AECOM

Civil Engineering and Development Department

Agreement No. CE 38/2010 (CE)

Liantang/Heung Yuen Wai Boundary Control Point and Associated Works (Site Formation and Infrastructure) – Design and Construction

Woodland Compensation Plan

(Revision 2)

June 2017

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1 INTRODUCTION

Background

1.1 The "Liantang/Heung Yuen Wai Boundary Control Point and Associated Works Project" (hereinafter referred to as "the Project") comprises a new Boundary Control Point (BCP) proposed at Liantang/Heung Yuen Wai (LT/HYW), its connecting road and other associated works. The Project comprises the following key components:

- Construction of BCP at the boundary with Shenzhen near the existing Chuk Yuen Village;
- Lin Ma Hang to Frontier Closed Area (FCA) Boundary – this section comprises at-grade and viaducts and includes the improvement works at Lin Ma Hang Road;
- Ping Yeung to Wo Keng Shan – this section stretches from the Frontier Closed Area Boundary to the tunnel portal at Cheung Shan and comprises at-grade and viaducts including an interchange at Ping Yeung;
- North Tunnel – this section comprises the tunnel segment at Cheung Shan and includes a ventilation building at the portals on either end of the tunnel;
- Sha Tau Kok Road – this section stretches from the tunnel portal at Wo Keng Shan to the tunnel portal south of Loi Tung and comprises at-grade and viaducts including an interchange at Sha Tau Kok and an administration building;
- South Tunnel – this section comprises a tunnel segment that stretches from Loi Tung to Fanling and includes a ventilation building at the portals on either end of the tunnel as well as a ventilation building in the middle of the tunnel near Lau Shui Heung; and
- Fanling – this section comprises the at-grade, viaducts and interchange connection to the existing Fanling Highway.

1.2 An Environmental Impact Assessment (EIA) study for the Project was conducted in accordance with EIA Study Brief No. ESB-199/2008. The EIA study concluded that the Project would be environmentally acceptable with the implementation of recommended mitigation measures.

1.3 The EIA Report (Register No.:AEIAR-161/2011) was approved on 24 March 2011 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Report, an Environmental Permit (EP) was granted on 24 March 2011 (EP No.: EP-404/2011) for the construction and operation of the Project.

1.4 The EIA identified that direct loss of woodland habitats would result due to the proposed construction of the portals of tunnels and some sections of the connecting road. Woodland compensation was therefore recommended to mitigate the impacts due to the unavoidable loss of woodland. The EIA recommended that the hillside grassland and shrubland habitats near Cheung Shan could be a suitable location for the Woodland Compensation Area (WCA).

1.5 AECOM Asia Co. Ltd (AECOM) has been commissioned by the Civil Engineering and Development Department to update the Woodland Compensation Plan (WCP) in the EIA report.

Permit Requirements

1.6 Under the Environmental Permit (EP-404/2011), the Permit Holder shall update the Woodland Compensation Plan (WCP) in the EIA Report base on the Vegetation Survey Report referred to in Condition 2.8 of this Permit and, no later than three months before commencement of construction of the Project, submit 3 sets of updated Woodland Compensation Plan to the Director for approval. The submission shall set out the planting strategy including details of plantation species, specifications for the establishment of the habitats and subsequent maintenance and monitoring requirements for the Woodland Compensation Area of an area not less than 18.6 hectares shown in Figure 2a of this Permit. The compensation ratio for *Aquilaria sinensis* shall not be less than 3:1 (ie. more than three seedlings to one individual tree lost from the Project). Before submission to the Director, the WCP shall be certified by the ET Leader and verified by the IEC as confirmed to the information and recommendations contained in the approved EIA Report.

Objectives of the Establishment of Woodland Compensation Area

1.7 The objective of the WCA is to compensate the unavoidable loss of woodland by the Project by providing compensatory tree and shrub planting through the process of woodland creation on existing hillside non-woodland areas. This WCP would guide the implementation of the proposed woodland mitigation. This plan would set out the planting strategy, implementation programme, landscape inspection and ecological monitoring.

2 DESCRIPTION OF SITE

Location and Environment

2.1 The proposed WCA is located on the hillslopes of Cheung Shan. The location of the proposed WCA is shown in **Drawing No. 60212563/SK7037**.

2.2 The environment of the proposed area in the EIA stage was mainly shrubland and hillside grassland occur between areas of woodland habitat. To the north of the WCA are woodlands of Cheung Shan. The majority of the habitat at the south of the WCA is hillside grassland, with a small area of woodland habitat of Shan Tong. To the northwest of the WCA are small parts of adjacent woodlands and farther apart the developed areas of Cheung Shan and Shui Lau Hang.

Existing Site Condition

2.3 The proposed WCA is located in between Wo Keng Shan Road and Ng Chow Road. In between the two roads and next to Sha Tau Kok Road (Ma Mei Ha), there are village houses at Tai Tong Wu. After passing through the village houses, the road continues through wooded areas. Further along the road, a steep, narrow footpath leads uphill to the eastern part of the proposed WCA (**Drawing No. 60212563/SK7037** refers).

2.4 The proposed woodland compensation area is located on existing hillside grassland with existing trees and shrubs established next to the woodland at the periphery near Cheung Shan, Shan Tong and Shui Lau Hang. A number of site photographs were taken and shown in **Appendix 1**. The soil of the site is mainly composed of coarse ash crystal tuff, with debris flow deposits at the superficial.

Existing Ecological Interest

2.5 The proposed WCA is located on the hillslopes of Cheung Shan, where shrubland with trees and hillside grassland occur between areas of woodland habitat. The hillside grassland habitat is a modified habitat disturbed by hill fires. The grassland is mainly dominated by a dense cover of *Dicranopteris pedata* to approximately 1 m in height with *Baeckea frutescens* and *Rhodomyrtus tomentosa*. The shrubland with trees at the fringe of the hillside grassland has also been modified habitat associated with hill fires. Areas with coverage of existing trees and shrubs were

established next to the woodland at the periphery near Cheung Shan, Shan Tong and Shui Lau Hang since the approval of the EIA Report. **Sketch No. CV/2013/08/SK1219** indicated the locations of hillside grassland and areas with coverage of existing trees and shrubs. Survey of the trees and shrubs species in the areas was conducted and results are listed in **Appendix 2**. Trees are dominated by *Alangium chinense*, *Cratoxylum cochinchinense, Endospermum chinense, Glochidion wrightii, Itea chinensis, Mallotus paniculatus, Phyllanthus emblica, Schefflera heptaphylla and Schima superba. Shrubs are dominated by Baeckea frutescens, Litsea rotundifolia* var. *oblongifolia, Melastoma candidum, Melicope pteleifolia, Melastoma sanguineum*, *Psychotria asiatica, Rhus chinensis and Rhodomyrtus tomentosa*. Exotic species including *Litchi chinensis, Leucaena leucocephala and Mikania micrantha are found.*

2.6 The woodlands adjacent to the WCA are secondary habitat derived from modified habitat with moderate floral diversity. Species recorded in the woodlands included *Alangium chinense*, *Aporusa dioica*, *Aquilaria sinensis*, *Bridelia tomentosa*, *Itea chinensis*, *Schima superba* and *Schefflera heptaphylla*. The woodland habitats had moderate ecological value.

3 WOODLAND COMPENSATION PLAN

Extent of Woodland Compensation Area

3.1 According to the EIA report, a total of 6.2 ha of woodland habitats would be lost permanently for the construction of the portals of tunnels and some sections of the connecting road. Mitigation measures in the form of woodland compensation were therefore recommended to avoid residual ecological impacts from the Project.

3.2 Due to the length of time required for the woodland planting to reach maturity (i.e. to simulate similar functions as the woodland to be removed), a compensation ratio of higher than 1:1 was recommended in the EIA to provide a surplus on the initial woodland area.

3.3 To offset the time lag between the implementation of the mitigation measures and the occurrence of the ecological impacts, as well as the possible unexpected difficulties that might hinder the progress of the compensation works during the establishment period, the WCA at a compensation ratio higher than 1:1 (approximately 18.6ha) is proposed.

