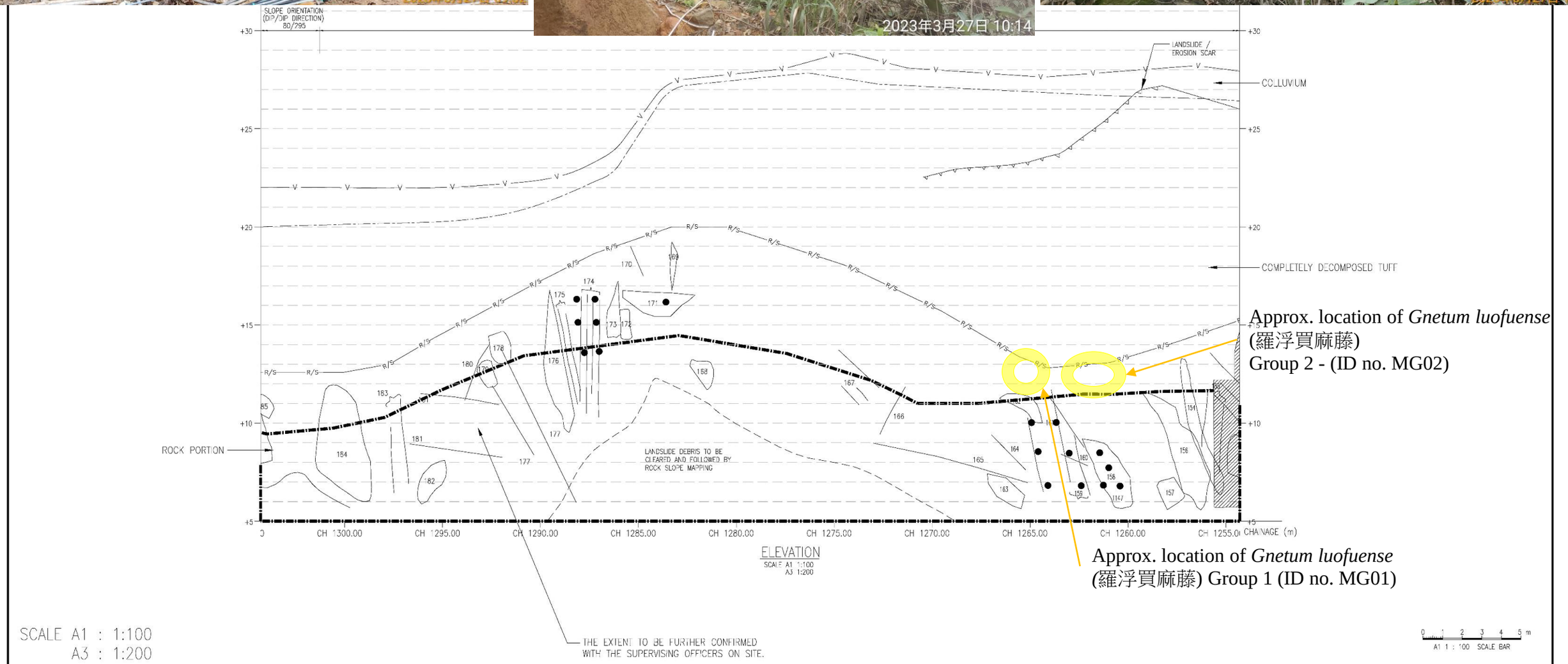
0 1 2 3 4 5 m
A1 1 : 100 SCALE BAR

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

CONTRACT NO. 13/WSD/17
DESIGN, BUILD AND OPERATE
FIRST STAGE OF TSEUNG KWAN O
DESALINATION PLANT

Title:
ROCK SLOPE ELEVATION
(CH1365 – CH1305)

Date: 2023/03/09	Drafted by DC
Outgoing letter Ref. No.: 190495/(13/WSD/17)/C10/100/L104038	Checked by LL
Reference Drawing: 190495/B/DD/00 20005	Approved by RW
Sketch No.: SK/190495B/C13/48-16004	Rev.: B



Approx. location of *Gnetum luofuense* (羅浮買麻藤) Group 2 - (ID no. MG02)

Approx. location of *Gnetum luofuense* (羅浮買麻藤) Group 1 (ID no. MG01)

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

CONTRACT NO. 13/WSD/17
DESIGN, BUILD AND OPERATE
FIRST STAGE OF TSEUNG KWAN O
DESALINATION PLANT

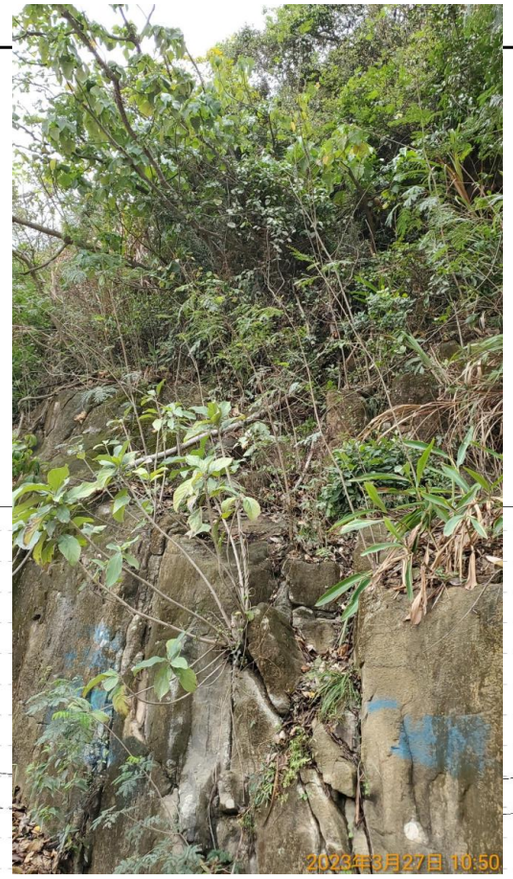
Title:
ROCK SLOPE ELEVATION
(CH1305 – CH1255)

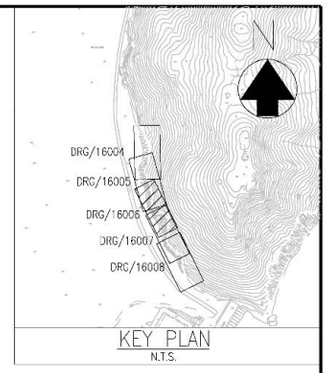
Date: 2022-08-03	Drafted by DC
Outgoing letter Ref. No.: 190495/(13/WSD/17)/C10/100/L104038	Checked by LL
Reference Drawing: 190495/B/DD/00-20006	Approved by RW
Sketch No.: SK/190495B/C13/48-16005	Rev.: 0

Gnetum luofuense (羅浮買麻藤)
Group 1 (ID no. MG01)

*Gnetum luofuense (*羅浮買麻藤)
Group 2 (ID no. MG02)

*Gnetum luofuense (*羅浮買麻藤)
Group 2 (ID no. MG02)





NOTE:
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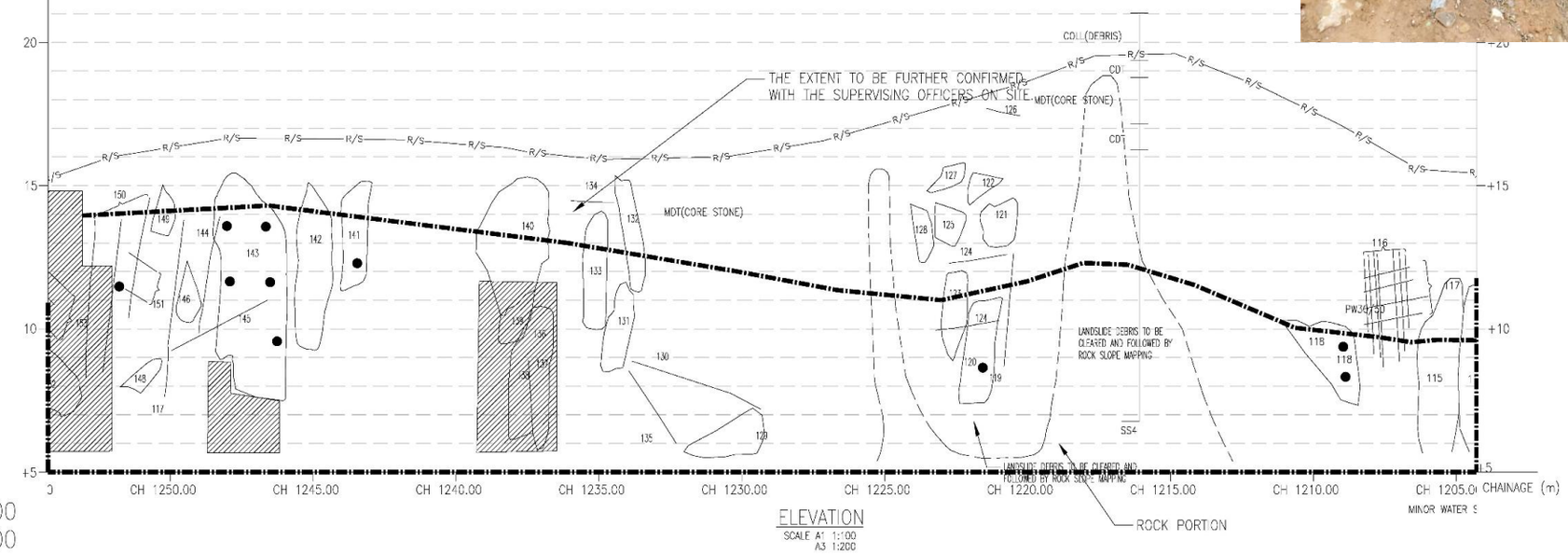
SLOPE ORIENTATION (DIP/DIP DIRECTION) 80/230

SLOPE ORIENTATION (DIP/DIP DIRECTION) 80/200



SCALE A1 : 1:100
A3 : 1:200

ELEVATION
SCALE A1 1:100
A3 1:200

0 1 2 3 4 5 m
A1 1 : 100 SCALE BAR

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

CONTRACT NO. 13/WSD/17
DESIGN, BUILD AND OPERATE
FIRST STAGE OF TSEUNG KWAN O
DESALINATION PLANT

Title:
ROCK SLOPE ELEVATION
(CH1255 – CH1205)

