

**Habitat Enhancement and Translocation Plan for
Amphibian Species of Conservation Importance
for Tung Chung New Town Extension (West)
(EP No. EP-519/2016)**

October 2021

Environmental Permit No. EP- 519/2016

Tung Chung New Town Extension (West)

Environmental Team Leader Certification

Reference Document /Plan

Document to be Certified:	Habitat Enhancement and Translocation Plan for Amphibian Species of Conservation Importance
Date of Document:	October 2021
Date received by ETL:	28 October 2021

Reference EP Condition

Environmental Permit Condition:	2.20
The Permit Holder shall, no later than three months before the commencement of construction works at Tung Chung Valley, submit a Plan for the amphibian species of conservation importance, including Romer's Tree Frogs, that could be affected by the Project to the Director for approval:	
<ul style="list-style-type: none">(i) The target species;(ii) Methodology for pre-construction survey, capture and translocation for each species;(iii) Identification of suitable receptor sites with recommended measures for enhancing the habitats for each species at the receptor sites;(iv) An implementation programme; and(v) A post-release monitoring programme	

ETL Certification

I hereby certify that the above reference document complies with the above referenced condition of EP-519/2016.



Daniel Sum
Environmental Team Leader

Date: 28 October 2021

Qualified Ecologist Certification

I hereby confirm that the Qualified Ecologist of the ET has been consulted in preparing ecological aspects of the above referenced document/plan.



John Tsang
Qualified Ecologist

Date: 28 October 2021

Your Ref.

By Post

Our Ref. 198377-0403

Date 28 October 2021

Sustainable Lantau Office
Civil Engineering and Development Department
13/F, North Point Government Offices
333 Java Road, North Point
Hong Kong

Attention: Mr. Samuel YIU / Ms. Carol LAM

Dear Sir / Madam,

Agreement No. CE 59/2017 (EP)
Independent Environmental Checker for Tung Chung New Town Extension – Investigation
Habitat Enhancement and Translocation Plan for Amphibian Species of Conservation
Importance (EP condition 2.20)

We refer to the Habitat Enhancement and Translocation Plan for Amphibian Species of Conservation Importance for Tung Chung New Town Extension (West) (TCW) dated October 2021 and certified by the Environmental Team Leader of TCW on 28 October 2021. Please note we have no adverse comments on the captioned submission. The captioned submission is hereby verified in accordance with the requirement stipulated in Condition 2.20 of EP-519/2016.

Should you have any query, please feel free to contact the undersigned at 2608 7314 (chuawo@binnies.com) or our Edward Lau at 6848 5737 (iec.tcnte@gmail.com or lauky@binnies.com).

Yours faithfully,
for and on behalf of
BINNIES HONG KONG LIMITED



MANUEL CHUA
INDEPENDENT ENVIRONMENTAL CHECKER

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1. Project Description

The development of Tung Chung New Town Extension (TCNTE), comprising Tung Chung East (TCE) and Tung Chung West (TCW), is a mega-scale and complex project aiming to provide land to meet the future housing economic and social development needs of Hong Kong. Due to the fact that the proposed works are geographically separated, the implementation of mega-scale Project is divided into two packages, namely TCE and TCW respectively. In accordance with the tight delivery programme, the Project will be implemented in phases under separate contracts for the developments of TCE and TCW.

2. Scope of Works for Tung Chung New Town Extension

The Tung Chung New Town Extension project (the Project) comprises the following elements:

- (i) reclamation of the seabed by a non-dredged method at TCE to form a total of about 130 hectares of land;
- (ii) construction of about 4.9 kilometers of seawalls, with an eco-shoreline, three drainage box culvert outfalls, three circulation drains and a seawater intake at TCE;
- (iii) provision of infrastructure for Tung Chung Area 58, including construction of a single two-lane road with a footpath and the associated utility works;
- (iv) site formation works at TCW;
- (v) construction of the River Park including a visitor centre at TCW;
- (vi) construction of proposed open space;
- (vii) construction of sustainable urban drainage systems at TCW;
- (viii) construction of roads, footpaths, cycle tracks and the associated junction / road improvement works;
- (ix) engineering infrastructure works covering drainage, sewerage, waterworks (including a fresh water service reservoir, a salt water service reservoir and a salt water pumping station), common utility tunnels and landscaping works; and
- (x) implementation of environmental mitigation measures and environmental monitoring and audit programme for the works.

3. Implementation Programme

The Contract No NL/2020/05 – Tung Chung New Town Extension – Site Formation and Infrastructure Works at Ma Wan Chung (i.e. Contract 5) at TCW has been awarded in May 2021 and is scheduled for completion in 2025. The main contractor for Contract No. NL/2020/05 is Build King – Richwell Civil Joint Venture (BKRCJV).

The Contract No NL/2020/06 – Tung Chung New Town Extension – Site Formation and Infrastructure Works at Tung Chung Valley, Phase 1 (i.e. Contract 6) at TCW has been awarded in May 2021 and is scheduled for completion in 2025. The main contractor for Contract No. NL/2020/06 is China Railway Group Limited (CREC).

The detailed design for the first phase of site formation and infrastructure works at TCE and TCW (First Phase development) has been completed, while the detailed design for the remaining phase of site formation and infrastructures works is in progress.




4. Submission under EP

In view that only Contract 6 has construction works at Tung Chung Valley, this submission is prepared based on the latest information of Contract 6 according to the relevant requirements contained in the EM&A Manual, EIA Report and EP. Please find the Habitat Enhancement and Translocation Plan for Amphibian Species of Conservation Importance enclosed below.



Civil Engineering and Development Department
The Government of the Hong Kong Special Administrative Region

HABITAT ENHANCEMENT AND TRANSLOCATION PLAN FOR AMPHIBIAN SPECIES OF CONSERVATION IMPORTANCE

H	28/10/21			
Rev	Date	Prepared By Environmental Officer	Revised By Dr. Mark Shea Qualified Ecologist	Approved By Project Manager

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1 Introduction

1.1 General

1.1.1 China Railway Group Ltd. (known as CREC) was commissioned by the Civil Engineering and Development Department (CEDD) of the Government of Hong Kong Special Administrative Region (HKSAR) on 31 May 2021 as the contractor to provide construction works for Tung Chung New Town Extension – Site Formation And Infrastructure Works At Tung Chung Valley, Phase 1 (Contract No.: NL/2020/06).

1.2 Project Background

1.2.1 In mid-1996, the Government completed the Territorial Development Strategy Review (TDSR) which identified housing shortfall in the medium to long term. The TDSR also identified the North Lantau New Town (NLNT) as a strategic growth area, among other areas to meet the territorial housing demand, with a revised population target of 320,000 by 2011.

1.2.2 In 2004, the Administration formulated a concept plan for planning initiatives on Lantau (Concept Plan). The Concept Plan was then revised in mid-2007 taking into account comments collected from the public consultation (Revised Concept Plan). Under the Revised Concept Plan, Tung Chung is to remain a comprehensively planned new town for a population of 220,000 with adequate community facilities and regional facilities to serve the whole of Lantau.

1.2.3 The CEDD and the Planning Department (PlanD) jointly commissioned Agreement No. CE 32/2011(CE) - Planning and Engineering Study on the Remaining Development in Tung Chung (P&E Study) in 2012. The P&E Study aims at identifying development potentials and opportunities to extend Tung Chung into a distinct community to meet housing, social, economic, environmental and local needs. Under the P&E Study, various planning, engineering and environmental studies were carried out to formulate a development scheme to extend existing Tung Chung to Tung Chung East (TCE) and Tung Chung West (TCW).

1.2.4 The P&E Study adopted a three-stage Public Engagement (PE) programme to facilitate public discussions and foster consensus building. Taking into account the public views and the planning and technical assessments, the Recommended Outline Development Plans (RODPs) for TCE and TCW were finalized under the P&E Study and were endorsed in January 2015. The planned new population of TCE and TCW under the RODPs would be around 120,000 and 25,000

respectively. With the new population in TCE and TCW, the total planned population in Tung Chung will reach about 270,000 upon full development.

- 1.2.5 The development theme of Tung Chung New Town Extension (TCNTE) will pursue a sustainable and balanced approach while taking account of its strategic location and the synergy effect to make Tung Chung a regional commercial hub for retail and office developments. The TCNTE development, comprising TCE and TCW, will provide about 49,600 flats for an additional population of 145,500 and about 877,000m² gross floor area (GFA) for commercial uses. The housing mix for public housing and private housing is of a ratio of 65:35 approximately.
- 1.2.6 Two amphibian species of conservation importance, including Romer's Tree Frog *Liuixalus romeri* and Chinese Bullfrog *Hoplobatrachus rugulosus*, were recorded in some of the proposed development areas of TCW. Romer's Tree Frogs were mainly recorded near the eastern branch of Tung Chung Stream, inside or near orchard and woodland habitats. Chinese Bullfrog was found in orchard near Shek Mun Kap (**Figure 1**, from Figure 9.6a of TCNTE EIA Report). Capture-and-translocation of amphibian species of conservation importance in these areas with sightings prior to site formation was recommended in Environmental Impact Assessment (EIA) stage as mitigation to minimize the impacts on these fauna species of conservation importance. These areas with sighting records of Romer's Tree Frog / Chinese Bullfrog included some areas proposed for public works as well as some areas zoned for residential/commercial developments by private developers. As stated in the EIA report, the capture-and-translocation exercise will cover areas for public works near the eastern branch of Tung Chung Stream, in particular 1) the River Park, 2) the Distributor Road along the eastern branch of Tung Chung Stream, 3) the road upgrade along the existing Shek Mun Kap Road, and 4) the stormwater attenuation and treatment ponds in TCV-k, TCV-e, TCV-l, TCV-c, and TCV-n (see **Figure 2** and **Figure 3**, showing the names of the various development areas during the EIA study, from Figure 9.8b(i) and 9.8b(ii) of the TCNTE EIA report). Capture-and-translocation exercise for those public works will be provided before site formation commences by the government departments responsible for the construction of those public works or the site formation works for those sites. Capture-and-translocation exercise of amphibian species of conservation importance will also be required in areas which are zoned for residential/commercial developments by private developers (i.e. TCV-1 and TCV-5 in the TCNTE EIA study, also see **Figure 2** and **Figure 3**) and the lands within mostly belong to private lots. It was stated in the EIA report that the future project

