Drainage Services Department

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Detailed Vegetation Survey Report
(Version 9.2)

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REMARKS:

The information supplied and contained within this report is, to the best of our knowledge, correct at the time of printing.

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1 INTRODUCTION

1.1 To support social and economic development in Hong Kong, there is a pressing need to optimize the supply of land for various uses by sustainable and innovative approaches. One possible approach is rock cavern development. The Policy Agenda of the 2016 Policy Address has stated that works for the relocation of the Sha Tin Sewage Treatment Works (STSTW) is to commence as soon as possible to release the existing site, of a size about 28 hectares, for development purpose.

1.2 The Relocation of Sha Tin Sewage Treatment Works (STSTW) to Caverns (the Project) is implemented so as to release the existing site, of a size about 28 hectares, for other uses.

1.3 The Project is a Designated Project under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Impact Assessment (EIA) Report for the Project was approved under EIAO in November 2016 in accordance with the EIA Study Brief (No.ESB-273/2014) and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). The corresponding Environmental Permit was issued (EP no.: EP-533/2017) by the Director of Environmental Protection (DEP) in March 2017.

1.4 The approved EIA Report has identified species of conservation importance within 500m distance from the boundary of the Project, as well as other areas likely to be impacted by the Project. The ecological baseline resources within the assessment area and the results of the potential ecological impact resulting from the construction and operation of the Project, measures required to mitigate any identified adverse impacts have been presented and addressed in the EIA Report. For instance, flora species recorded during the ecological surveys were listed under Appendix 8.03 of the EIA Report and their conservation importance with reference to relevant legislation, standards, criteria, and distribution in Hong Kong were also discussed. The EIA Report also presented recommended measures to avoid, minimize, mitigate and compensate potential ecological impact arising from the Project. The EIA Report concluded that no adverse residual ecological impacts are expected from the Project with the proper implementation of mitigation measures. In order to formulate the approach for mitigation measures, the EIA Report and EM&A Manual recommended to conduct a Detailed Vegetation Survey within the proposed works areas to identify any potentially affected plant species of conservation importance. Based on the findings from the Detailed Vegetation Survey, a Protection and Transplantation Proposal recommending appropriate measures to mitigate impact can be prepared and implemented for the Project.

1.5 The requirements on the Detailed Vegetation Survey Report proposed in Sections 8.8.2.4, 8.8.3.3, 8.10.1.3 of the EIA Report are listed as follows:

- Identify any potentially affected plant species of conservation importance in the immediate vicinity of the proposed works areas.
- The survey should be carried out prior to the commencement of site clearance works.
- These identified individuals should be labelled and fenced off on site prior to the commencement of works for better protection accordingly to the Protection and Transplantation Plan.
- The potentially affected individuals shall be preserved, or in the case of unavoidable loss, transplanted according to the Protection and Transplantation Plan.

- The survey shall be conducted by a suitably qualified botanist / ecologist.

1.6 To minimize the potential impact on flora species of conservation interest due to construction of the Project, including *Cibotium barometz*, *Canthium dicoccum*, *Peristylus tentaculatus* and any other flora species of conservation interest, Condition 2.13(i) of the EP specifies that a Detailed Vegetation Survey should be conducted within the proposed works areas. Cinotech Consultants Limited was commissioned by the Drainage Services Department (DSD) to prepare a Detailed Vegetation Survey Report. Details of the report specified in the EP include:

- methodology
- survey results, including the updated conditions, number and locations of the individuals of flora species of conservation interest identified within the works boundary
- confirmation on whether any individuals of these species would be directly affected by the proposed works
- recommendation on protective measures for identified individuals of each species where in situ preservation is feasible
- assessment on the suitability and / or practicality of the transplantation of those individuals to be directly affected.

Preliminary Development Plan

1.7 The EIA Report identified Nui Po Shan as the best site location for the cavern due to good geological conditions, proximity to existing STSTW and Tolo Harbour Effluent Export Scheme (THEES) effluent expert tunnel, minimal environmental nuisance to nearby residents and minimal traffic impact. The preliminary development plan is shown in **Figures 1b-1e**.

1.8 The EIA Report explored different location options for the STW facilities. The main portal was proposed near A Kung Kok Road (Site 3), which has the advantage of flexible integration of the sewage treatment works facilities with the THEES Tunnel Portal. The main portal will consist of access road to the cavern and outdoor facilities such as administration building, ventilation building and workshop. The slope modification work will be involved behind the THEES tunnel. While the design is under progress, the area that the modification work will affect is expected to cover both the existing SIMAR slope and its vicinity.

1.9 Secondary portal is proposed at an existing construction site office near Mui Tsz Lam Road (Site 2). It will consist of another ventilation building, secondary electrical substation and internal access road to the cavern.

1.10 A ventilation shaft will be built uphill of A Kung Kok Shan Road (Site 1). This site is far away from sensitive receivers so as to minimize odour impact from the shaft. The access road to the ventilation shaft will follow the topography of the existing natural terrain to minimize slope cutting and vegetation clearance. Also, part of the road will be elevated for stream crossing to avoid habitat loss, habitat fragmentation and impact on a freshwater crab species *Cryptopotamon anacoluthon*. Near the shaft is a flat land, which will be used as explosive magazine site for cavern tunnelling works.

1.11 During the construction phase, a community liaison center will be set up near the junction of Mui Tsz Lam Road and A Kung Kok Road in Site 3.

1.12 Since the ancillary facilities and portals to the cavern are constructed on the hill, the construction extent will also include slope stabilization works after slope cutting. Localized stabilization work will be required at road alignment with steep topography. Temporary works area is required adjacent to the permanent works for construction access and material storage.

Updating the Detailed Vegetation Survey

1.13 Detailed Vegetation Survey Report (Ver 8.1) was approved by the Environmental Protection Department in 2019. According to the engineer, the design of the secondary portal in Site 2 had been updated in early 2020. The expansion of Site 2 has encroached to surroundings which were previously protection zones for plant species. In addition, the works area had been expanded towards uphill at Sites 2 and 3 by adding landslip preventive mitigation measures such as soil nails, rigid barrier and flexible barrier. Therefore, detailed vegetation survey is required for reporting the condition of the new works areas.

1.14 Upon the review of works area, the scope of works for the project is still "site formation at secondary portal located on Mui Tsz Lam Road" (Environmental Permit Part B(6)) and "Associated slope stabilization, natural terrain hazard mitigation and geotechnical works" (EP Part B(9)) and fall within the limit of works area under Figure 1 of EP-533/2017. There the scope under EP-533/2017 remained valid. Any additional affected floral species would be mitigated as described within this report and Protection and Transplantation Proposal. It is therefore considered that no amendment to EP is required.

1.15 As EP conditions 2.13 & 2.14 do not prescribe any requirement on variation of submissions, this report shall be submitted under EP Condition 1.9 as variation of the submission.

2 METHODOLOGY

Findings in EIA Report

2.1 The detailed vegetation project boundary required under the Project is shown in **Figure 1a**. With reference to Figure 8.05a and 8.05b of the EIA Report, seven flora species of conservation importance were found within or in the proximity to the project boundary (**Table 2-1**).

Table 2-1 Flora Species of Conservation Importance Found within or near Project Boundary in the EIA

Chinese Name (Species Name)	Distribution in Hong Kong#	Observations in Appendix 8.03 of the EIA	Conservation Statuses
竹葉蘭 Bamboo Orchid (*Arundina graminifolia*)	Very common	• Shrubland (Scarce)	• Protected under the Forests and Countryside Ordinance (Cap. 96); & • Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)
魚骨木 Butulang Canthium (*Canthium dicoccum*)	Common	• Woodland (Occasional) • Plantation (Scarce) • Shrubland (Scarce)	• Listed as "Vulnerable" by the IUCN Red List
金毛狗 Lamb of Tartary (*Cibotium barometz*)	Common	• Woodland (Frequent) • Fung Shui Wood (Frequent) • Plantation (Occasional) • Shrubland (Frequent)	• Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); • Listed as "Category II" in the Wild Plants under State Protection; & • Listed as "Vulnerable" in the Rare and Precious Plants of Hong Kong
小果柿 Small Persimmon (*Diospyros vaccinioides*)	Very Common	• Woodland (Occasional) • Plantation (Occasional) • Shrubland (Frequent) • Stream (Scarce)	• Listed as "Critically Endangered" by the IUCN Red List
羅浮買麻藤 Luofushan Joint-fir (*Gnetum luofuense*)	Very Common	• Woodland (Frequent) • Shrubland (Frequent)	• Listed as "Near Threatened" by the IUCN Red List
香港大沙葉 Hong Kong Pavetta (*Pavetta hongkongensis*)	Common	• Woodland (Scarce) • Plantation (Scarce) • Cultivated Land (Scarce)	• Protected under the Forests and Countryside Ordinance (Cap. 96)

Chinese Name (Species Name)	Distribution in Hong Kong#	Observations in Appendix 8.03 of the EIA	Conservation Statuses
觸鬚闊蕊蘭 Club-spurred Tentacle Orchid (*Peristylus tentaculatus*)	Very Common	• Stream (Scarce)	• Protected under the Forests and Countryside Ordinance (Cap. 96); & • Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)

Corlett, R., Xing, F., Ng, S. C., Chau, L., Wong, L. (2000). Hong Kong Vascular Plants: Distribution and Status. Memoirs of the Hong Kong Natural History Society. 23:1-3.

Survey Requirement

2.2 The detailed vegetation survey aims to verify the findings in EIA, and to identify whether or not other species of conservation importance are present in the project boundaries. Definition of "species of conservation importance" follows the Technical Memorandum of Environmental Impact Assessment Ordinance (EIAO-TM) Annex 16: Guidelines for Ecological Assessment, criteria related to plants include:

1. listed in IUCN Red Data Books or those of the South China region;
2. listed in international conventions for conservation of wildlife;
3. endemic to Hong Kong or South China;
4. listed under local legislation :
   (1) Forestry Regulation (under Forests and Countryside Ordinance Cap. 96);
   (2) Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
   (3) Other relevant Ordinances or Regulations such as Marine Parks and Marine Reserves Regulation (under Marine Parks Ordinance Cap. 476);
   (References shall also be made to species protected by legislation in China, especially the Guangdong Province.)
5. considered as rare in the territory or having special conservation importance by scientific studies other than those listed above.

Survey Method and Equipment

2.3 Detailed vegetation survey was conducted from June to September 2018, January 2019 and June to August 2020 within four survey sites in the project boundary:

Table 2-2 Survey Sites

Site	Location
Site 1 – Magazine Site	A Kung Kok Shan Road Proposed Magazine Site
Site 2 – Mui Tsz Lam Site	DSD Mui Tsz Lam Site Office and section of Mui Tsz Lam Road
Site 3 – A Kung Kok Site	Vegetated slope around David Camp in A Kung Kok Road and landscape area located to the east of Ma On Shan Road
Site 4 – VDC Site	Ex-Custom and Excise Department Vehicle Detention Center (Ex-C&ED VDC) and landscape area near Hang Tai Road

2.4 Only plant species of conservation importance that naturally grows was counted. Species that are planted for landscape purpose or human consumption (e.g. fruit trees near village) were excluded.

Survey Method adopted in the EIA Study

2.5 During the EIA Study, vegetation surveys were conducted by direct observation to record diversity and dominance of plant species present in different habitat types. The location of any plant species of conservation importance was recorded. As shown in Figure 60334056/EIA/8.03 of the EIA Report, the survey was conducted along line transects that covered a large area within 500m boundary from the project boundary. The relative abundances of plant species observed were presented in terms of "Abundant", "Frequent", "Occasional" and "Scarce" in different habitats. The survey aimed to identify the general ecological characteristics of the Site and was therefore broad brush in nature. Therefore, the EIA Report, EM&A Manual and the EP proposed to conduct a detailed vegetation survey within the works boundary to identify and record the affected individuals prior to the commencement of any site clearance works.

Survey Method adopted in this Survey Report

2.6 In early stage of the survey, the detailed vegetation survey was designed to record the number and locations of all individuals of flora species of conservation importance identified within the works boundary as per Condition 2.13 of the EP.

2.7 Site visits were carried out at the three survey sites to understand the latest site condition. The sites were found to locate on steep slopes with no proper footpath. The understorey was covered by densely grown vegetation and fallen branches. In addition, *Diospyros vaccinioides* and *Gnetum luofuense* were found to be abundant in the three sites (site photos are shown in **Appendix B**). This opposed to "scarce", "occasional" to "frequent" encounters in Appendix 8.03 of the EIA Report (**Table 2-1**) and limited observations within and near the project boundary as illustrated in Figures 60334056/EIA/8.05a and 8.05b of the same report. Given the high species abundance and poor site accessibility, recording every individual of these two species with high accuracy is deemed impossible. Therefore, a reasonably practical survey method that is accepted both internationally and locally was explored.

2.8 In principle, the objective of a targeted threatened-plant survey in a vegetation survey methodologies is to establish, with a high level of confidence, the presence or absence of a threatened plant species at the survey site and, if the species is present, to collect data to determine the number of individuals or the habitat area. The survey aims to minimise 'false-negatives' (i.e. when a species is reported as absent from a site when it is actually present), with a high level of confidence in the reported results.

2.9 Due to large population size of *Diospyros vaccinioides* and *Gnetum luofuense* and habitats that can conceal them, the survey effort must generally be high to ensure confidence in the results. In order to ensure to have a high level of confidence in the reported results, we have chosen to record *Diospyros vaccinioides* and *Gnetum luofuense* through quadrat sampling. This method is commonly used worldwide, such as UK, USA, Australia and also in Hong Kong (e.g. intertidal surveys).

2.10 The following sections explain the proposed survey method for species with different degrees of occurrence observed during site visits.

A. Highly Abundant Species

- ***Diospyros vaccinioides* and *Gnetum luofuense***

- "Sampling" was adopted to determine the abundance of highly abundant species in location with poor accessibility.

  - Plots of about 1,000m^2 were established for all the survey areas. In each plot, detailed survey of *Diospyros vaccinioides* were conducted in five random quadrats of 5m x 5m area in order to increase the sample size, hence reducing statistical error.

  - All individuals of *Diospyros vaccinioides* in a quadrat were counted and divided into four height categories: 0 – 1m, 1 – 2m, 2 – 3m, >3m. This helps understand the maturity of this shrub in the project boundary.

  - After counting all individuals in the 5 quadrats, the total number of *Diospyros vaccinioides* in five quadrats was summed and divided by 125m^2 (total area of the five quadrats) to determine the average density in the corresponding plot. The number of *Diospyros vaccinioides* in each plot was then obtained by multiplying the average density by the plot area. The total population in each survey site was calculated by adding the results in all plots.

    (a) Average Density of *Diospyros vaccinioides* in a Plot
    = Total no. of individuals in 5 quadrats / (5m x 5m)

    (b) No. of *Diospyros vaccinioides* in a Plot
    = (a) x Area of a Plot

    (c) Population of *Diospyros vaccinioides* in a Survey Site
    = Sum of individuals in All Plots

  - As *Gnetum luofuense* is a climber that spreads across the canopy. It is difficult to identify whether the climber in an area contains one or more individuals. Therefore, its percentage coverage within a quadrat was estimated. The percentage coverage in a plot followed the similar method as *Diospyros vaccinioides*.

    (d) Average Percentage Coverage of *Gnetum luofuense* in a Plot
    = Sum of Percentage Coverage in all 5 quadrats / 5

    (e) Area of *Gnetum luofuense* in a Plot
    = (d) x Area of a Plot

    (f) Total Area of *Gnetum luofuense* in a Survey Site
    = Sum of Areas in All Plots

- "Walkthrough survey" was carried out in locations with low species abundance (e.g. area with sparse vegetation). The whole plot was walked through to count the number of *Diospyros vaccinioides* and to estimate the coverage of *Gnetum luofuense*. This method covered around one third of all plots.

B. Less Abundant Species

- ***Ania hongkongensis, Aquilaria sinensis, Artabotrys hongkongensis, Canthium dicoccum, Cibotium barometz*** **and** ***Spathoglottis pubescens***

- "Walkthrough survey" was carried out for other flora species of conservation importance that does not grow in significant number.

  All individuals were actively searched. A pair of binoculars with at least 8x magnification (e.g. Leica 8 x 32 BA) was used to aid searching and identifying species on tree top or in inaccessible area where necessary.

  Locating Species of Conservation Importance

  - The location of each individual/colony was marked on a map of suitable scale (1:800). A hand held Global Positioning System (GPS) was used to aid positioning where necessary. All individuals were tagged with a unique identification code and their locations were marked on a map.

  Recording Plant Conditions

  - The conditions of each individual/colony, including approximate number of individuals in the colony, form, health condition, and suitability for transplanting were recorded and evaluated where applicable. The evaluation was carried out with reference to "Development Bureau Technical Circular (Works) (DEVB TCW) No. 7/2015 – Tree Preservation". In addition, photographic record for each individual/colony was taken. The size of the plant (which can reflect its maturity) was recorded based on its growth form:

    - For trees (e.g. *Canthium dicoccum*), diameter at breast height (DBH), crown spread and height were recorded. DBH was measured in accordance to Agriculture, Fisheries and Conservation Department's (AFCD's) *Nature Conservation Practice Note No. 2 (Revised: June 2006) – Measurement of Diameter at Breast Height (DBH)*. A measurement tape was used for the measurement. Height and crown spread were measured by the tape / estimated where applicable.

    - For ferns (*Cibotium barometz*), climbers (*Artabotrys hongkongensis)* and herbs (e.g. orchid), the number of individuals were recorded and coverage of the colony was presented in a figure.

Qualification of the Ecologist

2.11 As per Section 7.3.1.2 of the EM&A Manual and EP Condition 2.6, the survey was conducted by a qualified ecologist with over 10 years relevant experience as shown in the curriculum vitae attached in **Appendix D**.

Change in the Size of Affected Area

2.12 As mentioned in **Section 1.13**, the affected area will be expanded due to the latest design of the secondary portal and landslip prevention measures. The affected area had changed as the following and details can be found at **Figure 1f – 1g**:

Table 2-3 Change in the Size of Affected Area

Location	Area (ha)		Increase in Number of Surveying Grids
	Before	After	
Site1	2.1ha	2.1ha	0
Site2	1.2ha	2.0ha	15
Site3	3.3ha	3.4ha	1
Total	**6.6ha**	**7.5ha**	**16**

3 SURVEY RESULT

3.1 Eight plant species of conservation importance (*Ania hongkongensis*, *Aquilaria sinensis*, *Artabotrys hongkongensis*, *Canthium dicoccum*, *Cibotium barometz*, *Diospyros vaccinioides*, *Gnetum luofuense* and *Spathoglottis pubescens*) were recorded within the project boundary. All species, with the exception of *Artabotrys hongkongensis* and *Spathoglottis pubescens*, have been reported in the EIA Report.

3.2 The EIA Report mentioned that a Club-spurred Tentacle Orchid *Peristylus tentaculatus* grew near a stream in Site 1 Magazine Site. While active searching was conducted around the area marked in Figure 60334056/EIA/8.05b of the EIA Report, this individual could not be found in the current study. Also, Bamboo Orchid *Arundina graminifolia* and Hong Kong Pavetta *Pavetta hongkongensis*, which were reported near the project boundary in the EIA Study, were not observed within the project boundary in the current study.

3.3 The number and location of *Diospyros vaccinioides* and *Gnetum luofuense* and the other species of conservation importance are illustrated in **Figures 2a-2i**. A plant schedule showing survey summary and photographic record are shown in **Appendices A** and **B** respectively. The survey method for each plot is illustrated in **Figures 3a-3e**. The survey findings for each site are described in the following sections:

Site 1 – Magazine Site

3.4 The magazine site is located at the hill upslope of A Kung Kok Shan Road. It is mainly covered by secondary woodland. Plantation woodland is found near A Kung Kok Shan Road and on the ridge in the southern portion of the proposed magazine site. Shrubland is sandwiched between secondary and plantation woodlands and also on the ridge. A few natural streams flowed across the magazine site.

3.5 Three species of conservation importance were recorded, with *Diospyros vaccinioides* and *Gnetum luofuense* being the most abundant species.

3.6 *Diospyros vaccinioides* was observed in all plots in Site 1 except Grid 1-24 near A Kung Kok Shan Road. Individuals of height from 0 – 1m was the major portion (45%). *Diospyros vaccinioides* with over 3m in height were mostly found under the shade of secondary woodland and in highly exposed shrubland.

3.7 Due to the climbing nature of *Gnetum luofuense*, this species mostly clung on trees in shrubland/woodland. It is estimated to cover 8% of Site 1 area (~1,930m^2).

3.8 Five individuals of *Ania hongkongensis* (in two clusters H0001 (4 nos.) and H0002 (1 no.)) grew on loose soil in secondary woodland.

Site 2 – Mui Tsz Lam Site

3.9 Site 2 is comprised of section of Mui Tsz Lam Road, DSD site office and the vegetated hill. The former two areas are manmade environment with concrete paving. Near the foot of the hill is predominantly woodland on flat ground. The upslope is a mix of woodland and shrubland.

3.10 Six species of conservation importance were recorded, with *Diospyros vaccinioides* and *Gnetum luofuense* being the most abundant species.

3.11 *Diospyros vaccinioides* dominated in shrubland/woodland in the uphill. Individuals of height from 0 – 1m was the major portion (73%)

3.12 Due to the climbing nature of *Gnetum luofuense*, this species mostly clung on trees in shrubland/woodland. It is estimated to cover 13% of Site 2 area (~3,980m^2).

3.13 One individual of Hong Kong Eagle's Claw (*Artabotrys hongkongensis*) (I0001) was found near a stream growing between rocks. A total of 11 patches of *Cibotium barometz* (E0001a (16 nos.), E0001b (2 nos.), E0002 (1 no.), E0003 (2 nos.), E0011 (1 no.), E0012 (1 no.), E0013 (106 nos.), E0014 (21 nos.), E0015 (1 no.), E0016A (estimated 730 nos.) and E0016B (estimated 70 nos.)) were found. Most of them are found near streams with seasonal waterflow or seeping water or in valley. Fourteen individuals of *Canthium dicoccum* (D0003, D0004, D0006, D0008, D0009, D0011, D0012, D0013, D0014, D0015, D0016A, D0016B, D0017 and D0018) scattered in the shrubland/woodland. 17 nos. of *Spathoglottis pubescens* (F0001A and F0001B) was found on the edge of a bedrock with loose soil. One of the individuals (F0001B) grows between the rocks.

Site 3 – A Kung Kok Site

3.14 Near A King Kok Street is a landscape area, cycle track, David Camp and a series of SIMAR slopes. The foot of Nui Po Shan is covered by woodland while near the top of the survey site is covered by plantation. In between these two habitats is a large stretch of shrubland.

3.15 Five species of conservation importance were recorded in Site 3, with *Diospyros vaccinioides* being the most abundant species.

3.16 *Diospyros vaccinioides* dominated in exposed shrubland in the uphill. Individuals of height from 0 – 1m was the major portion (42%). Compared with Site 2 which is located on the same hill (Nui Po Shan), upper slope in Site 3 has fewer trees and is more exposed.

3.17 Due to the climbing nature of *Gnetum luofuense*, this species mostly clung on trees in shrubland/woodland. It is estimated to cover 4% of Site 3 area (~2,980m^2).

3.18 Four patches of *Cibotium barometz* (E0004 (7 nos.), E0005 (50 nos.), E0006 (1 no.) and E0007 (100 nos.)) were found along three flowing streams and its damp vicinity. One major patch of about 100 individuals (E0007) is located in the upstream section of the stream behind A Kung Kok Shaft. Another major patch of about 50 individuals (E0005) is located in the downstream section of the stream near Mui Tsz Lam Road. Both streams are characterised by steep topography and well-shaded environment.

3.19 Four individuals of *Canthium dicoccum* (D0001 (2 nos.), D0002 and D0010) scattered in the woodland. A sapling of *Aquilaria sinensis* (C0001) grew under the canopy.