Date: 2022-08-03	Drafted by DC
Outgoing letter Ref. No.: 190495/(13/WSD/17)/C10/100/L104038	Checked by LL
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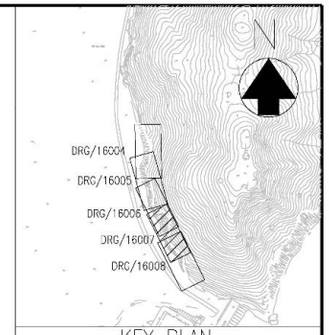
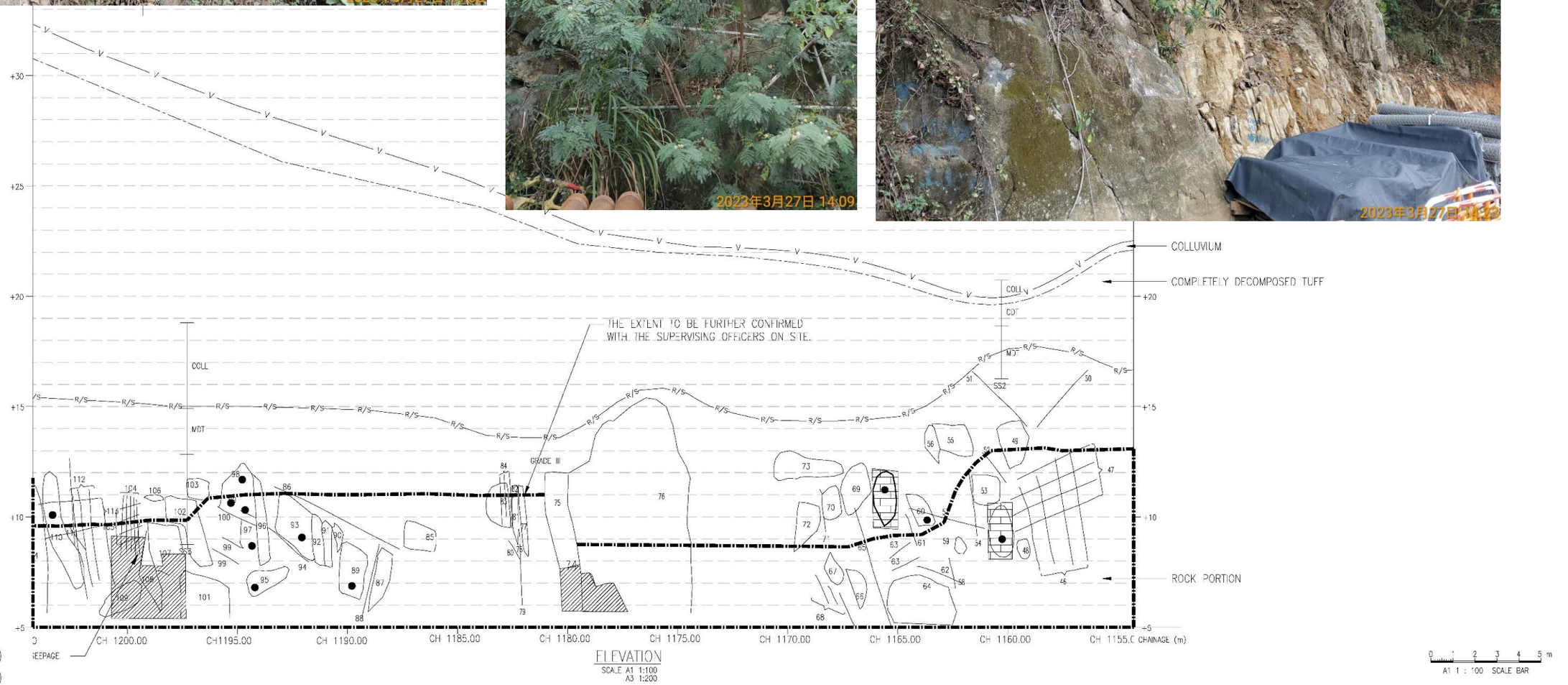
Sketch No.: SK/190495B/C13/48-16006	Rev.: 0



KEY PLAN
N.T.S.

TO DRAWING NO.



ELEVATION
SCALE A1 1:100
A3 1:200

SCALE A1 : 1:100
A3 : 1:200

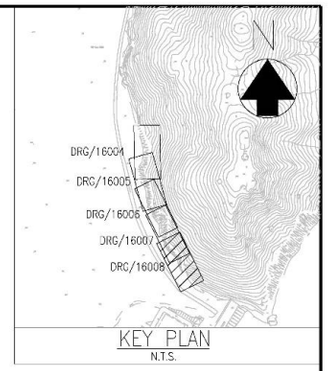
0 1 2 3 4 5 m
A1 1 : 100 SCALE BAR

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

CONTRACT NO. 13/WSD/17
DESIGN, BUILD AND OPERATE
FIRST STAGE OF TSEUNG KWAN O
DESALINATION PLANT

Title:
ROCK SLOPE ELEVATION
(CH1205 – CH1160)

Date: 2022-08-03	Drafted by DC
Outgoing letter Ref. No.: 190495/(13/WSD/17)/C10/100/L104038	Checked by LL
Reference Drawing: 190495/B/DD/00-20008	Approved by RW
Sketch No.: SK/190495B/C13/48-16007	Rev.: 0



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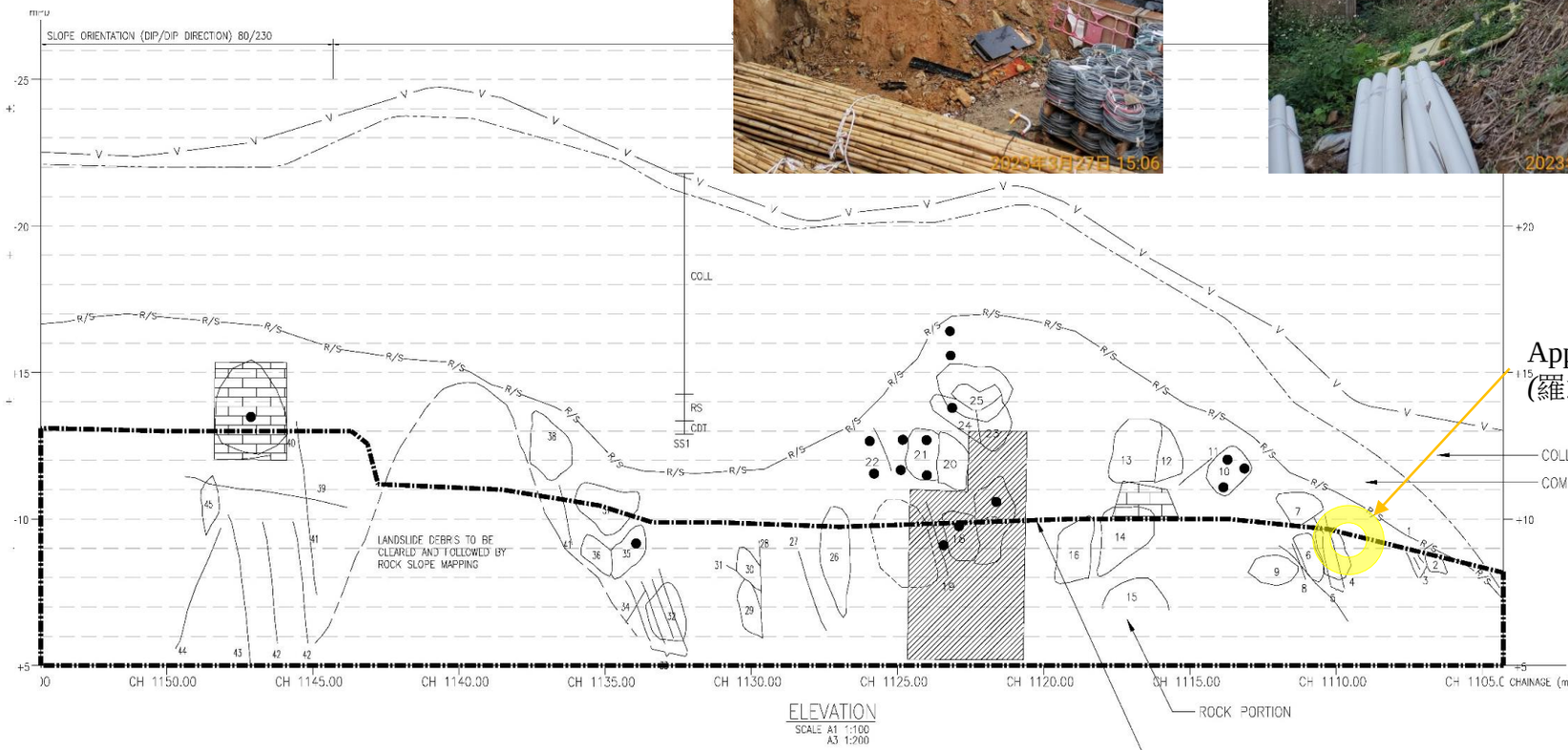


ELEVATION
SCALE A1 1:100
A3 1:200

Approx. location of *Gnetum luofuense* (羅浮買麻藤) Group 3 (ID no. MG03)

COLLUVIUM

COMPLETELY DECOMPOSED TUFF

ROCK PORTION

THE EXTENT TO BE FURTHER CONFIRMED WITH THE SUPERVISING OFFICERS ON SITE.

SCALE A1 : 1:100
A3 : 1:200

A1 1 : 100 SCALE BAR

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

CONTRACT NO. 13/WSD/17
DESIGN, BUILD AND OPERATE
FIRST STAGE OF TSEUNG KWAN O
DESALINATION PLANT

Title:
ROCK SLOPE ELEVATION
(CH1155 – CH1105)

Date: 2022-08-03	Drafted by DC
Outgoing letter Ref. No.: 190495/(13/WSD/17)/C10/100/L104038	Checked by LL
Reference Drawing: 190495/B/DD/00-20009	Approved by RW
Sketch No.: SK/190495B/C13/48-16008	Rev.: 0

Gnetum luofuense (羅浮買麻藤)
Group 3 (ID no. MG03)

APPENDIX H2

SURVEY METHODOLOGY AND RESULT IN 2023 FOR BOULDER REMOVAL (LOWER PORTION)

Report of Vegetation Checks for the Boulder Removal (Lower Portion)

ACUITY sustainability
Member of the Aurecon Group

aurecon

水務署
Water Supplies Department

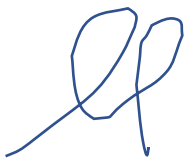
Contract No. 13/WSD/17

Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

Report of Vegetation Checks for the Boulder Removal/ Stabilization Work along the Existing Rock Slope

Document No.