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- proponents of those private lots shall be requested to conduct capture-and-translocation exercise prior to site formation via the established mechanism for land transaction application.
- 1.2.7 After the EIA study, the naming of the development areas in TCW followed the Outline Zoning Plan S/I-TCV/2. During the present assignment, the locations of areas proposed for public works in TCW were determined, and are shown in **Figure 4a** and **Figure 4b**. Among them, capture-and-translocation exercise will cover those near the eastern branch of Tung Chung Stream and the orchard near Shek Mun Kap. Under the current naming, these areas should include, in particular 1) the River Park Phase 1, 2) the Distributor Road L29 along the eastern branch of Tung Chung Stream, 3) the road upgrade along the existing Shek Mun Kap Road, and 4) the stormwater attenuation and treatment ponds near the eastern branch of Tung Chung River (see **Figure 4a** and **Figure 4b**). Capture-and-translocation exercise for the above areas for public works will be provided before commencement of site formation by CEDD, which is the government department responsible for the construction of those public works or the site formation works for those sites.
- 1.2.8 There are a number of lands in TCW which are zoned for residential/commercial developments by private developers and the lands within mostly belong to private lots (see **Figure 5**). Among them, Area 60 and Area 71A (i.e. referred as TCV-1 and TCV-5 in the TCNTE EIA study) had records of amphibian species of conservation importance during the EIA study, and capture-and-translocation exercise will also be required. It is the future project proponents of the private residential/commercial developments to be responsible for the site formation of these areas and the capture-and-translocation exercise prior to site formation. The requirements of these measures will be stipulated when processing the lease modification applications and/or land sales via the established mechanism for land transaction application. A sample of relevant land sale clause to request capture-and-translocation exercise from a previous land sale document is attached in **Appendix A** for reference, and the actual land sale clause for Area 60 and Area 71A will be confirmed and issued by Lands Department.
- 1.2.9 Infrastructural works in TCW including roads, sewerage facilities, river Park and stormwater attenuation and treatment ponds will be constructed by phases. There is no schedule for developments in lands zoned for residential/commercial developments by private developers and the lands within mostly belong to private lots during the writing of this plan.

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- 1.2.10 This Habitat Enhancement and Translocation Plan for Amphibian Species of Conservation Importance provides a framework for CEDD and private developers (or the contractors/specialists they assign) to prepare a translocation proposal for the required tasks and the implementation. The translocation proposal will cover preparation of capture and translocation implementation programme, habitat enhancement proposal in selected receptor site(s), methodology of capture-and-translocation exercise and other necessary pre- and post-monitoring shall be carried out by the contractors/specialists assigned by CEDD of each respective public works contract of TCW Project.

1.3 Purpose of this Plan

- 1.3.1 This Plan is prepared in accordance with the Conditions of Approval under Section 8(3) of the EIA Ordinance (letter ref. (37) in EP2/N9/S3/145 Pt. 12 dated 8 April 2016) and Clause 2.20 – Submission of Habitat Enhancement and Translocation Plan for Amphibian Species of Conservation Importance (the Plan) of the EP (EP No. EP-519/2016) for the amphibian species of conservation importance, including Romer’s Tree Frogs, that could be affected by the Project. The Permit holder shall submit the Plan to EPD for approval no later than 3 months before commencement of construction works at Tung Chung Valley.
- 1.3.2 In accordance with clause 2.20 of EP-519/2016, this Plan will include the following information:
- (a) Target species;
 - (b) Methodology for pre-construction survey, capture and translocation for each species;
 - (c) Identification of suitable receptor sites with recommended measures for enhancing the habitats for each species at the receptor sites;
 - (d) Implementation programme; and
 - (e) Post-release monitoring programme.
- 1.3.3 The site formation of the development areas in TCW will be implemented by phases. Preparation of capture and translocation implementation programme, habitat enhancement proposal in selected receptor site(s), capture-and-translocation exercise and other necessary pre- and post- monitoring shall be carried out by the contractors/specialists assigned by CEDD by each respective works contract of TCW Project as specified in **Figure 4a** and **Figure 4b** or by private developers for private residential developments in Area 60 and

Area 71A in **Figure 5** in order to fulfil the EP requirements. Revised / separate submission(s) will be conducted for the other remaining public works contract for TCW.

- 1.3.4 A capture-and-translocation exercise shall be implemented for each development area specified in **Figure 4a**, **Figure 4b**, and **Figure 5**. This Plan provide a framework for the assigned contractors/specialists to prepare a translocation proposal that includes the methodology and other necessary procedures to be implemented for the capture-and-translocation exercise of each development area. Methodology to be applied during the capture-and-translocation exercise should follow the procedures described in **Section 3**. Potential receptor sites are recommended in **Section 4**. Selection of alternative receptor sites should base on the ecology of the target species (**Section 2.1**) and criteria described in **Section 4**. Proposed habitat enhancement measures and the monitoring requirement are described in **Section 4** and **Section 5, respectively**. Implementation schedule is described in **Section 6**. A detailed translocation proposal of each development area shall be prepared by the assigned contractors/specialists and submitted to relevant authorities for comments.

2 Target Species

2.1 General Ecology

- 2.1.1 The target species of the capture-and-translocation exercise are Romer’s Tree Frog and Chinese Bullfrog and any other amphibian species of conservation importance encountered during the capture exercise.
- 2.1.2 Romer’s Tree Frogs were mainly found in orchard within the TCW during the EIA study. This species was also found in woodland and urbanised/disturbed habitats in the TCW, and woodland outside the proposed development areas. Romer’s Tree Frog is protected under Cap. 170, ranked as “endangered” in IUCN (2015) and considered of “potential global concern” by Fellowes *et al.* (2002). This species is endemic to Hong Kong.
- 2.1.3 Romer’s Tree Frog breeds in shaded, still or slow flowing waters without fish (Chan *et al.* 2005a). This species is also known to breed in artificial waterbodies and structures (e.g., polystyrene box, earthen or plastic pots) (Lau 1998, Chan *et al.* 2005b). Breeding sites are usually associated with woodland or shrubland. Non-breeding individuals are found in woodland and plantation (Chan *et al.* 2005a).
- 2.1.4 Chinese Bullfrog was found in ditches in orchard within the TCW and woodland outside the TCW during the EIA study. This species is Class 2 Protected Animal of China, and considered of “potential regional concern” by Fellowes *et al.* (2002).
- 2.1.5 Chinese Bullfrog is a lowland species and mainly occurs in agricultural land, ponds, streams and marshes in Hong Kong (Chan *et al.* 2005a).
- 2.1.6 Both Romer’s Tree Frogs and Chinese Bullfrog breed between March and September (Chan *et al.* 2005a).

2.2 Review of Previous Local Examples of Capture-and-Translocation of Target Species

- 2.2.1 There were six previous examples of capture-and-translocation exercise of amphibian species in Hong Kong (**Table 1**). Five of those involved capture-and-translocation of Romer’s Tree Frog. The study by Ecosystems Ltd. (2009) involved the capturing of Romer’s Tree Frog and Chinese Bullfrog. The study of Ramboll Environ Hong Kong Limited. (2017) involved the capturing of Big-headed Frog *Limnonectes*

fujianensis and Lesser Spiny Frog *Quasipaa exilispinosa* for a private development project.

- (a) Lau (1998): Habitat use by Hong Kong amphibians, with special reference to the ecology and conservation of *Philautus romeri*. University of Hong Kong, Hong Kong;
- (b) ERM (2004): Improvement to Tung Chung Road between Lung Tseng Tau and Cheung Sha: Amphibian and Fish Translocation;
- (c) The Hong Kong Electric Co. Ltd. (2005): Renewable Energy by a Wind Turbine System On Lamma Island;
- (d) Halcrow China Ltd. (2008): Translocation Manual for *Philautus romeri*;
- (e) Ecosystems Ltd. (2009): Drainage Improvement in South Lantau and Construction of Mui Wo Village Sewerage – Phase 1: Construction Phase Monitoring - Report for Frog Capture Survey and Translocation; and
- (f) Ramboll Environ Hong Kong Limited. (2017): Proposed Residential Development at New Kowloon Inland Lot No. 6542, Tai Wo Ping Translocation Survey for Stream Fauna: Translocation Report.

- 2.2.2 In the previous studies, Romer’s Tree Frog were translocated to both lentic and lotic habitats (**Table 1**). These aquatic habitats were usually associated with woodland/plantation/shrubland.
- 2.2.3 Chinese Bullfrog was only translocated in one previous study and the selected habitat type was abandoned agricultural land.
- 2.2.4 The proposed receptor sites are usually be assessed and evaluated, if the conditions of the proposed receptor sites do not meet all the requirement of the target species being translocated, enhancement measures for the habitat might be required. Besides, prevention of recolonization of the target species in the capture sites should be formulated after translocation. In the studies by Lau (1998) and ERM (2004), habitat modification works were carried out in the capture site / receptor sites.
- 2.2.5 In the study of ERM (2004), potential breeding habitats in capture sites (e.g., abandoned containers, U-shaped pipes) were removed or modified (e.g., covering immovable water trapping structure) after capture survey. These would ensure no breeding would occur during site formation.
- 2.2.6 In the studies by Lau (1998), enhancement measures were implemented in two receptor sites, Lions Nature Education Centre and

Zoological and Botanical Gardens, where breeding sites were limited. These included earthen/plastic pots of 25 to 50cm diameter, and concrete/ butynol-lined pools smaller than 2m².