Site 4 – VDC Site

3.20 The northeastern end of ex-VDC was rented out as car park under short term tenancy. Another carpark also partly encroached near the center of the site. The remaining area was left vacant. Opposite to the ex-VDC is a landscape area that is overgrown with weeds, self-grown trees and invasive White Popinac *Leucaena leucocephala*. No species of conservation importance was observed.

Summary

3.21 The following table summarized the current findings:

Table 3-1 Flora Species of Conservation Importance Found within Project Boundary in the Current Study

Chinese Name (Species Name)	Distribution in Hong Kong #@	Conservation Statuses	Observation in EIA	No. of Individuals observed within Project Boundary in Current Study			Total
				Site 1	Site 2	Site 3	
香港安蘭 Purple Bulb Orchid (*Ania hongkongensis)*	Common	• Protected under the Forests and Countryside Ordinance (Cap. 96); & • Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)	Found in Fung Shui Wood; Not observed inside or near project boundary	5			5
土沉香 Incense Tree (*Aquilaria sinensis*)	Common	• Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) • Listed as "Vulnerable" in the China Plant Red Data Book • Listed as "Vulnerable" by the IUCN Red List	Found in Woodland and Fung Shui Wood; Not observed inside or near project boundary			1	1
香港鷹爪花 Hong Kong Eagle's Claw (*Artabotrys hongkongensis*)	Common	• Listed in "Rare and Precious Plants of Hong Kong"	Not reported		1		1
魚骨木 Butulang Canthium (*Canthium dicoccum*)	Common	• Listed as "Vulnerable" by the IUCN Red List	Found in Woodland, Shrubland and Plantation; Observed near Site 2		14	4	18

Chinese Name (Species Name)	Distribution in Hong Kong #@	Conservation Statuses	Observation in EIA	No. of Individuals observed within Project Boundary in Current Study			Total
				Site 1	Site 2	Site 3	
金毛狗 Lamb of Tartary (*Cibotium barometz*)	Common	• Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); • Listed as "Category II" in the Wild Plants under State Protection; & • Listed as "Vulnerable" in the Rare and Precious Plants of Hong Kong	Found in Woodland, Fung Shui Wood, Plantation, Shrubland and Stream; Observed in a stream in Site 3		951	158	1,109
小果柿 Small Persimmon (*Diospyros vaccinioides*)	Very Common	• Listed as "Critically Endangered" by the IUCN Red List	Found in Woodland, Plantation, Shrubland, Stream; Observed in Site 1	6,090	7,540	12,860	26,490
羅浮買麻藤 Luofushan Joint-fir (*Gnetum luofuense*)	Very Common	• Listed as "Near Threatened" by the IUCN Red List	Found in Woodland and Shrubland; Observed near Site 1	1,930m^2	3,980m^2	2,980m^2	8,890m^2
苞舌蘭 Buttercup Orchid (*Spathoglottis pubescens*)	Common	• Protected under the Forests and Countryside Ordinance (Cap. 96); & • Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)	Not reported		17		17

Corlett, R., Xing, F., Ng, S. C., Chau, L., Wong, L. (2000). Hong Kong Vascular Plants: Distribution and Status. Memoirs of the Hong Kong Natural History Society. 23:1-3.
@ Pang K.S., Yip J.K.L., Lai P.C.C.. (2011) A Review of the Status of the IUCN Red List of Threatened Plants in Hong Kong. Hong Kong Biodiversity Issue No. 20. AFCD.

3.22 The IUCN Redlist is commonly used for understanding the threat to an assessed species at global level (AFCD, 2011). Nevertheless, the species may be locally common and widely distributed. For example, the distribution of *Diospyros vaccinioides* is restricted to Guangxi, Guangdong, Hainan and Taiwan. Although it is heavily exploited in Taiwan and is considered critically endangered by the IUCN (2018), it does not have commercial value in mainland China and Hong Kong and is very common in these regions. In the case of *Aquilaria sinensis*, it is locally common in Hong Kong but is heavily harvested in mainland China. The Hong Kong population is being targeted and is under threat as well.

4 IMPACT ASSESSMENT & RECOMMENDATIONS

Impact Assessment

4.1 The latest works area required under the Project (**Figures 2a – 2i**) covers areas with both temporary and permanent works. As vegetation clearance will be carried out within the works area, the following plants would be affected by the project without mitigation. The calculations are shown in **Appendix C**.

Table 4-1 Flora Species of Conservation Importance affected by the Project

Chinese Name (Species Name)	No. of Individuals outside Works Area to be Retained				No. of Individuals within Works Area affected by the Project			
	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total
香港安蘭 Purple Bulb Orchid (*Ania hongkongensis)*	4	0	0	**4**	1	0	0	**1**
土沉香 Incense Tree (*Aquilaria sinensis*)	0	0	0	**0**	0	0	1	**1**
香港鷹爪花 Hong Kong Eagle's Claw (*Artabotrys hongkongensis*)	0	0	0	**0**	0	1	0	**1**
魚骨木 Butulang Canthium (*Canthium dicoccum*)	0	6	0	**6**	0	8	4	**12**
金毛狗 Lamb of Tartary (*Cibotium barometz*)	0	860	101	**961**	0	91	57	**148**
小果柿 Small Persimmon (*Diospyros vaccinioides*)	930	3,240	4,510	**8,680**	5,160	4,300	8,350	**17,810**
羅浮買麻藤 Luofushan Joint-fir (*Gnetum luofuense*)	270m^2	750m^2	990m^2	**2,010**m^2	1,660m^2	3,230m^2	1,990m^2	**6,880**m^2
苞舌蘭 Buttercup Orchid (*Spathoglottis pubescens*)	0	0	0	**0**	0	17	0	**17**

Recommendations

4.2 According to Section 8.8.1.1 of the EIA Report, ecological impacts on important habitats should be mitigated by, in order of priority, avoidance, minimization, and compensation approaches to the maximum practical extent.

Avoidance

4.3 While the design of the ancillary facilities has yet been finalized, the vegetation survey was assigned to cover all potentially affected areas within project boundary. The works area has been refined in accordance with the latest design and survey works to minimize vegetation clearance coverage and to avoid species of conservation importance as far as possible. The coverage of the protection zone for retained vegetation is shown in **Figure 2a-2i**. Therefore, 6 individual of *Canthium dicoccum* (D0004, D0011, D0012, D0013, D0014, D0015), about 961 nos. of *Cibotium barometz* (E0006, E0007, E0011, E0012, E0013, E0014, E0015 and E0016A), 4 individuals of *Ania hongkongensis* (H0001), about 8,680 nos. of *Diospyros vaccinioides* and about 2,010m^2 of *Gnetum luofuense* will be preserved in-situ. They will be protected by clear site demarcation or with robust fencing to be explained in **Section 4.22**.

Minimization

4.4 Plants that fall within the works area are prone to damage during to site clearance. If impact on the plant species of conservation importance cannot be avoided, the suitability and /or practicality of transplantation will be assessed according to Condition 2.13(i) of the EP. Considerations include health condition, site condition, transplantation feasibility, conservation value and availability of receptor site. With reference to the *Guidelines on Tree Transplanting* issued by the Development Bureau, the suitability of transplantation of affected individuals was reviewed based on the following considerations:

- **Health, form and structural condition** – Healthy individual has higher chance to survive the transplant shock and recover after transplantation. Plants with poor form or structure (e.g. inclining, multiple trunk) have imbalanced shape that is difficult to grow well in new environment. Therefore, only healthy individuals with good to fair form and structural conditions will be considered for transplantation.

- **Formation of root ball** – A balanced root ball of suitable size is essential to support the transplanted plant and to re-grow for water and nutrient absorption. In general, the ratio between root ball diameter:trunk diameter is 8:1 to 10:1. Also, plants growing on steep slope develop roots that adapt to the existing gradient. If there is hindrance in the root growing direction (e.g. rocks and concrete structure), the root ball will be in unbalanced form and hard to support the plant in new environment. Mature plant needs larger root ball, implying that higher chance of imbalanced root ball formation on the sloped environment. Therefore, transplantation of herbs and young trees is recommended.

- **Site remoteness, accessibility, technical feasibility and cost effectiveness** – Unless the plant is located near road network, mobilization of powered mechanical equipment on the slope for large tree transplant is technical impractical and not cost-effective. In addition, there is safety concern for working in location with steep topography.

- **Conservation value** – While all plants considered in this proposal have certain conservation statuses, the commonness of the species in Hong Kong should be considered in evaluating the impact of removing the affected plant in a wider perspective (population survival).

- **Availability of Suitable Receptor Site** – Areas within the project boundary but outside the works area will be the receptor site of the affected plants. Habitat similar to the existing growing environment will be chosen to enhance the survival rate after transplant.

4.5 Based on the above, transplantation of healthy herbs and young trees with good to medium form and structural conditions is recommended. These include 1 *Aquilaria sinensis* (C0001), 1 *Ania hongkongensis* (H0002), 3 *Canthium dicoccum* (D0016B, D0017 and D0018) and 68 nos. of *Cibotium barometz* (E0001a (16 nos.), E0002 (1 no.), E0003 (2 nos.), E0004 (7 nos.) and E0016B (42 nos., see below)). Although most of them are located on steep slope and is difficult to access, transplantation to nearby receptor site is recommended in view of the small number of individuals involved to minimize the impact as far as possible.

4.6 Since many individuals of *Cibotium barometz* (E0016B) grows between boulders, it is would be difficult to transplant the individuals that grows on rock without dealing fatal damage to them. It was therefore recommended to fell the individuals that grow between boulders and transplant the remained individuals that grow on soil (which is estimated to be around 60% of the affected individuals (42 nos.)). In addition, the design of rigid barrier at Site 2 upper slope had been best-fitted to block the potential channelized debris flow along the valley from slope safety purpose in accordance to the findings in the Natural Terrain Hazard Mitigation Strategy Report (Secondary Portal). The affected area and related impact had been minimized.

4.7 The Hong Kong Eagle's Claw (*Artabotrys hongkongensis*) found (I0001) was located within the works area and found growing between rocks. Due to the climbing nature of the species, it would be difficult to transplant this individual without dealing heavy damage to it and the tangled vegetation. It would be unlikely to survive after transplantation and thus this option was not recommended.

4.8 Most *Canthium dicoccum* recorded are young trees less than 7m tall. Some individuals are growing near rocks or concrete structure. These make formation of a good root ball difficult. This included D0001, D0002, D0003, D0006 and D0010. For D0008, D0016A and D0009, the former two has poor health condition while the latter one has been uprooted. Although they would be affected by the construction works, they are unlikely to survive after transplantation and thus this option is not recommended.

4.9 3 young individuals of *Canthium dicoccum* (D0016B, D0017 and D0018) were found on flat ground at Grid 2-31. These individuals have good tree form and health conditions. They can be easily accessed as they are located near the Mui Tsz Lam Road Garden and thus transplantation of those individuals are recommended.

4.10 *Diospyros vaccinioides* is highly adaptive in the project boundary. It can be found in majority of plots and occurs in both exposed and shady environment. This species was also observed outside the project boundary. Appendix 8.03 of the EIA Report indicated that this species was found in woodland, plantation and shrubland. With reference to the habitat map of the approved EIA Report, Nui Po Shan consists of extensive stretch of woodland, plantation and shrubland. This species was reported in different locations in the 430ha Nui Po Shan study area in the EIA Report, indicating that its distribution is widespread throughout Nui Po Shan. Only a small portion of Nui Po Shan (8.6ha) would be affected by the Project.

4.11 According to the plant specialist, there is high risk of transplantation failure for *Diospyros vaccinioides*. To increase the chance of survival, transplantation of very young individuals is proposed to minimize the impact as far as possible. According to approved Detailed Vegetation Survey Report v.8.1, about 500 numbers of *Diospyros vaccinioides* are proposed to be transplanted from Grid No. 1-1 to 1-24, 2-1 to 2-16 and 3-1 to 3-65 based the criteria in the following table. The exact numbers to be transplanted are subject to the actual site conditions. The location of *Diospyros vaccinioides* to be transplanted is shown in **Figures 4a – 4c**. In addition to selection of individuals of high survival rate, care should be undertaken during root ball preparation and transplantation work as proposed in Sections 3.4 – 3.7 of the Protection and Transplantation Proposal to reduce the risk of transplantation failure, so that the total number of individuals survived after transplantation would meet the target of 500 (exact numbers to be transplanted are subject to actual site conditions).

Table 4-2 Screening of *Diospyros vaccinioides* to be Transplanted in Grids 1-1 to 1-24, 2-1 to 2-16 and 3-1 to 3-65

Screening of *Diospyros vaccinioides* not suitable for transplantation		**Justifications**	**No. of Individuals Remain**
Total number of affected *Diospyros vaccinioides* in the Approved Report v.8.1:			**14,100**
Step 1	Individuals >0.5m in height	The Sites are located on steep ground and the soil was dry. The roots of the vegetation are likely to grow wide and deep to reach groundwater. As older plant (Individuals >0.5m in height) is well adapted to existing environment, it will more likely to experience transplantation stress and may not be able to survive [1], [2]. Also, a balanced root ball for transplantation cannot be prepared on steep slope and near obstacles.	4,700 *
	Grown near woody plants and other obstacles (e.g. rocks, man-made structures)		
	Locally grown on Steep Slopes (>40 degree)		
Step 2	Grown in remote location away from road network (>50m) and grown on steep slopes with no proper access	No road access and proper man access for transportation. Also, ecologist/landscape specialist/workers cannot carry out root ball preparation and transplantation works under safe condition.	500^
Total number of *Diospyros vaccinioides* to be transplanted:			**~500**

* Twelve 5m x 5m quadrats that scattered around the three Sites were surveyed to count the number of *Diospyros vaccinioides* in different height ranges (**Figure 4a-4e**). About 30% of individuals among height range of 0-1m were screened out in Step 1 (**Appendix E**).

^Accessible grids include 1-10 to 1-18, 1-20 to 1-23, 2-5, 2-7, 2-8, 2-17, 2-18, 2-30, 2-31, 3-7, 3-30, 3-31, 3-47 and 3-54. Details of the exact extend shall be referred to **Figure 4a – 4c**.

4.12 At the time of preparation of this report, transplantation of affected individuals in Site 1 and 3 were completed. Based on the transplantation experience at Sites 1 and 3, the successful rate for transplantation in accessible area is about 22% of the theoretical

[1] LandOwner Resource Centre. 2017. Successful Transplanting of Woodland Vegetation for Plant Salvage or Habitat Restoration Projects. [online] Available: https://www.grca.on.ca/wp-content/uploads/2017/07/trnsplntng.pdf. Last Accessed: 3 July 2019.

[2] Nemati N. 1977. Shrub Transplanting for Range Improvement in Iran. Journal of Range Management Vol. 30, No. 2

prediction, which the detailed calculation shall be referred to **Appendix G**. Therefore, for newly affected grids in this report, the transplantation of *Diospyros vaccinioides* will be calculated based on the following table:

Table 4-3 Screening of *Diospyros vaccinioides* to be Transplanted due to Change of Design

Screening of *Diospyros vaccinioides* not suitable for transplantation		**Justifications**	**No. of Individuals Remain**
Total number of newly affected *Diospyros vaccinioides* due to the change of design (Grid no. 2-17 – 2-31 & 3-66 and increase due to expansion of works area in Grid no. 2-12 – 2-16, 3-33, 3-34, 3-41, 3-42, 3-49):			**3,710**
Step 1	Grown at remote location away from road network and grown on steep slopes with no proper access	No road access and proper man access for transportation. Also, ecologist/landscape specialist/workers cannot carry out root ball preparation and transplantation works under safe condition.	912^
Step 2	Proportion of individuals that fulfill criteria of **Table 4-2**	Previous experience in Site 1 and 3 for finding suitable individuals for transplantation is 22% on average*.	201
Total number of *Diospyros vaccinioides* to be transplanted:			**~200**

^Accessible grids include 1-10 to 1-18, 1-20 to 1-23, 2-5, 2-7, 2-8, 2-17, 2-18, 2-30, 2-31, 3-7, 3-30, 3-31, 3-47 and 3-54. Details of the exact extend shall be referred to **Figure 4a – 4c**

* No. of Transplanted Individuals / No. of Small Persimmon in Accessible Area in Sites 1 & 3
= 268 / 1,244 * 100% = 22%

4.13 *Gnetum luofuense* is a woody climber that spans across the shrubland and woodland in Nui Po Shan as reported in the EIA Report and this vegetation survey. This species was also observed outside the project boundary. Appendix 8.03 of the EIA Report indicated that this species was frequently found in woodland and shrubland. It twines on shrubs and trees to reach the canopy. It is impractical to segregate it from other plants for transplantation. Also, transplanting it may induce stress to the existing vegetation in the receptor site. As transplantation is not suitable, compensatory planting for this species is proposed in **Section 4.16**.

Compensation

4.14 The potential of compensatory planting for 17,110 nos. of *Diospyros vaccinioides*, 6,880m^2 *Gnetum luofuense*, 9 nos. of *Canthium dicoccum*, about 80 nos. of *Cibotium barometz* and 1 no. of *Artabotrys hongkongensis* that cannot be transplanted is reviewed and explained in the following sections. The planting location will be indicated in a separate Protection and Transplantation Proposal.

4.15 For *Diospyros vaccinioides*, compensatory planting of 17,110 nos. of seedling is proposed at the planting area on future completed SIMAR slopes behind Main Portal (Site 3) and next to the access road to Magazine Site (Site 1). This species produces numerous fruits. Seeds will be collected from individuals near the Project Site. After germination, only healthy seedlings will be selected to ensure the quantity and quality after planting. With reference to a community-involved tree planting event near the top of Nei Lak Shan in Lantau Island, seedlings of *Diospryros vaccinioides* planted had 94% survival rate one

month after planting[3]. Re-sampling after one year recorded an average height increment from 26.6cm to 38.1cm. Therefore, seedling planting is considered an effective compensatory measure. In addition, broadcast seeding in temporary works area after cessation of work is proposed to enhance the population. Furthermore, considering the commonness of this species in Nui Po Shan, the wild population growing in the vicinity of the project boundary is expected to naturally propagate into the disturbed area after cessation of construction works.

4.16 Similarly, *Gnetum luofuense* will be compensated by seedling planting at the future planting area. Since this species will grow in large mass and twine on nearby plants to compete for sunlight, it will be planted in low density (50m interval) to reduce its aggressiveness. Seedling will be planted on the edge of works area to connect to the undisturbed area. The planting areas in Sites 1, 2 & 3 can accommodate a total of 22 planting locations.

4.17 For *Canthium dicoccum*, at least 9 nos. of whip trees will be planted in the temporary works area so that there will be no net loss of this species. As this is a tree species, it will be planted in locations with slope ≤35º.

4.18 *Cibotium barometz* grows in damp environment (such as stream and seeping rock). However, nearby suitable habitats within the project boundary (stream in the upper slope in Site 3 and the valley in Site 2) has been adopted as transplantation receptor site and thus compensation for the lost individuals would not be recommended.

4.19 For *Artabotrys hongkongensis*, 1 seedling will be planted in the woodland within vegetation protection zone in the Secondary Portal (Site 2) to compensate the loss of the existing individual.

4.20 The preservation, transplantation and compensatory planting methods are proposed in the separate Protection and Transplantation Plan.

[3] The Conservancy Association (CA). 2016. Islands District Healthy City Tree Planting Festival Green Lantau 2015. Nei Lak Shan, Lantau Island. 2nd Tree Monitoring Report. [online] Available at: http://www.islands-healthycity.org/NP_tree_monitoring_2015_02.pdf. Last Accessed: 3 July 2019.

Summary of Recommendations

4.21 The overall recommendations is summarized in the following table:

Table 4-4 Summary of Recommendations (by Site)

Common Name	Species Name	Units	Recommendations				
			Retain	Transplant	Fell	Total (in Project Boundary)	Compensatory Planting in Temporary Works Area
Site 1							
小果柿 Small Persimmon	*Diospyros vaccinioides*	No.	930 (15%)	350 (6%)	4,810 (79%)	**6,090**	Seedlings + Broadcast Seeding
羅浮買麻藤 Luofushan Joint-fir	*Gnetum luofuense*	m^2	270 (14%)	0 (0%)	1,660 (86%)	**1,930**	Seedlings
香港安蘭 Purple Bulb Orchid	*Ania hongkongensis*	No.	4 (80%)	1 (20%)	0 (0%)	**5**	N/A
Site 2							
小果柿 Small Persimmon	*Diospyros vaccinioides*	No.	3,240 (43%)	250 (3%)	4,050 (54%)	**7,540**	Seedlings + Broadcast Seeding
羅浮買麻藤 Luofushan Joint-fir	*Gnetum luofuense*	m^2	750 (19%)	0 (0%)	3,230 (81%)	**3,980**	Seedlings
香港鷹爪花 Hong Kong Eagle's Claw	*Artabotrys hongkongensis*	No.	0 (0%)	0 (0%)	1 (100%)	**1**	1 Seedling
魚骨木 Butulang Canthium	*Canthium dicoccum*	No.	6 (43%)	3 (21%)	5 (36%)	**14**	5 Whip Trees
金毛狗 Lamb of Tartary	*Cibotium barometz*	No.	860 (91%)	61 (6%)	30 (3%)	**951**	No suitable habitat for compensatory planting
苞舌蘭 Buttercup Orchid	*Spathoglottis pubescens*	No.	0 (0%)	16 (94%)	1 (6%)	**17**	Difficult to propagate from seed & not available in market
Site 3							
小果柿 Small Persimmon	*Diospyros vaccinioides*	No.	4,510 (35%)	100 (1%)	8,250 (64%)	**12,860**	Seedlings + Broadcast Seeding
羅浮買麻藤 Luofushan Joint-fir	*Gnetum luofuense*	m^2	990 (33%)	0 (0%)	1,990 (67%)	**2,980**	Seedlings
魚骨木 Butulang Canthium	*Canthium dicoccum*	No.	0 (0%)	0 (0%)	4 (100%)	**4**	4 Whip Trees
金毛狗 Lamb of Tartary	*Cibotium barometz*	No.	101 (64%)	7 (4%)	50 (32%)	**158**	No suitable habitat for compensatory planting

Common Name	Species Name	Units	Recommendations				
			Retain	Transplant	Fell	Total (in Project Boundary)	Compensatory Planting in Temporary Works Area
土沉香 Incense Tree	*Aquilaria sinensis*	No.	0 (0%)	1 (100%)	0 (0%)	**1**	N/A

Table 4-5 Summary of Recommendations (by Project)

Common Name	Species Name	Units	Recommendations				
			Retain	Transplant	Fell	Total	Compensatory Planting in Temporary Works Area
小果柿 Small Persimmon	*Diospyros vaccinioides*	No.	8,680 (33%)	700 (3%)	17,110 (65%)	**26,490**	Seedlings (17,110 nos.)
羅浮買麻藤 Luofushan Joint-fir	*Gnetum luofuense*	m^2	2,010 (23%)	0 (0%)	6,880 (77%)	**8,890**	Seedlings (22 locations at 50m interval)
香港安蘭 Purple Bulb Orchid	*Ania hongkongensis*	No.	4 (80%)	1 (20%)	0 (0%)	**5**	N/A
香港鷹爪花 Hong Kong Eagle's Claw	*Artabotrys hongkongensis*	No.	0 (0%)	0 (0%)	1 (100%)	**1**	1 Seedling
魚骨木 Butulang Canthium	*Canthium dicoccum*	No.	6 (33%)	3 (17%)	9 (50%)	**18**	9 Whip Trees
金毛狗 Lamb of Tartary	*Cibotium barometz*	No.	961 (87%)	68 (6%)	80 (7%)	**1,109**	No suitable habitat for compensatory planting
土沉香 Incense Tree	*Aquilaria sinensis*	No.	0 (0%)	1 (100%)	0 (0%)	**1**	N/A
苞舌蘭 Buttercup Orchid	*Spathoglottis pubescens*	No.	0 (0%)	16 (94%)	1 (6%)	**17**	Difficult to propagate from seed & not available in market

Protective Measures

4.22 During construction of the Project, the following guidelines should be followed to protect retained trees and plant species of conservation importance within and in the vicinity of the work area:

- All works should be confined within the site boundary.
- Access of site staff should be controlled to avoid damage to the vegetation in surrounding areas. A protection zone for retained vegetation is shown in **Figures 2a – 2i**.
- Equipment or stockpile should be placed in the existing disturbed / urbanized land within the site boundary of the Project to minimize disturbance to vegetated areas.