3.4 The hillside grassland and shrubland habitats in close proximity to the existing woodland habitat have been selected to implement the woodland compensation due to the following reasons:

- their currently lower ecological value;
- similar topographical condition to the existing woodland habitats to be affected;
- potential value for ecological enhancement through natural succession;
- better ecological linkage with woodlands in the vicinity;
- site condition and soil type comparable to that of the existing woodlands; and
- location where construction disturbance could be avoided.

3.5 The potential WCA also meets the following land status criteria to avoid potential conflict with planed land uses:

- The area should be Government Land (or land to be resumed for the Project);
- The area should situate outside any permitted burial ground;

- The area should not be of incompatible land zoning, such as "Village" zone.

3.6 The location of the WCA is shown in **Drawing No. 60212563/SK7037**. The WCA is proposed on area in close proximity to the existing woodland areas to be lost, aiming to mitigate the local ecological impacts effectively. The WCA would cover mainly hillside grassland with some areas with coverage of existing trees and shrubs next to the woodland at the periphery near Cheung Shan, Shan Tong and Shui Lau Hang.

4 PLANTING STRATEGY

4.1 The compensatory planting would comprise species native to the local area, which are selected based on their suitability, stock availability in the market, and ecological values for the area.

4.2 The WCA is located at hillsides with some areas are steep slopes. For safety concern, planting works would be avoided at steep slopes.

4.3 The establishment period is the time when the soil and plants adjust to the environment and create the habitat. The woodland would be tolerant to change if allowed to stabilize over a period of time, and this would enhance the chance of survival of the plant species. The period of time for stabilization would be dependent on various factors including rainfall, temperature and vegetation growth.

4.4 To establish the woodland compensation area successfully and increase the diversity of species to be planted, the planting works would be carried out in two phases. These include initial planting phase and enhancement planting phase.

4.5 The Woodland Compensation will be implemented under the Contract 6 of the Assignment. The implementation programme for the initial and enhancement planting phase is shown in **Appendix 3**.

Initial Planting Phase

4.6 Not all tree species are suitable for planting on exposed areas. Pioneer species are selected to be planted in the initial planting phase in order to establish a brief canopy cover to improve the conditions for the additional planting in the next stage. Thinning of exotic pioneer species should be carried out where appropriate during the establishment period for initial planting phase. Plant species with higher tolerance to exposed planting conditions are recommended for the purpose of initial planting. The recommended plant species are shown in **Table 1**.

Table 1 Plant Species for Initial Planting Phase

Species	*Spacing (mm)*	*Size (mm)*	*Percentage Mix*	*Planting Requirements*
Trees				
Acacia confusa^	1500	Seedling Tree	20%	Trees to be planted in a group of 3 nos. to 5 nos. of the same species.
Acacia mangium^			20%	
*Castanopsis fissa**			10%	
*Litsea glutinosa**			10%	
*Mallotus paniculatus**			10%	
*Phyllanthus emblica**			10%	
*Sapium discolor**			10%	
*Schima superba**			10%	
Shrubs				
*Polyspora axillaris**	750	250(H) x 250(S)	20%	Shrubs to be planted in a

Species	*Spacing (mm)*	*Size (mm)*	*Percentage Mix*	*Planting Requirements*
*Melastoma malabathricum**			20%	group of 5 nos. to 8 nos. of the same species.
*Melastoma sanguineum**			20%	
*Rhaphiolepis indica**			20%	
*Rhodomyrtus tomentosa**			20%	
Note: * Native Species ^ Pioneer Species -Shrub species *Litsea rotundifolia* proposed in the EIA Report is not available in the market and therefore it is not included in the initial planting phase.				

4.7 Seedlings are proposed for tree planting for their higher survival rate and vigor to withstand the exposed condition. The trees would be planted at 1.5 m spacing in staggered pattern, with shrubs planted in 750 mm spacing.

4.8 The initial tree planting in order to establish a brief canopy cover to improve the conditions for the enhancement planting in the next stage would be carried out in areas of hillside grassland, approximately 8.5ha, as shown in the Woodland Compensation Planting Plan for Initial Planting Phase **Sketch No. CV/2013/08/SK1217**. Initial tree planting in the areas with coverage of existing trees and shrubs is not required by considering that the existing vegetation covering effect is sufficient for carrying out enhancement planting.

4.9 At the hillside grassland where dominated by *Dicranopteris pedata*, ground preparation such as clearance of this species is required for planting the seedlings. After the planting of the seedlings, the seedlings should be monitored so that the planting areas are kept clear of *Dicranopteris pedata* or other species to avoid competition for light and other resources.

Enhancement Planting Phase

4.10 After the initial planting phase, the microclimatic conditions established by the pioneer species will create more suitable conditions for planting additional species to enhance the plant diversity. Species to be used in this stage are native species to Hong Kong but could not be planted in the initial phase due to their lower tolerance to exposed conditions. The plant species selected are shown in **Table 2**.

Table 2 Plant Species for Enhancement Planting Phase

Species	*Spacing (mm)*	*Size (mm)*	*Percentage Mix*	*Planting Requirements*
Trees				
Acronychia pedunculata/ Bridelia tomentosa**	1500	Seedling Tree	5%	Trees to be planted in a group of 3 nos. to 5 nos. of the same species.
*Alangium chinense**			10%	
Aporusa dioica/ Cinnamomum camphora**			5%	
Aquilaria sinensis#*			10%	
*Bischofia javanica**			5%	
*Celtis sinensis**			10%	
Choerospondias axillaris/ Ficus hispida**			5%	
*Cinnamomum parthenoxylon**			5%	
Endospermum chinense/ Garcinia oblongifolia**			10%	
*Reevesia thyrsoidea**			10%	

Species	***Spacing (mm)***	***Size (mm)***	***Percentage Mix***	***Planting Requirements***
*Schefflera heptaphylla**			10%	
*Sterculia lanceolata**			10%	
Syzygium levinei/ Liquidambar formosana**			5%	
Shrubs				
*Ficus hirta**	750	250(H) x 250(S)	25%	Shrubs to be planted in a group of 5 nos. to 8 nos. of the same species.
*Ilex asprella**			25%	
Melicope pteleifolia/ Ardisia crenata**			25%	
*Psychotria asiatica**			25%	

Note : * Native Species

The number of seedlings of *Aquilaria sinensis* shall meet the minimum compensation ratio of 3:1 (i.e. more than 3 seedlings to 1 individual tree to be affected but unable to be transplanted). Seedlings collected within Works Area are the preferred source of stock of the species. They should be directly transplanted to suitable receptor sites within the proposed compensatory woodland areas or be temporarily kept in the transit nursery until the receptor sites are ready for planting. Seedlings of this species are also available in local nursery. However, if importation is required, a licence issued by AFCD under Cap. 586 should be acquired in advance.

4.11 Seedlings are proposed for their higher vigor to be established. The trees would be planted at 1.5 m spacing, while shrubs would be planted in 750 mm spacing.

4.12 Where possible, existing native trees and shrubs should be retained and seedlings should be planted in the space between them.

4.13 In view of the situation that areas with existing trees and shrubs has provided coverage suitable for enhancement planting, the planting works will be carried out into two stages as shown in the Woodland Compensation Planting Plan for Enhancement Planting Phase **Sketch No. CV/2013/08/SK1218**.

4.14 Based on the Woodland Compensation Planting Area of 18.6ha, it is predicted that approximately 47,600 seedling trees and 142,800 shrubs will be planted in the initial phase. Among the seedlings, approximately 19,040 seedlings of pioneer species will be removed in the thinning process during the establishment works for the initial planting phase. Approximately, 28,153 new seedling trees and 84,432 shrubs will be planted during the enhancement planting phase. It is estimated that approximately a net total of 56,713 seedling trees and 227,232 shrubs will be planted within the Woodland Compensation Planting Area. Due to the existence of steep slopes and native trees to be retained on site, the actual number of seedling trees and shrubs to be planted in the WCA would be subject to the latest site condition.