2.2.7 Post-translocation monitoring was conducted in the studies by Lau (1998). The post monitoring of both studies focused on determining of the occurrence of breeding in the receptor sites. Post-monitoring surveys of both studies covered wet season, when Romer’s Tree Frog bred. In the studies by Lau (1998), translocated frogs bred in seven of the eight translocated sites. This showed that the success rate of capture-and-translocation is high.

Table 1. Summary of Previous Local Examples of Capture-and-Translocation Exercise of Amphibian Species

Studies	Locations of Capture Sites	Habitat Types in Translocation Site(s)	Remarks
Lau (1998)	Chek Lap Kok	<p>Eight translocation sites throughout the New Territories and Hong Kong Island</p> <p>Terrestrial habitats: secondary woodland, plantation, riparian woodland, shrubland</p> <p>Breeding habitats: stream pools, seep pools, rainwater pools, marshes and abandoned agricultural lands</p>	<p>Artificial breeding habitats at two translocation sites where breeding sites are considered limited;</p> <p>Post-translocation monitoring surveys were performed</p>
The Hong Kong Electric Co. Ltd. (2005)	Shrubby grassland near the service reservoir of Tai Leng Tsuen of Lamma	Pools of a seasonal stream	<p>No target species captured;</p> <p>Post-monitoring and habitat enhancement not necessary</p>
ERM (2004)	Secondary woodland at Shek Mun Kap and Lung Tseng Tau, plantation	Woodland near a stream. Ground surface of the woodland covered by fallen leaves/ leaf litters and free from disturbance which is favourable habitat for the	Removal/ Modification of breeding habitats after capture surveys

Studies	Locations of Capture Sites	Habitat Types in Translocation Site(s)	Remarks
	woodland and tall shrub at Pak Kung Au, Tung Chung Stream	Romer's Tree Frog. Well-wooded flat areas near a small stream or other water source convenient for breeding; usually lives on ground or among fallen leaves	
Halcrow China Ltd. (2008)	Sok Kwu Wan of Lamma	Caves, woodland, marshes and streams	Some frogs were released to the capture site after construction works were completed
Ecosystems Ltd. (2009)	Mui Wo in Lantau	Seasonal streams associated with woodland for Romer's Tree Frog; Abandoned agricultural land for Chinese Bullfrog	No target species captured; Post-monitoring and habitat enhancement not necessary
Ramboll Environ Hong Kong Limited (2017)	Tai Wo Ping in Kowloon	Perennial streams associated with woodland for Big-headed Frog and Lesser Spiny Frog	Post-translocation monitoring surveys were performed; Habitat enhancement not considered necessary

3 Methodology for Pre-construction survey, Capture and Translocation

- 3.1.1 A qualified ecologist should be engaged by the Contractor to carry out the works relating to the capture-and-translocation works. The ecologist should possess a degree in a relevant subject and have at least 5 years' experience in Hong Kong on amphibian surveys and translocation works, and preferably with a relevant professional qualification, including but not limited to the membership of Hong Kong Institute of Environmental Impact Assessment (HKIEIA) and Chartered Biologist.
- 3.1.2 Before the commencement of capture-and-translocation exercise, site visits by ecologist will be conducted to identify the locations and types of habitats within each development area (specified in **Figure 4a**, **Figure 4b** and **Figure 5**). Locations and types of habitats likely to be utilised by amphibians such as aquatic habitats within each development area will be recorded and marked on a map for the capture-and-translocation exercise. A preliminary assessment will be conducted after the site visits, to determine the potential habitats of the two target species in each development area. Pre-construction surveys should be conducted at night in the wet season to determine the locations and relative abundance of the target species within each development area. The information collected from the surveys should be incorporated in the Translocation Proposal.
- 3.1.3 Capture-and-translocation exercise shall be conducted at seasons when both Romer's Tree Frog and Chinese Bullfrog breed and adult male frogs can be easily located by their calls, and the programme will be provided in the future translocation proposal. Frogs within each development area shall be located by active searching in addition to acoustic search. As both species are nocturnal (*ibid.*), the tasks should be commenced after dusk and completed before dawn. Capture-and-translocation exercises of frogs shall start one month in advance of the site formation works and programmed as far as possible for consecutive nights schedule. If no individual of both species of conservation interest is found from a particular capture area for three consecutive surveys are conducted in three evenings, the capture-and-translocation exercise for that capture area can be ceased.
- 3.1.4 All frogs, tadpoles and eggs seen in each development area during the tasks will be captured/collected using hands and/or hand net. Permit for using hand nets to collect frogs, tadpoles and eggs shall be applied from Agriculture, Fisheries and Conservation Department. Suitable techniques as recommended in Chan *et al.* (2005a) should be used to

avoid any injury on them. The ecologists should cup one hand over the frog to prevent its escape and then gently grab the frog by the waist.

- 3.1.5 Collected frogs and tadpoles shall be temporarily stored in plastic containers with a small amount of water for temporary storage before release to avoid mortality due to desiccation. Tadpoles and eggs, which need more water during transportation, shall be stored separately from adults. A few wet, dead leaves shall also be added to provide shelter and maintained the humidity. There should be enough room for the captured frogs in the containers during transport (no 'stacking' should occur). Captured frogs and collected tadpoles/eggs should be moved to the receptor site(s) on the same night and released as soon as possible to enhance their survival rate. Care should be taken during the whole handling process in order to ensure no harm to the captured individuals.
- 3.1.6 Other amphibian species of conservation importance sighted will also be captured and translocated with the target species.
- 3.1.7 Artificial containers (e.g., pots, tanks) were noticed within some of the proposed development area during the surveys in EIA stage. These containers might trap rain-water and provide breeding habitats to the target species. It is recommended that these artificial containers should be removed after the capture-and-translocation exercise. Immovable structures should be properly covered.
- 3.1.8 The capture-and-translocation exercise should be conducted before commencement of the site formation works, and would be finished when no individual of the target species is caught for three consecutive days.
- 3.1.9 Measures such as fencing off each Capture-and-translocation Exercise Zone, redirect the water sources entering the Capture-and-translocation Exercise Zone, fill the ponding, after Capture-and-translocation exercise to avoid recolonization of the Target Species shall be formulated. Site check shall be conducted 1 week before commencement of site formation works to ensure no Target Species will be affected. If Target Species were found in the site check, they will be captured/collected. Captured frogs and tadpoles should be moved to the receptor site(s) on the same night and released as soon as possible to enhance their survival rate. Capture-and-translocation exercises will be conducted again to ensure no Target Species found in that area.

4 Receptor Sites Identification and Enhancement Measures

4.1 Criteria of Receptor Site Selection

- 4.1.1 Criteria of selection of receptor site for Romer’s Tree Frog was made reference to Lau (1998). Two criteria were used in the selection of receptor sites of Romer’s Tree Frog. These included 1) a large area of woodland / plantation / shrubland; 2) suitable breeding habitats, i.e., shaded, slow flowing or standing waters which are fish-free and with plenty of leaf litter.
- 4.1.2 For Chinese Bullfrog, criteria of selection of receptor site were also referred to Lau (1998). Chinese Bullfrog usually inhabits and breeds in permanent or seasonal inundated lentic habitats in lowland areas (e.g., ponds, agricultural lands, streams, marshes).
- 4.1.3 Capture-and-translocation exercise and post-translocation monitoring shall be implemented for each development area. A Translocation Proposal summarizing the results of site visits and pre-construction surveys, translocation plan with necessary enhancement measures (e.g., installation of earthen pot) and post-translocation monitoring shall be submitted to relevant authorities by the contractor at least 1 month before the site formation work for each development area.

4.2 Site Visits & Selection of Receptor Sites

- 4.2.1 Field surveys for selection of receptor sites were conducted in wet season of 2017. A total of 23 sites were visited by Arup (**Figure 6**), including localities with previous records, receptor sites of previous capture-and-translocation exercises and localities with the preferred habitat features of the target species.
- 4.2.2 Three proposed receptor sites (R1 to R3) for Romer’s Tree Frog are shown in **Figure 7a**, **Figure 7b** & **Photo Plate 1**, all are within Lantau South Country Park. Fish-free pools covered by litter, which can provide breeding habitats for Romer’s Tree Frog and are located near shaded slow flowing perennial streams, are found at Sites R1 to R3, which are all considered suitable as receptor sites for Romer’s Tree Frog. Woodlands are found at/near all these four sites. Litter on the ground of woodland can provide foraging habitats for the translocated Romer’s Tree Frogs.
- 4.2.3 The part of Fong Yuen Marsh within the Conservation Section of the future River Park (C1) (**Figure 7a** and **Figure 7b**) will be the proposed receptor site for Chinese Bullfrog. Fong Yuen Marsh is a wet

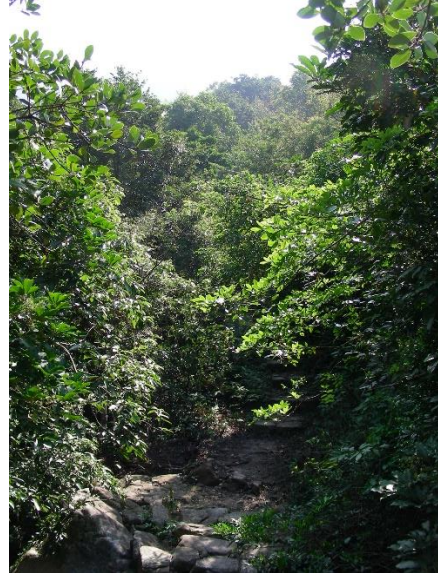
abandoned agricultural land, and can provide breeding habitats for Chinese Bullfrog. Fong Yuen Marsh is covered by a mixture of plant species adapted to wet places (e.g. *Leersia hexandra*, *Melastoma candidum*, *Cyclosorus interruptus*, *Ludwigia perennis*), which can provide foraging habitats for the translocated frogs. The translocated frogs are preferably released in the part of Fong Yuen Marsh within the Conservation Section of the future River Park as the area will be preserved under the River Park design.