- Before the commencement of construction works, the Contractor must be aware of which trees/plants are to be retained and which are to be transplanted.
- Trees/plants which have been proposed to be transplanted should be clearly marked on the layout plan.
- Trees/plants which are to be retained should be clearly marked on site prior to the commencement of site construction works, preferably by printed numbers consistent with the Tree Survey Report and Detailed Vegetation Survey Report for the Project. Trees/plants to be retained will also be marked with surveyor's flagging or ribbon.
- As a general rule the majority of a tree's roots lies within an area just greater than the spread of its crown and are at a depth of approximately 600mm. This may be less on heavy soils and greater on drier soils. Therefore, the following precautions should be undertaken in order to prevent damage to the trunks, roots and crowns of trees during constructions.
- A tree protection zone should be set below the drip line of the tree crown for trees near the edge of the works area. A typical design of the tree protection zone for individual trees/tree groups is shown in **Appendix F**. For plant species of conservation importance to be preserved (inclusive of trees, shrubs and herbs), the protection zone should be set 1m from the dripline of the plant. Robust, bright-coloured fencing of 1.5m in height should be erected to remind workers not to trespass before site clearance.
- Heavy equipment, supplies, ditches and underground utility lines should be placed outside the protection zone.
- Care should be taken to prevent trees/plants being damaged by mechanical equipment both during site clearance works and construction works.
- No fixings should be driven into trees/plants.
- No workshop, canteens, or similar should be installed beneath trees/plants, nor will equipment maintenance etc. be carried out under trees/plants.
- No excavation, including that for services or changes in ground level will take place within the spread of the crown of the trees/plants.
- No change of ground level around preserved trees/plants is permitted.
- No soil, debris or construction materials should be deposited around and against the trunk of a tree/plant as this causes bark damage and compaction of the soil.
- No fire should be lit below the branches and no petrol, oil or caustic substances stored near the trees/plants.
- No trees/plants should be used for anchoring or winching purposes or for the display of signs.
- Regular inspection should be conducted to ensure the integrity of the protection zone and the plant condition.

4.23 If trees are wounded or stressed during construction, they are more susceptible to insect and disease attack. Any wounds to the bark should be cleaned to sound wood by removing loose bark and wood, leaving a smooth edge around the wound. No application of a wound dressing is necessary.

Review of Residual Ecological Impacts

4.24 Although plant species of conservation importance will be affected by the project, mitigation measures have been proposed to minimize the impact based on the hierarchy in EIAO-TM Annex 16:

- Avoidance, by reducing works area to minimum
  (The survey area was designed to cover all potential works area. The extent of works area was reviewed and reduced to light-blue-hatched area shown in **Figures 1b-1e** based on the actual site condition with an aim to avoid the impact on the flora species as far as possible. For *Diospyros vaccinoides* and *Gnetum luofuense*, the affected population is reduced from 26,490nos. to 17,810nos. and 8,890m^2 to 6,880m^2 respectively. Also, 6 individuals of *Canthium dicoccum*, about 961 nos. of *Cibotium barometz*, 4 individuals of *Ania hongkongensis* will be preserved.)

- Minimization, by transplanting individuals of high survival rate
  (1 *Aquilaria sinensis*, 1 of *Ania hongkongensis*, 3 nos. of *Canthium dicoccum*, 68 nos. of *Cibotium barometz*, 700 nos. of *Diospyros vaccinioides* and 16 nos. of *Spathoglottis pubescens*)

- Compensation, by planting of 1 seedling for *Artabotrys hongkongensis*, 9 whip trees for *Canthium dioccum*, 17,110 seedlings of *Diospyros vaccinoides* and 22 seedlings of *Gnetum luofuense*

4.25 These measures will minimize the loss of plant species of conservation importance. Together with the fact that all species identified are common in Hong Kong, no adverse residual ecological impacts are expected from the Project with the proper implementation of mitigation measures.

5 CONCLUSION

5.1 Eight plant species of conservation importance were recorded within the project boundary. According to Section 8.8.2.4 of the EIA Report, direct impact on species of conservation importance should be avoided. Identified individuals should be labelled and fenced off on site for preservation. In case of unavoidable loss, mitigation measures such as transplantation should be implemented to minimise impact.

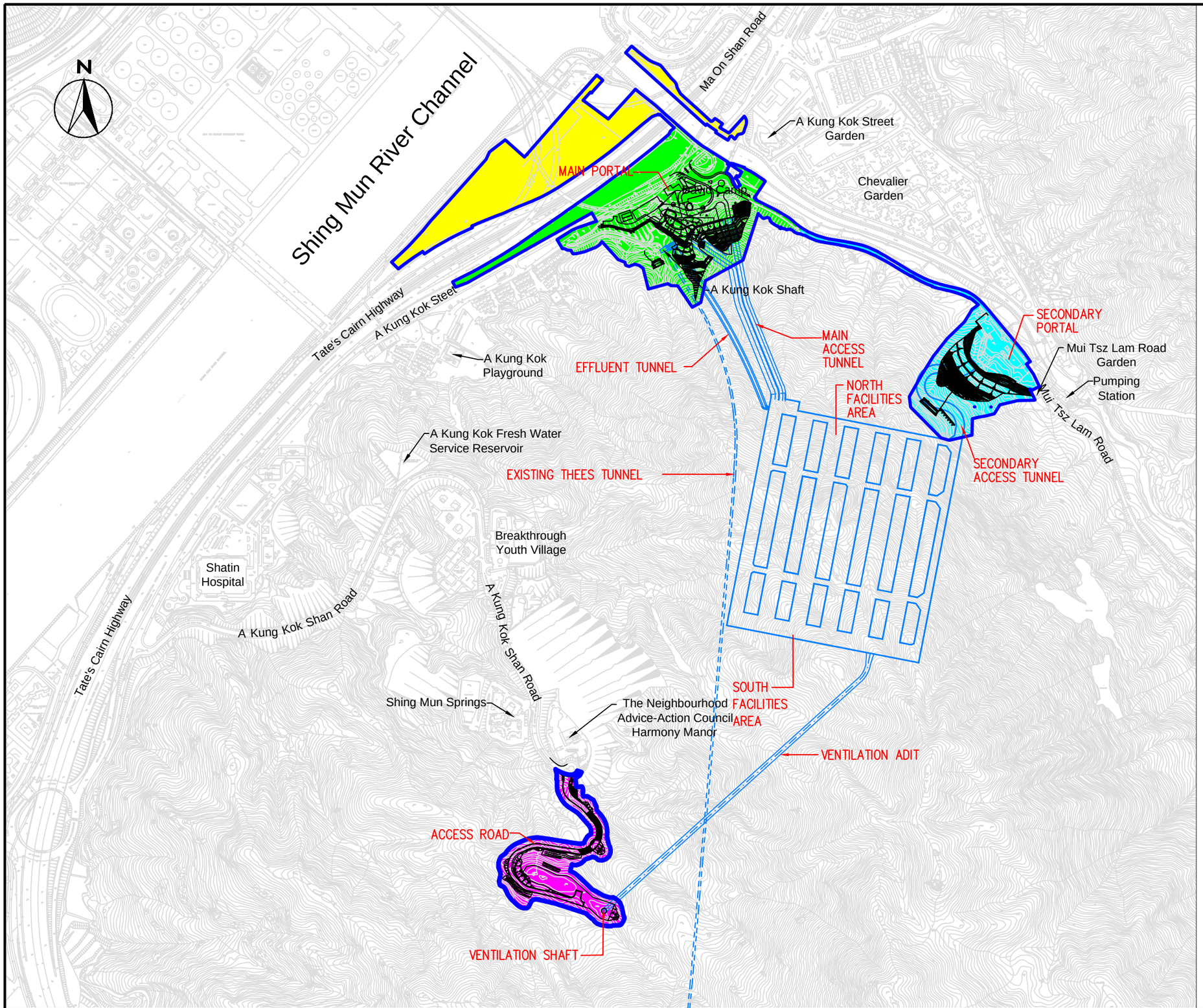
5.2 The works area has been refined to minimize vegetation clearance coverage and to avoid species of conservation importance as far as possible. Plants outside the works area shall be preserved and protected on-site, which include 4 individuals of *Ania Hongkongensis* (H0001), 6 nos. of *Canthium dicoccum* (D0004, D0011, D0012, D0013, D0014 and D0015), 961 nos. of *Cibotium barometz* (E0006 (1 no.), E0007 (100 nos.), E0012 (1 no.), E0013 (103 nos.), E0014 (21 nos.), E0015 (1 no.) and E0016A (730 nos.)), about 8,680 nos. of *Diospyros vaccinioides* and around 2,010m^2 *Gnetum luofuense*.

5.3 Plants that are prone to removal due to vegetation clearance will be transplanted as far as possible, which include 1 of *Ania hongkongensis* (H0002), 1 *Aquilaria sinensis* (C0001), 3 nos. of *Canthium docicum* (D0016B, D0017 & D0018), 68 nos. of *Cibotium barometz* (E0001a (16 nos.), E0002 (1 no.), E0003 (2 nos.), E0004 (7 nos.) and E0016B (42 nos.)), 700 nos. of *Diospyros vaccinioides* and 16 *Spathoglottis pubescens* (F0001A). The exact numbers to be transplanted are subject to the actual site conditions.

5.4 Compensatory planting is proposed to minimize the loss of *Diospyros vaccinioides* (seedling planting and broadcast seeding), *Gnetum luofuense* (seedling planting), *Canthium dicoccum* (whip tree planting) and *Artabotrys hongkongensis* (seedling planting). As there is no suitable habitat for *Cibotium barometz* within project boundary, compensatory planting for this common species is not considered.

5.5 The above measures will minimize the loss of plant species of conservation importance. Together with the fact that all species identified are common in Hong Kong, no adverse residual ecological impacts are expected from the Project with the proper implementation of mitigation measures which concurs with the findings and recommendations from the approved EIA for the Project.

FIGURES



Legend

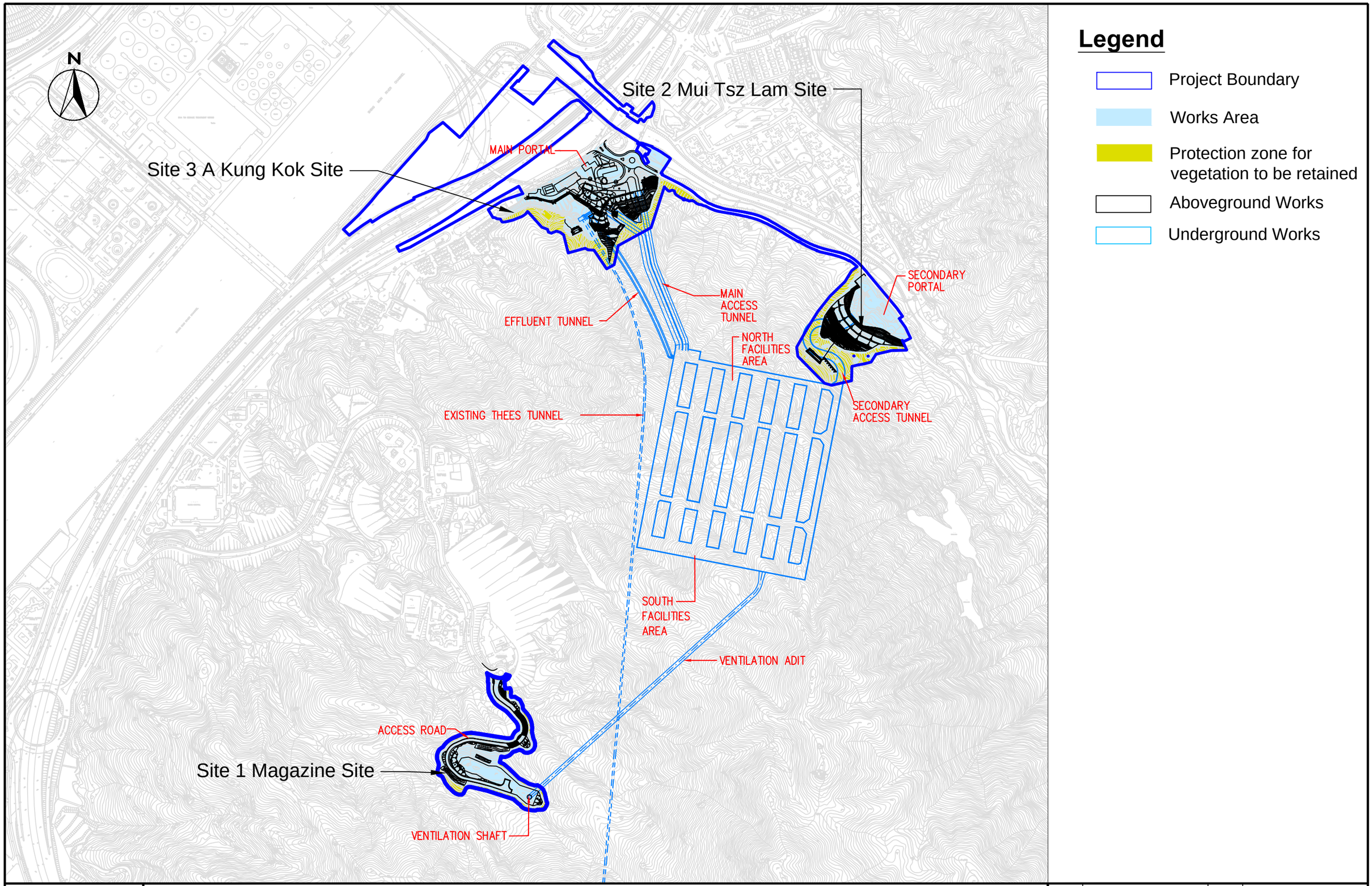
- Project Boundary
- Site 1 (Magazine Site)
- Site 2 (Mui Tsz Lam Site)
- Site 3 (A Kung Kok Site)
- Site 4 (Vehicle Detention Centre)

CINOTECH
Cinotech Consultants Limited

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Site Plan and Project Boundary

SCALE	1:7000 @ A3	DATE	Jul 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 1a	REV 2



Legend

- Project Boundary
- Works Area
- Protection zone for vegetation to be retained
- Aboveground Works
- Underground Works

CINOTECH
Cinotech Consultants Limited

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Preliminary Development Plan (Overview)

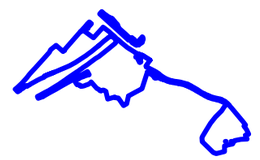
SCALE	1:7000 @ A3	DATE	MAY 2019
CHECK	BC	DRAWN	TL
JOB No.	IA18064	FIGURE No. 1b	REV 1

N

CUT SLOPE
CUT SLOPE
RETAINING WALL
FILLING TO ACCESS ROAD LEVEL
CUT SLOPE
BRIDGE A
ELEVATED ROAD SECTION
CUT SLOPE
CUT SLOPE
RETAINING WALL
ELEVATED ROAD SECTION
CUT SLOPE
BRIDGE B
FILLING TO ACCESS ROAD LEVEL
MAGAZINE SITE
VENTILATION SHAFT
CUT SLOPE
CUT SLOPE
RETAINING WALL
CUT SLOPE
RETAINING WALL
CUT SLOPE

Legend

- Project Boundary
- Works Area
- Protection zone for vegetation to be retained
- Permanent Works
- Underground Works

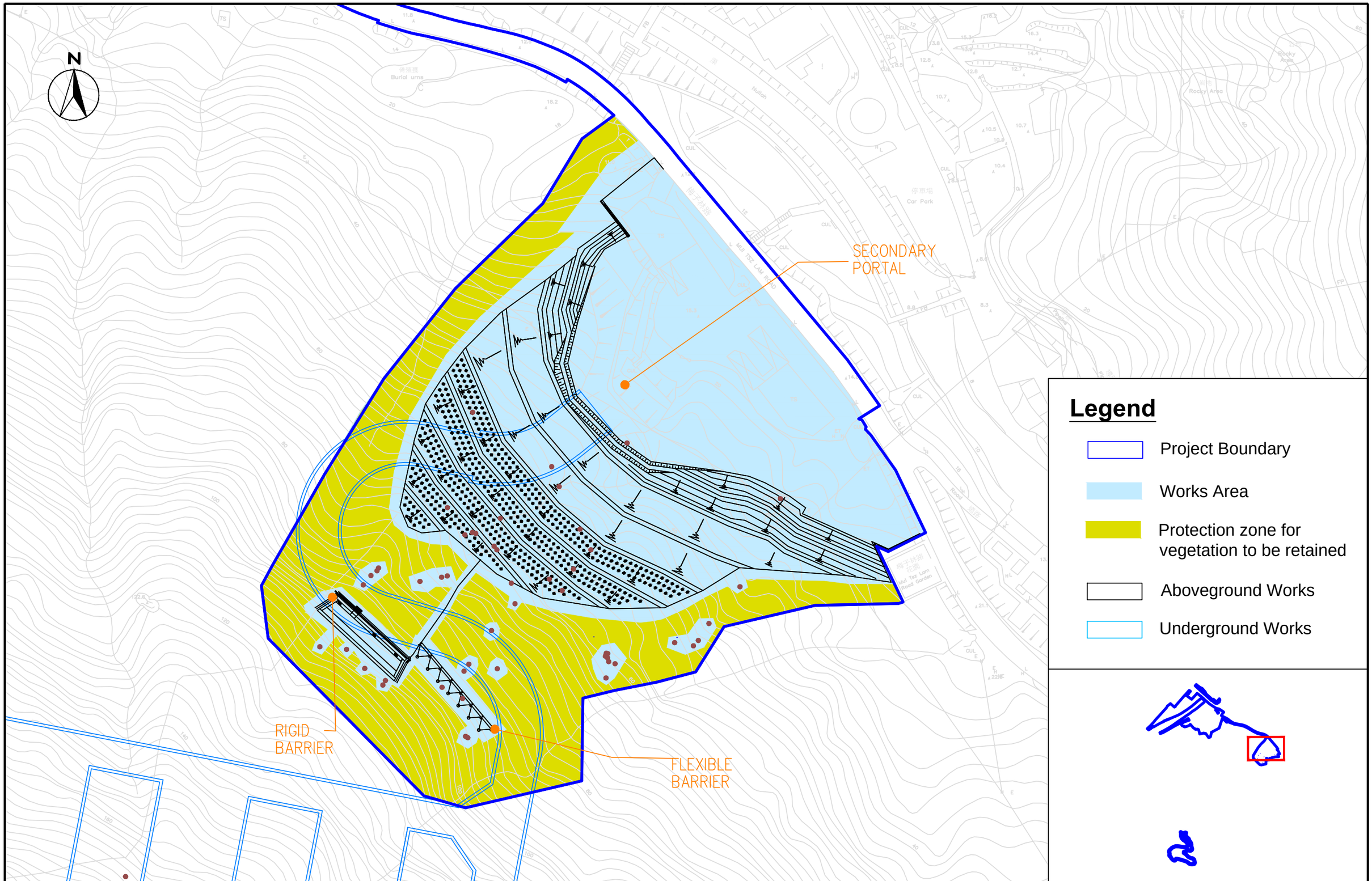


CINOTECH
Cinotech Consultants Limited

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Preliminary Development Plan (Site 1 Magazine Site)

SCALE	1:1200 @ A3	DATE	MAY 2019
CHECK	BC	DRAWN	TL
JOB No.	IA18064	FIGURE No.	1c
		REV	1



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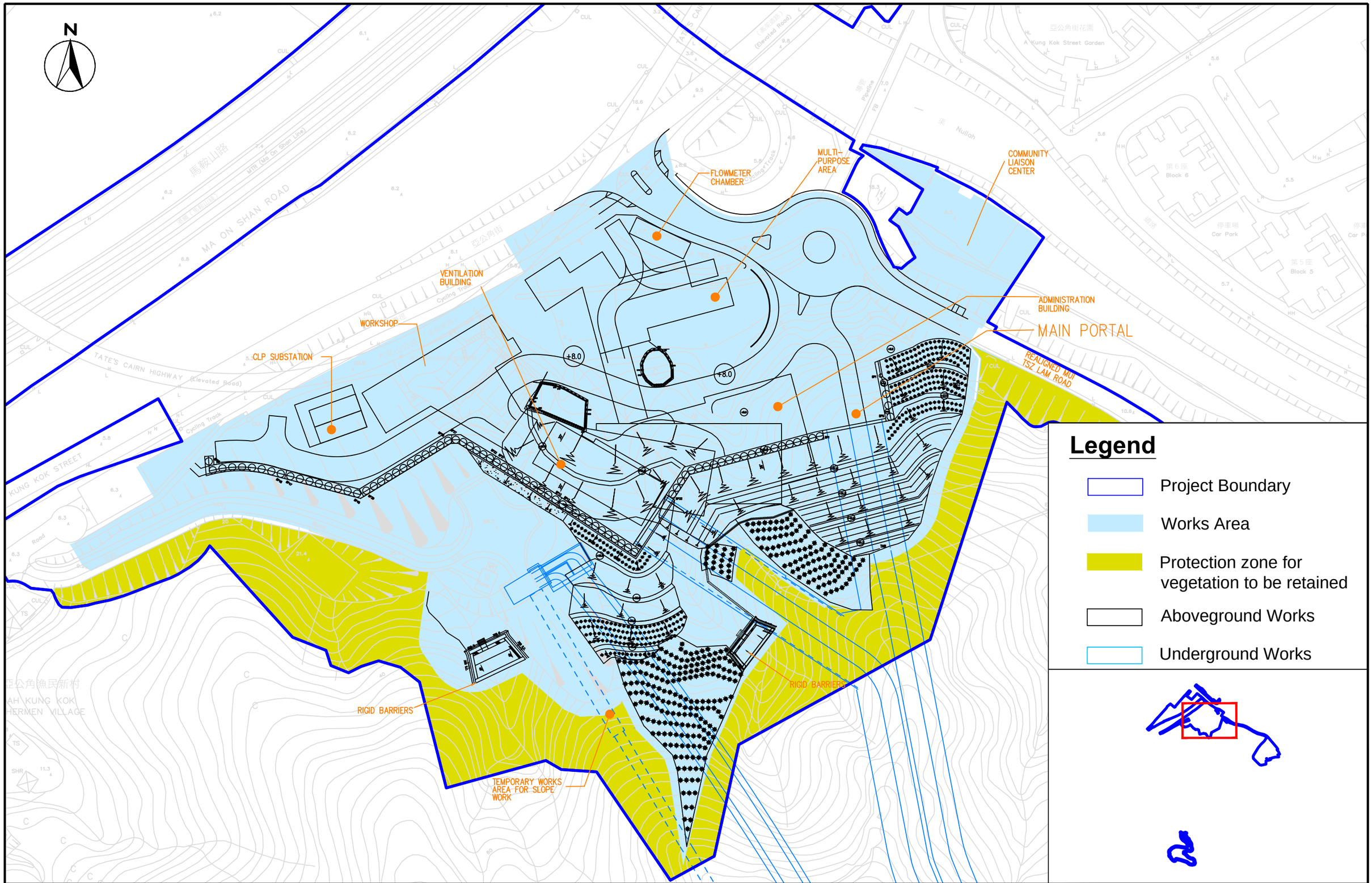
Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Preliminary Development Plan (Site 2 Mui Tsz Lam Site)