4.15 Based on the Vegetation Survey Report submitted under Condition 2.8 of the EP, a total of 83 numbers of *Aquilaria sinensis* was lost due to the Project, including 48 numbers proposed to be felled and the rest were either felled by others, found dead or missing in the Initial Survey. The lost is compensated by planting of 2,815 numbers of seedlings of *Aquilaria sinensis* in the Woodland Compensation Area (WCA). The compensation ratio is about 34:1 which is higher than the Permit requirement.

Thinning Process

4.16 The objective of thinning process of exotic trees within the woodland compensation area is to improve the growth rate and health of the targeted native trees as well as allowing space for enhancement planting.

4.17 In areas with initial planting, thinning of exotic species shall be carried out when the crown and root

of the targeted native trees are healthy developed after the establishment period. Exotic species, *Acacia confusa* and *Acacia mangium*, shall be removed from the WCA to provide space for the native species for further growth in advance or during the enhancement planting. In areas where initial planting is not necessary, removal of exotic trees identified, such as *Litchi chinensis* and *Leucaena leucocephala* will be conducted in parallel with the first stage of enhancement planting.

4.18 Thinning works shall only be carried by using hand tools. The thinned trees will be left on the woodland floor as such wood can be decomposed naturally and will also provide habitat for various invertebrates and birds etc to enhance biodiversity of the area. The contractor shall provide detailed method statement for the thinning process prior to commencement of any thinning works.

Establishment of Firebreak

4.19 A history of fires is evident within and adjacent to the WCA as the natural successional stages from grassland to shrubland to forest are present. In addition, bare areas including charcoal were observed amongst the graves at Tai Hom Tuk indicating recent fires. A review of the land uses in the vicinity of the WCA indicates that the graves at Tai Hom Tuk are mostly probably the source of past fires in the area, particularly on the slopes of the WCA resulting in the grassland and shrubland habitats. The establishment of a firebreak between the WCA and the Tai Hom Tuk, graves, and area around the proposed WCA near any identified graves/burial ground is therefore recommended. The firebreak should consist of a mown strip of 10 – 20 m wide dependent upon the terrain, adjacent to a densely planted tree belt (no less than 15 m wide). Tree species to be included in the tree belt should be fast growing and could include Schima (*Schima superba*) (<1 m spacing) which has been widely used in fire breaks in South China. Other species that could be used include Castanopsis (*Castanopsis fissa*), Sweet Gum (*Liquidambar formosana*), Sweet Viburnum (*Viburnum odoratissimum*), Red Machilus (*Machilus thunbergii*), Ivy Tree (*Schefflera heptaphylla*).

5 PLANTING MANAGEMENT

5.1 The proposed planting management would include monitoring and establishment softworks, aiming to ensure the compensation meets the planting performance in accordance with the requirements of the planting strategy.

5.2 The specifications for planting and establishment works for woodland compensation would follow the General Specification for Civil Engineering Works (2006) Section 3 – Landscape Softworks and Establishment Works. Landscape inspection should be carried out at fortnightly intervals during planting period and at bi-monthly (i.e., once every two months) intervals during establishment period of the initial planting phase and enhancement planting phase.

5.3 Landscape inspections will assess whether the contactor has carried out the planting works in accordance with the contract during the planting phases and carried out regular planting establishment works in accordance with the specification of the contract, including replacement of dead plants, weeding and watering etc. Pre-planting works and site preparation works shall follow the General Specification and Particular Specification (**Appendix 4**) of the Contract.

5.4 Maintenance of the firebreak (e.g. grass cutting), to protect the WCA against hill fires, will also be required and should be carried out twice a year. Whilst this has been included in the implementation programme (**Appendix 3**), the firebreak could take 5-10 years to be fully functional and would therefore require on-going maintenance.

6 ECOLOGICAL MONITORING

6.1 To ensure the establishment of the woodland compensation area, a regular ecological monitoring programme covering both the initial and enhancement planting phases is proposed, in addition to the standard practices and site inspections regularly conducted by the Engineer. The necessity for further monitoring would be reviewed at the end of the ecological monitoring programme.

6.2 The ecological monitoring should be supervised by a qualified botanist/ecologist (Project Botanist/Ecologist) who would form part of the Environmental Team (ET).

6.3 Due to the large size of the WCA (18.6ha), monitoring is proposed to be conducted by inspection walk and quadrat sampling. As the inspection walk monitoring aims to observe the overview and general condition of the WCA, the transect routes should be selected to cover all representative areas of the WCA as far as possible. The general health condition (good/fair/poor/dead) and survival rate (%) of individual species of the planted trees and shrubs would be recorded by direct observation.

6.4 A minimum of nine fixed quadrats (20 m x 20 m) are proposed for monitoring, which aims to collect quantitative information. The quadrat locations will be based on the areas in which planting has been undertaken (i.e. as opposed to areas of retained trees and shrubs) and should be evenly distributed throughout the WCA, covering both grassland and hillslope habitats. Parameters to be measured within the quadrats include health condition (good/fair/poor/dead), and survival rate (%) of individual species. The proposed locations for the fixed quadrats are shown in **Drawing No. 60212563/SK7037**.

6.5 The frequency of the monitoring is proposed to be bi-monthly during the first year of the initial planting phase and should be reduced to quarterly from the second year. Change of monitoring frequency should be advised by the Project Ecologist/Botanist of the ET and approved by Environmental Protection Department and Agriculture, Fisheries and Conservation Department.

6.6 The Trigger and Action Levels for the monitoring and the Action Plan of the WCA are shown in **Table 3**.

Table 3 Trigger and Action Levels for Monitoring and Action Plan

Parameters	Trigger and Action Level	Action Plan
General Health Condition of planted species (i.e. good/fair/poor; based on parameters e.g. wilting, insect attack, disease, fungal infection, browsing damage)	Trigger Level: % of individual plant species in poor health condition >20%	- the ET should inform Contractor and IEC immediately; - identify the causes(s) of the exceedance; - advise Contractor the necessity of replanting.
	Action Level: % of individual plant species in poor health condition >30%	- the ET should inform Contractor and IEC immediately; - identify the cause(s) of the exceedance; - advise remedial action and work out solution including change of species in re-planting, re-soiling of the target areas; and seek acceptance from AFCD; - once the remedial action has been accepted by AFCD, the Contractor should implement the remedial action.

Parameters	Trigger and Action Level	Action Plan
Survival of Planted Species (i.e. dead)	Trigger Level: Survival rate of individual plant species <80%	- the ET should inform Contractor and IEC immediately; - identify the causes(s) of the exceedance; - advise Contractor the necessity of replanting.
	Action Level: Survival rate of individual plant species <70%	- the ET should inform Contractor and IEC immediately; - identify the cause(s) of the exceedance; - advise remedial action and work out solution including change of species in re-planting, re-soiling of the target areas; and seek acceptance from AFCD; - once the remedial action has been accepted by AFCD, the Contractor should implement the remedial action.

7 REPORTING

Introduction

7.1 The monitoring findings, site observations and recommendations should be reported in periodic monitoring reports. Agriculture, Fisheries and Conservation Department should be included in the circulation list of the monitoring reports.

Bi-monthly Woodland Compensation Monitoring Reports

7.2 The results and findings of the bi-monthly (i.e., once every two months) monitoring including the landscape inspection during the first year of the initial planting phase and the first year of the enhancement planting phase shall be recorded in the bi-monthly woodland compensation monitoring reports prepared by the ET Leader. The bi-monthly monitoring report shall be prepared and submitted within 10 working days from the end of each reporting month. Each bi-monthly monitoring report shall be submitted to the following parties: the Contractor, the IEC, the ER, CEDD, EPD and AFCD. Before the submission of the first bi-monthly monitoring report, the ET Leader shall liaise with the parties on the required number of copies and format of the monitoring reports in both hard copy and electronic medium.