- 4.2.4 According to the ecological surveys during EIA stage, Romer's Tree Frogs were mainly found in orchard and was also found in woodland and urbanized/disturbed area within the development area, while Chinese Bullfrog was found in ditches in orchard within the development area. Only low to moderate number of Romer's Tree Frog and low number of Chinese Bullfrog were recorded. Hence, the numbers and carrying capacity of the proposed receptor sites for the two target species are considered appropriate. However, should abundant Romer's Tree Frog or Chinese Bullfrog be recorded during the pre-construction survey, more receptor sites might be required and subject to the comments from AFCD.

**Photo Plate 1. Photos of the proposed receptor sites for Romer’s
Tree Frog and Chinese Bullfrog**



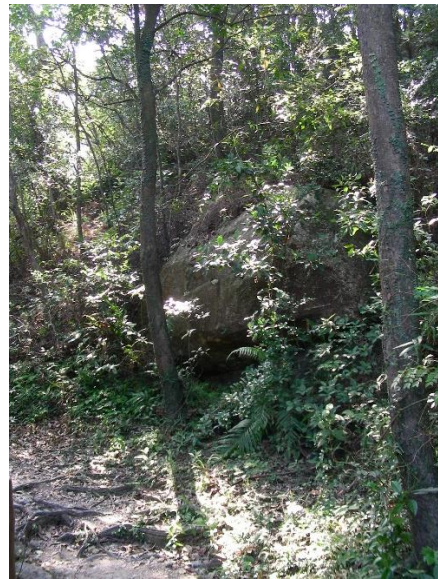
Stream at R1



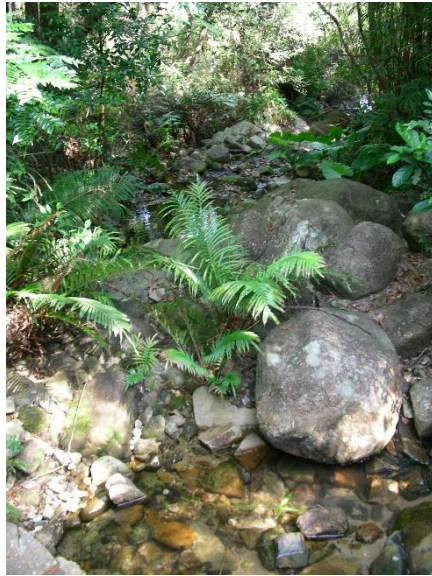
Woodland at R1



Stream at R2



Woodland at R2



Stream at R3



Woodland at R3



C1 Fong Yuen Marsh

4.3 Habitat Enhancement

- 4.3.1 Distribution and abundance of frogs are affected by the availability of breeding habitats (Denton *et al.* 1997 and Tocher *et al.* 1997 in Lau 1998). Romer's Tree Frog can utilise a wide range of breeding sites, including man-made structures (Lau 1998). Hence, provision of breeding habitats in the receptor sites, if considered necessary, could enhance the sustainability of the translocated frogs. For example, artificial breeding pools were constructed in Tsiu Hang to provide

breeding habitats for Romer's Tree Frog (**Photo Plate 2**). Other examples of artificial breeding pools are shown in **Photo Plates 3** and 4.



Photo Plate 2. Artificial breeding pool in Tsiu Hang
(https://www.afcd.gov.hk/english/conservation/con_fau/con_fau_rom/con_fau_rom_con/con_fau_rom_con.html)



Photo Plate 3. Artificial breeding pool
(<https://news.mongabay.com/2017/02/bright-lights-big-city-tiny-frog-romers-tree-frog-survives-hong-kong/>)



Photo Plate 4. Artificial breeding pool

[\(https://news.mongabay.com/2017/02/bright-lights-big-city-tiny-frog-romers-tree-frog-survives-hong-kong/\)](https://news.mongabay.com/2017/02/bright-lights-big-city-tiny-frog-romers-tree-frog-survives-hong-kong/)

- 4.3.2 In Hong Kong, Romer's Tree Frog mainly breeds in seasonally-inundated lentic habitats, and occasionally in permanent or intermittent lotic habitats (Lau 1998). Sizes of waterbodies with breeding records of Romer's Tree Frog ranged from less than 0.1m² to over 10m² (*ibid.*). The substratum were mostly covered by mud/silt and sand/gravel. Most of these waterbodies were surrounded by forest/plantation/shrubland and had medium to dense canopy cover and had variable amount of marginal macrophyte cover.
- 4.3.3 Earthen pots of openings of diameter of 20 to 25 cm with depth of 20 cm can also be used to provide breeding habitats to Romer's Tree Frog (**Photo Plate 5**).



Photo Plate 5. Earthen pot providing breeding habitats of Romer's Tree Frog (Lau and Banks 2008)

- 4.3.4 All the three proposed receptor sites R1-R3 for Romer's Tree Frog are located inside Lantau South Country Park which are in good conditions (well covered by vegetation) and under protection and management by authority. During the site visit in wet season 2017, the natural pools found in these receptor sites were all fish-free. In light of there are sufficient fish-free breeding habitats for the future translocated frogs, no immediate need to implement habitat enhancement measures in these receptor sites is identified. In the case that reduction of fish-free breeding habitats is observed when the translocation is implemented, the translocation team may discuss with management authority on the need of implementing habitat enhancement measure, and the authority will make the final decision on the necessity of habitat enhancement based on the site conditions.
- 4.3.5 The Fong Yuen Marsh (C1) (which was partly included as conservation zone of the future Tung Chung River Park and partly zoned as Green Belt in the Approved Tung Chung Valley Outline Zoning Plan No. S/I-TCV/2 with no development was proposed) was chosen as the receptor site for Chinese Bullfrog. Both breeding and foraging habitats of Chinese Bullfrog are already present in this marsh. Hence, no habitat enhancement is considered necessary. However, suitable locations in Fong Yuen marsh should be identified for translocation of Chinese Bullfrog. If the environmental conditions of the marsh are no longer suitable for Chinese Bullfrog, another suitable receptor site should be considered.

5 Post-translocation Monitoring Programme

- 5.1.1 Post-translocation monitoring surveys will be carried out to evaluate the effectiveness of the capture-and-translocation programme. Translocated frogs will not be monitored individually. The effectiveness of the capture-and-translocation exercise will be qualitatively assessed by monitoring the breeding habitats in the receptor sites to determine whether reproduction occurs. Monitoring surveys will be carried out at night during the breeding seasons of Romer’s Tree Frog and Chinese Bullfrog (March to September) (Chan *et al.* 2005a).
- 5.1.2 Romer’s Tree Frog / Chinese Bullfrog might already be present in the proposed receptor sites. Existing population (baseline condition) of Romer’s Tree Frog / Chinese Bullfrog in each receptor site will be estimated from the number of calling males during breeding season, which is a widely applied survey technique (e.g., Hayek 1994, Woodford and Meyer 2003, Costa *et al.* 2013). Surveys will be conducted in each receptor site at night before release of frogs from the development areas. Other evidence of breeding including the findings of eggs and tadpoles will also be recorded.
- 5.1.3 Both Romer’s Tree Frog and Chinese Bullfrog breed between March and September in Hong Kong (Chan *et al.* 2005). At least three surveys will be conducted in each release site during the breeding season, preferably monthly between April and June, Signs of breeding including calling males, eggs and tadpoles will be indications of breeding. Number of calling males in each receptor site will be compared to the baseline condition before release of captured frogs.
- 5.1.4 In case the target species are not recorded in the receptor sites during post-translocation monitoring surveys, the factor(s) leading to the failure of establishment of breeding population in the receptor site will be identified. Site(s) potentially with these factor(s) will be avoided as receptor sites in capture-and-translocation exercises in the future. On the other hand, if target species can still be recorded at the receptor sites during post-translocation monitoring, the measures of translocation works are considered effective.
- 5.1.5 One report for this Post-translocation Monitoring shall be prepared and submitted to authorities (e.g. AFCD) within 1 calendar month after the Post-translocation Monitoring surveys.

6 Implementation programme

- 6.1.1 Adult male frogs can be easily located by their calls, and the programme will be provided in the future translocation proposal. Capture-and-translocation exercise of each development area shall be conducted between March and November prior to site formation. Frogs within the development areas shall be located by active searching in addition to acoustic search.
- 6.1.2 The qualified ecologist(s) shall prepare a Translocation Report. The Translocation Report shall be submitted within 1 calendar month after the completion of the Capture-and-translocation exercise to the Project Manager, ET, IEC and subsequently submitted to AFCD and EPD.
- 6.1.3 For the proposed receptor sites for Romer’s Tree Frog R1 to R3, in case habitat enhancement is considered necessary, the enhancement measures should be conducted before frogs are translocated to these sites.
- 6.1.4 In case the proposed receptors are no longer suitable habitats for the target species during the site visits and verification surveys by the contractors/specialist, other potential receptor site(s) for translocation should be proposed in the Translocation Proposal prepared by contractors and agreed by the authorities. An implementation schedule summarized the translocation programme is shown in **Table 2**.