SCALE	1:800 @ A3	DATE	MAY 2019
CHECK	BC	DRAWN	TL
JOB No.	IA18064	FIGURE No.	1d
		REV	1

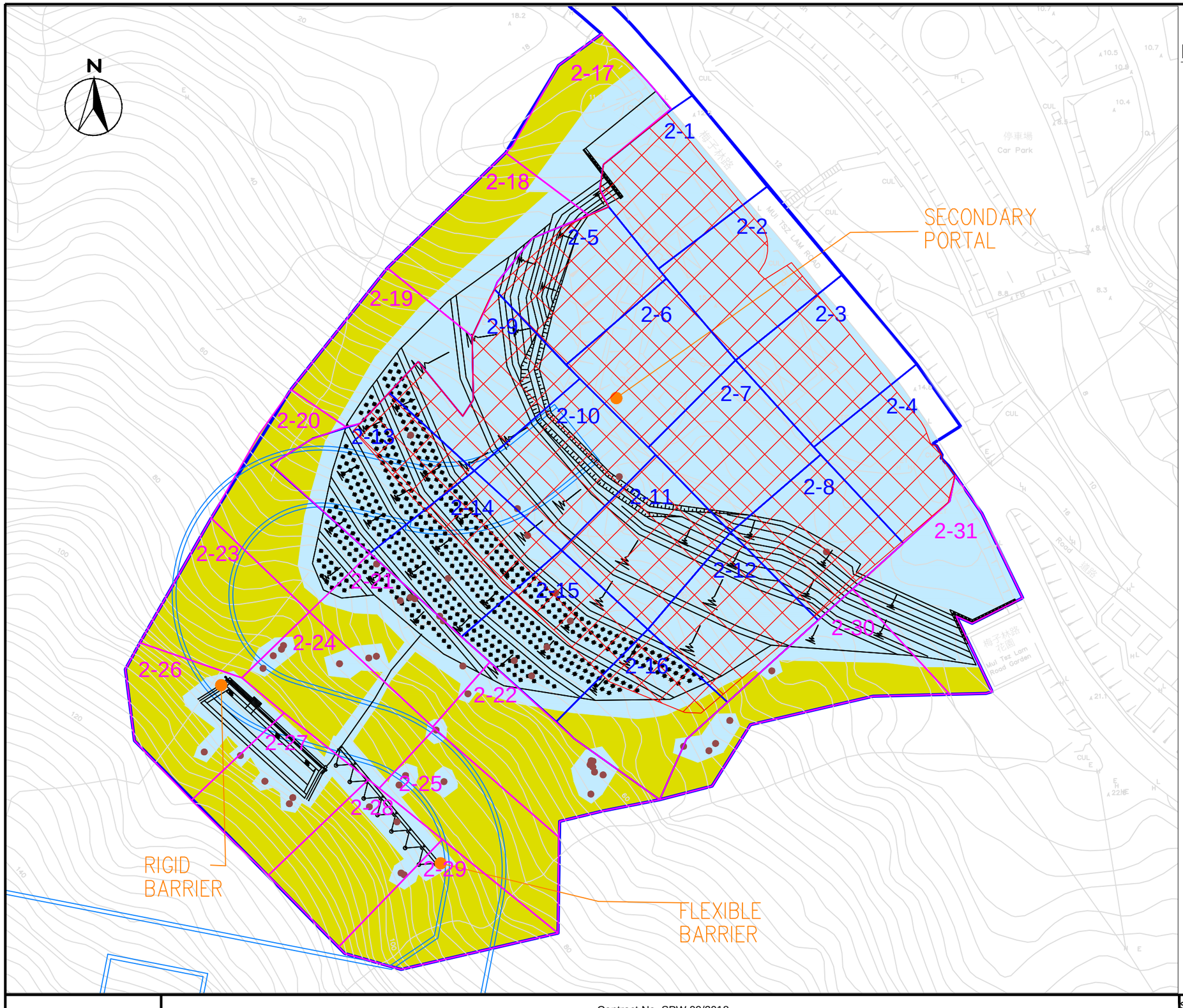


CINOTECH
Cinotech Consultants Limited

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Preliminary Development Plan (Site 3 A Kung Kok Site)

SCALE	1:1200 @ A3	DATE	MAY 2019
CHECK	BC	DRAWN	TL
JOB No.	IA18064	FIGURE No. 1e	REV 1



LEGEND

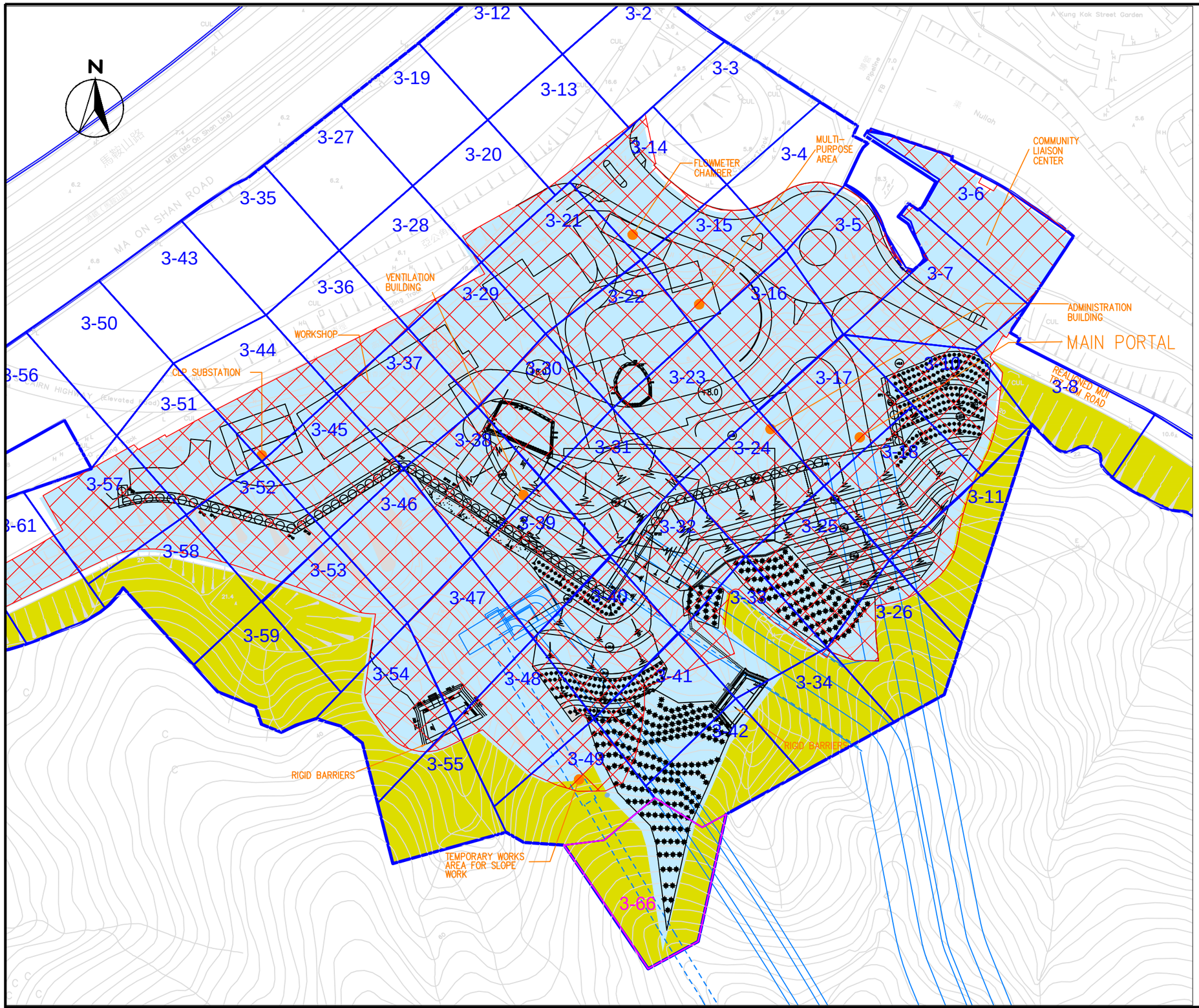
- Works Area in Approved Detailed Vegetation Survey Report (Version 8.1) & Protection and Transplantation Proposal (Version 7.1)
- Works Area after Change of Design
- Previously Surveyed Grid
- Newly Surveyed Grid
- Aboveground Works in Latest Design
- Underground Works in Latest Design
- Protection Zone for Vegetation

CINOTECH

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Comparison of Works Area and Survey Effort between Past and Current Designs (Site 2 Mui Tze Lam Site)

SCALE	A3 1:10000	DATE	JAN 21
CHECK	BC	DRAWN	RT
PROJECT NO.	IA18064	FIGURE NO. 1f	REV 1



LEGEND

- Works Area in Approved Detailed Vegetation Survey Report (Version 8.1) & Protection and Transplantation Proposal (Version 7.1)
- Works Area after Change of Design
- Previously Surveyed Grid
- Newly Surveyed Grid
- Aboveground Works in Latest Design
- Underground Works in Latest Design
- Protection Zone for Vegetation

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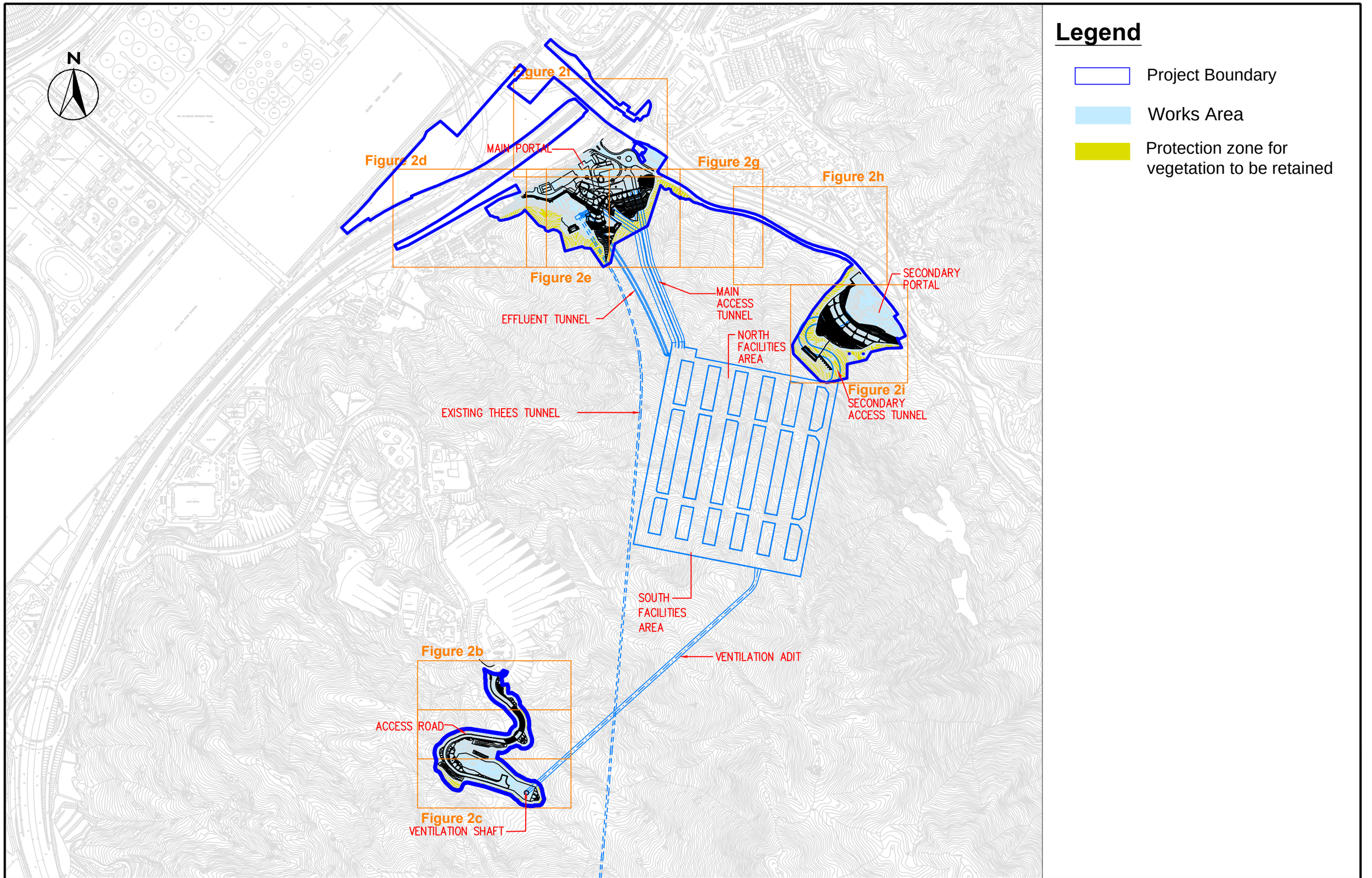
Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Comparison of Works Area and Survey Effort between Past and Current Designs (Site 3 A Kung Kok Site)

SCALE	A3 1:8000	DATE	JAN 21
CHECK	BC	DRAWN	RT
PROJECT NO.	IA18064	FIGURE NO. 1g	REV 1



Legend

- Project Boundary
- Works Area
- Protection zone for vegetation to be retained

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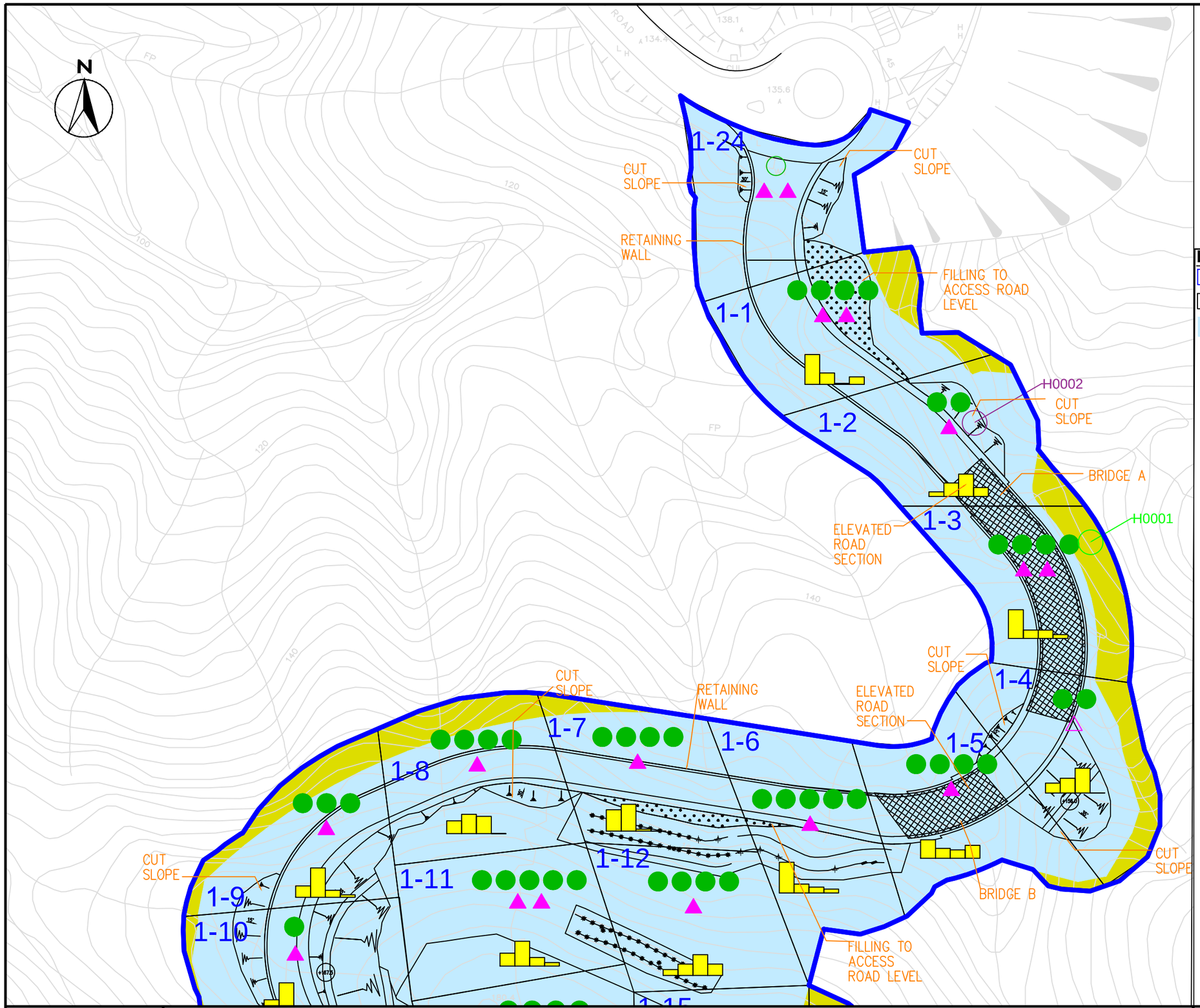
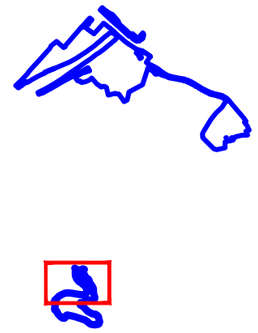
Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Location of Species of Conservation Importance (Key Plan)

SCALE	1:7000 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 2a	REV 1





Legend

- Project boundary
- Survey Grid
- Works Area
- C Incense Tree (*Aquilaria sinensis*)
- D Butulang Canthium (*Canthium dicoccum*)
- E Lamb of Tartary (*Cibotium barometz*)
- H Hong Kong Ania (*Ania hongkongensis*)

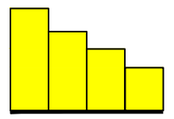
Recommendations of Plant Species of Conservation Importance Observed:

- Retain
- Transplant
- Fell
- Protection zone for vegetation to be retained

Quantity of *Diospyros vaccinioides*

- Not observed during sampling
- 1 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2500

Percentage of *Diospyros vaccinioides*



0-1 1-2 2-3 >3

Height (m)

Coverage of *Gnetum luofuense*

- Not observed during sampling
- 1 - 10%
- 11 - 20%
- 21 - 50%
- 51 - 80%
- 81 - 100%

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Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Location of Species of Conservation Importance (Site 1 Magazine Site)

SCALE	1:800 @ A3	DATE	JUL 2019
CHECK	BC	DRAWN	TL
JOB No.	IA18064	FIGURE No. 2b	REV 1

N

ELEVATED ROAD SECTION

1-3

H0001

CUT SLOPE

RETAINING WALL

1-7

1-6

1-8

ELEVATED ROAD SECTION

CUT SLOPE

1-4

1-5

CUT SLOPE

1-12

1-11

CUT SLOPE

1-9

1-10

BRIDGE B

FILLING TO ACCESS ROAD LEVEL

1-14

1-13

1-15

MAGAZINE SITE

1-16

1-20

1-21

VENTILATION SHAFT

1-19

1-22

1-17

1-18

1-23

CUT SLOPE

RETAINING WALL

CUT SLOPE

RETAINING WALL

CUT SLOPE

Legend

- Project boundary
- Survey Grid
- Works Area
- C Incense Tree (*Aquilaria sinensis*)
- D Butulang Canthium (*Canthium dicoccum*)
- E Lamb of Tartary (*Cibotium barometz*)
- H Hong Kong Ania (*Ania hongkongensis*)

Recommendations of Plant Species of Conservation Importance Observed:

- Retain
- Transplant
- Fell
- Protection zone for vegetation to be retained

Quantity of *Diospyros vaccinioides*

- Not observed during sampling
- 1 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2500

Percentage of *Diospyros vaccinioides*

0-1 1-2 2-3 >3

Height (m)

Coverage of *Gnetum luofuense*

- Not observed during sampling
- 1 - 10%
- 11 - 20%
- 21 - 50%
- 51 - 80%
- 81 - 100%

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Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Location of Species of Conservation Importance (Site 1 Magazine Site)

SCALE	1:800 @ A3	DATE	JUL 2019
CHECK	BC	DRAWN	EC
JOB No.	IA18064	FIGURE No. 2c	REV 1

Legend

Survey Grid

Works Area

Protection Zone for Vegetation

C Incense Tree (*Aquilaria sinensis*)

D Butulang Canthium (*Canthium dicoccum*)

E Lamb of Tartary (*Cibotium barometz*)

H Hong Kong Ania (*Ania hongkongensis*)

Recommendations of Plant Species of Conservation Importance Observed:

Retain

Transplant

Fell

Quantity of *Diospyros vaccinioides*

- Not observed during sampling
- 1 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2500

Coverage of *Gnetum luofuense*

- Not observed during sampling
- 1 - 10%
- 11 - 20%
- 21 - 50%
- 51 - 80%
- 81 - 100%

Percentage of *Diospyros vaccinioides*

0-1 1-2 2-3 >3
Height (m)

Project boundary

3-50
3-44
3-56
3-51
3-60
3-57
3-52
3-62
3-61
3-63
3-58
3-59
3-64
3-65

CLP SUBSTATION

MA ON SHAN ROAD
TATE'S CAIRN HIGHWAY (Elevated Road)
A KUNG KOK STREET
亞公角漁民新村
AH KUNG KOK FISHERMEN VILLAGE
亞公角休憩處 A Kung Kok Sitting-out Area
花園 Garden
MTR (Ma On Shan Line)
Pipeline

N

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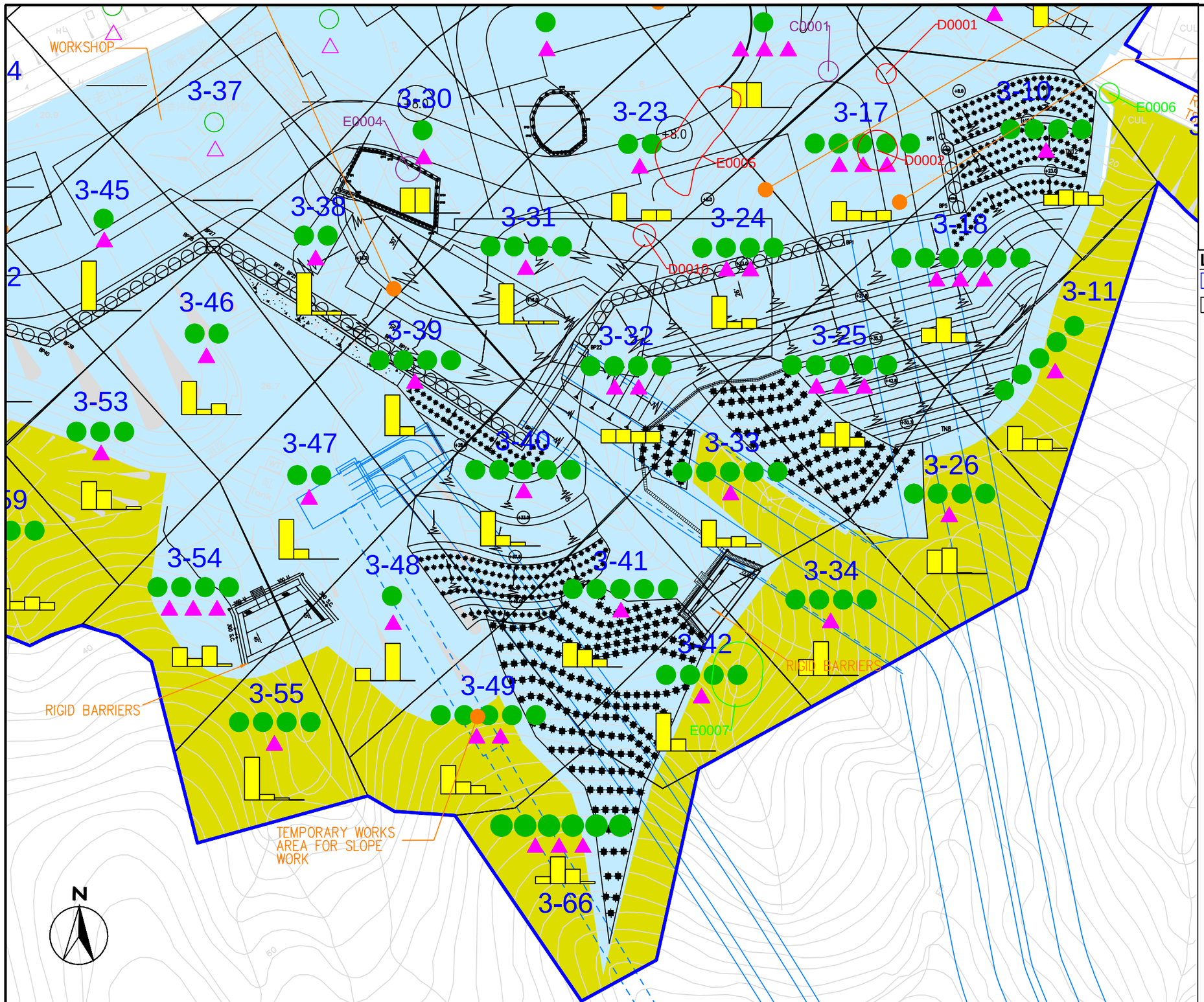
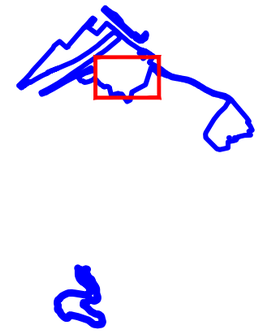
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Location of Species of Conservation Importance (Site 3 A Kung Kok Site)