7.3 The bi-monthly woodland compensation monitoring report shall include at least but not be limited to the following:

(i) Executive summary:

- breaches of Action and Limit levels
- changes made that affect the EM&A
- future key issues

(ii) Project background

(iii) Monitoring Requirements:

- monitoring parameters
- environmental quality performance limits (Action and Limit levels)
- Action Plans
- environmental mitigation measures, as recommended in the project EIA study final report
- environmental requirements in contract documents

(vi) Monitoring Results:

- monitoring methodology
- parameters monitored
- monitoring locations
- monitoring date, time, frequency, and duration
- weather conditions during the period/monitoring

(v) Analysis of Monitoring Results and Non-compliances:

- analysis and interpretation of monitoring results in the month
- any non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
- changes made that affect the monitoring during the month
- reasons for and the implications of non-compliance
- actions taken in the event of non-compliance and deficiency, and follow-up actions related to earlier non-compliance

(vi) Appendices

- monitoring schedule for the present and next reporting period
- outstanding issues and deficiencies

(vii) Outstanding works and any works accomplished during the reporting

Quarterly Woodland Compensation Monitoring Reports

7.4 Starting from the second year of the initial planting phase and the enhancement planting phase, the frequency of the monitoring is reduced to quarterly basis. The results and findings of the quarterly monitoring as well as the landscape inspection after the first year of the initial planting phase and the first year of the enhancement planting phase shall be recorded in the quarterly woodland compensation monitoring reports prepared by the ET Leader. The quarterly monitoring report shall be prepared and submitted within 10 working days from the end of each reporting month. Each quarterly monitoring report shall be submitted to the following parties: the Contractor, the IEC, the ER, CEDD, EPD and AFCD. Before the submission of the monitoring report, the ET Leader shall liaise with the parties on the required number of copies and format of the monitoring reports in both hard copy and electronic medium.

7.5 The reporting requirement for the quarterly woodland compensation monitoring report shall be the same as the bi-monthly monitoring report as stated in **Section 7.4**.

8 IMPLEMENTATION AND MAINTENANCE MANAGEMENT

8.1 As the woodland compensation is proposed on areas where no construction works are carried out, the implementation of the woodland compensation can start once the Project commences, therefore it is not necessary to wait for the completion of works. This has an advantage of shorter time lag between the occurrence of ecological impact and establishment of the mitigation measure.

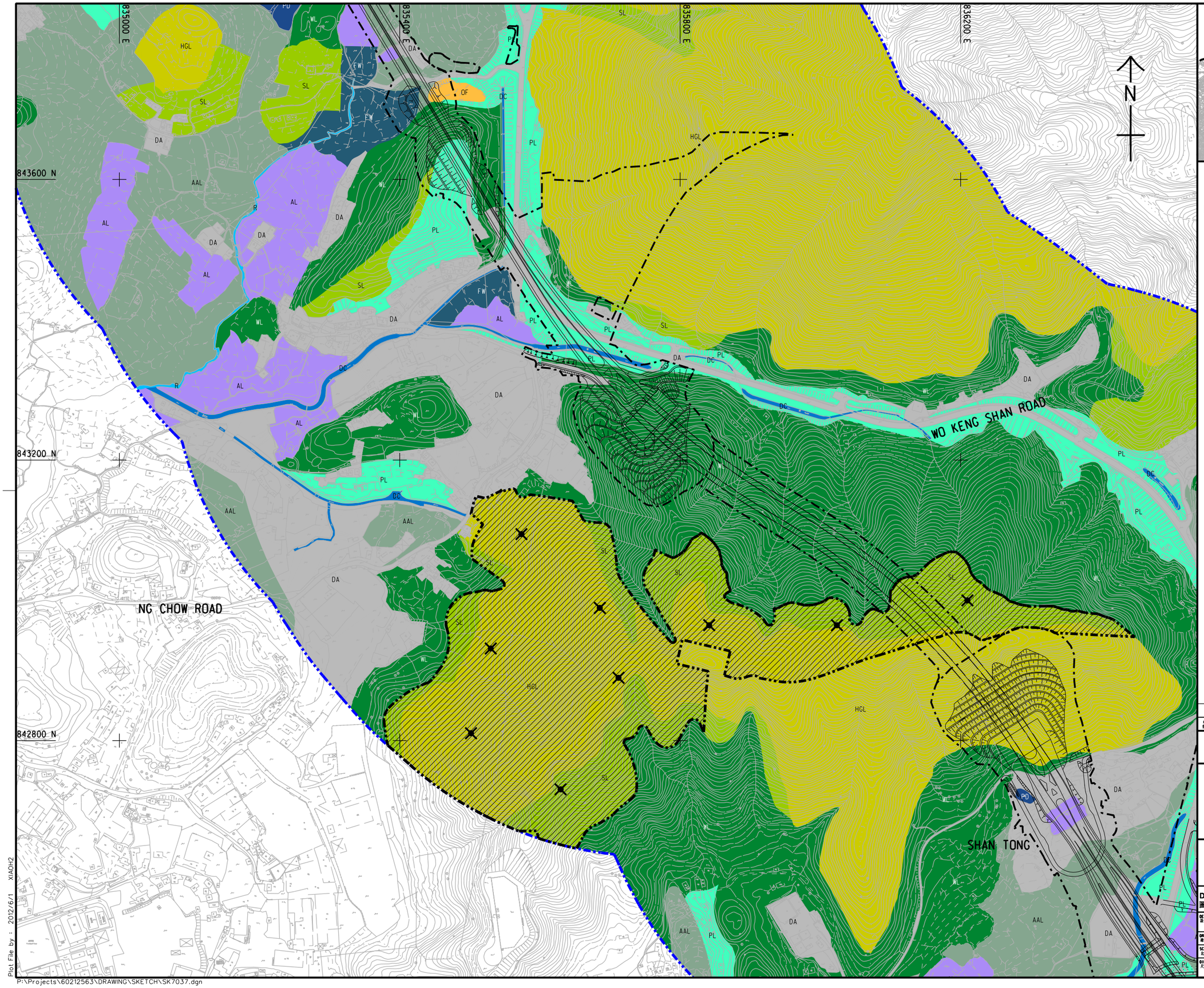
8.2 Both the implementation and maintenance of the compensatory planting would be fully funded by the Project Proponent.

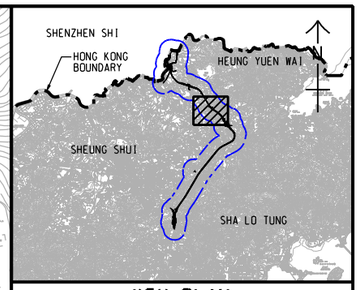
8.3 The management and maintenance of the woodland compensation area would be regulated by the Environment, Transport and Works Bureau Technical Circular (Works) No. 2/2004 – Maintenance of Vegetation and Hard Landscape Features. According to the technical circular, AFCD would maintain the ecological planting as recommended by the EIA till the vegetation is fully established. The Project department should properly establish the designated WCA before handing over and provide necessary recurrent cost for the maintenance and monitoring works.

9 CONCLUSION

9.1 The Woodland Compensation Plan has been developed to facilitate the establishment of the Woodland Compensation Area of 18.6ha to mitigate the loss of woodland habitats due to the construction and operation of the Project – Liantang/Heung Yuen Wai Boundary Control Point and Associated Works. The proposed WCA would be provided with a compensation ratio higher than 1:1. The planting works would be carried out in two phases (i.e. initial planting phase and enhancement planting phase). The purpose of initial planting phase is to establish a brief canopy cover by using pioneer species. With canopy cover, additional native tree and shrub species would be planted in the enhancement planting phase to increase the plant diversity. Where areas with existing trees and shrubs suitable for carrying out enhancement planting, initial planting will not be conducted in the areas and the enhancement planting will be conducted earlier. For proper implementation of the planting works, establishment works and ecological monitoring would be conducted for the duration of Contract 6. The monitoring findings and recommendations would be included in periodic EM&A reports.