Table 2 Implementation schedule

Section Ref.	Task	Implementation agent	Location / timing	Implementati on stage	Requireme nt
3.1.2	Site visit	Contractor/specialist assigned by CEDD or private developer	Development areas of public and private works, and proposed receptor sites during day time	Before capture-and-translocation exercise	By qualified ecologist
3.1.2	Pre-construction survey	Contractor/specialist assigned by CEDD or private developer	Development areas of public and private works, and proposed receptor sites during night time	Before capture-and-translocation exercise	By qualified ecologist
4.1.4	Translocation Proposal	Contractor/specialist assigned by CEDD or private developer	N/A	Before capture-and-translocation exercise and at least 1 month before site formation of each development area	By qualified ecologist
3.1.3	Capture-and-translocation exercise	Contractor/specialist assigned by CEDD or private developer	Development areas of public and private works and proposed receptor site(s) during night time.	one month before site formation works	By qualified ecologist
3.1.8, 3.1.9	Measures to prevent recolonization of amphibians	Contractor/specialist assigned by CEDD or private developer	Development areas of public and private works	After capture-and-translocation exercise, and 1 week before site formation	
6.1.2	Translocation report	Contractor/specialist assigned by CEDD or private developer	N/A	Within 1 calendar month after capture-and-	By qualified ecologist

Section Ref.	Task	Implementation agent	Location / timing	Implementati on stage	Requireme nt
				translocation exercise	
4.3.3, 4.3.4	Habitat enhancement (if considered necessary)	Contractor/specialist assigned by CEDD or private developer	Receptor site(s)	Before capture-and-translocation exercise	Not necessary at the moment, but will be discussed with the authority regarding the necessity of habitat enhancement during implementation
5.1.1, 5.1.2, 5.1.3	Post-translocation monitoring	Contractor/specialist assigned by CEDD or private developer	Receptor site(s) during night time	After capture-and-translocation exercise	By qualified ecologist
5.1.5	Post-translocation report	Contractor/specialist assigned by CEDD or private developer	N/A	Within 1 calendar month after Post-translocation monitoring surveys	By qualified ecologist

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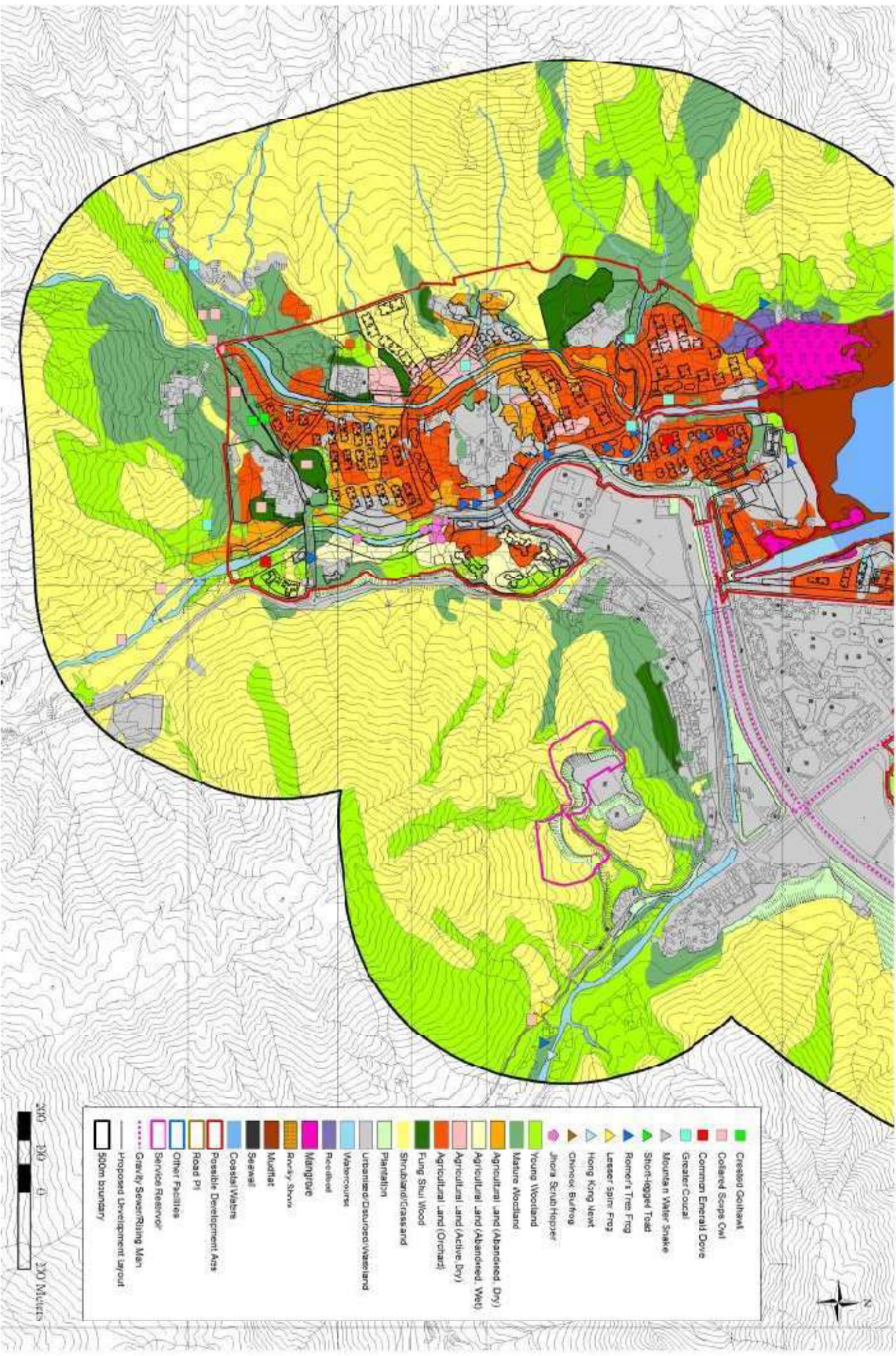


Figure 1 Sighting locations of amphibian species of conservation importance during the EIA study (from Figure 9.6a of TCNTE EIA Report)

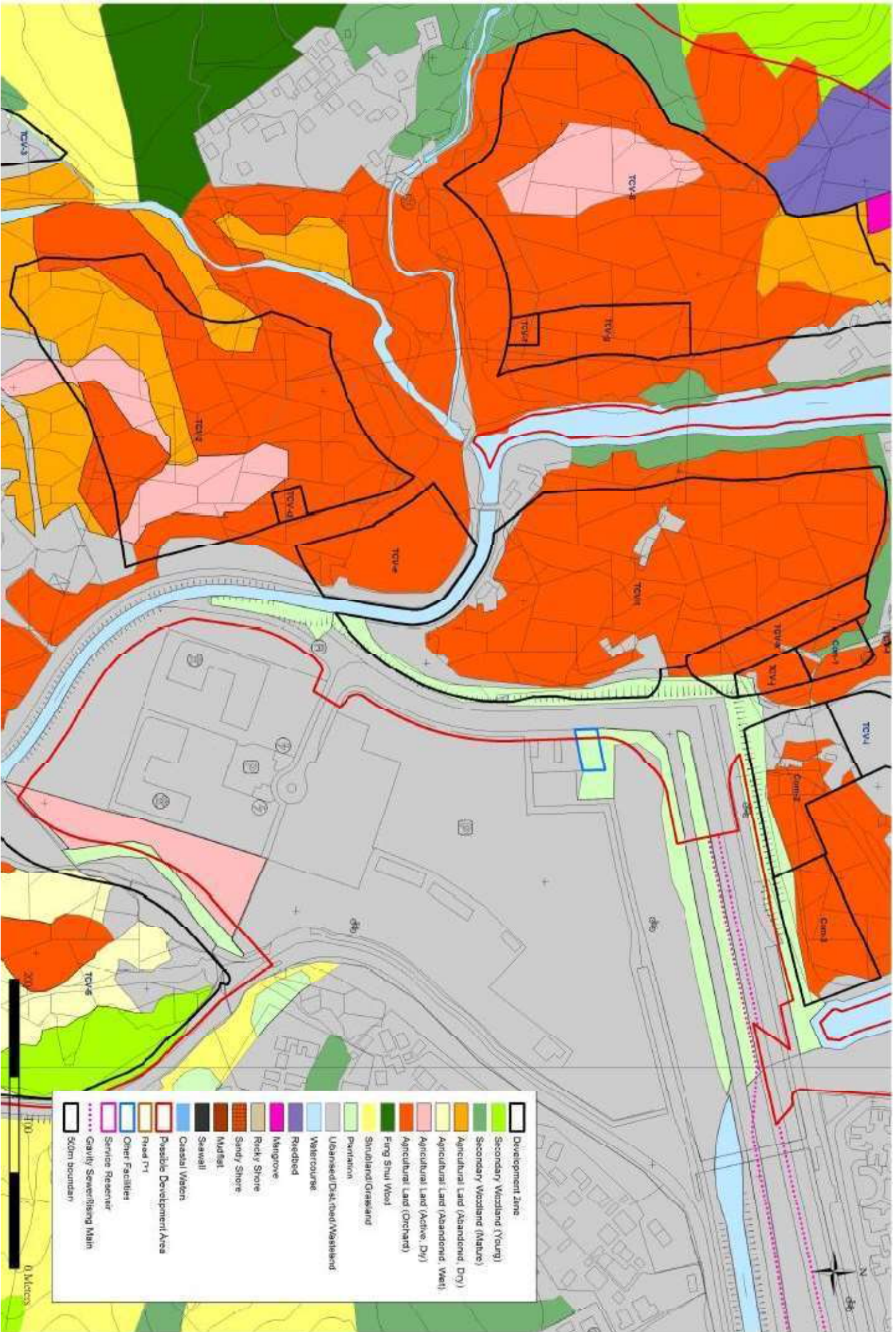


Figure 2 Names of Development Areas in the Northern Tung Chung Valley during the EIA study (from Figure 9.8b(ii) of TCNTE EIA Report)