SCALE	1:800 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 2d	REV 2





Legend

- Project boundary
- Survey Grid
- Works Area

C Incense Tree (*Aquilaria sinensis*)

D Butulang Canthium (*Canthium dicoccum*)

E Lamb of Tartary (*Cibotium barometz*)

H Hong Kong Ania (*Ania hongkongensis*)

Recommendations of Plant Species of Conservation Importance Observed:

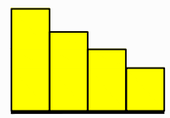
- Retain
- Transplant
- Fell

Protection Zone for Vegetation

Quantity of *Diospyros vaccinioides*

- Not observed during sampling
- 1 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2500

Percentage of *Diospyros vaccinioides*



0-1 1-2 2-3 >3

Height (m)

Coverage of *Gnetum luofuense*

- Not observed during sampling
- 1 - 10%
- 11 - 20%
- 21 - 50%
- 51 - 80%
- 81 - 100%

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Location of Species of Conservation Importance (Site 3 A Kung Kok Site)

SCALE	1:800 @ A3	DATE	AUG 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 2e	REV 2

Legend

- Project boundary
- Survey Grid
- Works Area

- C Incense Tree (*Aquilaria sinensis*)
- D Butulang Canthium (*Canthium dicoccum*)
- E Lamb of Tartary (*Cibotium barometz*)
- H Hong Kong Ania (*Ania hongkongensis*)

Recommendations of Plant Species of Conservation Importance Observed:

- Retain
- Transplant
- Fell

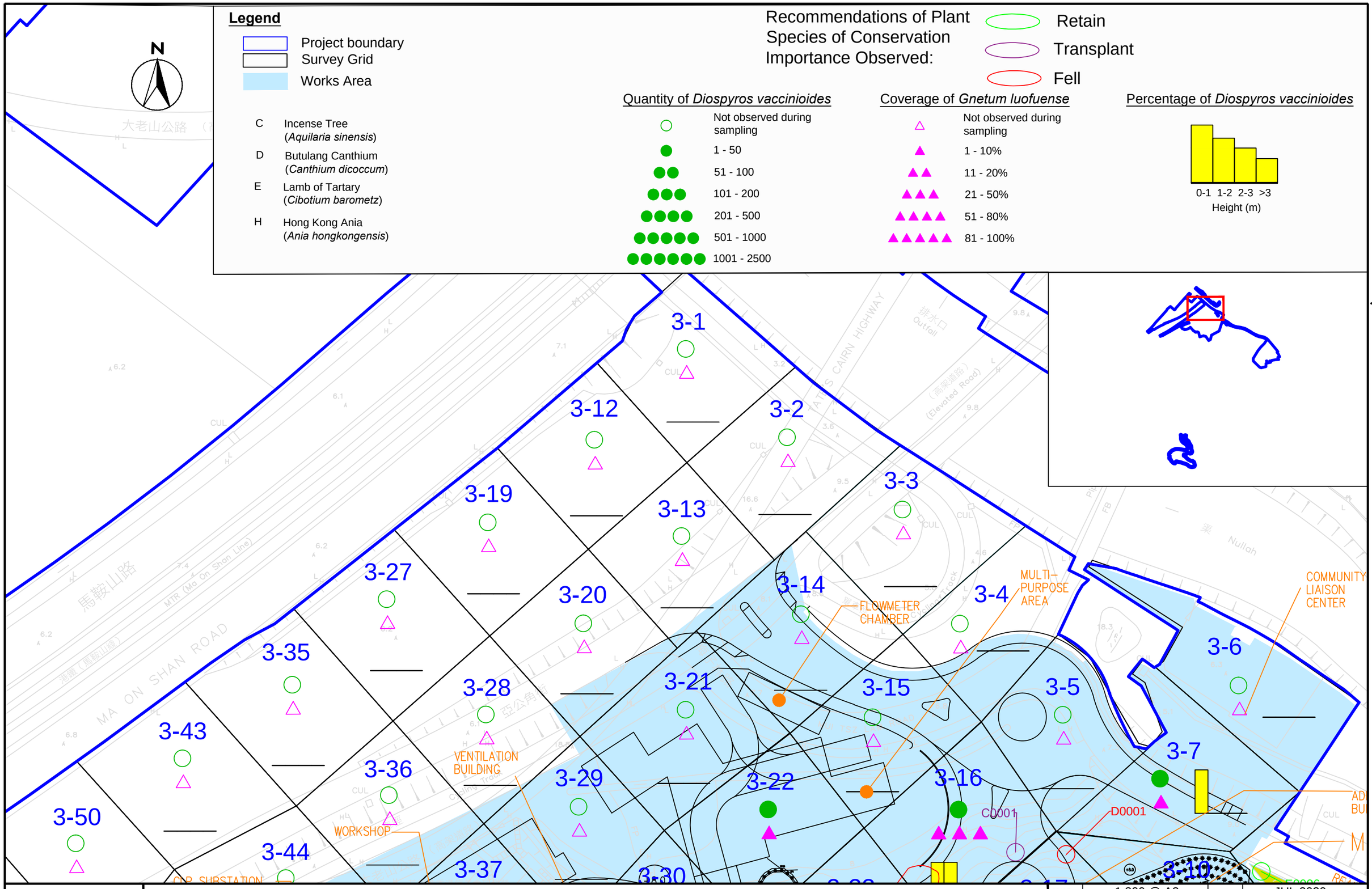
Quantity of *Diospyros vaccinioides*

- Not observed during sampling
- 1 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2500

Coverage of *Gnetum luofuense*

- Not observed during sampling
- 1 - 10%
- 11 - 20%
- 21 - 50%
- 51 - 80%
- 81 - 100%

Percentage of *Diospyros vaccinioides*



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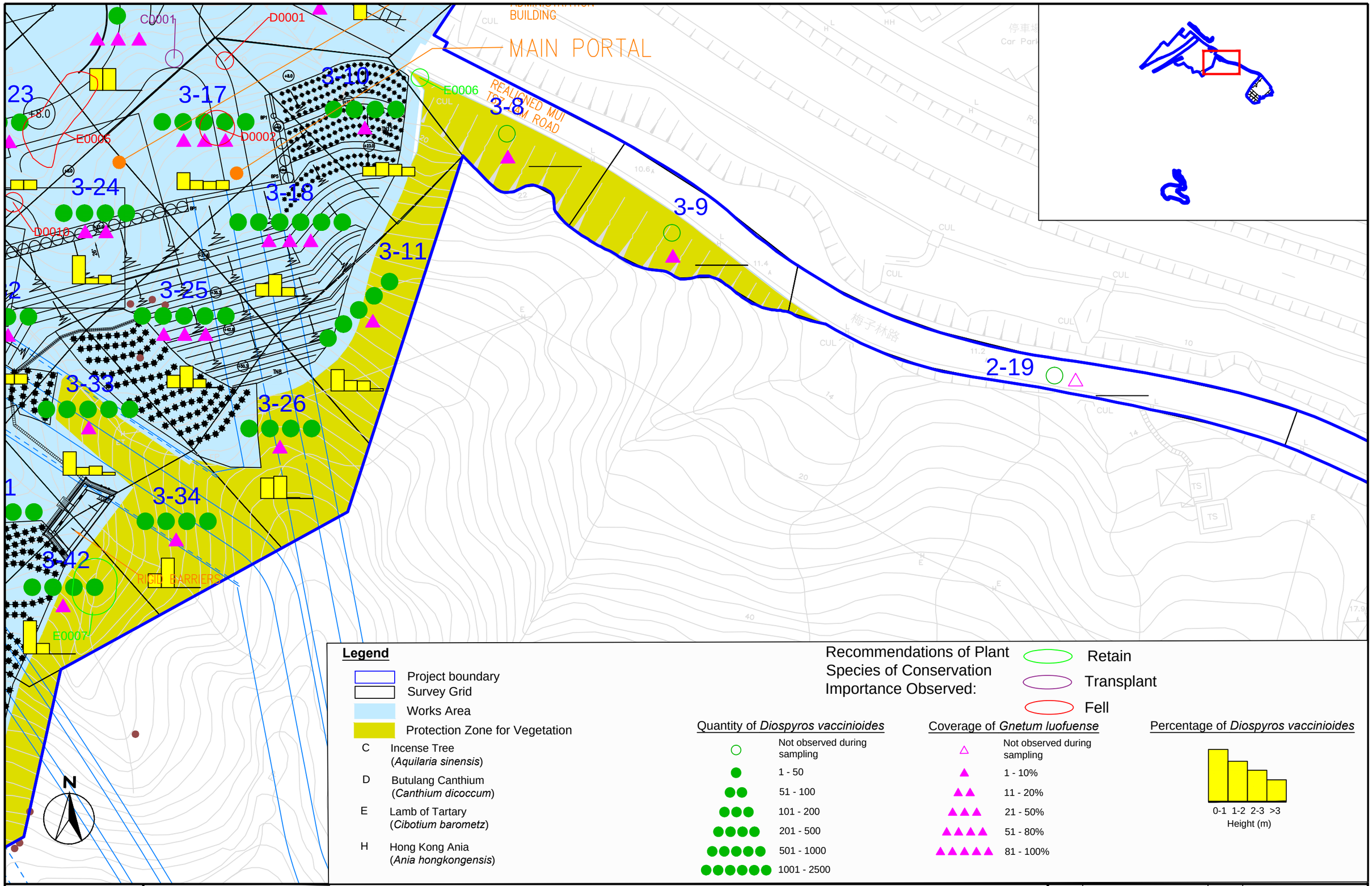
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Location of species of conservation importance (Site 3 A Kung Kok Site)

SCALE	1:800 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 2f	REV 2



Legend

- Project boundary
- Survey Grid
- Works Area
- Protection Zone for Vegetation
- C Incense Tree (*Aquilaria sinensis*)
- D Butulang Canthium (*Canthium dicoccum*)
- E Lamb of Tartary (*Cibotium barometz*)
- H Hong Kong Ania (*Ania hongkongensis*)

Recommendations of Plant Species of Conservation Importance Observed:

- Retain
- Transplant
- Fell

Quantity of *Diospyros vaccinioides*

- Not observed during sampling
- 1 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2500

Coverage of *Gnetum luofuense*

- Not observed during sampling
- 1 - 10%
- 11 - 20%
- 21 - 50%
- 51 - 80%
- 81 - 100%

Percentage of *Diospyros vaccinioides*

0-1 1-2 2-3 >3
Height (m)

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Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Location of species of conservation importance (Site 2 Mui Tzs Lam Site and Site 3 A Kung Kok Site)

SCALE	1:800 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 2g	REV 2

Legend

- Project boundary
- Survey Grid
- Works Area
- Protection Zone for Vegetation

C Incense Tree (*Aquilaria sinensis*)

D Butulang Canthium (*Canthium dicoccum*)

E Lamb of Tartary (*Cibotium barometz*)

H Hong Kong Ania (*Ania hongkongensis*)

Recommendations of Plant Species of Conservation Importance Observed:

- Retain
- Transplant
- Fell

Quantity of *Diospyros vaccinioides*

- Not observed during sampling
- 1 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2500

Coverage of *Gnetum luofuense*

- Not observed during sampling
- 1 - 10%
- 11 - 20%
- 21 - 50%
- 51 - 80%
- 81 - 100%

Percentage of *Diospyros vaccinioides*

0-1 1-2 2-3 >3
Height (m)

2-18

2-17

2-17

D0011

2-1

2-18

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Location of Species of Conservation Importance (Site 2 Mui Tzs Lam Site)

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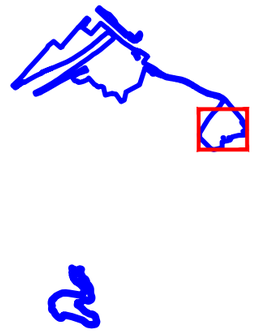
SCALE	1:800 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No.	2h
		REV	2



Legend

- Project boundary
- Survey Grid
- Works Area

C Incense Tree (*Aquilaria sinensis*)

D Butulang Canthium (*Canthium dicoccum*)

E Lamb of Tartary (*Cibotium barometz*)

F Buttercup Orchid (*Spathoglottis pubescens*)

I Hong Kong Eagle's Claw (*Artabotrys hongkongensis*)

Recommendations of Plant Species of Conservation Importance Observed:

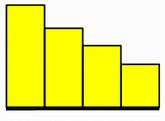
- Retain
- Transplant
- Fell
- Fell & Transplant

Protection Zone for Vegetation

Quantity of *Diospyros vaccinioides*

- Not observed during sampling
- 1 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2500

Percentage of *Diospyros vaccinioides*



0-1 1-2 2-3 >3

Height (m)

Coverage of *Gnetum luofuense*

- Not observed during sampling
- 1 - 10%
- 11 - 20%
- 21 - 50%
- 51 - 80%
- 81 - 100%

2-1 2-2 2-3 2-4 2-5 2-6 2-7 2-8 2-9 2-10 2-11 2-12 2-13 2-14 2-15 2-16 2-18 2-19 2-20 2-21 2-22 2-23 2-24 2-25 2-26 2-27 2-28 2-29 2-30 2-31

SECONDARY PORTAL

RIGID BARRIER

FLEXIBLE BARRIER

D0012 D0003 D0009 E0013 (106nos) E0014 (201nos) E0016A (730 nos) E0015 D0016A E0016B (70 nos) E0002 D0006 E0003 D0004 E0012 D0008 E0001b (2 nos.) E0001a (16 nos.) D0016B D0017 D0018 D0013 E0011 I0001 F0001a (16 nos) F0001b (1 no) D0014 D0015

N

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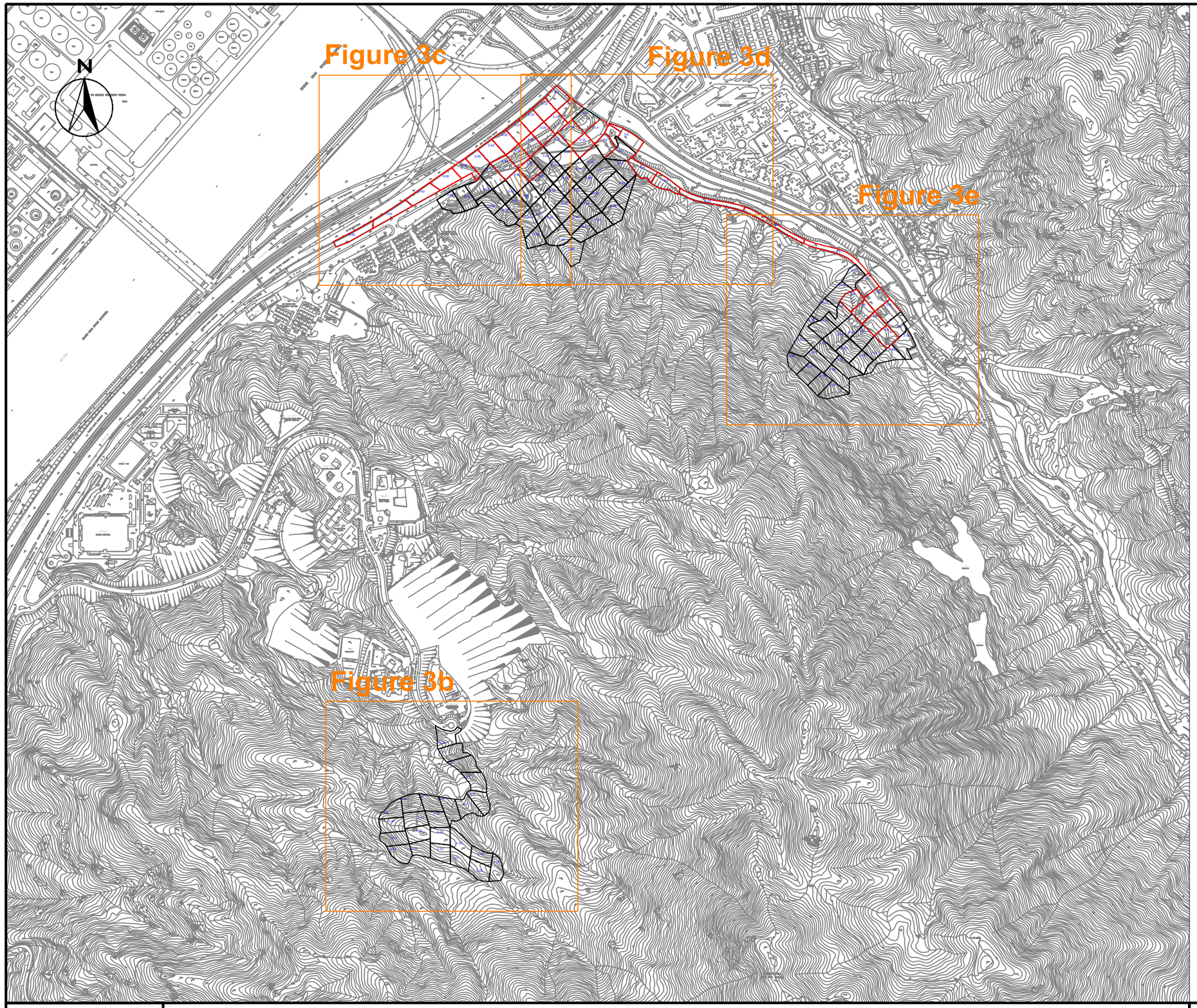
Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Location of Species of Conservation Importance (Site 2 Mui Tsz Lam Site)

SCALE	1:800 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 2i	REV 2



Legend

- Walkthrough Survey
- Sampling Survey

* Active searching was adopted in all sites for species other than Small Persimmon and Luofoshan Joint-fir

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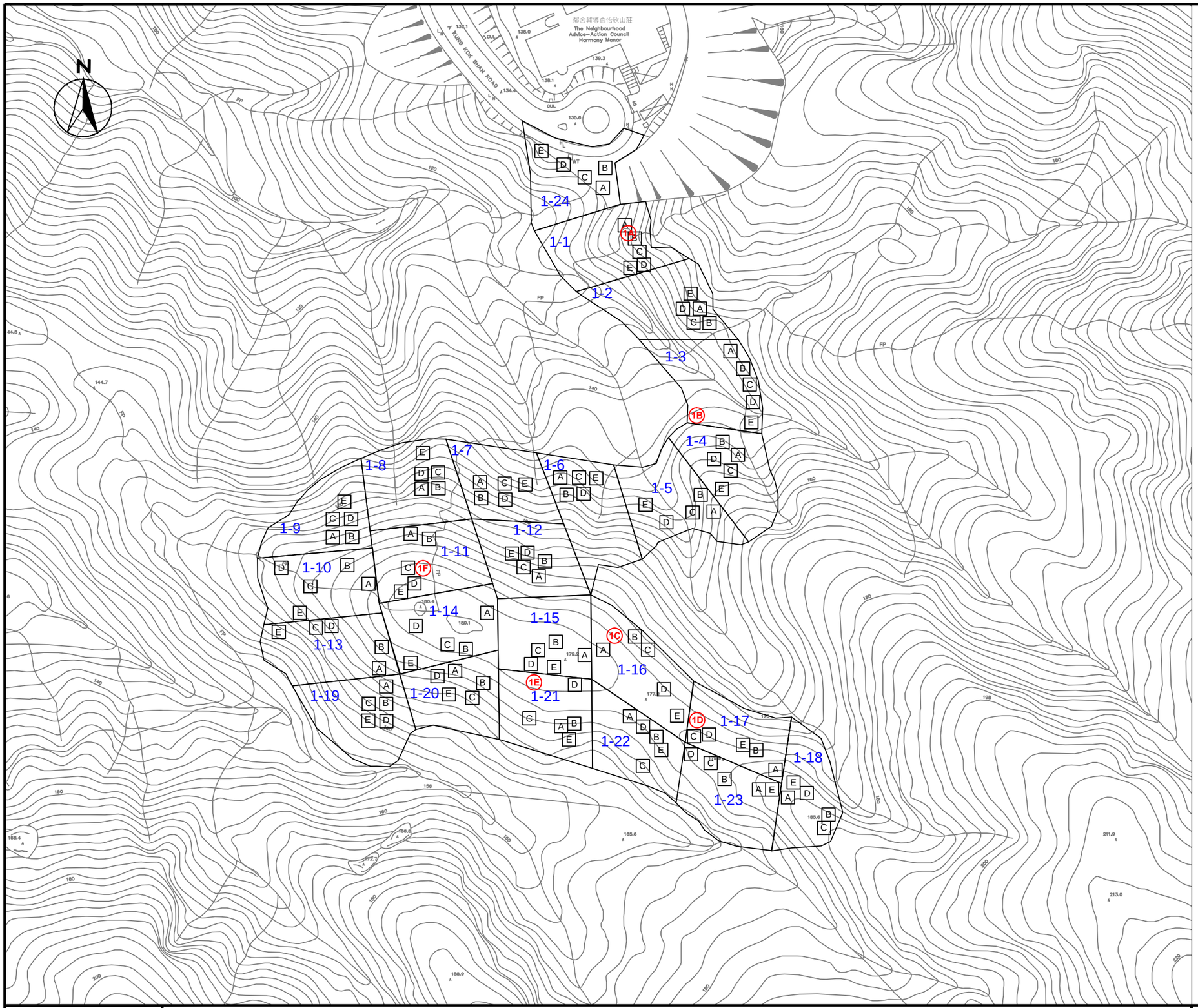
Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Survey Method (Key Plan)

SCALE	1:7000 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 3a	REV 2



Legend

- Walkthrough Survey
- Sampling Survey
- A — 5m x 5m Small Grid (For estimation of average density in the corresponding 1000m^2 grid)
- 1A — 5m x 5m Small Grid (For estimation of no. of transplantable Small Persimmon *Diospyros vaccinoides*)

* Active searching was adopted in all sites for species other than Small Persimmon and Luofoshan Joint-fir