Figures





KEY PLAN
SCALE 1 : 150000

LEGEND:

- 500m ASSESSMENT AREA
- TENTATIVE WORKS AREA
- TUNNEL SECTION
- WL — WOODLAND
- SL — SHRUBLAND
- PL — PLANTATION
- FW — FRESHWATER WETLAND (WET AGRICULTURAL LAND (ACTIVE/ABANDONED))
- AL — ACTIVE AGRICULTURAL LAND
- AAL — ABANDONED AGRICULTURAL LAND
- HGL — HILLSIDE GRASSLAND
- PD — POND
- DC — DRAINAGE CHANNEL
- R — WATERCOURSE
- OF — OPEN FIELD
- DA — DEVELOPED AREA
- EXTENT OF WOODLAND COMPENSATION PLANTING AREA
- TENTATIVE WOODLAND MONITORING QUADRAT (THE EXACT LOCATION TO BE DETERMINED BY THE ENGINEER ON SITE)

REV. 修訂	DESCRIPTION 內容摘要	D.C.	P.E.	CHECKED 審核	DATE 日期

CEDD 土木工程拓展署 Civil Engineering and Development Department

LIANTANG/HEUNG YUEN WAI BOUNDARY CONTROL POINT AND ASSOCIATED WORKS (SITE FORMATION AND INFRASTRUCTURES) - DESIGN AND CONSTRUCTION

PROPOSED WOOLAND COMPENSATION AREA

AECOM

DRG.NO. 圖紙編號	60212563/SK7037
DESIGNED BY 設計	KW
CONTRACT NO. 合約編號	–
P. Dir. APPROVED 批准人	–
DRAWN BY 繪圖	YJP
STATUS 階段	
SCALE 比例	A1 1 : 2500
DIMENSIONS ARE IN 尺寸單位	METRES

Plot File by : 2012/6/1 XIAOH2

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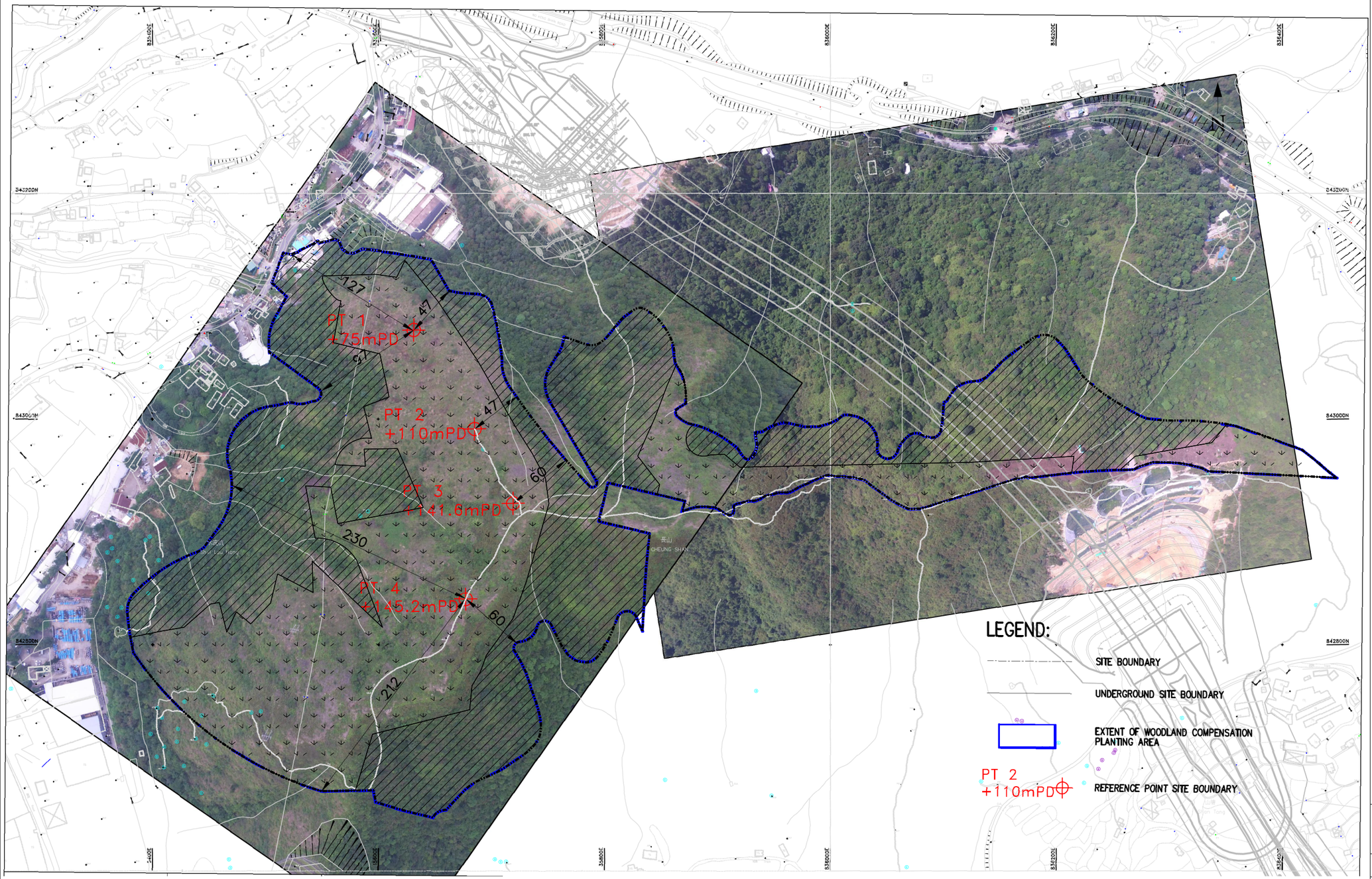

LEGEND:

- BOUNDARY OF WOODLAND COMPENSATION PLANTING AREA
- AREA WITH COVERAGE OF EXISTING TREES AND SHRUBS
- AREAS OF HILLSIDE GRASSLAND

REFERENCE:

Rev.	Date	Description	Drawn	Prepared	Checked
-	07/12/16	ISSUE FOR CONSTRUCTION	MCYT	CW	

AECOM

CEDD CONTRACT NO. CV/2013/08
LIANTANG/HEUNG YUEN WAI BOUNDARY CONTROL POINT SITE FORMATION AND INFRASTRUCTURE WORKS - CONTRACT 6

TITLE: AERIAL VIEW OF EXISTING WOODLAND COMPENSATION AREA

SKETCH NO. CV/2013/08/SK1219 | SCALE N.T.S.

$DATE$ $TIME$
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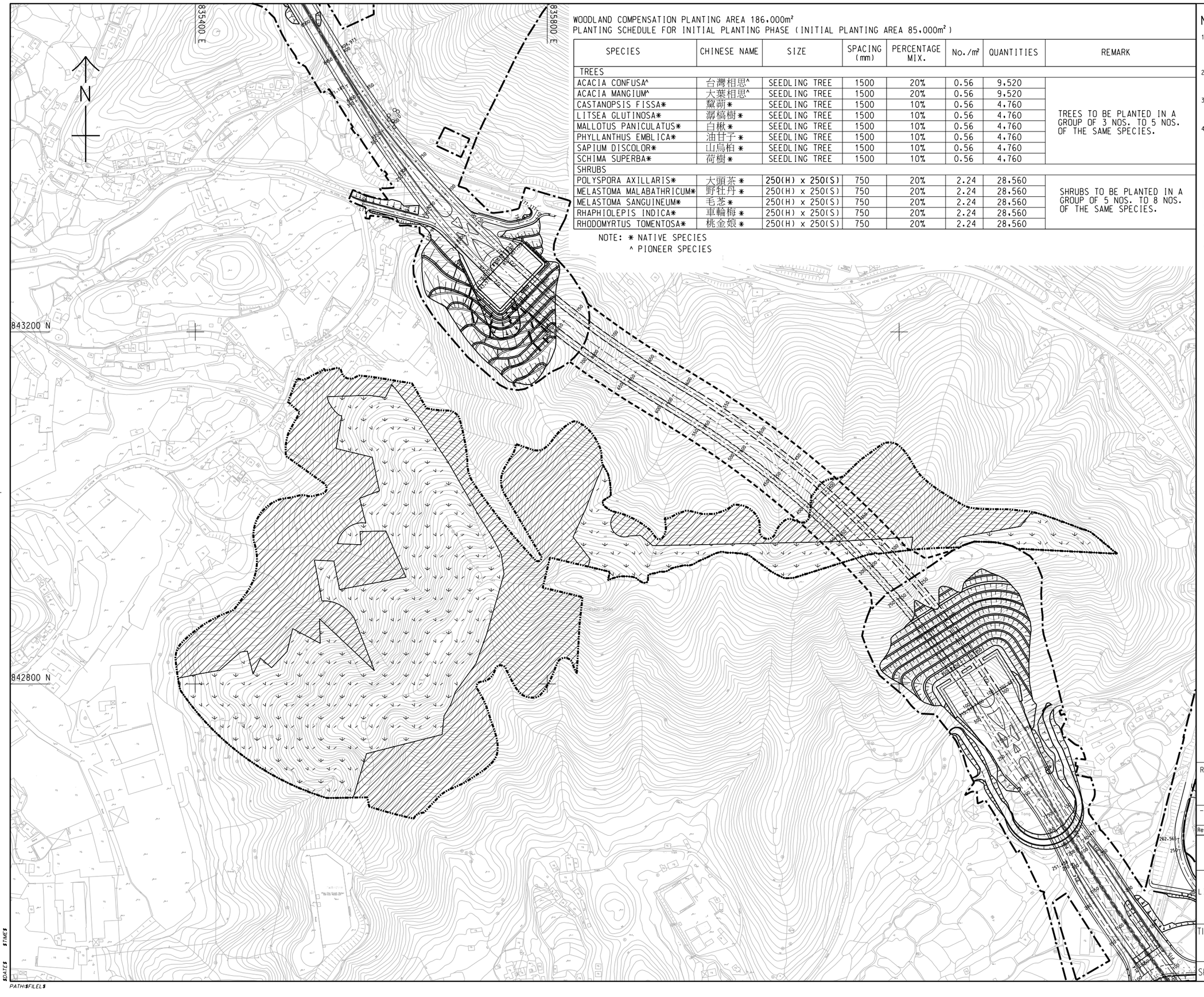