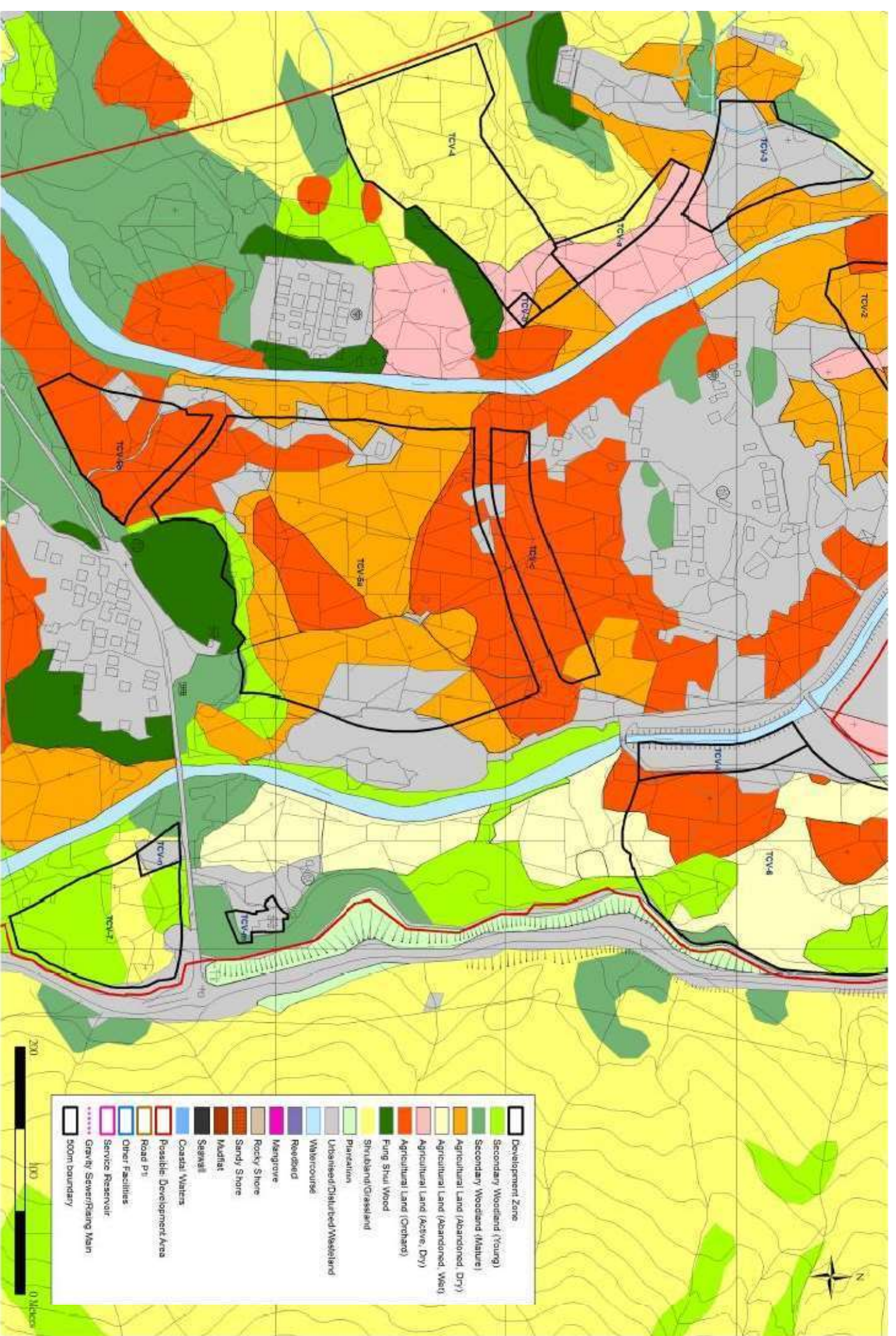
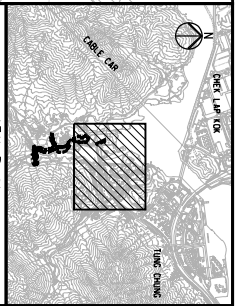
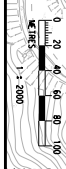
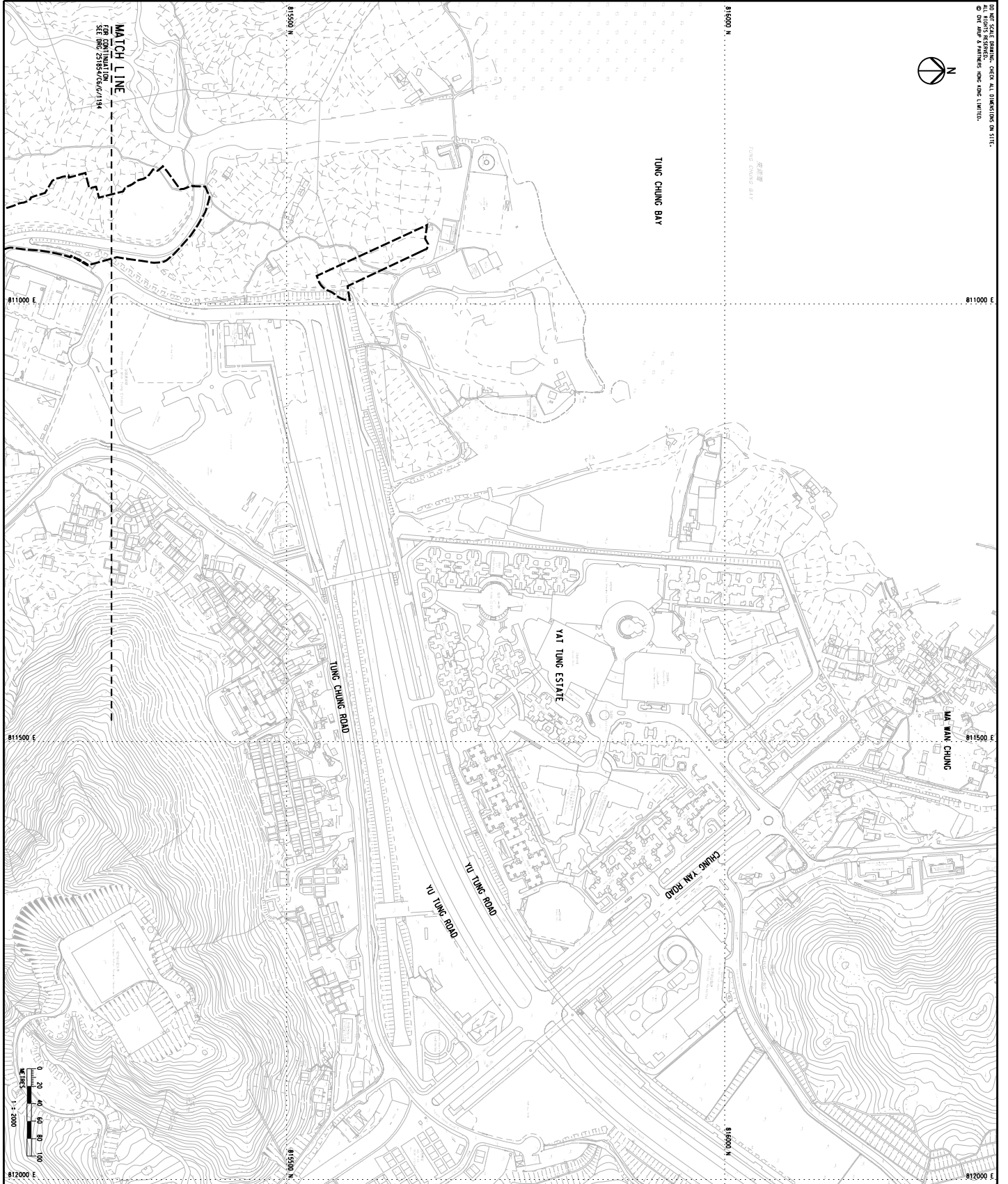


Figure 3 Names of Development Areas in the Southern Tung Chung Valley during the EIA study (from Figure 9.8b(i) of TCNTE EIA Report)



LEGEND
 CAPTURE-AND-TRANSLLOCATION
 EXERCISE ZONE

KEY PLAN

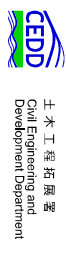
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ARUP

Project Title
 Tung Chung New Town Extension -
 Site Formation and Infrastructure Works
 at Tung Chung Valley, Phase 1