ASCL	/	200168078	/	VMR	/	B
Publisher		Project Code		Sequential No.		Revision Index

	Prepared by:
Name	Melody Cheng
Position	Qualified Plant Ecologist
Signature	
Date:	2 March 2023

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Verification Survey of Plant Species of Conservation Importance before Commencement of Slope Mitigation Works – WSD Contract No. 13/WSD/17 Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

1. INTRODUCTION

1.1 Acuity Sustainability Consulting Limited was appointed by the project contractor Acciona Agua, Jardine Engineering Corp, China State Joint Venture (AJCJV) to engage a qualified plant ecologist to conduct a vegetation check with focus on plant species of conservation importance before commencement of boulder removal, in accordance with the recommended good site practices in section 5.3.8 of previous Updated Vegetation Survey Report for Slope Mitigation Works (issue 212-2) dated July 2017 submitted by Black & Veatch Hong Kong Limited.

1.2 According to Condition 2.7 of the Environmental Permit (FEP-503/2015/A) of the Project specifies that an Updated Vegetation Survey for Slope Mitigation Works shall be carried out to reduce ecological impact on plant species of conservation importance, including but not limited to *Marsdenia lachnostoma*, due to the slope mitigation works of the Project. The Updated Vegetation Survey for Slope Mitigation Works has been conducted and the report submitted in July 2017 by Black & Veatch Hong Kong Limited. The vegetation survey report was further updated by the project contractor on 20th August 2020.

1.3 This survey covers boulder removal/break-off of 11 unstable boulders (ID no. B105, B106, B107, B182, B196, B198, B199, B203, B206, B207 and B216) identified at the natural terrain within the Clearwater Bay Country Park area.

1.4 Previous verification survey in concerned area was conducted by binocular scanning in 2020 where the slope was inaccessible and growing with dense shrubland / pioneer young shrubland.

1.5 Currently, the project contractor Acciona Agua, Jardine Engineering Corp, China State Joint Venture (AJCJV) revisited the access route for the boulder stabilization works and made available for direct observation.

2. METHODOLOGY

2.1 Actively searched and recorded for *Marsdenia lachnostoma* and any other plant species of conservation importance along the access route (incl. the scaffold access on slope face) and surrounding of the concerned boulders on 30 January and 21 February 2023 (Figure 1).

2.2 Each found individual/ patch (for those grow closely with each other) of plant species of conservation importance was marked by a colour ribbon and the position was pin-pointed with a GPS by the contractor's survey team. Photographic records of groups/ individuals of plant species of conservation importance are illustrated in **Appendix B**.

2.3 Nomenclature for plant species follows AFCD's Hong Kong Herbarium Database. Local commonness of recorded plant species of conservation importance in Hong Kong follows Corlett et al. (2000) and Hong Kong Plant Database managed by the Hong Kong Herbarium. Conservation status follows AFCD (2003), IUCN Red List (2021) and relevant legislations, including Forests and Countryside Ordinance (Cap. 96) and Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

2.4 Based on the survey findings, recommended protection measures are proposed to conserve the recorded plant species of conservation importance as identified in the survey.

3. RESULTS

3.1 With reference to the previous survey result in Updated Vegetation Survey Report dated 20th August 2020, stated the habitat is not favorable for *Marsdenia lachnostoma* and *Habenaria linguella*. In this survey, no *Marsdenia lachnostoma* and *Habenaria linguella* were found.

3.2 Another species of conservation importance, four patches of *Gnetum luofuense* (羅浮買麻藤) were found nearby boulder ID no. B182 and B196. This climber is very common in Hong Kong while it is listed as Near Threatened (NT) internationally under IUCN Red List, due to potential decline in population caused by habitat loss (IUCN, 2023).

4. PROTECTION MEASURES & CONCLUSION

4.1 The concern species nearby boulder ID no. 182 have been blocked off from access by the temporary elevated access, the plants were immediately tagged by colour ribbon for easy recognization. Another patch of plant nearby boulder ID no. B196 was also tagged and protection zone will be established before the boulder removal works.

4.2 The Contractor was reminded to maintain the protection zone during the boulder removal works.

REFERENCES

AFCD (2003) Rare and Precious Plants of Hong Kong (Online Version). https://www.herbarium.gov.hk/en/publications/books/book2/index.html assessed on 30 January 2023.

AFCD (2021) Hong Kong Biodiversity Information Hub. https://bih.gov.hk/en/species-database/index.html assessed on 30 January 2023.

AFCD (2021) Hong Kong Herbarium Database. https://www.herbarium.gov.hk assessed on 30 January 2023.

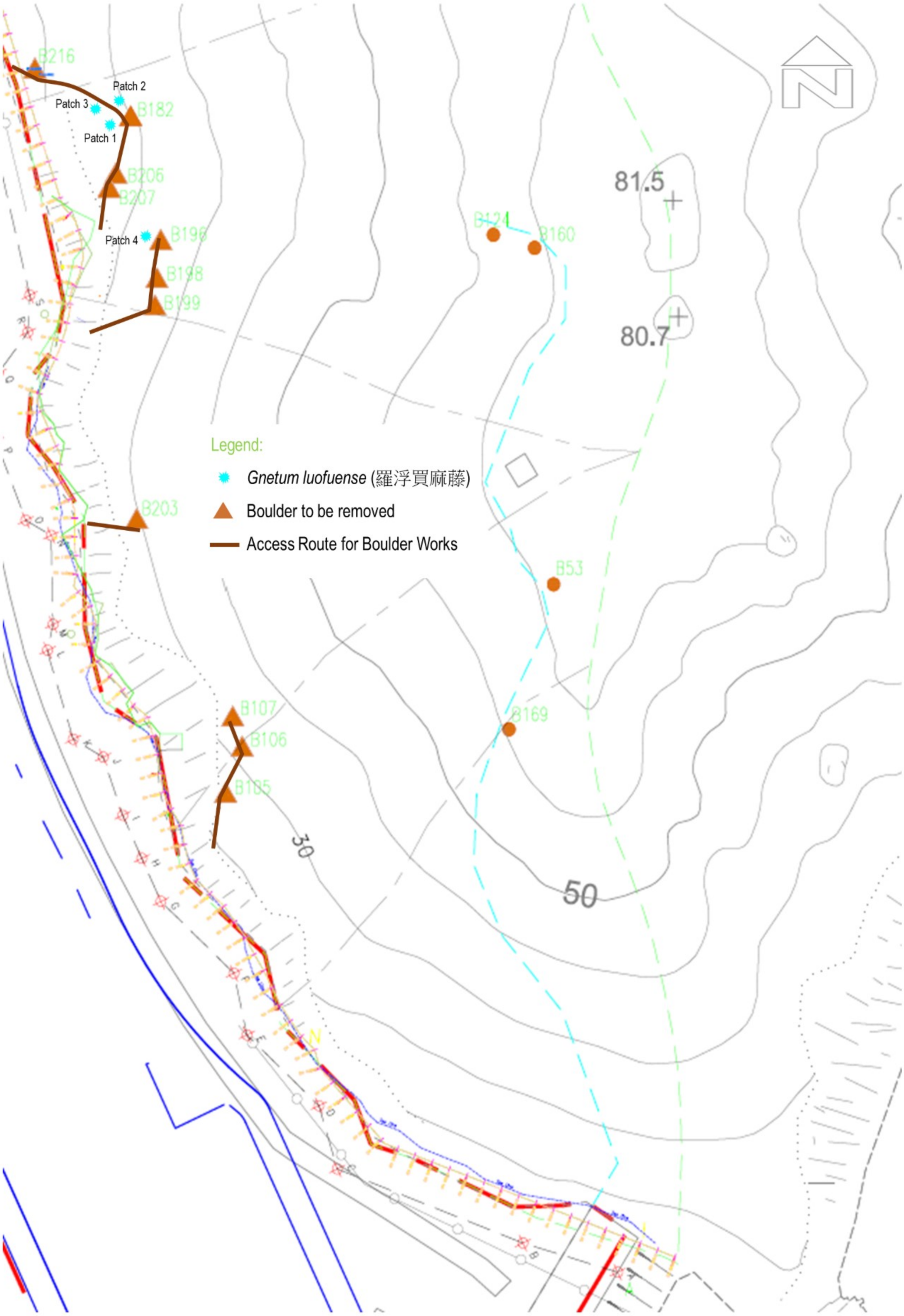
Black & Veatch Hong Kong Limited (2017) Updated Vegetation Survey Report for Slope Mitigation Works (issue 212-2).

The IUCN Red List of Threatened Species. Version 2022-2 (2023) https://www.iucnredlist.org/species/194922/8919354 assessed on 30 January 2023.

Appendix A

Verification Survey Results

Figure 1 Indicative localities of plant species of conservation importance (*Gnetum luofuense*). One dot may represent more than one individual if they are close to each other.



Appendix B

Photo Records

Photo Record:

<table>
<tr><td> 
Patch 1</td><td> 
Patch 2</td></tr>
<tr><td> 
Patch 3</td><td></td></tr>
<tr><td colspan="2">Boulder ID. B182</td></tr>
<tr><td> 
Patch 4 (view 1)</td><td> 
Patch 4 (view 2)</td></tr>
<tr><td colspan="2">Boulder ID. B196</td></tr>
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APPENDIX I

NOT USED

APPENDIX J

QUALIFIED ECOLOGISTS

CV of Qualified Ecologist
for 2016 Survey

Terence Fong

Ecologist

Terence Fong is Partner responsible for overseeing ecological impact assessments, landscape and visual impact assessment, and permitting works for development projects. He has over fifteen years experience and has managed, designed and supervised numerous habitat/ biodiversity baseline surveys and IFC compliant Biodiversity Impact Assessments in the Asia Pacific region including: Kalimantan and Java (Indonesia), Vladivostok (Russia), Brunei, Philippines, Vietnam, Thailand, Saudi Arabia, Myanmar, Laos, Singapore, Korea, China, Hong Kong and Taiwan.