WOODLAND COMPENSATION PLANTING AREA 186,000m²
PLANTING SCHEDULE FOR INITIAL PLANTING PHASE (INITIAL PLANTING AREA 85,000m²)

SPECIES	CHINESE NAME	SIZE	SPACING (mm)	PERCENTAGE MIX.	No./m²	QUANTITIES	REMARK
TREES							
ACACIA CONFUSA^	台灣相思^	SEEDLING TREE	1500	20%	0.56	9,520	TREES TO BE PLANTED IN A GROUP OF 3 NOS. TO 5 NOS. OF THE SAME SPECIES.
ACACIA MANGIUM^	大葉相思^	SEEDLING TREE	1500	20%	0.56	9,520	
CASTANOPSIS FISSA*	黧蒴*	SEEDLING TREE	1500	10%	0.56	4,760	
LITSEA GLUTINOSA*	潺槁樹*	SEEDLING TREE	1500	10%	0.56	4,760	
MALLOTUS PANICULATUS*	白楸*	SEEDLING TREE	1500	10%	0.56	4,760	
PHYLLANTHUS EMBLICA*	油甘子*	SEEDLING TREE	1500	10%	0.56	4,760	
SAPIUM DISCOLOR*	山烏桕*	SEEDLING TREE	1500	10%	0.56	4,760	
SCHIMA SUPERBA*	荷樹*	SEEDLING TREE	1500	10%	0.56	4,760	
SHRUBS							
POLYSPORA AXILLARIS*	大頭茶*	250(H) x 250(S)	750	20%	2.24	28,560	SHRUBS TO BE PLANTED IN A GROUP OF 5 NOS. TO 8 NOS. OF THE SAME SPECIES.
MELASTOMA MALABATHRICUM*	野牡丹*	250(H) x 250(S)	750	20%	2.24	28,560	
MELASTOMA SANGUINEUM*	毛菶*	250(H) x 250(S)	750	20%	2.24	28,560	
RHAPHIOLEPIS INDICA*	車輪梅*	250(H) x 250(S)	750	20%	2.24	28,560	
RHODOMYRTUS TOMENTOSA*	桃金娘*	250(H) x 250(S)	750	20%	2.24	28,560	

NOTE: * NATIVE SPECIES
^ PIONEER SPECIES

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOODLAND COMPENSATION PLANTING PLAN FOR ENHANCEMENT PLANTING PHASE (DRG NO. CV/2013/08/SK1218).
2. ALL SEEDLING TREES AND SHRUBS SHALL BE PLANTED ACCORDING TO THE STATED SPACING IN STAGGERED PATTERN.
3. WOODLAND COMPENSATION PLANTING PLAN FOR INITIAL PLANTING PHASE SHALL BE CARRIED OUT AT THE EARLY STAGE AFTER COMMENCEMENT OF THE CONTRACT.
4. THE CONTRACTOR SHALL PROVIDE DETAILED METHOD STATEMENT INCLUDING WORKING METHODOLOGY AND PROGRAMME FOR IMPLEMENTATION WOODLAND COMPENSATION PLANTING OR INITIAL PLANTING PHASE WITHIN 3 MONTHS AFTER COMMENCEMENT OF THE CONTRACT. THINNING OF EXOTIC PIONEER SPECIES SHOULD BE CARRIED OUT WHERE APPROPRIATE WHERE APPROPRIATE DURING THE ESTABLISHMENT PERIOD FOR INITIAL PLANTING PHASE.

LEGEND:

- SITE BOUNDARY
- UNDERGROUND SITE BOUNDARY
- BOUNDARY OF WOODLAND COMPENSATION PLANTING AREA
- AREA WITH COVERAGE OF EXISTING TREES AND SHRUBS
- INITIAL PLANTING AREA

REFERENCE:

Rev.	Date	Description	Drawn	Prepared	Checked
-	07/12/16	ISSUE FOR CONSTRUCTION	MCYT	CW	

AECOM

CEDD CONTRACT NO. CV/2013/08
LIANTANG/HEUNG YUEN WAI BOUNDARY CONTROL POINT SITE FORMATION AND INFRASTRUCTURE WORKS - CONTRACT 6

TITLE: WOODLAND COMPENSATION PLANTING PLAN FOR INITIAL PLANTING PHASE

SKETCH NO. CV/2013/08/SK1217 | SCALE 1:4000(A3)

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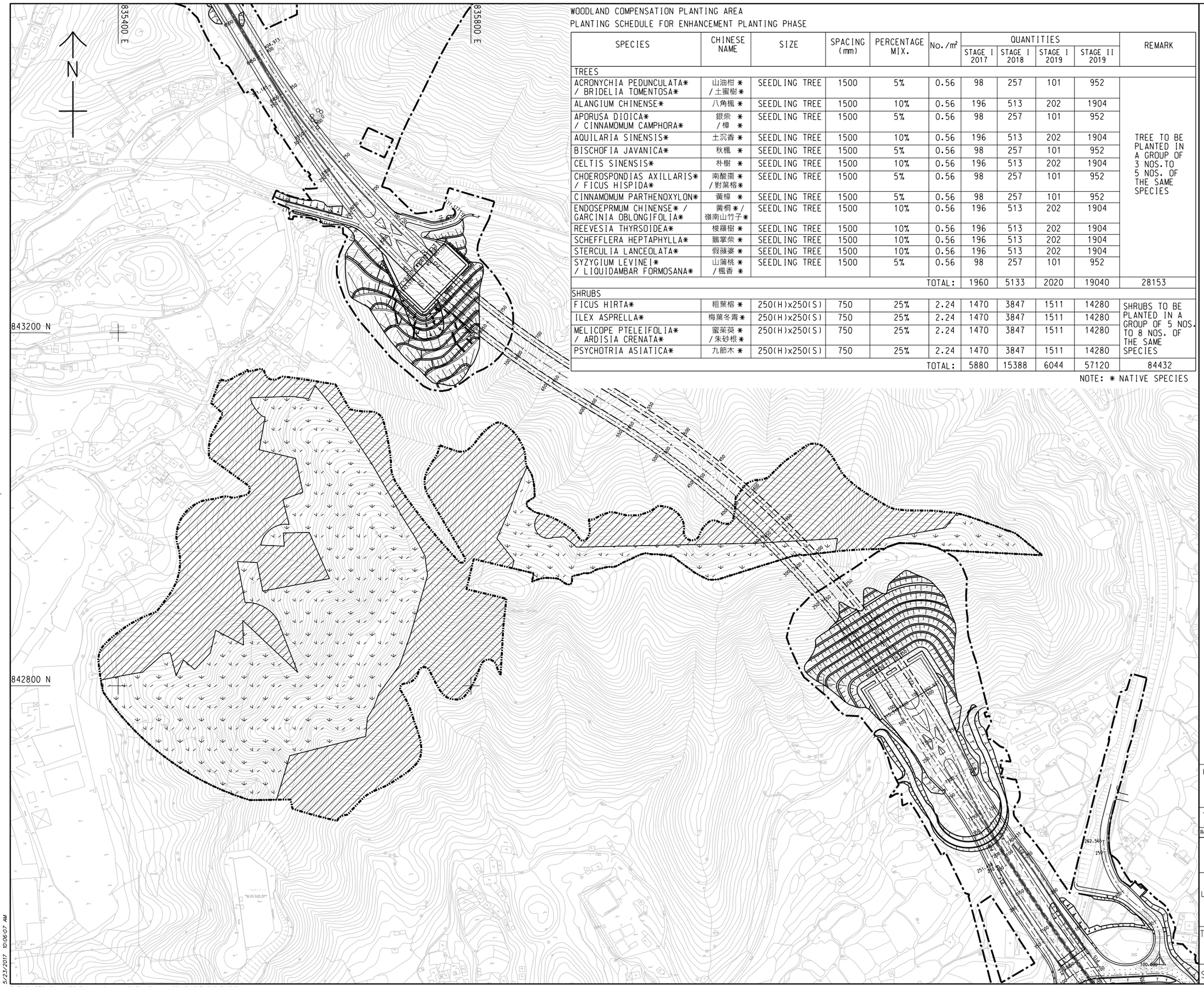