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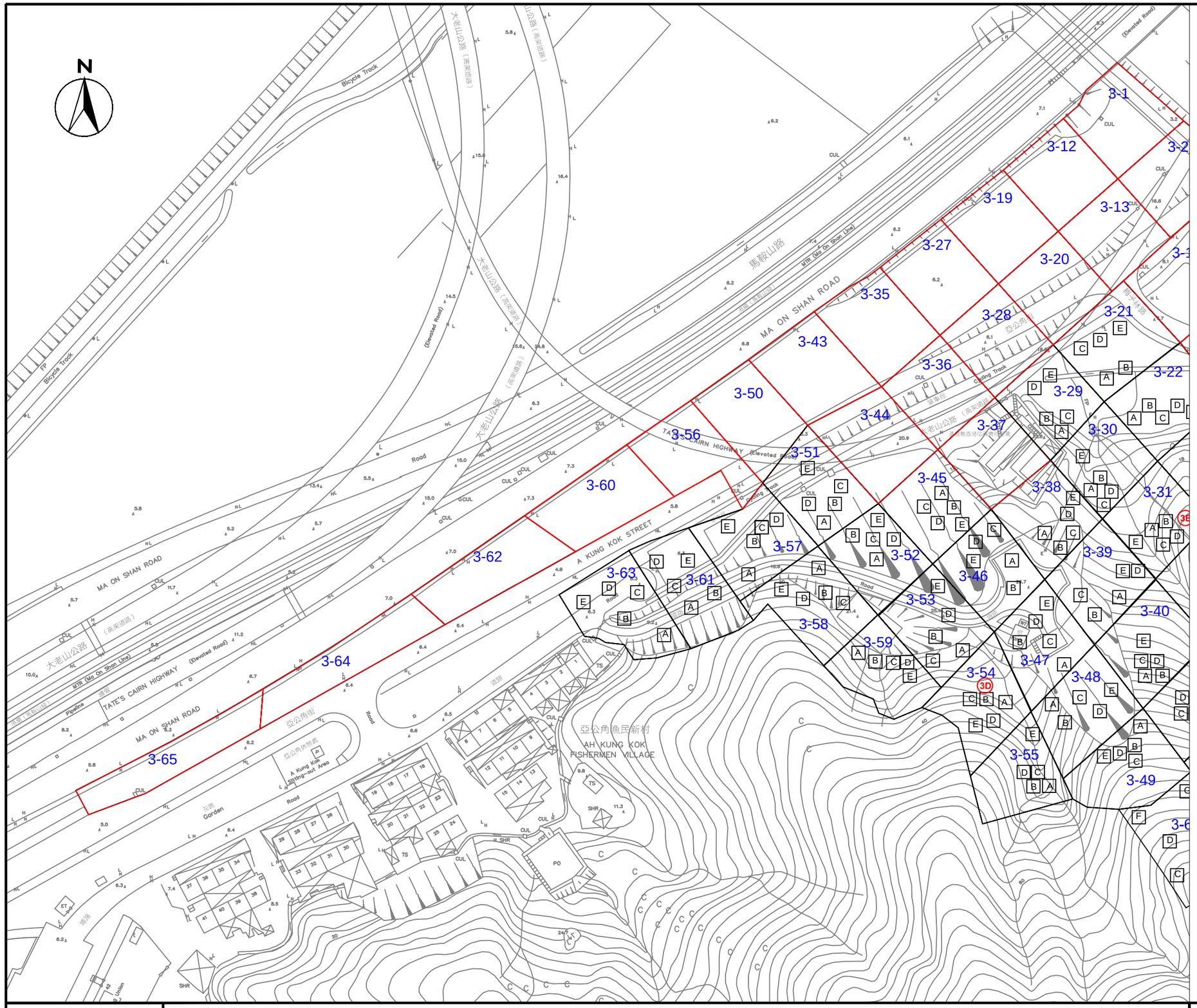
Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Survey Method

SCALE	1:1500 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 3b	REV 2



Legend

- Walkthrough Survey
- Sampling Survey
- A — 5m x 5m Small Grid (For estimation of average density in the corresponding 1000m^2 grid)
- 1A — 5m x 5m Small Grid (For estimation of no. of transplantable Small Persimmon *Diospyros vaccinoides*)

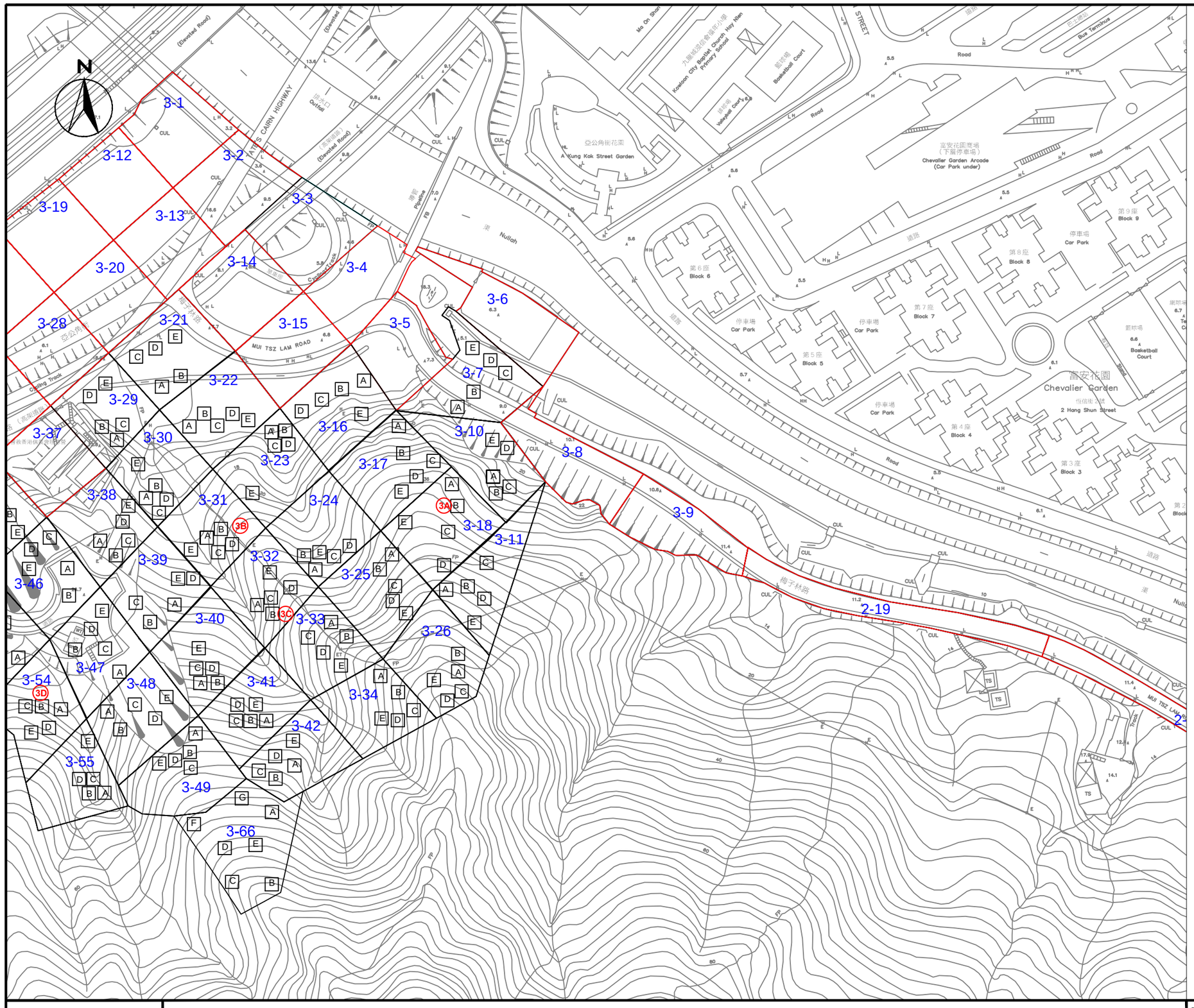
* Active searching was adopted in all sites for species other than Small Persimmon and Luofoshan Joint-fir

CINOTECH
Cinotech Consultants Limited

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Survey Method

SCALE	1:1500 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 3c	REV 2



Legend

- Walkthrough Survey
- Sampling Survey
- A — 5m x 5m Small Grid (For estimation of average density in the corresponding 1000m^2 grid)
- 1A — 5m x 5m Small Grid (For estimation of no. of transplantable Small Persimmon *Diospyros vaccinoides*)

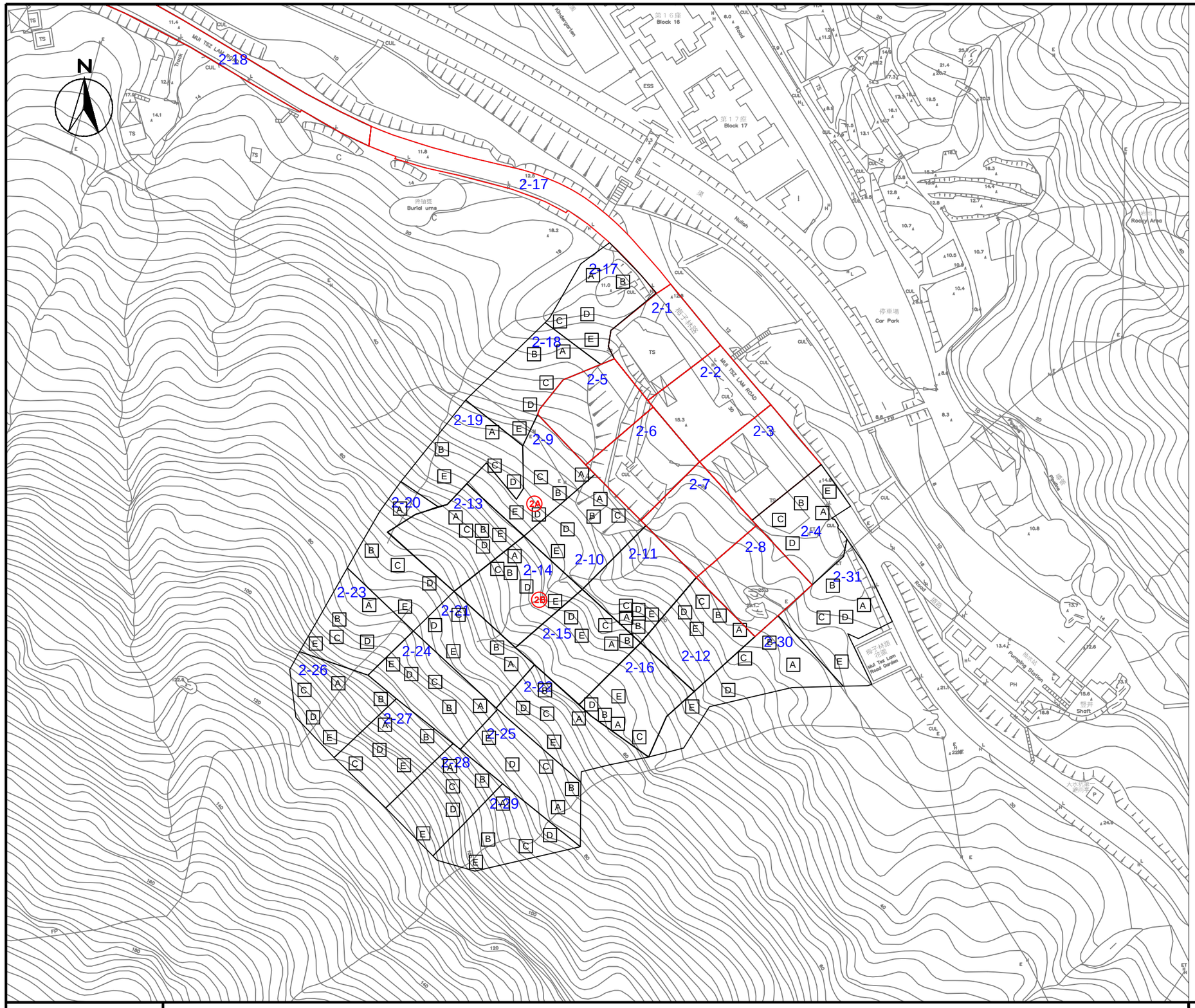
* Active searching was adopted in all sites for species other than Small Persimmon and Luofoshan Joint-fir

CINOTECH
Cinotech Consultants Limited

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Survey Method

SCALE	1:1500 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No.	3d
		REV	2



Legend

- Walkthrough Survey
- Sampling Survey
- A — 5m x 5m Small Grid (For estimation of average density in the corresponding 1000m^2 grid)
- 1A — 5m x 5m Small Grid (For estimation of no. of transplantable Small Persimmon *Diospyros vaccinoides*)

* Active searching was adopted in all sites for species other than Small Persimmon and Luofoshan Joint-fir

CINOTECH
Cinotech Consultants Limited

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Survey Method

SCALE	1:1500 @ A3	DATE	JUL 2020
CHECK	BC	DRAWN	MY
JOB No.	IA18064	FIGURE No. 3e	REV 1

N

ELEVATED ROAD SECTION

1-3

Existing slope too steep

CUT SLOPE

RETAINING WALL

CUT SLOPE

1-4

ELEVATED ROAD SECTION

1-5

1-6

1-7

1-8

CUT SLOPE

1-9

1-10

1-11

1-12

CUT SLOPE

BRIDGE B

FILLING TO ACCESS ROAD LEVEL

1-13

1-14

Accessible after forming of haul road

1-15

MAGAZINE SITE

1-16

1-20

1-21

1-19

VENTILATION SHAFT

1-22

1-17

1-18

1-23

CUT SLOPE

RETAINING WALL

CUT SLOPE

RETAINING WALL

CUT SLOPE

LEGEND

- Project boundary
- Survey Grid
- Works Area
- Protection Zone for Vegetation
- Gentle Area Accessible for Transplantation

CINOTECH

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Area Accessible for Transplantation of Small Persimmon (Site 1 Magazine Site)

SCALE	A3 1:8000	DATE	AUG 20
CHECK	BC	DRAWN	MY
PROJECT NO.	IA18064	FIGURE NO.	4a
		REV	–

N

2-17
2-18
2-19
2-20
2-23
2-26
2-1
2-2
2-3
2-4
2-5
2-6
2-7
2-8
2-9
2-10
2-11
2-12
2-13
2-14
2-15
2-16
2-21
2-22
2-24
2-25
2-27
2-28
2-29
2-30
2-31

Roadside plant (accessible)

Merely accessibe

Merely accessibe

SECONDARY PORTAL

Merely accessibe

Existing Slope too Steep

Existing slope too steep

Dense Vegetation

Roadside plant (accessible)

Existing slope too steep

Existing slope too steep and difficult to access due to height

RIGID BARRIER

FLEXIBLE BARRIER

Car Park

Mui Tsz Lam Road Garden

LEGEND

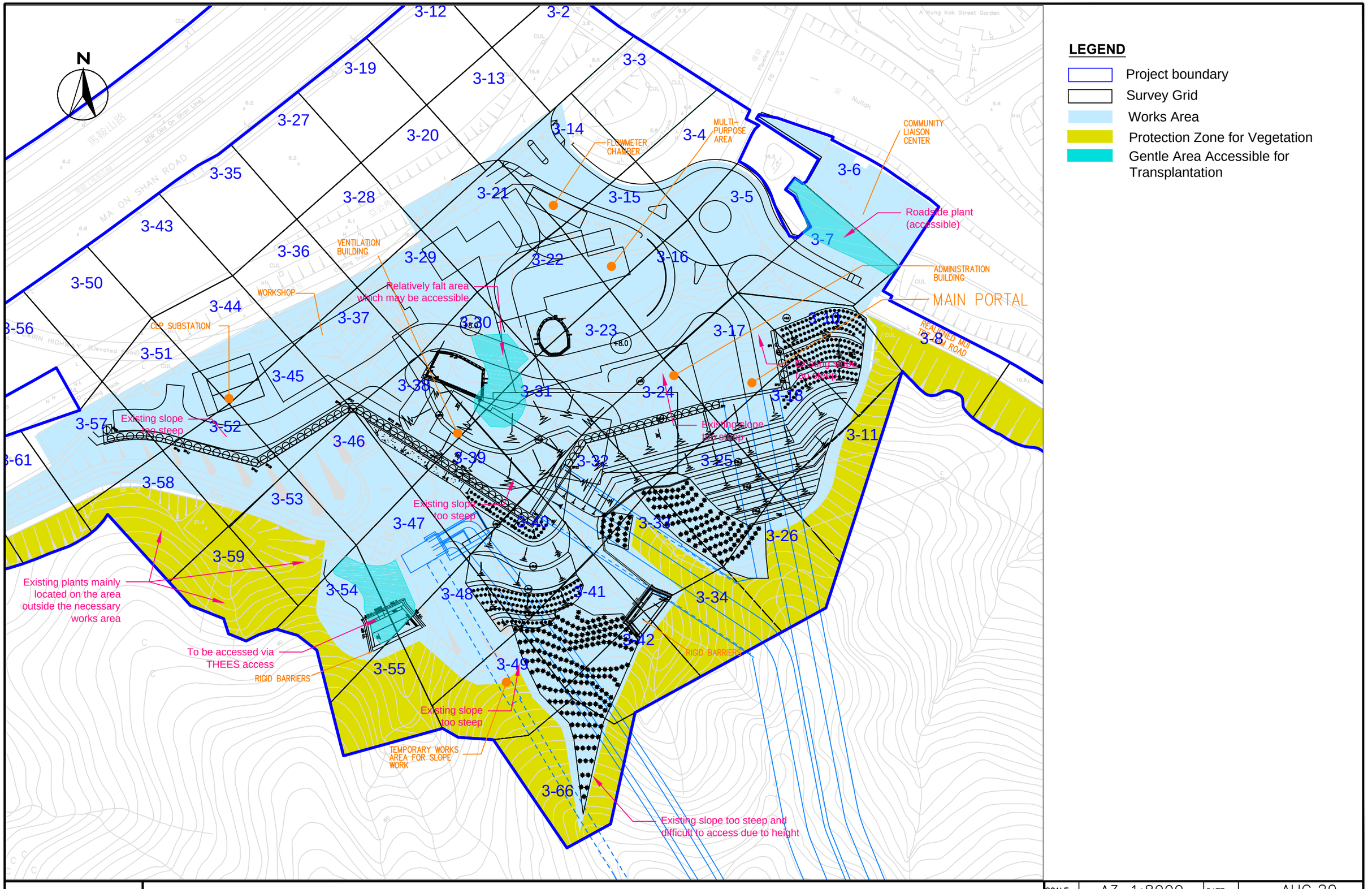
- Project boundary
- Survey Grid
- Works Area
- Protection Zone for Vegetation
- Gentle Area Accessible for Transplantation

CINOTECH

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Area Accessible for Transplantation of Small Persimmon(Site 2 Mui Tze Lam Site)

SCALE	A3 1:10000	DATE	AUG 20
CHECK	BC	DRAWN	MY
PROJECT NO.	IA18064	FIGURE NO. 4b	REV –



LEGEND

- Project boundary
- Survey Grid
- Works Area
- Protection Zone for Vegetation
- Gentle Area Accessible for Transplantation

CINOTECH

Contract No. SPW 09/2018
Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Area Accessible for Transplantation of Small Persimmon (Site 3 A Kung Kok Site)

SCALE	A3 1:8000	DATE	AUG 20
CHECK	BC	DRAWN	MY
PROJECT NO.	IA18064	FIGURE NO. 4c	REV –

APPENDIX A
VEGETATION SURVEY RESULTS

Appendix A - Vegetation Survey Results (Small Persimmon and Luofushan Joint-fir)

Project Title: Contract No. SPW 09 / 2018 Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Site 1 Magazine Site

Grid No.	Grid Area (m^2)	Small Persimmon *Diospyros vaccinioides*					
		Density (no./m^2)	Estimated Total Individuals	Percentage of Individuals in Different Height Ranges (m)			
				0-1	1-2	2-3	3+
1 - 1	1,096	0.424	465	60%	23%	2%	15%
1 - 2	1,095	0.088	96	9%	27%	45%	18%
1 - 3	1,067	0.192	205	58%	17%	17%	8%
1 - 4	1,050	0.080	84	20%	30%	50%	0%
1 - 5	1,068	0.280	299	37%	20%	17%	26%
1 - 6	1,086	0.584	634	62%	18%	12%	8%
1 - 7	952	0.224	213	43%	54%	4%	0%
1 - 8	1,103	0.184	203	26%	39%	35%	0%
1 - 9	954	0.176	168	23%	59%	14%	5%
1 - 10	1,096	0.024	26	33%	67%	0%	0%
1 - 11	1,093	0.464	507	26%	50%	17%	7%
1 - 12	1,000	0.456	456	12%	23%	42%	23%
1 - 13	1,097	0.192	211	58%	29%	13%	0%
1 - 14	1,100	0.336	370	81%	12%	7%	0%
1 - 15	1,037	0.024	25	0%	100%	0%	0%
1 - 16	1,139	0.144	164	6%	50%	39%	6%
1 - 17	864	0.304	263	42%	26%	24%	8%
1 - 18	889	0.080	71	20%	50%	0%	30%
1 - 19	1,080	0.304	328	42%	50%	8%	0%
1 - 20	915	0.168	154	62%	14%	24%	0%
1 - 21	1,064	0.520	553	60%	31%	9%	0%
1 - 22	942	0.552	520	55%	6%	30%	9%
1 - 23	1,064	0.072	77	44%	44%	11%	0%
1 - 24	1,086	0.000	0	0%	0%	0%	0%
Total Estimated Individual			**6,092 (~6,090)**	**45%**	**29%**	**18%**	**8%**

Grid No.	Average Coverage of Luofushan Joint-fir *Gnetum luofuense*	
	%	m^2
1 - 1	20	219
1 - 2	4	44
1 - 3	12	128
1 - 4	0	0
1 - 5	4	43
1 - 6	8	87
1 - 7	1	10
1 - 8	3	33
1 - 9	7	67
1 - 10	1	11
1 - 11	17	186
1 - 12	1	10
1 - 13	0	0
1 - 14	14	154
1 - 15	0	0
1 - 16	6	68
1 - 17	8	69
1 - 18	5	44
1 - 19	4	43
1 - 20	41	375
1 - 21	9	96
1 - 22	4	38
1 - 23	7	74
1 - 24	12	130
Average Coverage		**8%**
Esimated Coverage (m^2)		**1,929 (~1,930)**

Appendix A - Vegetation Survey Results (Small Persimmon and Luofushan Joint-fir)

Project Title: Contract No. SPW 09 / 2018 Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Site 2 Mui Tzs Lam Site

Grid No.	Grid Area (m^2)	Small Persimmon *Diospyros vaccinioides*					
		Density (no./m^2)	Estimated Total Individuals	Percentage of Individuals in Different Height Ranges (m)			
				0-1	1-2	2-3	3+
2 - 1	1,022	0.000	0	0%	0%	0%	0%
2 - 2	1,044	0.000	0	0%	0%	0%	0%
2 - 3	1,018	0.000	0	0%	0%	0%	0%
2 - 4	906	0.000	0	0%	0%	0%	0%
2 - 5	963	0.055	53	47%	47%	6%	0%
2 - 6	931	0.000	0	0%	0%	0%	0%
2 - 7	967	0.032	31	55%	35%	6%	3%
2 - 8	932	0.012	11	64%	27%	9%	0%
2 - 9	907	0.500	454	60%	31%	7%	1%
2 - 10	1,008	0.236	238	30%	55%	16%	0%
2 - 11	960	0.080	77	30%	40%	30%	0%
2 - 12	943	0.011	11	25%	0%	25%	50%
2 - 13	1,039	0.288	299	81%	19%	0%	0%
2 - 14	1,034	0.584	604	74%	12%	10%	4%
2 - 15	1,042	0.264	275	48%	27%	18%	6%
2 - 16	921	0.480	442	58%	30%	10%	2%
2 - 17	960	0.216	207	100%	0%	0%	0%
2 - 18	988	0.232	229	97%	3%	0%	0%
2 - 19	990	2.104	2,083	85%	3%	1%	10%
2 - 20	997	0.328	327	85%	12%	0%	2%
2 - 21	917	0.288	264	75%	11%	8%	6%
2 - 22	1,032	0.144	149	44%	33%	11%	11%
2 - 23	913	0.168	153	81%	10%	10%	0%
2 - 24	997	0.232	231	66%	17%	14%	3%
2 - 25	1,000	0.072	72	67%	0%	11%	22%
2 - 26	926	0.264	244	70%	12%	15%	3%
2 - 27	926	0.152	141	84%	5%	11%	0%
2 - 28	914	0.168	154	81%	14%	5%	0%
2 - 29	921	0.248	228	55%	16%	13%	16%
2 - 30	1,151	0.384	442	67%	8%	17%	8%
2 - 31	1,142	0.104	119	85%	15%	0%	0%
Estimated Total Individual			**7,538 (~7,540)**	**73%**	**14%**	**7%**	**6%**