Terence has been involved in and managed numerous local and overseas EIAs for examining the impacts of developments (including power plant, housing, port, mining, landfill, highways, railways, pipelines and cables) on ecological resources, particularly sensitive habitats, such as:

- Riparian vegetation
- Migratory bird habitats;
- Marshes and wetland bird habitats;
- Raptor nesting and foraging areas;
- Montane and lowland forest;
- Endemic amphibian habitats;
- Butterfly and larval host plants;
- Protection freshwater fish habitats;
- Orchid and pitcher plant habitats;
- Seagrass beds;
- Mangroves and horseshoe crab habitats;
- Coral reefs;
- Fish nursery ground.

Terence has been invited by the PRC Environmental State Protection Administration, to be one of the experts to participant in the Project "Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand", whereas the project is funded by UNEP/GEF, and appointed by UNEP as the Final Evaluator for one of the Demonstrate Site. The Project involves six components, coral, mangrove, seagrass, wetland, land-based pollution and over-exploitation of fisheries.

As Terence is specialized in terrestrial and wetland ecology and EIA, he has been invited to give lectures in different universities in Hong Kong since 1998, and also invited by East Asian Seas Regional Coordinating Unit, UNEP (United Nations Environment Programme) to attend "The International Symposium on Protection and Management of Coastal Marine Ecosystems" and present on specialized in wetland and coastal ecology. Terence is recently appointed by The University of Hong Kong as Assistant Professor (part-time) and teaching "Ecology and Landscape Sciences" and "Ecology and Design", and Adjunct Professor (part-time) leading an EIA course for MSc programme in The City University of Hong Kong.

Fields of Competence

- Environmental Impact Assessment/Planning
- Habitat Assessment
- Renewable Energy
- Natural Resources and Conservation

Education

- MPhil, Wetland Ecology The University of Hong Kong, 1998
- BSc (Hons), Environmental Science, University of Hong Kong, 1993
- Certificate of Tropical Marine Invertebrate, 1995 Bermuda Biological Station for Research, Bermuda

Professional Affiliations & Registrations

- Adjunct Professor (part-time), The City University of Hong Kong
- Assistant Professor (part-time), The University of Hong Kong
- China-Hong Kong co-ordinator and trainer of Global Reef Check survey
- Councillor of the Marine Conservation Society, Hong Kong
- Co-opt Council Member of the Marine Biological Association of Hong Kong

Languages

- English
- Chinese (Cantonese & Mandarin)

Key Projects

Biodiversity Review for Yang Gong Windfarm Project in China (Confidential Client), 2015. Mr Fong provided technical review of the EIA Report.

Biodiversity Impact Assessment for a 100MW Photovoltaic Power Project in Jiangsu Province, China (Confidential Client), 2014. The Project involves building a solar photovoltaic system with total area of approximately 418 hectares. ERM was commissioned to conduct a detailed Biodiversity Impact Assessment and recommend feasible and practical mitigation measures for the Project. Mr Fong is the Project Director.

A Proposed Wind Farm Development, Jilin Province, China (Confidential Client), 2009-2010. ERM assessed the environmental and social management of the wind farm using Chinese regulatory, IFC performance standards and Equator Principles to identify potential environmental and social impacts of the project. ERM also assisted to implement IFC requirement including bird monitoring and staff training. Mr Fong was responsible for the design and conducting bird monitoring, as well as reassessment of bird collision risk due to the updated information.

Environmental Impact Assessment for Development of a 100MW Wind Farm in Hong Kong (Hong Kong Electric Co.), 2008-2014. ERM was commissioned to conduct the EIA for 2 alternative offshore wind farm locations in Hong Kong. Key issues for the project included impact to seabirds and migratory birds as well as impacts to two species of resident marine cetaceans. Mr Fong was responsible for the design of ecological baseline surveys including habitat mapping, seabird, marine mammal, intertidal, benthic and coral, and technical review of the ecological impact assessment and fisheries impact assessment for the Project during EIA stage. The EIA was approved, with conditions, by the Advisory Council on the Environment in April 2010. As part of the ongoing work, a Fisheries Review and Consultation Programme (FRCP) is being implemented to consult with the fishery sector and determine whether there is scope for fishing operations to be conducted within the development area and to explore the possibility of enhancing fishery resources there. In addition, Mr Fong also provided technical support and attended Stakeholder Liaison Group meetings.

Hong Kong Offshore Wind Farm in Southeastern Waters (CAPCO), Hong Kong, 2009-2014. ERM were commissioned to implement certain conditions of approval of the EIA for a wind farm in southeastern waters of Hong Kong. Mr. Fong led the work on one such condition, to develop a fisheries enhancement plan (FEP) in consultation with the fishery sector and the Hong Kong government, incorporating such measures as the deployment of artificial reefs. The FEP will ensure the views of fishermen are heard, addressed and utilized. In addition, Mr Fong provided technical support and attended Stakeholder Liaison Group meetings.

Offshore Wind Farm Pilot EIA (Unitech Engineering Inc.), Taiwan, 2013-2014. ERM was engaged to conduct bird collision risk assessment for an offshore wind farm pilot EIA which built upon Taiwan regulatory approvals. Mr Fong provided technical input on the bird collision risk assessment.

Environmental Assessment for the Town Island Renewable Energy Supply (CLP Power), Hong Kong, 2009-2010. CLP proposed to establish permanent Renewable Energy including photovoltaic arrays, two 6kW wind turbines, underground cabling system and associated equipment for a residential drug rehabilitation facility. The key concerns of the project include ecology, tree felling, visual and landscape, and electric and magnetic field. Mr Fong was responsible for the design of ecological baseline surveys and technical review of the ecological impact assessment (including bird collision risk assessment) for the Project.

Environmental Assessment for the Town Island Renewable Energy Supply (CLP Power), Hong Kong, 2009-2010. CLP proposed to establish permanent Renewable Energy including photovoltaic arrays, two 6kW wind turbines, underground cabling system and associated equipment for a residential drug rehabilitation facility. The project involved 6 months avifauna surveys. Mr Fong was responsible for the design of ecological baseline surveys and technical review of the ecological impact assessment for the Project.

Environmental, Social and Health Impact Assessment of a Proposed 380 MW Hydropower Project, (Confidential Client), Philippines, 2014-2015. ERM is presently conducting the ESHIA for a hydropower facility in Luzon Province in the Philippines. ERM is also tasked with supervising the local consultants who are responsible for obtaining the Environmental Compliance Certificate. Key issues include dam safety, changes in seasonal flooding patterns, habitat loss and ecological flow assessment. Terence is the Project Director.

Coc San Hydropower Project: Environmental and Social Impact Assessment Study, Vietnam (Colben Energy (Vietnam) Joint Stock Company and Viet Hydro Pte. Ltd.), 2013. ERM were commissioned to conduct the ESIA for the development of a hydroelectric project in Trung Chai Commune, Sa Pa

District and Coc San Commune, Bat Xat District, close to the Chinese border in northern Vietnam. The Coc San Hydropower Project (HPP) will utilise the waters of the Dum River (Ngoi Dum) to potentially generate 134.2 GWh of energy per year from an installed capacity of 29.7 MW. The study involved detailed biodiversity field surveys including habitat mapping, vegetation and wildlife surveys and social baseline surveys. Terence was the Project Manager and Biodiversity Specialist responsible for overseeing the EIA, biodiversity baseline survey design and technical review of the EIA and recommendations for mitigation measures and monitoring requirements.

Nam Ngiep 1 Hydropower Project: Biodiversity Offset Assessment & Environmental Flow Assessment, Laos, (Kansai Electric Power Company Inc.), 2013. Nam Ngiep 1 Hydropower Project (NNHP1) Project involves construction and operation of a 290MW hydroelectric power generation facility on a build-operate-transfer basis at the Nam Ngiep River. The Project site is in the provinces of Vientiane and Bolikhamxay, Lao PDR with the majority of generated power exported to Thailand and some for domestic supply. ERM were commissioned to the conduct biodiversity offset assessment including undertaking comprehensive baseline biodiversity surveys, assessing biodiversity impact and suitability of a biodiversity offset, as well as its design of measures. The scope of works also included technical review of environmental flow assessment. Terence was the Biodiversity Specialist of the study.

Nam Sane 3 Hydro-Power Plant Environmental Impact Assessment Study, (Rohas) Laos, 2008. ERM were commissioned to conduct the EIA for the development of a hydroelectric project in a remote region of Xieng Khouang province in Laos. The study involved detailed biodiversity field survey including habitat mapping, vegetation and wildlife surveys to gather baseline information as well as conducting stakeholder consultation meetings with various NGOs and government departments. Mr Fong was responsible for biodiversity baseline survey design and technical review of the ecological impact assessment and recommendations for mitigation measures and monitoring requirements.

Biodiversity Impact Assessment for Downtown Line Stages 2 & 3 Alignment (Land Transport Authority), Singapore, 2009. The biodiversity impact assessment forms part of the EIA study for the Downtown Line Stages 2 & 3 Alignment. Mr Fong was responsible for the design and coordination of the terrestrial biodiversity baseline surveys including habitat mapping, vegetation and wildlife, surveys, and the biodiversity assessment.

Scoping Environmental Impact Assessment of the Mount Faber Development (Sentosa Development Corporation), Singapore, 2007. Sentosa Development Corporation (SDC) intended to develop 65 hectares of land at the foothill of Mount Faber, which include low intensity developments such as themed leisure experiences, unique accommodations and transport nodes connecting the precinct to the Mount Faber Ridge top, a cluster of attractions that leverage on the natural landscape and terrain. Mr Fong was responsible for biodiversity and ecological assessment.

EIA for Marina Bay Sands in Singapore (Venetian Macau Limited) 2007. Mr Fong was responsible for the design and coordination of the terrestrial and marine biodiversity baseline surveys including habitat mapping, vegetation, wildlife, coastal and benthic surveys. The biodiversity assessment evaluated the biodiversity and ecological conditions of the site and identified the potential impacts due the development.

The Baroque on Lamma (Confidential Client) 2010-2012. ERM has been commissioned to undertake the EIA and planning applications for a marina development off southeast Lamma Island. Key issues for the EIAs include impacts of sensitive habitats for Romer's Tree Frog, birds, finless porpoise, green turtle, and fisheries. ERM is therefore responsible for the design of ecological baseline surveys including habitat mapping, terrestrial wildlife, marine mammal, intertidal, benthic and coral. Mr Fong is the Ecology Team Leader responsible for co-ordinating and organizing ecological field surveys, identifying potential environmental constraints of the proposed project, providing appropriate mitigation measures and preparing the ecological and LVIA sections of the EIA Report.