WOODLAND COMPENSATION PLANTING AREA

PLANTING SCHEDULE FOR ENHANCEMENT PLANTING PHASE

SPECIES	CHINESE NAME	SIZE	SPACING (mm)	PERCENTAGE MIX.	No./m²	QUANTITIES				REMARK
						STAGE I 2017	STAGE I 2018	STAGE I 2019	STAGE II 2019	
TREES										
ACRONYCHIA PEDUNCULATA* / BRIDELIA TOMENTOSA*	山油柑 * /土蜜樹 *	SEEDLING TREE	1500	5%	0.56	98	257	101	952	TREE TO BE PLANTED IN A GROUP OF 3 NOS. TO 5 NOS. OF THE SAME SPECIES
ALANGIUM CHINENSE*	八角楓 *	SEEDLING TREE	1500	10%	0.56	196	513	202	1904	
APORUSA DIOICA* / CINNAMOMUM CAMPHORA*	銀柴 * /樟 *	SEEDLING TREE	1500	5%	0.56	98	257	101	952	
AQUILARIA SINENSIS*	土沉香 *	SEEDLING TREE	1500	10%	0.56	196	513	202	1904	
BISCHOFIA JAVANICA*	秋楓 *	SEEDLING TREE	1500	5%	0.56	98	257	101	952	
CELTIS SINENSIS*	朴樹 *	SEEDLING TREE	1500	10%	0.56	196	513	202	1904	
CHOEROSPONDIAS AXILLARIS* / FICUS HISPIDA*	南酸棗 * /對葉榕 *	SEEDLING TREE	1500	5%	0.56	98	257	101	952	
CINNAMOMUM PARTHENOXYLON*	黃樟 *	SEEDLING TREE	1500	5%	0.56	98	257	101	952	
ENDOSEPRMUM CHINENSE* / GARCINIA OBLONGIFOLIA*	黃楣 * / 嶺南山竹子 *	SEEDLING TREE	1500	10%	0.56	196	513	202	1904	
REEVESIA THYRSOIDEA*	梭羅樹 *	SEEDLING TREE	1500	10%	0.56	196	513	202	1904	
SCHEFFLERA HEPTAPHYLLA*	鵝掌柴 *	SEEDLING TREE	1500	10%	0.56	196	513	202	1904	
STERCULIA LANCEOLATA*	假蘋婆 *	SEEDLING TREE	1500	10%	0.56	196	513	202	1904	
SYZYGIUM LEVINEI* / LIQUIDAMBAR FORMOSANA*	山蒲桃 * /楓香 *	SEEDLING TREE	1500	5%	0.56	98	257	101	952	
					TOTAL:	1960	5133	2020	19040	28153
SHRUBS										
FICUS HIRTA*	粗葉榕 *	250(H)x250(S)	750	25%	2.24	1470	3847	1511	14280	SHRUBS TO BE PLANTED IN A GROUP OF 5 NOS. TO 8 NOS. OF THE SAME SPECIES
ILEX ASPRELLA*	梅葉冬青 *	250(H)x250(S)	750	25%	2.24	1470	3847	1511	14280	
MELICOPE PTELEIFOLIA* / ARDISIA CRENATA*	蜜茱萸 * /朱砂根 *	250(H)x250(S)	750	25%	2.24	1470	3847	1511	14280	
PSYCHOTRIA ASIATICA*	九節木 *	250(H)x250(S)	750	25%	2.24	1470	3847	1511	14280	
					TOTAL:	5880	15388	6044	57120	84432

NOTE: * NATIVE SPECIES

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOODLAND COMPENSATION PLANTING PLAN FOR INITIAL PLANTING PHASE (DRG NO. CV/2013/08/SK1217).
2. ALL SEEDLING TREES AND SHRUBS SHALL BE PLANTED ACCORDING TO THE STATED SPACING IN STAGGERED PATTERN.
3. THE CONTRACTOR SHALL PROVIDE DETAILED METHOD STATEMENT INCLUDING WORKING METHODOLOGY AND PROGRAMME FOR IMPLEMENTATION WOODLAND COMPENSATION PLANTING PLAN FOR ENHANCEMENT PLANTING PHASE AT LEAST 3 MONTHS BEFORE THE COMMENCEMENT OF THE PLANTING WORKS.
4. THE PLANTING WORKS FOR ENHANCEMENT PLANTING PHASE SHALL BE CARRIED OUT THE LOCATIONS AFTER THINNING OF EXOTIC PIONEER SPECIES PLANTED IN THE INITIAL PLANTING PHASE. ENHANCEMENT PLANTING SHALL BE PLANTED BETWEEN THE CANOPY SHELTER ESTABLISHED IN THE INITIAL PLANTING PHASE.

LEGEND:

- SITE BOUNDARY
- UNDERGROUND SITE BOUNDARY
- BOUNDARY OF WOODLAND COMPENSATION PLANTING AREA
- STAGE I ENHANCEMENT PLANTING IN AREAS WITH EXISTING TREES AND SHRUBS
- STAGE II ENHANCEMENT PLANTING IN AREAS WITH INITIAL PLANTING

REFERENCE:

Rev.	Date	Description	Drawn	Prepared	Checked
-	07/12/16	ISSUE FOR CONSTRUCTION	MCYT	CW	

AECOM

CEDD CONTRACT NO. CV/2013/08
LIANTANG/HEUNG YUEN WAI BOUNDARY CONTROL POINT SITE FORMATION AND INFRASTRUCTURE WORKS - CONTRACT 6

TITLE: WOODLAND COMPENSATION PLANTING PLAN FOR ENHANCEMENT PLANTING PHASE

SKETCH NO. CV/2013/08/SK1218 | SCALE 1:4000(A3)

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Appendix 1 - Woodland Compensation Area - Site Photos

Proposed Woodland Compensation Area

Proposed Woodland Compensation Area

Proposed Woodland Compensation Area

AECOM	Agreement No. CE 38/2010 (CE) Liantang/Heung Yuen Wai Boundary Control Point and associated works (Site Formation and Infrastructures) – Design and Construction	SCALE	N.T.S.	DATE	Jan-13
	Woodland Compensation Area - Site Photos	CHECK	-	DRAWN	CMH
		JOB NO.	60212563	DRAWING No.	Appendix 1