Grid No.	Average Coverage of Luofushan Joint-fir *Gnetum luofuense*	
	%	m^2
2 - 1	0	0
2 - 2	0	0
2 - 3	0	0
2 - 4	20	181
2 - 5	24	231
2 - 6	0	0
2 - 7	20	193
2 - 8	58	541
2 - 9	59	535
2 - 10	30	302
2 - 11	6	58
2 - 12	34	321
2 - 13	10	104
2 - 14	23	238
2 - 15	5	52
2 - 16	5	46
2 - 17	0	0
2 - 18	23	227
2 - 19	4	40
2 - 20	16	160
2 - 21	3	28
2 - 22	3	31
2 - 23	2	18
2 - 24	7	70
2 - 25	0	0
2 - 26	15	139
2 - 27	19	176
2 - 28	1	9
2 - 29	13	120
2 - 30	0	0
2 - 31	14	160
Average Coverage		**13%**
Estimated Coverage (m^2)		**3,978 (~3,980)**

Appendix A - Vegetation Survey Results (Small Persimmon and Luofushan Joint-fir)

Project Title: Contract No. SPW 09 / 2018 Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Site 3 A Kung Kok Site

Grid No.	Grid Area (m^2)	Small Persimmon *Diospyros vaccinioides*					
		Density (no./m^2)	Estimated Total Individuals	Percentage of Individuals in Different Height Ranges (m)			
				0-1	1-2	2-3	3+
3 - 1	1,021	0.000	0	0%	0%	0%	0%
3 - 2	1,075	0.000	0	0%	0%	0%	0%
3 - 3	1,100	0.000	0	0%	0%	0%	0%
3 - 4	948	0.000	0	0%	0%	0%	0%
3 - 5	895	0.000	0	0%	0%	0%	0%
3 - 6	1,078	0.000	0	0%	0%	0%	0%
3 - 7	1,092	0.016	17	100%	0%	0%	0%
3 - 8	1,000	0.000	0	0%	0%	0%	0%
3 - 9	937	0.000	0	0%	0%	0%	0%
3 - 10	1,057	0.392	414	22%	31%	27%	20%
3 - 11	958	0.767	735	49%	24%	23%	5%
3 - 12	937	0.000	0	0%	0%	0%	0%
3 - 13	916	0.000	0	0%	0%	0%	0%
3 - 14	1,097	0.000	0	0%	0%	0%	0%
3 - 15	969	0.000	0	0%	0%	0%	0%
3 - 16	1,063	0.010	10	50%	50%	0%	0%
3 - 17	1,068	0.702	749	39%	21%	19%	21%
3 - 18	1,104	1.067	1,178	29%	50%	20%	1%
3 - 19	969	0.000	0	0%	0%	0%	0%
3 - 20	932	0.000	0	0%	0%	0%	0%
3 - 21	1,107	0.000	0	0%	0%	0%	0%
3 - 22	1,032	0.000	0	0%	0%	0%	0%
3 - 23	1,010	0.072	73	56%	0%	22%	22%
3 - 24	971	0.392	381	65%	14%	20%	0%
3 - 25	1,066	0.889	948	29%	50%	20%	1%
3 - 26	1,091	0.344	375	47%	51%	2%	0%
3 - 27	993	0.000	0	0%	0%	0%	0%
3 - 28	931	0.000	0	0%	0%	0%	0%
3 - 29	912	0.000	0	0%	0%	0%	0%
3 - 30	909	0.016	15	50%	50%	0%	0%
3 - 31	921	0.384	354	81%	6%	6%	6%
3 - 32	942	0.480	452	27%	27%	23%	23%
3 - 33	975	0.896	874	54%	18%	21%	7%
3 - 34	938	0.272	255	32%	68%	0%	0%
3 - 35	1,084	0.000	0	0%	0%	0%	0%
3 - 36	938	0.000	0	0%	0%	0%	0%
3 - 37	911	0.000	0	0%	0%	0%	0%
3 - 38	960	0.104	100	85%	8%	8%	0%
3 - 39	1,009	0.224	226	82%	18%	0%	0%
3 - 40	1,070	0.672	719	70%	21%	8%	0%
3 - 41	962	0.552	531	49%	35%	16%	0%
3 - 42	911	0.408	372	76%	24%	0%	0%
3 - 43	1,105	0.000	0	0%	0%	0%	0%
3 - 44	1,101	0.000	0	0%	0%	0%	0%
3 - 45	934	0.032	30	100%	0%	0%	0%
3 - 46	990	0.072	71	67%	11%	22%	0%
3 - 47	967	0.080	77	80%	20%	0%	0%
3 - 48	1,075	0.032	34	25%	0%	75%	0%
3 - 49	1,065	0.688	733	57%	24%	17%	1%
3 - 50	1,021	0.000	0	0%	0%	0%	0%
3 - 51	992	0.040	40	100%	0%	0%	0%
3 - 52	931	0.032	30	100%	0%	0%	0%
3 - 53	1,028	0.128	132	56%	38%	0%	6%
3 - 54	1,022	0.488	499	38%	16%	41%	5%
3 - 55	910	0.224	204	86%	11%	4%	0%
3 - 56	965	0.000	0	0%	0%	0%	0%
3 - 57	1,061	0.000	0	0%	0%	0%	0%

Grid No.	Average Coverage of Luofushan Joint-fir *Gnetum luofuense*	
	%	m^2
3 - 1	0	0
3 - 2	0	0
3 - 3	0	0
3 - 4	0	0
3 - 5	0	0
3 - 6	0	0
3 - 7	0	0
3 - 8	5	50
3 - 9	5	47
3 - 10	0	0
3 - 11	6	57
3 - 12	0	0
3 - 13	0	0
3 - 14	0	0
3 - 15	0	0
3 - 16	23	244
3 - 17	21	224
3 - 18	22	243
3 - 19	0	0
3 - 20	0	0
3 - 21	0	0
3 - 22	0	0
3 - 23	4	40
3 - 24	19	184
3 - 25	21	224
3 - 26	0	0
3 - 27	0	0
3 - 28	0	0
3 - 29	0	0
3 - 30	0	0
3 - 31	1	9
3 - 32	18	170
3 - 33	0	0
3 - 34	0	0
3 - 35	0	0
3 - 36	0	0
3 - 37	0	0
3 - 38	0	0
3 - 39	2	20
3 - 40	4	43
3 - 41	1	10
3 - 42	0	0
3 - 43	0	0
3 - 44	0	0
3 - 45	2	19
3 - 46	1	10
3 - 47	6	58
3 - 48	10	108
3 - 49	11	117
3 - 50	0	0
3 - 51	0	0
3 - 52	0	0
3 - 53	1	10
3 - 54	26	266
3 - 55	7	64
3 - 56	0	0
3 - 57	0	0

Appendix A - Vegetation Survey Results (Small Persimmon and Luofushan Joint-fir)

Project Title: Contract No. SPW 09 / 2018 Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Site 3 A Kung Kok Site

Grid No.	Grid Area (m^2)	Small Persimmon *Diospyros vaccinioides*					
		Density (no./m^2)	Estimated Total Individuals	Percentage of Individuals in Different Height Ranges (m)			
				0-1	1-2	2-3	3+
3 - 58	1,108	0.136	151	59%	24%	18%	0%
3 - 59	905	0.376	340	43%	17%	26%	15%
3 - 60	1,087	0.000	0	0%	0%	0%	0%
3 - 61	1,093	0.000	0	0%	0%	0%	0%
3 - 62	1,050	0.000	0	0%	0%	0%	0%
3 - 63	1,101	0.000	0	0%	0%	0%	0%
3 - 64	1,043	0.000	0	0%	0%	0%	0%
3 - 65	943	0.000	0	0%	0%	0%	0%
3 - 66	1,382	1.256	1736	14%	54%	29%	4%
Estimated Total Individual			**12,855 (~12,860)**	**44%**	**32%**	**19%**	**5%**

Grid No.	Average Coverage of Luofushan Joint-fir *Gnetum luofuense*	
	%	m^2
3 - 58	30	332
3 - 59	4	36
3 - 60	0	0
3 - 61	0	0
3 - 62	0	0
3 - 63	4	44
3 - 64	0	0
3 - 65	0	0
3 - 66	25	346
Average Coverage		**4%**
Estimated Coverage (m^2)		**2,975 (~2,980)**

Appendix A - Vegetation Survey Results (Species other than Small Persimmon and Luofoshan Joint-fir)

Project Title: Contract No. SPW 09 / 2018 Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works

Site	Plant / Colony No.	No. of individuals	Chinese Name	Common Name	Species Name	Height (m)	DBH (m)	Crown Spread (m)	Form	Health	Amenity Value	Structural Condition	Suitability for Transplanting	Recommendations	Justifications						Remarks
															A	H	R	T	C	S	
1	H0001	4	香港安蘭	Purple Bulb Orchid	*Ania hongkongensis*	-	-	-	Good	Fair	-	-	Medium	Retain							-
1	H0002	1	香港安蘭	Purple Bulb Orchid	*Ania hongkongensis*	-	-	-	Fair	Fair	-	-	Medium	Transplant	1						On slope, grow next to tree
2	D0003	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	3	0.05	2	Fair	Fair	Medium	Good	Low	Fell	1		1	1	1		On slope, near u-channel
2	D0004	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	1.7	0.01	1.5	Fair	Good	Medium	Good	Low	Retain							On rocky slope
2	D0006	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	9	-	7	Fair	Fair	Medium	Fair	Low	Fell	1		1	1	1		On slope, inaccessible
2	D0008	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	4	0.17	6	Poor	Poor	Low	Poor	Low	Fell	1	1	1	1	1		On rock, 80% dieback
2	D0009	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	6	0.25	4	Poor	Poor	Low	Poor	Low	Fell	1	1	1	1	1		On slope, uprooted, dying leaves
2	D0011	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	5	0.12	3	Fair	Fair	Medium	Fair	Medium	Retain			1				tilted trunk
2	D0012	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	8	0.23	5.5	Fair	Fair	Medium	Fair	Medium	Retain							TB0175
2	D0013	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	6	0.12	4	Good	Good	High	Good	Medium	Retain							TB0244
2	D0014	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	6	0.08	3	Fair	Good	High	Fair	Low	Retain							Inclined, grow between rocks
2	D0015	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	6	0.08	3	Fair	Good	High	Fair	Low	Retain							Inclined, grow between rocks
2	D0016A	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	8	0.12	3	Fair	Poor	Low	Fair	Low	Fell	1	1		1	1		TB0043, invaded by termites
2	D0016B	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	3	0.05	1	Good	Good	Medium	Good	High	Transplant	1						Immature
2	D0017	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	1.3	0.03	0.3	Good	Good	Medium	Good	High	Transplant	1						Immature
2	D0018	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	1.6	0.05	0.5	Good	Good	Medium	Good	High	Transplant	1						Immature, tangled by liana
2	E0001A	16	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Fair	Fair	-	-	Medium	Transplant	1						-
2	E0001b	2	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Fair	Poor	-	-	Low	Fell	1	1	1		1		Grow on bare rocks along the stream
2	E0002	1	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Fair	Fair	-	-	Medium	Transplant	1						Grow on rocks along the stream
2	E0003	2	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Good	-	-	Medium	Transplant	1						Grow near stream
2	E0011	1	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Good	-	-	Low	Retain							Immature, grow on rock
2	E0012	1	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Good	-	-	Medium	Retain							Immature
2	E0013	106	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Fair	-	-	Low	Retain							
2	E0014	21	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Good	-	-	Medium	Retain							-
2	E0015	1	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Good	-	-	High	Retain							Immature
2	E0016A*	730	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Good	-	-	Medium	Retain							Many are growing on rock
2	E0016B*	70	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Good	-	-	Medium	Transplant (42 nos.) & Fell (28 nos.)	1			1	1		
2	F0001A	16	苞舌蘭	Butttercup Orchid	*Spathoglottis pubescens*	-	-	-	Good	Good	-	-	Medium	Transplant	1						On slope
2	F0001B	1	苞舌蘭	Butttercup Orchid	*Spathoglottis pubescens*	-	-	-	Good	Good	-	-	Medium	Fell	1			1			Grows between rocks
2	I0001	1	香港鷹爪花	Hong Kong Eagle's Claw	*Artabotrys hongkongensis*	-	-	5m	Fair	Fair	-	-	Low	Fell	1			1			Scandent shrub, grows between rocks
3	C0001	1	土沉香	Incense Tree	*Aquilaria sinensis*	0.6	<0.01	0.25	Good	Good	Low	Good	Medium	Transplant	1						On slope
3	D0001	2	魚骨木	Butulang Canthium	*Canthium dicoccum*	8	0.15	4	Poor	Fair	Medium	Fair	Low	Fell	1		1	1	1		On slope, leaning
3	D0002	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	8	0.15	8	Good	Fair	Medium	Fair	Low	Fell	1		1	1	1		On slope
3	D0010	1	魚骨木	Butulang Canthium	*Canthium dicoccum*	8	0.23	4.5	Good	Fair	Medium	Fair	Low	Fell	1		1	1	1		On slope, slight leaning, watersprout
3	E0004	7	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Fair	Fair	-	-	Low	Transplant	1						Grow on slope near stream
3	E0005*	50	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Good	Fair - Good	-	-	Low	Fell	1		1		1		Grow on steep slope near stream
3	E0006	1	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Fair	Fair	-	-	Low	Retain							Grow on steep, seeping rock
3	E0007*	100	金毛狗	Lamb of Tartary	*Cibotium barometz*	-	-	-	Fair	Poor - Good	-	-	Low	Retain							Some grow on steep slope near stream

* No. of individual was estimated on-site based on the density in a small area.

Justifications

A - Affected by project (located within works area)
H - Poor health, form and/or structural condition
R - Imbalanced root ball
T - Technically impractical and not cost-effective for transplantation
C - Common in Hong Kong that removal would not affect survival of the population of the species
S - Suitable receptor site not available

APPENDIX B
PHOTOGRAPHIC RECORD

H0001 Purple Bulb Orchid *Ania hongkongensis*

H0002 Purple Bulb Orchid *Ania hongkongensis*

Appendix B1 – Photographic Record (Site 1)

D0003 Butulang Canthium *Canthium dicoccum*

D0004 Butulang Canthium *Canthium dicoccum*

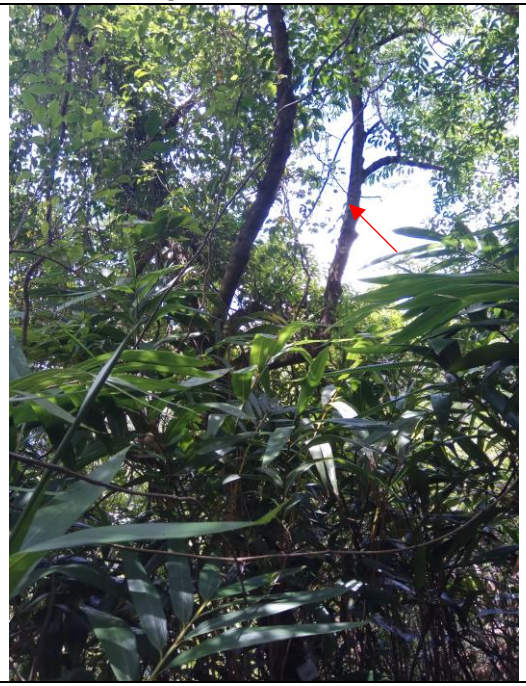
D0006 Butulang Canthium *Canthium dicoccum*

D0008 Butulang Canthium *Canthium dicoccum*

Appendix B2 – Photographic Record (Site 2)

D0011 Butulang Canthium *Canthium dicoccum*

Close up of D0011 Butulang Canthium *Canthium dicoccum*



D0012 Butulang Canthium *Canthium dicoccum*

D0013 Butulang Canthium *Canthium dicoccum*

Appendix B2 – Photographic Record (Site 2)

D0014 Butulang Canthium *Canthium dicoccum*

D0015 Butulang Canthium *Canthium dicoccum*

D0016A Butulang Canthium *Canthium dicoccum*

D0016B Butulang Canthium *Canthium dicoccum*

Appendix B2 – Photographic Record (Site 2)

D0017 Butulang Canthium *Canthium dicoccum*

D0018 Butulang Canthium *Canthium dicoccum*

E0001a Lamb of Tartary *Cibotium barometz*

E0001b Lamb of Tartary *Cibotium barometz*

Appendix B2 – Photographic Record (Site 2)

E0002 Lamb of Tartary *Cibotium barometz*

E0003 Lamb of Tartary *Cibotium barometz*

E0011 Lamb of Tartary *Cibotium barometz*

E0012 Lamb of Tartary *Cibotium barometz*

Appendix B2 – Photographic Record (Site 2)

E0013 Lamb of Tartary *Cibotium barometz*

E0014 Lamb of Tartary *Cibotium barometz*

E0015 Lamb of Tartary *Cibotium barometz*

Appendix B2 – Photographic Record (Site 2)

E0016 Lamb of Tartary *Cibotium barometz*

Appendix B2 – Photographic Record (Site 2)

F0001A Buttercup Orchid *Spathoglottis pubescens*

F001A Buttercup Orchid *Spathoglottis pubescens*

F001A Zoom up of Buttercup Orchid *Spathoglottis pubescens*

F001B Buttercup Orchid *Spathoglottis pubescens* (grows between rocks)

Appendix B2 – Photographic Record (Site 2)

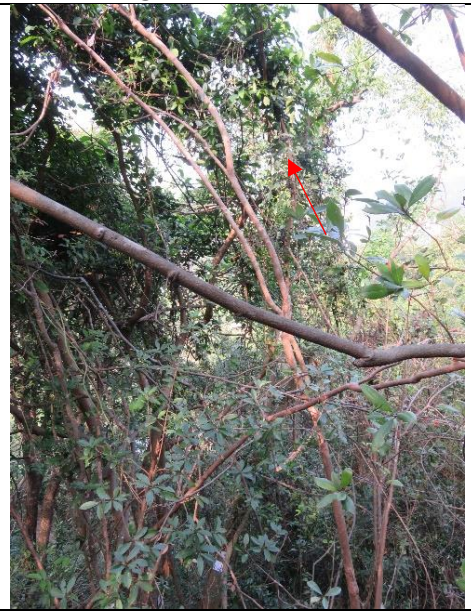
I0001 Hong Kong Eagle's Claw (*Artabotrys hongkongensis*)

Appendix B2 – Photographic Record (Site 2)

C0001 Incense Tree *Aquilaria sinensis*

D0001 Butulang Canthium *Canthium dicoccum*

D0002 Butulang Canthium *Canthium dicoccum*



D0010 Butulang Canthium *Canthium dicoccum*

Appendix B3 – Photographic Record (Site 3)

E0004 Lamb of Tartary *Cibotium barometz*

E0006 Lamb of Tartary *Cibotium barometz*

E0005 Lamb of Tartary *Cibotium barometz*

Appendix B3 – Photographic Record (Site 3)

E0007 Lamb of Tartary *Cibotium barometz*

Appendix B3 – Photographic Record (Site 3)

Grid 1-12

Grid 3-25

Grid 3-16

Example of Small Persimmon *Diospyros Vaccinioides*

Appendix B4 – Photographic Record (Example of Floral Species of Conservation Importance)

Grid 2-5

Grid 3-55

Grid 3-41

Grid 1-9

Example of Small Persimmon *Diospyros Vaccinioides*

Appendix B4 – Photographic Record (Example of Floral Species of Conservation Importance)

Grid 3-10

Grid 2-5

Grid 3-11

Grid 3-25

Example of Luofushan Joint-fir *Gnetum lufuoense*

Appendix B4 – Photographic Record (Example of Floral Species of Conservation Importance)

APPENDIX C
ESTIMATION OF QUANTITY OF AFFECTED SMALL PERSIMMON AND LUOFUSHAN JOINT-FIR

Appendix C - Quantity of Affected Small Persimmon and Luofushan Joint-fir

Site 1 **Magazine Site**

Grid No.	Works Area (m^2)	Small Persimmon *Diospyros vaccinioides*		Luofushan Joint-fir *Gnetum luofuense*	
		Density (no./m^2)	Affected Individuals	% Coverage	Affected Area (m^2)
1 - 1	935.9	0.424	397	20	187
1 - 2	1,003.2	0.088	88	4	40
1 - 3	806.2	0.192	155	12	97
1 - 4	827.9	0.080	66	0	0
1 - 5	1,016.1	0.280	285	4	41
1 - 6	1,086.0	0.584	634	8	87
1 - 7	894.2	0.224	200	1	9
1 - 8	887.5	0.184	163	3	27
1 - 9	719.5	0.176	127	7	50
1 - 10	1,054.0	0.024	25	1	11
1 - 11	1,093.0	0.464	507	17	186
1 - 12	1,000.0	0.456	456	1	10
1 - 13	870.1	0.192	167	0	0
1 - 14	1,100.0	0.336	370	14	154
1 - 15	1,030.9	0.024	25	0	0
1 - 16	840.7	0.144	121	6	50
1 - 17	620.9	0.304	189	8	50
1 - 18	457.2	0.080	37	5	23
1 - 19	378.2	0.304	115	4	15
1 - 20	807.0	0.168	136	41	331
1 - 21	843.3	0.520	439	9	76
1 - 22	734.0	0.552	405	4	29
1 - 23	784.8	0.072	57	7	55
1 - 24	1,086.0	0.000	0	12	130
Total Area	**20,876.6**	**Total Individual**	**5,164** (~ 5,160)	**Total Area**	**1,658** (~1,660)

Appendix C - Quantity of Affected Small Persimmon and Luofushan Joint-fir

Site 2 Mui Tzs Lam Site

Grid No.	Works Area (m^2)	Small Persimmon *Diospyros vaccinioides*		Luofushan Joint-fir *Gnetum luofuense*	
		Density (no./m^2)	Affected Individuals	% Coverage	Affected Area (m^2)
2 - 1	1,022	0.000	0	0	0
2 - 2	1,044	0.000	0	0	0
2 - 3	1,018	0.000	0	0	0
2 - 4	906.0	0.000	0	20	181
2 - 5	963.0	0.055	53	24	231
2 - 6	931.0	0.000	0	0	0
2 - 7	967.0	0.032	31	20	193
2 - 8	932.0	0.012	11	58	541
2 - 9	907.0	0.500	454	59	535
2 - 10	1,008.0	0.236	238	30	302
2 - 11	960.0	0.080	77	6	58
2 - 12	910.8	0.011	10	34	310
2 - 13	930.6	0.288	268	10	93
2 - 14	1,034.0	0.584	604	23	238
2 - 15	1,031.7	0.264	272	5	52
2 - 16	452.2	0.480	217	5	23
2 - 17	524.1	0.216	113	0	0
2 - 18	409.8	0.232	95	23	94
2 - 19	491.5	2.104	1,034	4	20
2 - 20	261.3	0.328	86	16	42
2 - 21	559.7	0.288	161	3	17
2 - 22	190.7	0.144	27	3	6
2 - 23	20.5	0.168	3	2	0
2 - 24	245.3	0.232	57	7	17
2 - 25	104.1	0.072	7	0	0
2 - 26	312.1	0.264	82	15	47
2 - 27	380.5	0.152	58	19	72
2 - 28	223.6	0.168	38	1	2
2 - 29	60.4	0.248	15	13	8
2 - 30	469.7	0.384	180	0	0
2 - 31	1,053.0	0.104	110	14	147
Total Area	**20,323.6**	**Total Individual**	**4,301**	**Total Individual**	**3,229**
			(~4,300)		**(~3,230)**