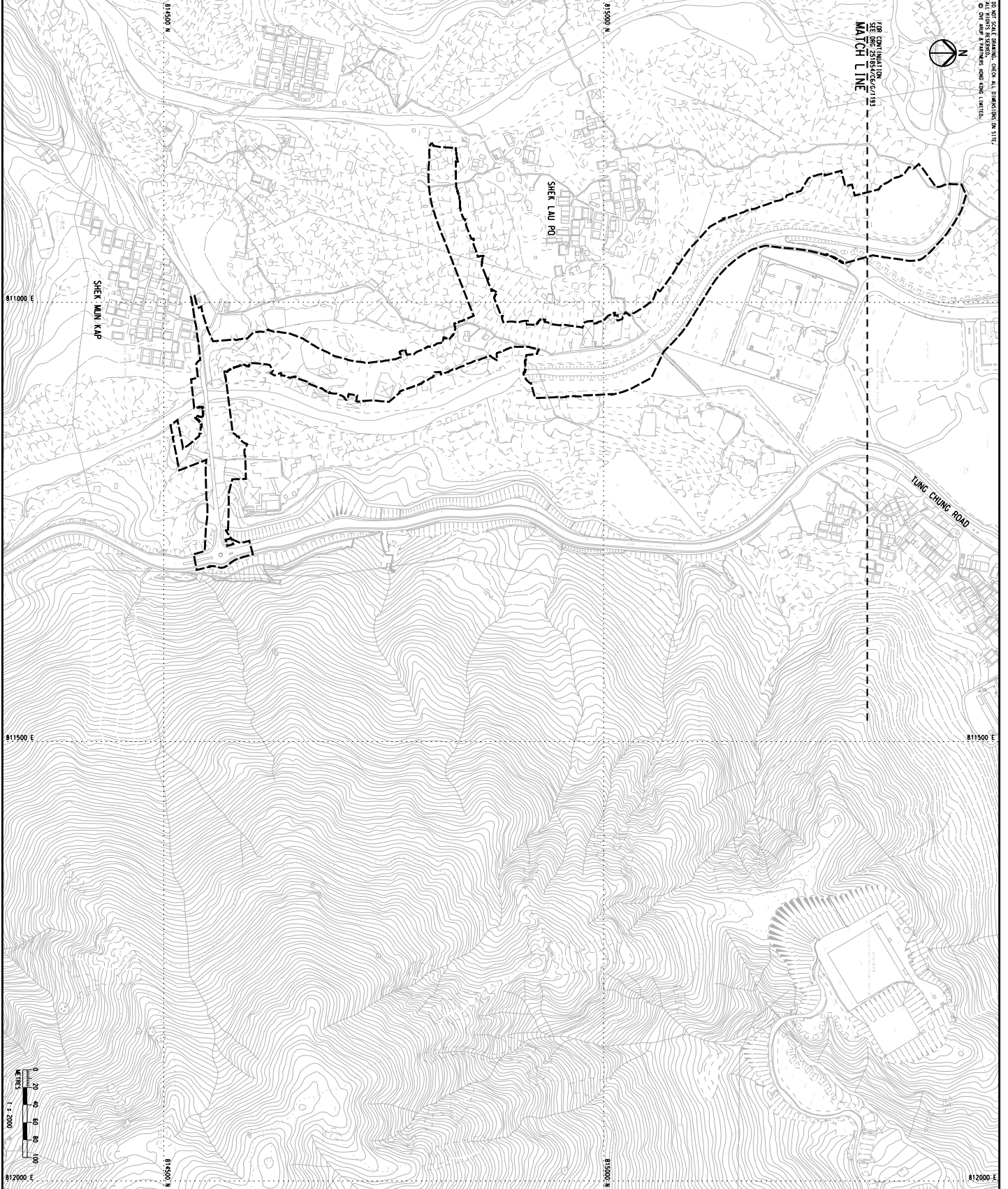
Working Title
 Areas proposed for public works
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 and areas required for
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 (Sheet 1 of 2)

Drawing No.	Figure 4a	Rev.	A
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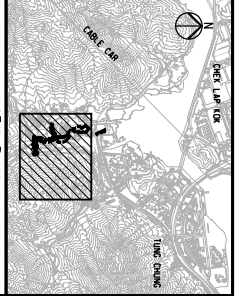


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LEGEND
 CAPTURE-AND-TRANSLLOCATION EXERCISE ZONE

Rev.	Description	By	Date
1	FIRST ISSUE	SC	11/20
Consultant			
ARUP			
Project Title			
Contract No. NU/2020/06			
Tung Chung New Town Extension - Site Formation and Infrastructure Works at Tung Chung Valley, Phase 1			
Drawing Title			
Areas proposed for public works under the present assignment and areas required for capture-and- translocation exercise (Sheet 1 of 2)			
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土木工程拓展署
 Civil Engineering and Development Department

Plan of Proposed Private Residential Development

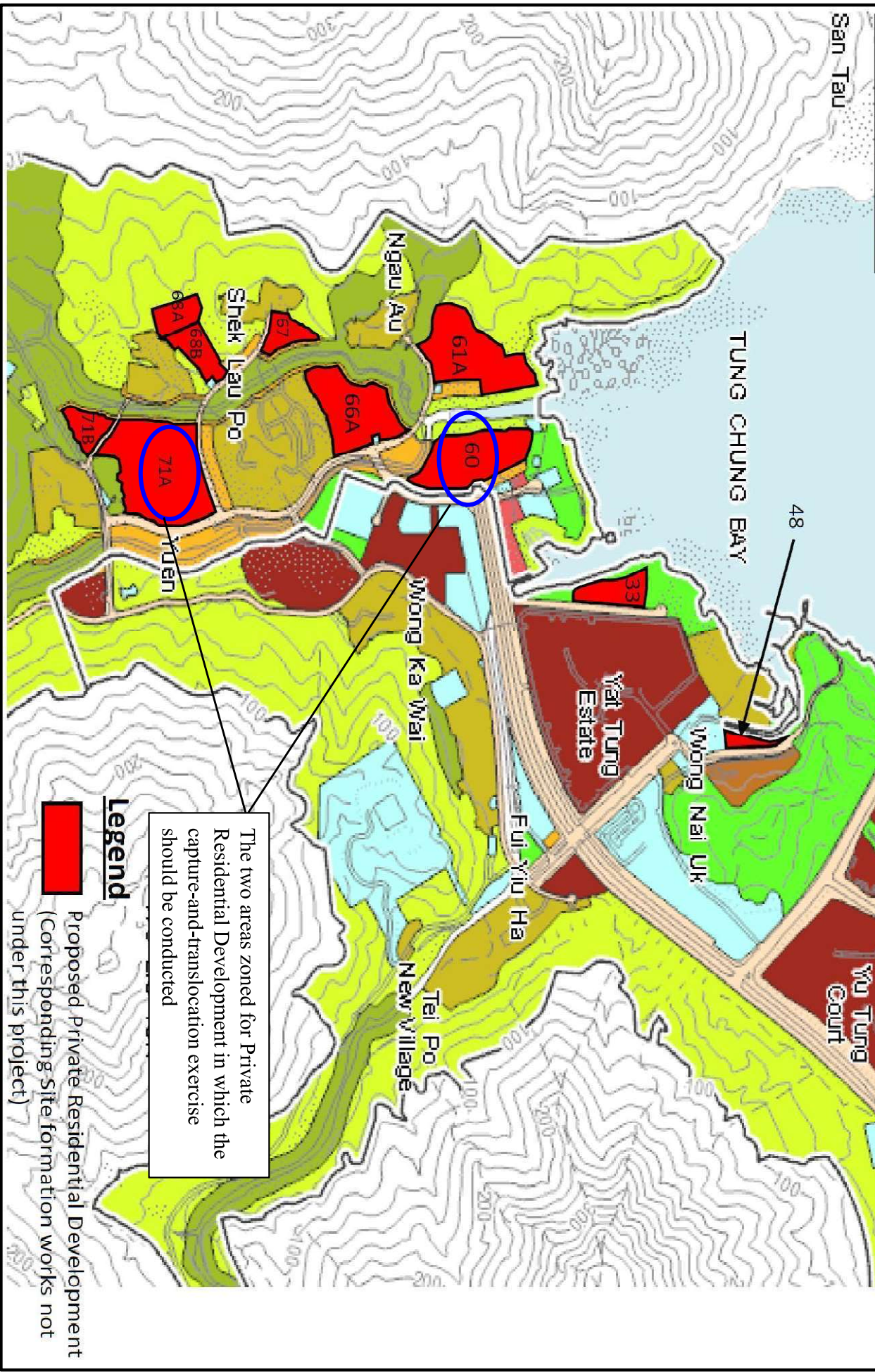


Figure 5 Areas proposed for private residential development and required for capture-and- translocation exercise