Pilot Project for Public - Private Conservation Scheme, Sha Lo Tung Valley, Tai Po (Sha Lo Tung Development Company), 2005-2009. The Pilot Project is proposed to be one of the pilot projects under the scheme of Public-Private Partnership (PPP) further to HKSAR government's Nature Conservation Policy. This Project establishes the framework for a public-private partnership to conserve the Sha Lo Tung Valley in Tai Po which is well known dragonfly heaven and of ecological significance. Endorsement of the Project will ensure long-term active conservation management of the ecologically sensitive areas currently located on private land owned by the Sha Lo Tung Development Company. The Project will provide a source of funds to sustain conservation action of the ecological sensitive area. This balance between development and conservation expectations, will enable the Valley to become a unique nature

attraction and educational resource for both locals and tourists, which can be achieved quickly and without Government funding. Mr Fong was the Project Manager responsible for the environmental impacts assessment due to the proposed development outside the Sha Lo Tung Valley, as well as the development of Conservation Management Plan.

2008 Update of Terrestrial Habitat Mapping and Ranking Based on Conservation Value (Sustainable Development Division of the Environment Bureau, HKSAR), Hong Kong, 2008-2009. The main objectives of the Study are to update the findings of the previous Habitat Mapping Studies (in 2000, 2003, 2005 and 2007) to review and update the existing terrestrial habitat and ecological baseline database (including the maps contained in the Computer-Aided Sustainability Evaluation Tool (CASET)) and maintain the data integrity through (a) remote sensing analysis using up-to-date satellite images; (b) desktop truthing using orthophotos; and (c) field truthing surveys including for freshwater/brackish wetland, natural watercourse, rocky shore, sandy shore, mangrove and intertidal mudflats in Hong Kong, amongst others. Mr. Fong was the Project Manager and habitat mapping specialist on this project, having also been the Project Manage or deputy for the previous 2006-7 and 2002-2003 Habitat Mapping Projects that ERM were commissioned for as well as the original 2000 Project whereby the Habitat Map baseline was established.

Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand, for UNEP/GEF, 2002-2008. Mr Fong was invited by the PRC Environmental State Protection Administration to work along-side other international experts from the project region. The project involves six components: coral, mangrove, seagrass, wetland, land-based pollution and over-exploitation of fisheries, and aims to develop Demonstration Sites for each component. As one of the experts, Mr Fong was responsible for conducting ecological surveys, proposing suitable demonstration sites and collaborating with local government, community stakeholders and academics, etc to preserve and manage the area properly. Due to the lack of ecologists in Mainland China, Mr Fong instructed some training courses for the South China Sea Institute of Oceanology. Mr Fong also appointed by UNEP as the Final Evaluator for one of the Demonstrate Site.

Environmental Consultancy Services (Confidential Theme Park Group), 2014-2015. ERM has been commissioned by a theme park group to provide consultancy services around its environmental permitting, advising on what is permissible within the limits of the current permit and what would require an application for a variation. Mr. Fong has been a key advisor on all environmental and strategic elements, also leading the ecological and LVIA inputs to any reporting.

Environmental Consultancy Services (Confidential Theme Park Group), 2013-2014. ERM has been commissioned by a theme park in Hong Kong to provide consultancy services around its environmental permitting, particularly with regards to the scope of existing permits and any requirement for additional permit applications for proposed new developments. Mr. Fong, with his detailed knowledge of the environmental legislation and permitting processes, was key strategic advisor for this Project, particularly with regards to LVIA and biodiversity inputs.

Infrastructure for Penny's Bay Development – Contract 1: Vegetation Transplantation (China State), 2002–2005. ERM has been commissioned to conduct vegetation survey and transplantation works for two restricted sedge species impacted by the development of Penny's Bay. Mr Fong was the Project Manager and was responsible for preparation of transplantation proposal, supervision of the overall transplantation procedures. The plants have been transplanted to Sze Pak Wan and monitored for three years before handover to AFCD.

Detailed Design for Wetland Recreation, Kowloon and Canton Railway Corporation (KCRC), Hong Kong, 2000-2004. Mr Fong was the Deputy Project Manager of this study. Its overall objective is to compensate for the loss of ecologically-rich wetland habitat in the Kam Tin Valley through a habitat creation programme based on the guiding principles established in the HCMP. As the ecology of the Kam Tin Valley has been disrupted through the West Rail project, the guiding principles should facilitate the early establishment of ecological resources on commissioning of the re-created wetland habitat. With this overall objective in mind, broad principles will be applied for the expeditious wetland design and creation process.

CV of Qualified Ecologist
for 2020 and 2021 Surveys

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CV – Jay Wan

Name:	Mr. Pak-Ho Wan, Jay
Nationality:	Chinese
Country	Hong Kong S.A.R.
Language:	Cantonese (Native), English (Fluent), Mandarin (Fluent)
Ecological Experience:	15 years

FIELDS OF COMPETENCE

Ecological Impact Assessment (EcoIA), Preliminary Environmental Review (PER), EM&A, BEAM Plus SA5 Ecological Impact Assessment, Mammalogy, Camera Trapping, Aquatic Fauna Survey, Herpetology, Wildlife Management, Terrestrial Ecology, Environmental Education, Conservation, Tree Risk Assessment, Tree Preservation & Removal Proposal (TPRP)

PROFESSIONAL SERVICE

Member, IUCN Species Survival Commission Small Mammal Specialist Group 2013 – present
Regional Implementation Team, Critical Ecosystem Partnership Fund in Indo-Burma Hotspot (CEPF). May 2013 – September 2014; April 2018 – present
Certified Arborist of International Society of Arboriculture 2015
ISA Qualified TRAQ 2017 – 2022
ISA Headquarters & Hong Kong Chapter Member 2017 –2018

KEY QUALIFICATIONS

Jay is a professional ecologist specializing in plant-animal interaction. He has over 14 years of experience in ecological studies in Hong Kong and overseas. Apart local ecological consultancy, he has conducted extensive *in-situ* ecological studies and managed conservation programmes across wider Austroasiatic region, including tropical and karst region in South and Southwest China, Singapore, Laos, Malaysia (Sarawak), Indonesia (Bali, Sumatra) and Australia.

Jay helps several national-class nature reserves to reinforce conservation mitigations, wildlife monitoring and habitat management. In 2011, he joined the Conservation of Asian Tortoises and Freshwater Turtles Workshop in Singapore in order to set conservation priorities for the next ten years, Singapore. As one of the key conservation team members of Kadoorie Farm & Botanic Garden (KFGB) since 2008, he made significant contributions in conserving critically endangered herpetofauna and mammals in South China and Hong Kong through field surveys and educational programmes. In 2014-2015, he co-organized and conducted wildlife surveys (including night surveys for herpetofauna) with an international ecology team for the Cross Island Line railway contracted by Land Transport Authority, Government of Singapore.

Recently Jay has based in Hong Kong, focusing on ecological surveys, assessments, monitoring and audits; and providing recommendations at different scales, from CEDD's

ACUITY SUSTAINABILITY CONSULTING LIMITED

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Fax.: (852) 2698 9383

Landslip Prevention and Mitigation Programme (LPMitP), EPD's EcoIA, PER and Project Profiles, AFCD's biodiversity consultancy, to ecological BEAM Plus to private clients. Major tasks involve tree surveys, baseline surveys and monitoring of fauna and flora species of conservation importance.

EDUCATION

MPhil in Terrestrial Ecology and Mammalogy, 2008, Department of Ecology & Biodiversity, The University of Hong Kong

BSc (Hons), Environmental Life Science, 2006, Department of Ecology & Biodiversity, The University of Hong Kong

WORKING EXPERIENCES

1. **Ecologist** (2018 – present), Acuity Sustainability Consulting Ltd. Carry out environmental/ ecological survey and consultancy for EA and EM&A projects in Hong Kong.
2. **Director** (2015 – present), Coalition for Research on Ecology and Wildlife Ltd. Manage ecological research and education programme, provide environmental/ ecological consultancy in Hong Kong and Overseas.
3. **Consultant** (2014 –2015), Landscape & Ecology Team, ERM (HK) Ltd. Provide consultancy services of EcoIA, LVIA, EM&A and IEC. Act as a key terrestrial ecologist for environmental projects in HK and SE Asia. Design and conduct field surveys on various wildlife groups.
4. **Surveyor** (2015 – 2016), Hong Kong Bird Watching Society. Conduct night surveys for herpetofauna in wetland at the NW New Territories, Hong Kong.
5. **Conservation Officer** (2008 –2014), Kadoorie Conservation China, Kadoorie Farm and Botanic Garden. Manage herpetofauna and mammal conservation projects. Conduct ecological research and biodiversity surveys in China. Provide training of forest and wetland survey techniques.
6. **Research Assistant** (June – July 2005), Department of Ecology and Biodiversity, The University of Hong Kong. Conducted a 3000-cuttings outdoor experiment at a native tree nursery
7. **Trainee** (July – August 2004) Agriculture, Fisheries and Conservation Department and Hong Kong Dolphin Conservation Society. Dolphin Conservation Ambassador Training Program.

SELECTED JOB REFERENCES

1. **First Stage of Desalination Plant at Tseung Kwan O – Investigation, Design and Construction: Preconstruction Ecology Survey & Updated Vegetation Survey for Slope Mitigation Works**
   Ecologist: responsible for day and night-time surveys on various fauna groups and reporting in the preliminary ecological impact assessment (EcoIA).

2. **Agreement No. 0430504 – Confidential Project at Castle Peak (Tsing Shan) – Vegetation and Habitat Survey**
   Plant specialist: responsible for baseline surveys and recommendation of mitigation measures on recorded plant species of conservation importance, including Camellia sp., Cibotium barometz, Enkianthus quinqueflorus, Gnetum luofuense, Rhododendron farrerae and Rhododendron simsii.

3. **Contract No. GE/2016/01 Landslip Prevention and Mitigation Programme, 2016, Package K, Landslip Prevention and Mitigation Works in Hong Kong Island, Kowloon, the New Territories and Outlying Islands**
   Plant specialist: responsible for a 1-year EM&A of recorded plant species conservation importance, including Aquilaria sinensis, Pavetta hongkongensis and Gnetum luofuense.