Appendix C - Quantity of Affected Small Persimmon and Luofushan Joint-fir

Site 3 A Kung Kok Site

Grid No.	Works Area (m^2)	Small Persimmon *Diospyros vaccinioides*		Luofushan Joint-fir *Gnetum luofuense*	
		Density (no./m^2)	Affected Individuals	% Coverage	Affected Area (m^2)
3 - 1	0.0	0.000	0	0	0
3 - 2	1.4	0.000	0	0	0
3 - 3	0.0	0.000	0	0	0
3 - 4	280.0	0.000	0	0	0
3 - 5	885.4	0.000	0	0	0
3 - 6	1,073.8	0.000	0	0	0
3 - 7	1,090.6	0.016	17	0	0
3 - 8	913.4	0.000	0	5	46
3 - 9	0.0	0.000	0	5	0
3 - 10	905.3	0.392	355	0	0
3 - 11	315.7	0.767	242	6	19
3 - 12	0.0	0.000	0	0	0
3 - 13	54.3	0.000	0	0	0
3 - 14	1,097.0	0.000	0	0	0
3 - 15	969.0	0.000	0	0	0
3 - 16	1,063.0	0.010	10	23	244
3 - 17	1,068.0	0.702	749	21	224
3 - 18	1,101.2	1.067	1,175	22	242
3 - 19	969.0	0.000	0	0	0
3 - 20	932.0	0.000	0	0	0
3 - 21	1,107.0	0.000	0	0	0
3 - 22	1,032.0	0.000	0	0	0
3 - 23	1,010.0	0.072	73	4	40
3 - 24	971.0	0.392	381	19	184
3 - 25	1,066.0	0.889	948	21	224
3 - 26	305.2	0.344	105	0	0
3 - 27	993.0	0.000	0	0	0
3 - 28	931.0	0.000	0	0	0
3 - 29	912.0	0.000	0	0	0
3 - 30	909.0	0.016	15	0	0
3 - 31	921.0	0.384	354	1	9
3 - 32	942.0	0.480	452	18	170
3 - 33	680.0	0.896	609	0	0
3 - 34	67.0	0.272	18	0	0
3 - 35	1,084.0	0.000	0	0	0
3 - 36	938.0	0.000	0	0	0
3 - 37	911.0	0.000	0	0	0
3 - 38	960.0	0.104	100	0	0
3 - 39	1,009.0	0.224	226	2	20
3 - 40	1,069.9	0.672	719	4	43
3 - 41	369.5	0.552	204	1	4
3 - 42	519.0	0.408	212	0	0
3 - 43	1,105.0	0.000	0	0	0
3 - 44	1,101.0	0.000	0	0	0
3 - 45	934.0	0.032	30	2	19
3 - 46	990.0	0.072	71	1	10
3 - 47	892.1	0.080	71	6	54
3 - 48	845.7	0.032	27	10	85
3 - 49	406.0	0.688	279	11	45
3 - 50	1,021.0	0.000	0	0	0
3 - 51	640.3	0.040	26	0	0

Appendix C - Quantity of Affected Small Persimmon and Luofushan Joint-fir

Site 3 A Kung Kok Site

Grid No.	Works Area (m^2)	Small Persimmon *Diospyros vaccinioides*		Luofushan Joint-fir *Gnetum luofuense*	
		Density (no./m^2)	Affected Individuals	% Coverage	Affected Area (m^2)
3 - 52	862.5	0.032	28	0	0
3 - 53	445.6	0.128	57	1	4
3 - 54	616.0	0.488	301	26	160
3 - 55	37.5	0.224	8	7	3
3 - 56	965.0	0.000	0	0	0
3 - 57	894.1	0.000	0	0	0
3 - 58	157.6	0.136	21	30	47
3 - 59	0.0	0.376	0	4	0
3 - 60	1,087.0	0.000	0	0	0
3 - 61	308.0	0.000	0	0	0
3 - 62	0.0	0.000	0	0	0
3 - 63	61.0	0.000	0	4	0 *
3 - 64	0.0	0.000	0	0	0
3 - 65	0.0	0.000	0	0	0
3 - 66	373.2	1.256	469	25	93
Total Area	**45,168.3**	**Total Individual**	**8,352**	**Total Area**	**1,989**
			(~8,350)		**(~1,990)**

* No Luofushan Joint-fir was observed in the works area

APPENDIX D
CURRICULUM VITAE OF QUALIFIED ECOLOGIST

COMPANY	CINOTECH CONSULTANTS LIMITED
POSITION	PRINCIPAL ENVIRONMENTAL CONSULTANT
PROFESSION	ENVIRONMENTAL SCIENTIST
NATIONALITY	CHINESE

PROFESSIONAL QUALIFICATIONS & AFFILIATIONS

- BSc in Environmental Protection, The University of Hong Kong, 2010
- Corporate Member, The Hong Kong Institution of Environmental Impact Assessment (HKIEIA), 2020

LANGUAGES

Cantonese, English, Mandarin

KEY EXPERIENCE

Betty Choi has over 10-year experience in environmental studies. Since joining Cinotech, Betty has been responsible for ecological impact assessment for infrastructure development projects, which involve field survey, data collection and drafting of assessment reports.

Being the Project Manager for Environmental Impact Assessment (EIA) projects and planning studies and Audit Team Leader for Environmental Monitoring and Audit (EM&A) projects, Betty is responsible for day-to-day communication with the government department, client and project team, providing advices on projects and ensuring the project is on track. Examples of major development projects include EIA for *Po Toi O Sewerage Works*, EIA for *Wang Tong River Bridge* and EM&A for *Tseung Kwan O - Lam Tin Tunnel Design and Construction*. She is also a certified BEAM Pro for new building (BEAM Pro No.: BP2018-0056), and is involved in provision of advice, data collection, review of supporting documents and drafting of assessment reports.

PROFESSIONAL HISTORY

2019 – Present	Principal Environmental Consultant, Cinotech Consultants Limited
2013 – 2018	Senior Environmental Consultant, Cinotech Consultants Limited
2012 – 2013	Environmental Consultant, Cinotech Consultants Limited
2010 – 2012	Assistant Environmental Consultant, Cinotech Consultants Limited
Jun – Aug 2009	Internship, Hong Kong Wetland Park

VOLUNTEER

2012-present	Surveyor for "House Swift and Barn Swallow Nests Survey in Hong Kong" by Hong Kong Bird Watching Society
2018-present	Butterfly Surveyor for Green Power

PROFESSIONAL EXPERIENCE AND RECORD

TERRESTRIAL ECOLOGICAL IMPACT ASSESSMENT & TREE SURVEYS

Aberdeen Boat Club, Middle Island Development, Phase III, IV, V (2018 – present)
Managed a team for this EIA Study. Conducted Fisheries and Marine Ecological Impact Assessment, including habitat identification, intertidal surveys (rocky shore and sandflat) in Middle Island and analysis of coral and benthic grab survey data. Also conducted vegetation survey for option selection.

Associated Outdoor Facilities for the New Prison, Ká Hó, Coloane, Macau (2017 – present)
Managed a team for this EIA Study. Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly) in Ká Hó Reservoir Natural Park and its vicinity in Macau.

Comprehensive Residential and Open Space Development at Various Lots in DD 129, Lau Fau Shan, Yuen Long (2016 – 2019)
Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly) near Tin Yuet Road.

Cycle Tracks Connecting North West New Territories with North East New Territories – (Extension), Minor Sections Investigation, Design and Construction (2010 – 2013)
Conducted Tree Survey and Archeological Impact Assessment for the proposed cycle track sections in Sam Mun Tsai and Tai Wo.

Development of Mong Tung Wan for Columbarium (2011 – 2012)
Conducted Ecological Impact Assessment, including terrestrial and freshwater surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly) in Mong Tung Wan.

Discovery Bay Maintenance Dredging – Project Profile (2012)
Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly), intertidal surveys in rocky shores and benthic grab surveys in Yi Pak Wan, Discovery Bay.

Drainage Improvement in Northern Hong Kong Island - Western Lower Catchment Works (2012)
Conducted Tree Survey along the nullah next to Queen's College and prepared tree survey report with compensatory planting proposal.

EIA for Residential Development at TN20 & TN24 Taipa, Macau (2019 – 2020)
Managed a team for this EIA Study. Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly)) in the Site near Avenida Dr. Sun Yat Sen and Taipa Grande Natural Park in Taipa.

Environmental Team Baseline Surveys for Sha Tin Cavern Sewage Treatment Works (2018 – present)
Conducted Detailed Vegetation Survey for plant species of conservation importance at four vegetated sites near A Kung Kok Shan Road, A Kung Kok Road, Mui Tsz Lam Road and Ex-Custom and Excise Department Vehicle Detention Center. Prepared Detailed Vegetation Survey Report, and Protection and Transplantation Proposal.

Expansion of Mountain Bike Trail Networks in Mui Wo and Chi Ma Wan, South Lantau - Design and Construction (2016 – 2018)
Managed a team for this Environmental Study. Conducted Ecological Impact Assessment, including terrestrial and freshwater surveys (habitat identification, vegetation survey, daytime and nocturnal fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) for three sites in Mui Wo and Chi Ma Wan. Also carried out assessments on air quality, noise, water quality and waste management.

Four Proposed Small Houses on Lots 476 S.A ss.1, 476 S.A RP, 476 S.B. ss.2, 476 S.B ss.3, 476 S.C ss.2 & 476 S.C RP in D.D.289, Tai Po (2015)
Managed a team for this Planning Study. Conducted vegetation survey to identify plant species of conservation importance *Pavetta hongkongensis* within the Site in Ko Tong.

Improvement to Fan Kam Road (Feasibility Study) (2010 – 2013)
Conducted Tree Survey and Ecological Impact Assessment, including terrestrial and freshwater surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) along Fan Kam Road. Also carried out Carbon Audit and Cultural Heritage Impact Assessment.

Improvement to Fan Kam Road (Investigation) (2013 – 2015)
Conducted Tree Survey and Ecological Impact Assessment, including terrestrial and freshwater surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) along Fan Kam Road. Also carried out Carbon Audit.

Improvement to Tung Chung Road between Lung Tseng and Cheung Sha (2010)
Assisted in Tree Risk Assessment in Tung Chung Road.

Landslip Prevention and Mitigation Programme, 2010, Package F, Landslip Prevention and Mitigation Works – Lantau (2011 – 2012)
Conducted Ecological Impact Assessment, including terrestrial and freshwater surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) in Ngong Ping, Lower Keung Shan and Sham Shek Tsuen (Lantau).

Landslip Prevention and Mitigation Programme, 2011, Package G, Landslip Prevention and Mitigation Works – Investigation, Design and Construction (2013 – 2016)
Managed a team for this LPM Study. Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) in four sites in Sai Kung (near Wong Chuk Shan New Village, Sai Kung Outdoor Training Camp, Clear Water Bay Road) and Lantau (Luk Wu). Prepared Tree Preservation and Removal Plan for Luk Wu.

Landslip Prevention and Mitigation Programme, 2014, Package D, Landslip Prevention and Mitigation Works – Investigation, Design and Construction (2015 – present)
Managed a team for this LPM Study. Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, daytime and nocturnal fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) in Hing Keng Shek (Sai Kung), Bride's Pool Road (Tai Po) and Route Twisk. Prepared Project Profiles for Bride's Pool Road and Route Twisk. Also prepared Tree Preservation and Removal Plan for Hing Keng Shek.

Ling Wan Temple Development and Conservation - Feasibility Study for Stage 1A (2016 – 2017)
Managed a team for this Planning Study. Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, daytime and nocturnal fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) for the proposed extension of Ling Wan Temple in Lam Tsuen. Also conducted drainage and sewerage appraisals.

Multi-Purpose Sports Complex at Kai Tak Area Environmental Impact Assessment & Traffic Impact Assessment Studies – Investigation (2014 – 2016)
Conducted Tree Survey and Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly)) in Kai Tak Development Area for this EIA Study.

New Wang Tong River Bridge, Mui Wo - Environmental Impact Assessment and Drainage Impact Assessment Studies (2014 – 2016)
Managed a team for this EIA Study. Conducted Tree Survey and Ecological Impact Assessment, including terrestrial and estuarine surveys (habitat identification, vegetation survey, daytime and nocturnal fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and estuarine fish)) in Wang Tong.

Port Shelter Sewerage, Stage 3 – Sewerage Works at Po Toi O Environmental Impact Assessment Studies – Investigation (2013 – 2016)
Managed a team for this EIA Study. Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, daytime and nocturnal fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly)); intertidal surveys (Rocky Shore, Sandflat, Mudflat) and benthic grab surveys. Analyzed coral survey data. Also carried out fisheries impact assessment, waste management implications and prepared Environmental Monitoring and Audit Manual.

Preliminary Environmental Review & Drainage/Sewage Impact Assessment for Swimming Pool Complex and Open Space in Remaining portion of district Open Space in Area 107, Tin Shui Wai (2017)
Conducted Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, daytime and nocturnal fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly)) in Tin Shui Wai.

Prevention and Mitigation Programme 2014 Package D, Landslip Prevention and Mitigation Works. Investigation, Design and Construction behind house Nos. 18, 19 and 22, Ha Yeung Village, Hang Hau (2016)
Conducted Tree Survey in the Site in Ha Yeung.

Proposed Mixed Use Development at New Kowloon Inland Lot ("NKIL") No. 6568 (2019)
Conducted Ecological Site Appraisal for HK-BEAM v.1.2 SA5 assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, odonate and butterfly)) in Kai Tak Development Area.

Proposed Residential House at D.D. CCL 942, Nam Tam, Cheung Chau (2015)
Conducted Vegetation Survey to identify plant species of conservation importance in the Site in Nam Tam.

Review of Toilet Facilities in Various Country Parks in Hong Kong, Package 1 (2018 – 2020)
Conducted Ecological Impact Assessment, including vegetation survey at 10 potential sites for construction of new toilet facilities in various Country Parks and Special Areas.

Section 12A Rezoning Application for Proposed "Private Garden of Remembrance" Use in Lot 169 and subsections in DD 219, Kei Pik Shan, Sai Kung (2014 – 2016)
Managed a team for this Planning Study. Conducted Tree Survey and Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly)) in Kei Pik Shan.

S16 Application for 875-877 Lai Chi Kok Road (2016 – 2017)
Managed a team for this Planning Study. Conducted Tree Survey in the Site near Lai Chi Kok Road.

Section 16 Planning Application for Proposed Film Studio in "Recreation" and "Green Belt" Zones. Lots 287(Part), 288(Part), 289SA, 289RP, 295, 299 and adjoining government land in DD247 Ho Chung, Sai Kung (2013, 2017, 2018)
Managed a team for this Planning Study. Conducted Tree Survey in the Site in Ho Chung and prepared S16 applications and submissions for condition compliance.

Section 16 Planning Application for Proposed House Development in "Unspecified Use" Area at Lots No. 484, 489, 491, 492 and 493 in D.D. 311, Keung Shan, Lantau Island (2013 – 2014)
Managed a team for this Planning Study. Conducted Tree Survey and Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly)) in Keung Shan.

Section 16 Planning Application for Proposed Religious Institution in "Village Type Development" Zone at Lots No. 8, 9, 10, 11 &14 in DD271, Tan Ka Wan, Tai Po, New Territories (2013 – 2014)
Managed a team for this Planning Study. Conducted Tree Survey and Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly)) in Tan Ka Wan.

Site Formation and Foundation Works for New Eastern Terrace for Proposed Residential Development at 1-15 New Eastern Terrace, 5-11 Dragon Road, Tin Hau, North Point, Hong Kong (2011)
Conducted Ecological Site Appraisal, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly)) and Weekly Site Inspection for HK-BEAM 04 submission.

Small Housing Development at Uk Tau, Sai Kung (2012)
Conducted Tree Survey and Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate and butterfly)) in Uk Tau.

The Establishment of an Agricultural Park in Kwu Tung South - Investigation, Design and Construction (2015 – present)
Managed a team for this Environmental Study. Conducted Ecological Impact Assessment, including terrestrial and freshwater surveys (habitat identification, vegetation survey, daytime and nocturnal fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) in >80 ha area in Tsui Keng and Cheung Lek.

Tin Wan Concrete Batching Plant (2010)
Conducted Tree Survey.

Upgrading of Rising Mains between NENT Landfill Leachate Pumping Station and Lin Ma Hang Road Leachate Pumping Station – Investigation and Design (2014 – 2015)
Conducted Tree Survey and Ecological Impact Assessment, including terrestrial surveys (habitat identification, vegetation survey, fauna surveys (avifauna, mammal, herpetofauna, odonate, butterfly and freshwater communities)) along Lin Ma Hang Road and NENT Access Road.

APPENDIX E
ESTIMATION OF TRANSPLANTABLE SMALL PERSIMMON

Appendix E - Estimation of Transplantable Small Persimmon

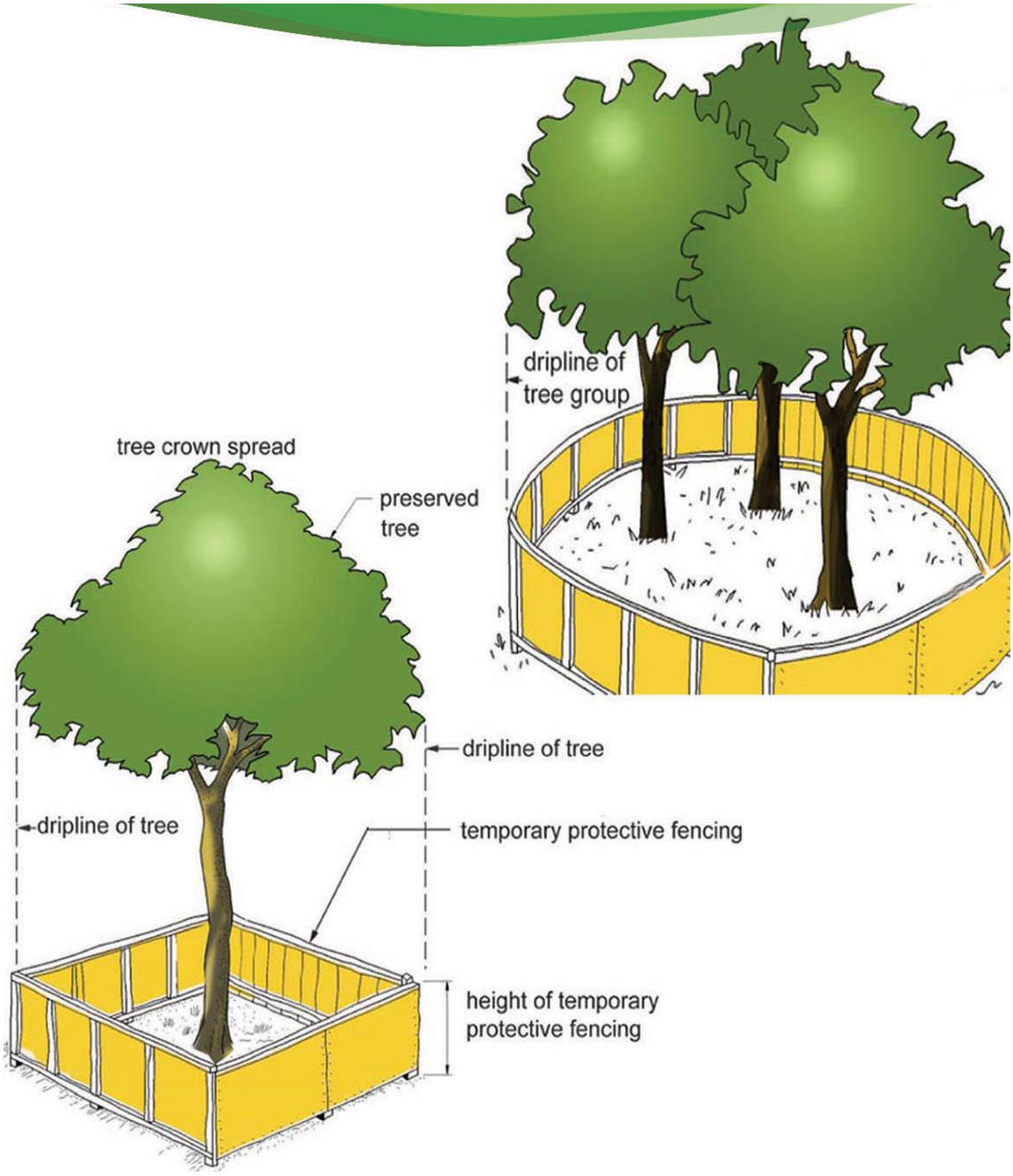
Grid No.	No. of Individuals in Diff Height (m)				Total	No. of transplantable individuals *	% of transplantable Individuals among 0-1m in Height
	0-1	1-2	2-3	3+			
1A	7	3	4	0	14	5	71%
1B	6	2	0	0	8	6	100%
1C	1	3	2	0	6	0	0%
1D	0	6	1	0	7	0	0%
1E	5	2	3	0	10	3	60%
1F	6	9	1	0	16	4	67%
2A	7	4	0	0	11	4	57%
2B	3	2	0	0	5	3	100%
3A	16	17	0	0	33	9	56%
3B	11	0	0	0	11	5	45%
3C	9	1	2	1	13	7	78%
3D	5	1	1	0	7	4	80%
Total	**76**	**50**	**14**	**1**	**141**	**50**	

Average % of transplantable Individuals among 0-1m in Height **= 50 / 76 *100%**
= 66% (Approx. 70%)

* • Young individual with vigorous growth (<0.5m in height)
  • Grown away from other woody plants
  • Grown away from obstacles (e.g. rocks, man-made structures)
  • Not grown on steep slope (>40 degree)

APPENDIX F
TYPICAL DESIGN OF TREE PROTECTON ZONE

Appendix F – Typical Design of Tree Protection Zone



APPENDIX G
ACTUAL TRANPLANTATION
STATISTICS OF SMALL PERSIMMON

Theoretical No. of Transplantable Small Persimmon in Site 1 and Site 3

Drawing No.	Grid no.	Grid Area (m2) [A]	Percentage of Accessible Area within Grid [B]	Density of Small Persimmon [C]	No. of Small Persimmon in Accessible Area [D]
2c	1-11	1093	30%	0.464	152
	1-14	1100	70%	0.336	259
	1-15	1037	80%	0.024	20
	1-16	1139	60%	0.144	98
	1-17	864	50%	0.304	131
	1-20	915	35%	0.072	23
	1-21	1064	20%	0.552	117
	1-22	942	30%	0.52	147
	1-23	1064	5%	0.168	9
				Sub-total:	**956**

Drawing No.	Grid no.	Grid Area (m2) [A]	Percentage of Accessible Area within Grid [B]	Density of Small Persimmon [C]	No. of Small Persimmon in Accessible Area [D]
2e	3-54	1022	30%	0.488	150
	3-47	967	15%	0.08	12
	3-30	909	50%	0.016	7
	3-31	921	20%	0.384	71
				Sub-total:	**240**

Drawing No.	Grid no.	Grid Area (m2) [A]	Percentage of Accessible Area within Grid [B]	Density of Small Persimmon [C]	No. of Small Persimmon in Accessible Area [D]
2f	3-Jul	1092	80%	0.055	48
				Sub-total:	**48**
				Total:	**1244**

No. of Actual Transplantable Small Persimmon in Site 1 and Site 3

Site	No. of Small Persimmon in Accessible Area (Theoriotical)	Actual No. of transplantable Small Persimmon	%
1	956	228	24%
3	288	40	14%
Total	**1244**	**268**	**22%**