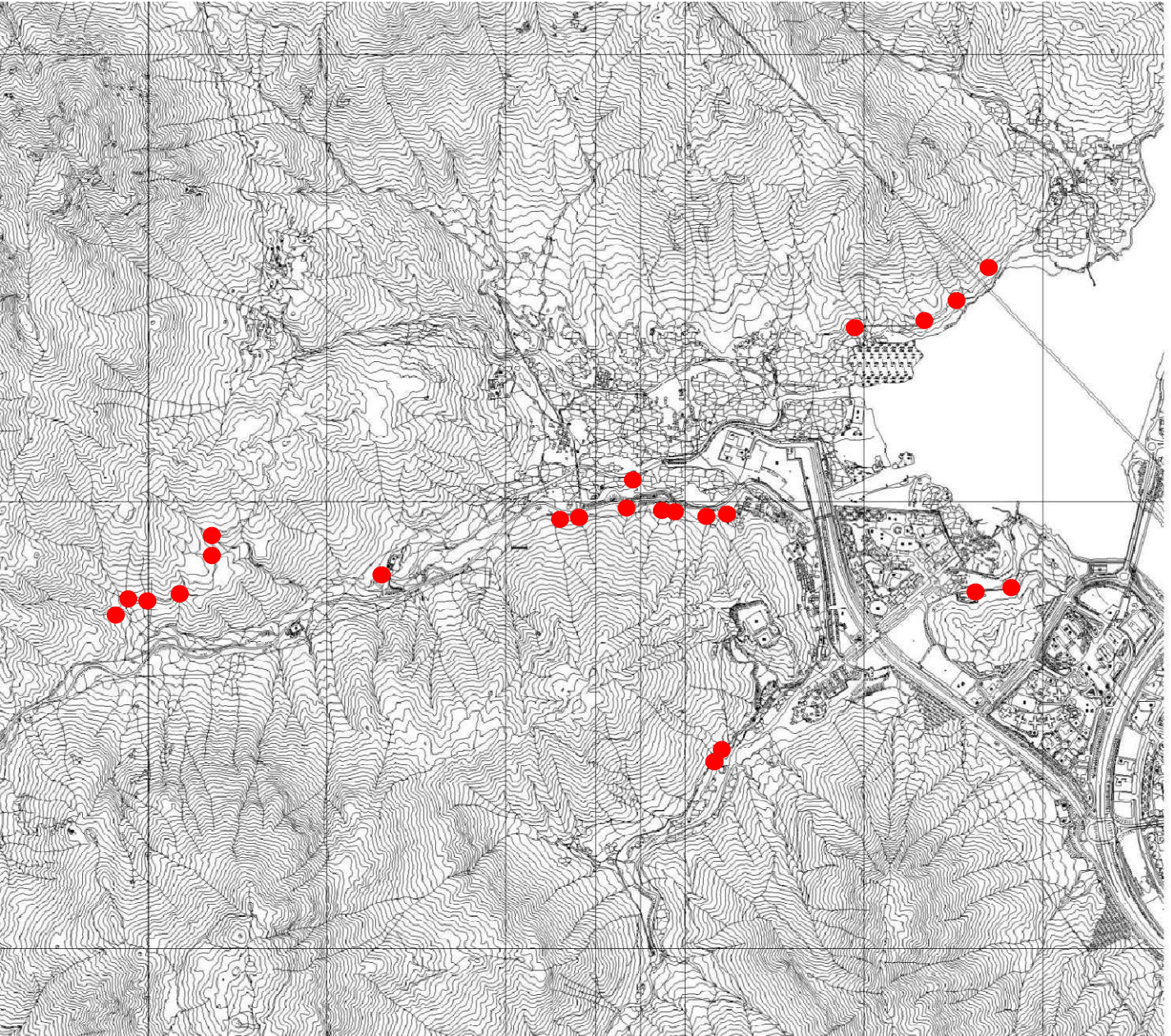
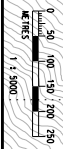
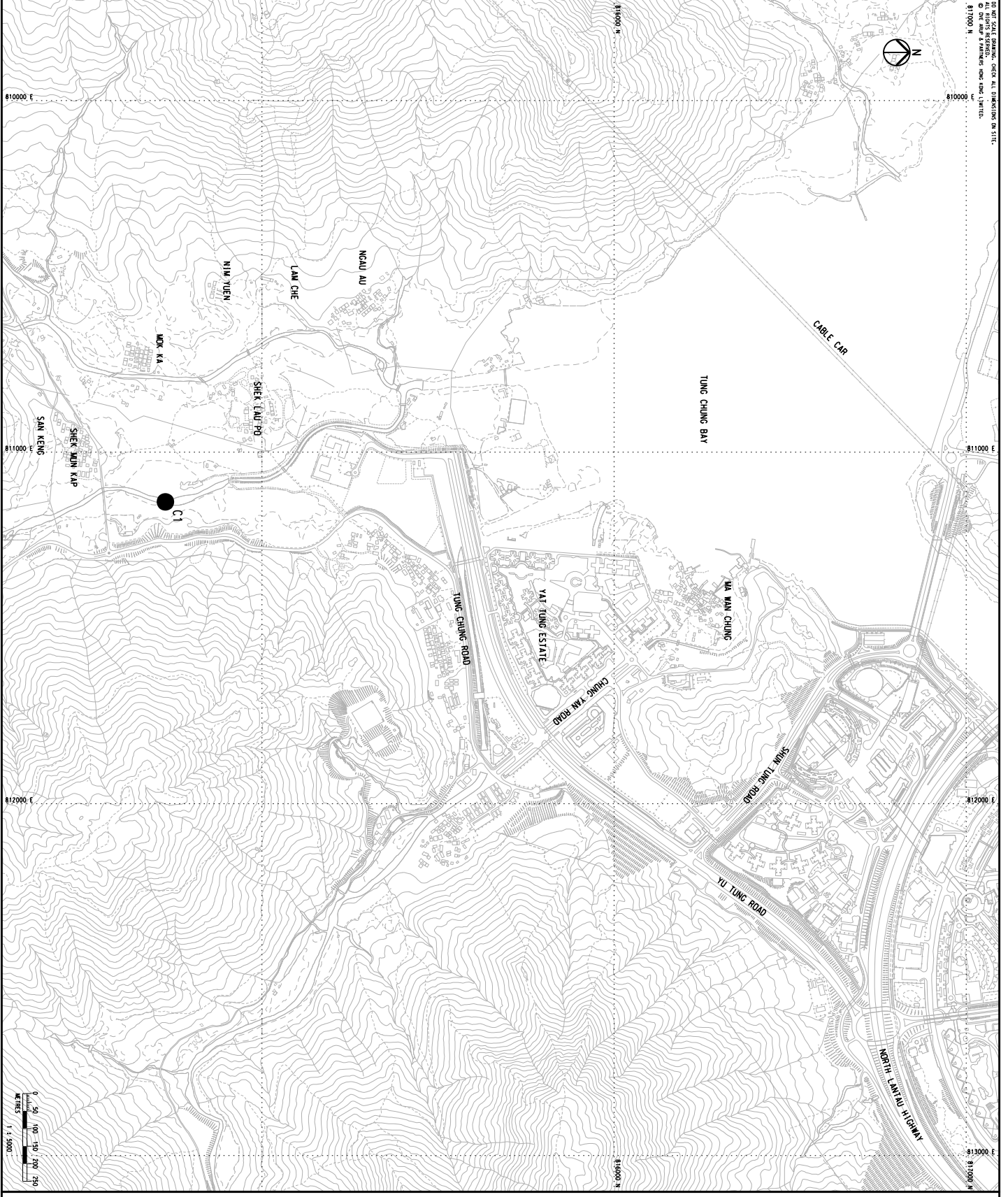


Figure 6 Visited Locations

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LEGEND
 ● PROPOSED RECEPTOR SITE FOR CHINESE BULLFROG (C1)

Rev	Description	By	Date
1	ISSUE FOR PERMIT	SC	12/20

Consultant
ARUP

Project Title
 Tung Chung New Town Extension -
 Site Formation and Infrastructure Works
 at Tung Chung Valley, Phase 1

Contract No. NI/2020/06

**Proposed Receptor Site C1:
 Recommended Receptor Site
 for Chinese Bullfrog**

Drawing No. Figure 7a

Scale	Date	Status	Appr. by
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Appendix A

Sample Land Sale Clause for Amphibian Translocation

(a) The Purchaser shall within twelve calendar months from the date of this Agreement (or such other extended period as may be approved by the Director) at his own expense:

- (i) carry out surveys of amphibian species of conservation importance including but not limited to *Liuixalus romeri* Romer's Tree Frog and *Hoplobatrachus chinensis* Chinese Bullfrog in the lot containing such information and particulars as the Director of Agriculture, Fisheries and Conservation (hereinafter referred to as "the DAFC") may require (which surveys are hereinafter collectively referred to as "the Surveys");
- (ii) submit or cause to be submitted within one calendar month from the last date of the Surveys to the DAFC for approval in writing a proposal for the translocation of the amphibian species of conservation importance found in the lot according to the Surveys (hereinafter referred to as "the Translocation Proposal") containing, among others, the findings of the Surveys, the methodology and implementation programme for the translocation works, details of the recipient sites for the translocation and the details of the post-translocation monitoring programme;
- (iii) carry out, implement and complete the translocation works contained in the Translocation Proposal as approved by the DAFC (hereinafter referred to as "the Translocation Works") in all respects to the satisfaction of the DAFC within one calendar month from the date of the Director's written approval of the Translocation Proposal; and
- (iv) carry out, implement and complete the post-translocation monitoring programme (hereinafter referred to as "the Post-translocation Monitoring") contained in the Translocation Proposal as approved by the DAFC in all respects to the satisfaction of the DAFC within the next breeding season (from March to September) of the Target Species after the completion of the translocation works.

(b) The technical aspects of the Surveys, the Translocation Proposal, the Translocation Works and the Post-translocation Monitoring shall be undertaken by a qualified person with relevant degree and experience ecologist with should possess a degree in a relevant subject and have at least 5 years' experience in Hong Kong on amphibian surveys and translocation works, and preferably with a relevant professional qualification, including but not limited to the membership of Hong Kong Institute of Environmental Impact Assessment (HKIEIA) and Chartered Biologist.

(c) The Purchaser acknowledges and agrees that prior to the carrying out of the Translocation Works and the Post-translocation Monitoring, the Purchaser shall not alter or do anything to affect the habitats for all amphibian species of conservation importance within the lot.

(d) No building works (other than ground investigation) may be commenced on the lot or any part thereof until the Translocation Works and Post-translocation Monitoring shall have been completed in all respects, to the satisfaction of the DAFC except erection of boundary walls or fences or both for the lot.

(e) For the avoidance of doubt and without prejudice to the generality of General Condition No.

5 hereof, the Purchaser hereby expressly acknowledges and agrees that he shall have the sole responsibility at his own expense to carry out the Surveys and to carry out and implement the Translocation Works and Post-translocation Monitoring in all respects to the satisfaction of the DAFC. The Government and its officers shall be under no responsibility, obligation or liability whatsoever to the Purchaser for any cost, damage or loss caused to or suffered by the Purchaser whether arising out of or incidental to the fulfilment of the Purchaser's obligations under this Special Condition or otherwise, and no claim whatsoever shall be made against the Government or its officers by the Purchaser in respect of such cost, damage or loss,

(f) For the purposes of this Special Conditions, the determination of DAFC as to;

- (i) what constitutes a amphibian species of conservation importance referred to in sub-clause (a) of this Special Condition;
- (ii) what constitutes the technical aspects of the Surveys, the Translocation Proposal, the Translocation Works and the Post-translocation Monitoring referred to in sub-clause (b) of this Special Condition;
- (iii) what constitutes a qualified person with relevant degree and experience referred to in sub-clause (b) of this Special Condition; and
- (iv) (iv) what constitutes the habitats referred to in sub-clause (c) of this Special Condition

shall be final and binding on the Purchaser.