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Fax.: (852) 2698 9383

4. **Agreement No. GE/2013/27 Landslip Prevention and Mitigation Programme, 2011, Package A Landslip Prevention and Mitigation Works in Hong Kong Island Batch B**
Ecological Advisor & Botanist: preparation of transplantation protocol for wild orchid and other flora species of conservation importance. Supervision of transplantation works; EM&A of both transplanted and retained species of conservation importance. Ecological advisor on restoration planting of selected native seedlings at disturbed areas.

5. **Agreement No. CE 31/2015 (CE) - Site Formation and Infrastructural Works for the Development near Tan Kwai Tsuen, Yuen Long - Feasibility Study**
Ecologist: responsible for day and night-time surveys on various fauna groups and reporting in the preliminary ecological impact assessment (EcoIA).

6. **Agreement No. CE 60/2013 (CE) Engineering Study for Site Formation and Infrastructural Works at Hong Po Road – Feasibility Study**
Ecologist: responsible for day and night-time surveys on various fauna groups and reporting in the preliminary ecological impact assessment (EcoIA).

7. **Agreement No. GE/2013/16 Landslip Prevention and Mitigation Programme, 2008, Package N, Landslip Prevention and Mitigation Works in Sham Wat, Tai O East, Upper Keung Shan and Keung Shan Road East in West Lantau**
Ecological Survey **–** Rare Species Survey and Stream Course Survey for Natural Hillside Mitigation Works in Keung Shan Road East.
Ecologist: Responsible for day and night time surveys with special focus on animal and plant species of conservation importance, especially Romer's Tree Frog (*Liuixalus romeri*); preparation of translocation protocol.

CV of Qualified Ecologist
for 2023 Survey

Curriculum Vitae – Senior Environmental Consultant

Name:	Ms. Melody CHENG Ho Yan
Experience:	16 years
Contact No.:	6096 9697
Email:	mcheng@acityhk.com

EDUCATIONAL & PROFESSIONAL QUALIFICATIONS

- 2006 Bachelor of Science in Environmental Life Science, The University of Hong Kong
- 2009 Master of Science in Environmental Engineering, The University of Hong Kong
- 2013 Advanced Professional Diploma Programme in Garden Design and Management, School of Continuing and Professional Studies, The Chinese University of Hong Kong
- 2014 Diploma in Chinese Medicinal Herbs, Hong Kong Chinese Medical Research Institute
- 2016 Bachelor of Science in Arboriculture and Urban Forestry, University of Central Lancashire
- 2019 Professional Certificate in Turfgrass Science and Management, Technological and Higher Education Institute of Hong Kong
- 2009 Certified Arborist, International Society of Arboriculture
- 2013 Tree Risk Assessment Qualification, International Society of Arboriculture
- 2014 Full Membership of the Institution of Environmental Sciences (MIEnvSc)
- 2019 Certified Carbon Auditor, The Energy Institute Hong Kong Branch
- 2022 BEAM Professional (NB), Hong Kong Green Building Council Limited

PROFESSIONAL HISTORY

Sep 2022 – Present	Acuity Sustainability Consulting Limited - *Senior Environmental Consultant*
Nov 2021 – Jun 2022	Lam Environmental Services Limited - *Senior Environmental Specialist*
Aug 2019 – Jul 2021	Leigh & Orange Limited - *Resident Senior Field Officer*
Sept 2018 – Mar 2019	Hong Kong Productivity Council - *Associate Consultant*
Feb 2015 – May 2018	AECOM - *Resident Senior Field Officer*
Jan 2015 – Feb 2015	Dragages Hong Kong Limited - *Senior Site Engineer*
Jul 2012 – Jan 2015	Arup - *Resident Field Officer I*
May 2011 – Jul 2012	URS/Scott Wilson Ltd - *Environmental Consultant I*
Jun 2010 – May 2011	Sun Hung Kai Architects and Engineering Ltd - *Arborist*
Oct 2007 – May 2010	Kenneth Ng & Associates Ltd - *Horticulturist*

Jun 2006 – Oct 2007 Penta-Ocean Construction Co. Ltd
- Assistant Engineer

Ms. Cheng has over 16 years working experience in environmental and audit and environmental consultancy related works. She has worked on more than 12 projects in Environmental Assessment, Environmental Monitoring & Audit (EM&A), tree preservation and Building Environmental Assessment Method (BEAM).

PROFESSIONAL EXPERIENCE – ENVIRONMENTAL MANAGEMENT AND ENVIRONMENTAL MONITORING AND AUDIT (EM&A)

- **Environmental Team Leader** for Contract No. DC/2020/02 "Construction of San Shek Wan Sewage Treatment Works, Associated Submarine Outfall and Pui O Sewerage Works", Nov 2021 – Jun 2022 (Duration: 7 months). Responsible for implementation of EM&A requirements, audit environmental mitigation measures, certifying the Environmental Permit submission as required under the corresponding Environmental Permit (EP-538/2017), conducted weekly site inspection, routine impact noise and marine water quality monitoring, evaluation of environmental data, complaint investigation and reporting, preparation of Baseline Monitoring Report and EM&A Reports, non-compliance reports, and liaison with the IEC, the contractor and the client.

- **Inspection Officer** for Tree Risk Assessment Contract no. DC/2017/03 – Upgrading of West Kowloon and Tsuen Wan Sewerage – Phase 1, Mar – Apr 2022 (Duration: 1 month). Responsible for tree risk assessment form 1 (Tree Group Inspection).

- **Environmental Team Leader Representative** for Contract No. DC/2016/01 Kai Tak Development – Construction of an additional sewage rising main between Tung Chung and Siu Ho Wan and Associated Works, Nov 2021 – Jun 2022 (Duration: 7 months). Responsible for ET's coordination of EM&A programme, weekly site inspection, preparation of weekly report and liaison with the contractor and the client.

- **Resident Senior Field Officer** for Contract No. HAB/KTSP/01 Design, Construction and Operation of the Kai Tak Sports Park, Aug 2019 – Jul 2021 (Duration: 24 months). Act as Technical Service Consultant to Home Affair Bureau to review on Environmental Permit submissions under Environmental Permit (No. EP-544/2017), regular weekly and monthly site inspection, review Tree Preservation and Tree Removal Proposal and audit Tree Risk Assessment. Responsible for coordination of BEAM Plus certification process, arrange regular meeting and workshop, credit review and corresponding design and material review.

- **Associate Consultant** for Environmental Campaign Committee (ECC), Environmental Protection Department (EPD), Sept 2018 – Mar 2019 (Duration: 6 months). Act as Wastewi$e Advisor for the Wastewi$e Scheme which aims to assist organizations in Construction sectors to achieve waste avoidance, minimization and recycling on site. Act as Assessor for Hong Kong Awards for Environmental Excellence (HKAEE) for Construction sectors on site environmental performance and prepare assessment reports accordingly.

- **Resident Senior Field Officer** for Contract No. HY/2013/01 Hong Kong – Zhuhai – Macao Bridges HKBCF Superstructures and Infrastructures, Feb 2015 – May 2018 (Duration: 39 months). Responsible for EM&A implementation monitoring, evaluation of environmental data, review of EM&A Reports and Environmental Permit submissions, review Tree Preservation and Tree Removal Proposal and audit Tree Risk Assessment and liaison with the contractor and the client. Site-wide assistant in BEAM Plus certification process, arrange regular meeting and workshop, credit review and corresponding design and material review.

- **Senior Site Engineer** for Contract No. SS W304 - Trade and Industry Tower in Kai Tak, Jan 2015 – Feb 2015 (Duration: 1 month). Responsible for site works supervision, environmental monitoring and preparation of monitoring reports.

- **Resident Field Officer I** for Contract No. CV/2007/03 - Development at Anderson Road – Site Formation and Associated Infrastructure Works, Jul 2012 – Jan 2015 (Duration: 30 months). Responsible for site supervision of EM&A implementation and mitigation measures, weekly site inspection, audit Tree Risk Assessment, handle Complaints Hotline and address public complaints and all interface with local resident committee, district affairs bodies, District Council, road users, etc., and liaison with the contractor and the client.

- **Environmental Consultant (Environmental Impact Assessment)** for Reprovisioning of FEHD Sai Yee Street Environmental Hygiene Offices-cum-vehicle Depot at Yen Ming Road, West Kowloon Reclamation Area (EIA report: AEIAR-177/2013), May 2011 – Jul 2012 (Duration: 14 months). Conducted Environmental Impact Assessment on noise impact, landscape and visual impact.

- **Environmental Consultant (BEAM Plus Consultancy Services)** for Contract No. No. 2/2011/AB1 - Tsing Yi Indoor Recreation Centre, May 2011 – Jul 2012 (Duration: 14 months). Responsible for site aspect, energy use and indoor environmental quality aspect assessment, project team coordination, site inspection, and liaison with the contractor and the client.

- **Environmental Consultant (Environmental Assessment)** for MTRC Shatin to Central Link Consultancy Agreement C1101, May 2011 – Jul 2012 (Duration: 14 months). Conducted construction noise assessments.

- **Environmental Consultant (Landscape design and tree preservation)** responsible for field tree survey and tree risk assessment, Tree Removal Application, detailed proposal for planting design and corresponding soft landscape specifications for the following projects, May 2011 – Jul 2012 (Duration: 14 months).
    - TP/2010/02 Cycle Tracks Connecting North West New Territories with North East new Territories (Section from Sheung Shui to Ma On Shan)
    - HY/2007/03 – Extension of Footbridge Network in Tsuen Wan – Footbridge A along Tai Ho Road
    - Contract No. EP/SP/65/11 Development of Ecopark in Tuen Mun Area 38

- **Arborist (Environmental management and tree preservation)** responsible for environmental and tree issues for residential developments for the following projects, Jun 2010 – May 2011 (Duration: 11 months). Prepared Landscape Master Plan, JPN3 and tree removal application, reviewed Landscape and Visual Impact Assessment and Ecological Impact Assessment from consultant.
    - Urban Renewal Authority, Redevelopment of Larch Street/Fir Street Project (Lime Stardom)
    - Sha Po North Residential Development, Park Vista
    - Yoho Midtown

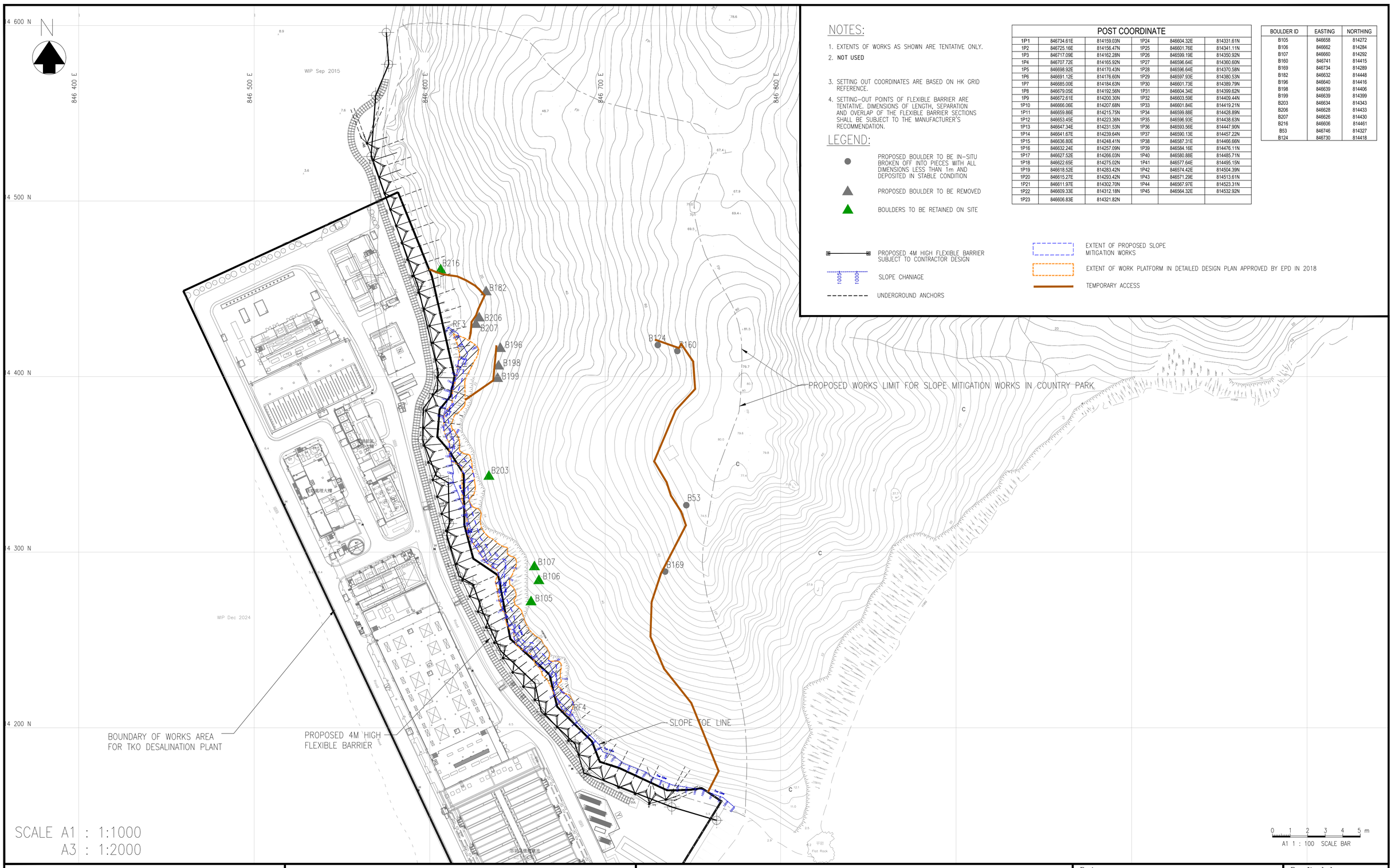
- **Horticulturist (Landscape and Visual Impact Assessment and tree preservation)** responsible for field tree and vegetation survey, tree appraisal and tree risk assessment, Tree Removal Application, Landscape and Visual Impact Assessment and preparation of corresponding Environmental Monitoring and Audit Manual for the following projects, Oct 2007 – May 2010 (Duration: 31 months).
    - ArchSD, Rank and File Quarters for Immigration Department at Wo Yi Hop Road, Kwai Chung
    - ArchSD, Queen Mary Hospital – Accident and Emergency and Heart Centre
    - ArchSD, Proposed Fire Station-cum-ambulance Depot at Nam Fung Road, Aberdeen
    - Cathay Pacific Cargo Terminal at Hong Kong International Airport
    - CE 53 / 2007 (HY) Topographical and Tree Surveys for Tuen Mun Western Bypass
    - CE/61/2007 (CE) North East New Territories New Development Areas Planning and Engineering Study - Investigation (Fanling, North Sheung Shui, Ping Che)
    - Contract No. SSP 314 Design and Construction of an Indoor Recreation Centre, Community Hall cum Library in area 17, Tung Chung, Lantau
    - MTR Corporation Consultancy Agreement C904 South Island Line (Wong Chuk Hang Station and Depot and Temporary Bus Terminus site)
    - MTR Corporation South Island Line (East) Consultancy Agreement No. C901 SIL(E) Admiralty Station and SCL Enabling Works

- MTR Corporation NEX/2212 Shatin to Central link (Ho Man Tin, Mong Kok, To Kwa Wan Station and Kai Tak Airport)
- MTR Corporation NEX/2210 Express Rail Link (XRL)
- MTR Corporation Kwun Tong Line Extension, Yau Ma Tei to Whampoa
- MTR Corporation Consultancy Agreement NEX/1022, C703 West Island Line (University and Sai Ying Pun Station and temporary storage area at Victoria Road)
- MTR Corporation tree survey report for existing tree along East Rail Line, Ma On Shan Line, Light Rail Line and West Rail Line
- KCRC Provision of tunnel ventilation system for Beacon Hill Tunnel – Kowloon Tong portal and Tai Wai Portal
- Redevelopment of Hong Kong Federation of Youth Groups Tai Mong Tsai Outdoor Training Camp Phase III
- Proposed Residential Redevelopment at Tung Shing Lei, Yuen Long
- Proposed Residential Development at TMTL 422 Tsing Lung Road, Siu Lam, Tuen Mun
- Proposed Residential Development at KIL 11167 & 11168, Tai Kok Tsui
- Proposed Residential Development at No.3 Black's Link, The Peak, Hong Kong
- Proposed Composite Building at No.99 Po Kong Village Road
- Baptist University Road Campus and Shaw Annex at Joint Sports Centre
- Proposed development of Community College of City University Building
- Caritas Bianchi College of Careers TKO Town Lot No. 92, Area 73B - Soft Landscape Works
- School development of Po Leung Kuk Choi Kai Yau School, 6 Caldecott Road, Kowloon
- Proposed SEKD cable tunnel at Kai Tak
- Proposed development at Open Space in Area 52, Tuen Mun (326LS)
- PWP Item no. 705 Hang Hau Tsuen Channel at Lau Fau Shan
- PWP Item no. 4139CD Reconstruction & Improvement of Staunton Creek Nullah in Wong Chuk Hang and Fuk Man Road Nullah in Sai Kung

- **Assistant Engineer** for Contract No. ST/2005/02 - Sha Tin New Town Stage II Road Works at Area 34 and 52 in Shui Chuen O and Area 56A in Kau To, Jun 2006 – Oct 2007 (Duration: 16 months). Responsible for all types of environmental permits application included water discharge licence, Construction Noise Permit, billing account/chemical waste disposal license for construction waste management, etc., and associated works arrangement on Site, on site waste management and participated in Wastewi$e scheme and awarded with the "Class of Excellence" Wastewi$e Label; reporting of environmental monitoring and audit (EM&A) works include daily compliance site inspection for various legislative environmental requirements to the site and follow-up mitigation measures; provide environmental training to Sub-contractors, conduct weekly site inspection.

APPENDIX K

EXTENT OF PROPOSED SLOPE MITIGATION WORKS



NOTES:

1. EXTENTS OF WORKS AS SHOWN ARE TENTATIVE ONLY.
2. NOT USED
3. SETTING OUT COORDINATES ARE BASED ON HK GRID REFERENCE.
4. SETTING-OUT POINTS OF FLEXIBLE BARRIER ARE TENTATIVE. DIMENSIONS OF LENGTH, SEPARATION AND OVERLAP OF THE FLEXIBLE BARRIER SECTIONS SHALL BE SUBJECT TO THE MANUFACTURER'S RECOMMENDATION.

LEGEND:

- PROPOSED BOULDER TO BE IN-SITU BROKEN OFF INTO PIECES WITH ALL DIMENSIONS LESS THAN 1m AND DEPOSITED IN STABLE CONDITION
- PROPOSED BOULDER TO BE REMOVED
- BOULDERS TO BE RETAINED ON SITE
- PROPOSED 4M HIGH FLEXIBLE BARRIER SUBJECT TO CONTRACTOR DESIGN
- 5001 4001 SLOPE CHANIAGE
- UNDERGROUND ANCHORS
- EXTENT OF PROPOSED SLOPE MITIGATION WORKS
- EXTENT OF WORK PLATFORM IN DETAILED DESIGN PLAN APPROVED BY EPD IN 2018
- TEMPORARY ACCESS

POST COORDINATE

1P1	846734.61E	814159.03N	1P24	846604.32E	814331.61N
1P2	846725.16E	814156.47N	1P25	846601.76E	814341.11N
1P3	846717.09E	814162.28N	1P26	846599.19E	814350.92N
1P4	846707.72E	814165.92N	1P27	846596.64E	814360.60N
1P5	846698.92E	814170.43N	1P28	846596.64E	814370.58N
1P6	846691.12E	814176.60N	1P29	846597.93E	814380.53N
1P7	846685.00E	814184.63N	1P30	846601.73E	814389.79N
1P8	846679.05E	814192.56N	1P31	846604.34E	814399.62N
1P9	846672.61E	814200.30N	1P32	846603.59E	814409.44N
1P10	846666.06E	814207.68N	1P33	846601.84E	814419.21N
1P11	846659.86E	814215.75N	1P34	846599.88E	814428.89N
1P12	846653.45E	814223.36N	1P35	846596.93E	814438.63N
1P13	846647.34E	814231.53N	1P36	846593.56E	814447.90N
1P14	846641.67E	814239.64N	1P37	846590.13E	814457.22N
1P15	846636.80E	814248.41N	1P38	846587.31E	814466.66N
1P16	846632.24E	814257.09N	1P39	846584.16E	814476.11N
1P17	846627.52E	814266.03N	1P40	846580.88E	814485.71N
1P18	846622.65E	814275.02N	1P41	846577.64E	814495.15N
1P19	846618.52E	814283.42N	1P42	846574.42E	814504.39N
1P20	846615.27E	814293.42N	1P43	846571.29E	814513.61N
1P21	846611.97E	814302.70N	1P44	846567.97E	814523.31N
1P22	846609.33E	814312.18N	1P45	846564.32E	814532.92N
1P23	846606.83E	814321.82N			

BOULDER ID	EASTING	NORTHING
B105	846658	814272
B106	846662	814284
B107	846660	814292
B160	846741	814415
B169	846734	814289
B182	846632	814448
B196	846640	814416
B198	846639	814406
B199	846639	814399
B203	846634	814343
B206	846628	814433
B207	846626	814430
B216	846606	814461
B53	846746	814327
B124	846730	814418

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

CONTRACT NO. 13/WSD/17
DESIGN, BUILD AND OPERATE
FIRST STAGE OF TSEUNG KWAN O
DESALINATION PLANT

Title:

PROPOSED SLOPE
MITIGATION WORKS

Date: 12/12/2025	Drafted by CL
Outgoing letter Ref. No.:	Checked by IY
Reference Drawing: 190495/K/TEND/80/1001	Approved by MP
Sketch No.:	Rev.:

Plot Date = 2025-12-12 14:47:20

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APPENDIX L

PLANT SPECIES OF CONSERVATION IMPORTANCE

MAP NOS. T12SW

NOTES:

ONLY WORKERS WITH HAND HELD TOOLS ARE ALLOWED TO ENTER THE RESTRICTED ACCESS ZONE TO CARRY OUT THE ROCK SLOPE MITIGATION WORKS.

LEGEND:

- PROPOSED ROCK DOWELS
- PROPOSED BUTTRESS
- PROPOSED WIRE MESH
- PROPOSED DENTITION
- CLEAR WATER BAY COUNTRY PARK
- PROPOSED FLEXIBLE BARRIER
- SITE BOUNDARY / OPEN CHANNEL
- BARRIERS
- RESTRICTED ACCESS ZONE
- STOCKPILING AREA
- GATE
- TEMPORARY WORKING PLATFORMS AND VEGETATION CLEARANCE
- MARSDENIA LACHNOSTOMA (SURVEYED IN 2015)
- MARSDENIA LACHNOSTOMA (SURVEYED IN 2016)
- PLATYCODON GRANDIFLORUS (SURVEYED IN 2016)
- HABENARIA LINGUELLA (SURVEYED IN 2020)
- MARSDENIA LACHNOSTOMA (SURVEYED IN 2020)
- MARSDENIA LACHNOSTOMA (SURVEYED IN 2021)
- GNETUM LUOFUENSE (SURVEYED IN 2021)
- GNETUM LUOFUENSE (SURVEYED IN 2023)
- BOULDER STABILISATION WORKS
- BOULDERS TO BE RETAINED ON SITE
- TEMPORARY ACCESS
- EXTENT OF WORK PLATFORM IN DETAILED DESIGN PLAN APPROVED BY EPD IN 2018
- Proposed Garbage Chute Location
- Lilium brownii found in 2014
- Pachystoma pubescens found in 2014
- PROPOSED BOULDER TO BE IN-SITU BROKEN OFF INTO PIECES WITH ALL DIMENSIONS LESS THAN 1m AND DEPOSITED IN STABLE CONDITION

FOR DETAILS SEE SKETCH: SK/190495B/C13/48-16030

N.T.S.

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

CONTRACT NO. 13/WSD/17
DESIGN, BUILD AND OPERATE
FIRST STAGE OF TSEUNG KWAN O
DESALINATION PLANT

Title:

LAYOUT OF GEOTECHNICAL WORKS TO BE CARRIED OUT
INSIDE THE CLEARWATER BAY COUNTRY PARK

(SHEET 1 OF 2)

Date: 2025/12/01	Drafted by CL
Outgoing letter Ref. No.:	Checked by IY
Reference Drawing:	Approved by MP
Sketch No.: SK/190495B/C13/48-16029	Rev.: D

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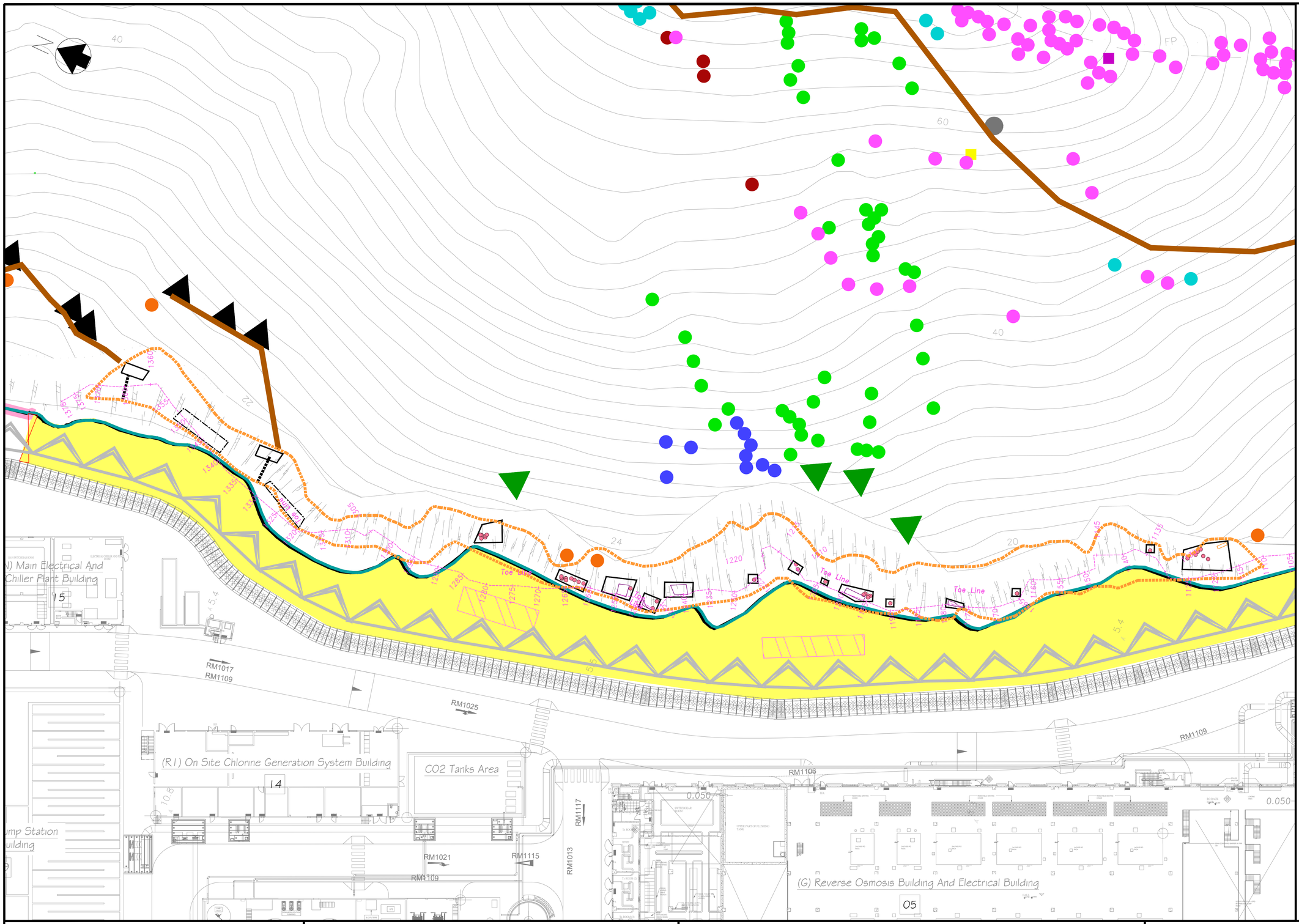

MAP NOS. T12SW

NOTES:

ONLY WORKERS WITH HAND HELD TOOLS ARE ALLOWED TO ENTER THE RESTRICTED ACCESS ZONE TO CARRY OUT THE ROCK SLOPE MITIGATION WORKS.

- PROPOSED ROCK DOWELS
- PROPOSED BUTTRESS
- PROPOSED WIRE MESH
- PROPOSED DENTITION
- CLEAR WATER BAY COUNTRY PARK
- PROPOSED FLEXIBLE BARRIER
- SITE BOUNDARY / OPEN CHANNEL
- BARRIERS
- RESTRICTED ACCESS ZONE
- STOCKPILING AREA
- GATE
- TEMPORARY WORKING PLATFORMS AND VEGETATION CLEARANCE
- MARSDENIA LACHNOSTOMA (SURVEYED IN 2015)
- MARSDENIA LACHNOSTOMA (SURVEYED IN 2016)
- PLATYCODON GRANDIFLORUS (SURVEYED IN 2016)
- HABENARIA LINGUELLA (SURVEYED IN 2020)
- MARSDENIA LACHNOSTOMA (SURVEYED IN 2020)
- MARSDENIA LACHNOSTOMA (SURVEYED IN 2021)
- GNETUM LUOFUENSE (SURVEYED IN 2021)
- GNETUM LUOFUENSE (SURVEYED IN 2023)
- BOULDER STABILISATION WORKS
- BOULDERS TO BE RETAINED ON SITE
- TEMPORARY ACCESS
- EXTENT OF WORK PLATFORM IN DETAILED DESIGN PLAN APPROVED BY EPD IN 2018
- Proposed Garbage Chute Location
- Lilium brownii found in 2014
- Pachystoma pubescens found in 2014
- PROPOSED BOULDER TO BE IN-SITU BROKEN OFF INTO PIECES WITH ALL DIMENSIONS LESS THAN 1m AND DEPOSITED IN STABLE CONDITION

N.T.S.

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

CONTRACT NO. 13/WSD/17
DESIGN, BUILD AND OPERATE
FIRST STAGE OF TSEUNG KWAN O
DESALINATION PLANT

Title:

LAYOUT OF GEOTECHNICAL WORKS TO BE CARRIED OUT
INSIDE THE CLEARWATER BAY COUNTRY PARK

(SHEET 2 OF 2)

Date: 2025/12/01	Drafted by CL
Outgoing letter Ref. No.:	Checked by IY
Reference Drawing:	Approved by MP
Sketch No.: SK/190495B/C13/48-16030	Rev.: D

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