Existing *Dicranopteris pedata* cover on hillslope

Access to the proposed Woodland Compensation Area

Access to the proposed Woodland Compensation Area

AECOM	Agreement No. CE 38/2010 (CE) Liantang/Heung Yuen Wai Boundary Control Point and associated works (Site Formation and Infrastructures) – Design and Construction	SCALE	N.T.S.	DATE	Jan-13
	Woodland Compensation Area - Site Photos	CHECK	-	DRAWN	CMH
		JOB NO.	60212563	DRAWING No.	Appendix 1

Existing native trees in woodland compensation area

Existing native trees in woodland compensation area

Existing native trees in woodland compensation area

AECOM	Agreement No. CE 38/2010 (CE) Liantang/Heung Yuen Wai Boundary Control Point and associated works (Site Formation and Infrastructures) – Design and Construction	SCALE	N.T.S.	DATE	Nov-16
	Woodland Compensation Area - Site Photos	CHECK	-	DRAWN	CMH
		JOB NO.	60212563	DRAWING No.	Appendix 1

Existing native trees in woodland compensation area

Existing exotic trees in woodland compensation area

Existing exotic trees in woodland compensation area

AECOM	Agreement No. CE 38/2010 (CE) Liantang/Heung Yuen Wai Boundary Control Point and associated works (Site Formation and Infrastructures) – Design and Construction	SCALE	N.T.S.	DATE	Nov-16
	Woodland Compensation Area - Site Photos	CHECK	-	DRAWN	CMH
		JOB NO.	60212563	DRAWING No.	Appendix 1

Appendix 2 - Woodland Compensation Area - Trees and Shrubs Species

Plant species in Areas with Coverage of Existing Tree and Shrubs (Survey conducted in November 2016)

Botanical Name	中文名稱	Origin	Abundance
Tree			
Acronychia pedunculata	山油柑	Native	Scattered
Alangium chinense	八角楓	Native	Common
Aporusa dioica	銀柴	Native	Scattered
Aquilaria sinensis	土沉香	Native	Scattered
Archidendron lucidum	亮葉猴耳環	Native	Scattered
Cratoxylum cochinchinense	黃牛木	Native	Common
Endospermum chinense	黃桐	Native	Common
Garcinia oblongifolia	嶺南山竹子	Native	Scattered
Glochidion wrightii	白背算盤子	Native	Common
Glochidion zeylanuicum	香港算盤子	Native	Scattered
Ilex pubescens	毛冬青	Native	Scattered
Itea chinensis	鼠刺	Native	Common
Litchi chinensis	荔枝	Exotic	Common
Litsea cubeba	木薑子	Native	Scattered
Leucaena leucocephala	銀合歡	Exotic	Common
Macaranga tanarius var. *tomentosa*	血桐	Native	Scattered
Mallotus paniculatus	白楸	Native	Common
Phyllanthus emblica	油甘子	Native	Common
Rhus succedanea	木蠟樹	Native	Scattered
Sapium discolor	山烏桕	Native	Scattered
Saurauia tristyla	水東哥	Native	Scattered
Schefflera heptaphylla	鵝掌柴	Native	Common
Schima superba	荷樹	Native	Common
Tetradium glabrifolium	楝葉吳茱萸	Native	Scattered
Zanthoxylum avicennae	簕欓花椒	Native	Scattered
Zanthoxylum myriacanthum	大葉臭花椒	Native	Scattered
Shrubs			
Baeckea frutescens	崗松	Native	Common
Breynia fruticosa	黑面神	Native	Scattered
Ficus variolosa	變葉榕	Native	Scattered
Litsea rotundifolia var. *oblongifolia*	豺皮樟	Native	Common
Melastoma dodecandrum	地菍	Native	Scattered
Melastoma malabathricum (*Melastoma candidum*)	野牡丹	Native	Common

Melastoma sanguineum	毛蕊 (毛棯)	Native	Common
Melicope pteleifolia	蜜茱萸	Native	Common
Psychotria asiatica	九節 (九節木)	Native	Common
Rhodomyrtus tomentosa	崗棯 (桃金孃)	Native	Common
Rhus chinensis	鹽膚木	Native	Common
Rubus reflexus	蛇泡簕	Native	Common
Zanthoxylum nitidum	兩面針	Native	Scattered
Climbers / Others			
Dicranopteris pedata	芒萁	Native	Common
Mikania micrantha	薇甘菊	Exotic	Common
Smilax china	菝葜	Native	Scattered
Urceola rosea	酸葉膠藤	Native	Scattered

*All names are adopted from Hong Kong Herbarium; those in bracket are used in Contract Drawings.

Appendix 3 - Implementation Programme

Task No.	Task Description	Months																																																																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
		2016										2017												2018												2019												2020												2021								
		3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
1	Planting Works for Initial Planting Phase																																																																			
2	Establishment Works for Initial Planting Phase																																																																			
3a	Stage I Planting Works for Enhancement Planting Phase (for areas with existing tree coverage)																																																																			
3b	Stage II Planting Works for Enhancement Planting Phase (for the areas with Initial Planting Phase)																																																																		
4	Establishment Works for Enhancement Planting Phase																																																																		
5	Landscape inspection																																																																		
6	Ecological Monitoring							1st		2nd		3rd		4th		5th		6th		7th			8th			9th			10th			11th			12th			13th			14th			15th			16th			17th			18th			19th			20th			21st			22nd			
7	Maintenance of Firebreak																																																																		
8	Site Handover to AFCD																																																																		

Appendix 4 - Particular Specification of Landscape Works

SECTION 3

LANDSCAPE SOFTWORKS AND ESTABLISHMENT WORKS

GENERAL

G.S. Clause 3.06 is deleted and replaced by :-

Weather and Ground Conditions 3.06

(1) Planting shall take place in suitable weather conditions. Planting shall not take place in weather conditions which will result in initial drying out of root systems and/or scorching of leaves. Ideally planting shall take place in overcast or moist conditions. If planting has to be carried out in sun or drying winds or in hot and dry weather, plants awaiting planting shall at all times be covered to prevent drying out.

(2) The Contractor shall cease planting immediately when in the opinion of the Engineer the weather conditions or ground conditions adversely affect the planting works.

MATERIALS

G.S. Clause 3.17(c) and (d) are deleted and replaced by :-

Small Shrubs 3.17

(c) A height between 150mm and 400mm,

(d) Grown and supplied in a container not less than 125mm in diameter and 150mm deep, and

The following is added after G.S. Clause 3.17 :-

Medium Shrubs 3.17A

Medium Shrubs shall have the following characteristics :

(a) A seeding or rooted cutting two or more years old which has a bushy habit, bushiness which has been encouraged by pruning,

(b) Well furnished with shoots to produce a plant with a diameter two-thirds of the height,

(c) A height between 400mm and 700mm,

(d) Grown and supplied in a container not less than 175mm in diameter and 200mm deep, and

(e) Free of pests, fungi and disease.

G.S. Clause 3.18(c) and (d) are deleted and replaced by :-

Large Shrubs 3.18

(c) A height between 600mm and 1000mm,

(d) Grown and supplied in a container not less than 175mm in diameter and 200mm deep, and

The following is added after G.S. Clause 3.29 :-

Origin of Plants 3.29A

The Contractor shall state the origin of all trees, shrubs, turves, sprigs and plant materials, in good time before planting. The Engineer may inspect the nursery and agree on a selection of all plant material for approval. All plant material subsequently delivered to the Site shall be to at least the same standard in all respects as that approved. The Contractor shall note that in order to provide all the plant material as specified it may be necessary for him to grow the material in his own nursery in advance of commencing planting works on Site.

Substitution of Plant Material 3.29B

(1) In the event of plant material as specified herein not being available, the Contractor shall notify the Engineer at the beginning of the Contract in order that suitable substitutes can be considered. The Contractor shall propose substitutes which are similar in height, shape, flowering characteristics and function as the original species.

(2) The Contractor shall have photographs taken of approved samples for each species and plant size to be used. The photographs shall be used as a standard to which similar species to be supplied and planted in the Contract shall be equivalent.

(3) Any changes, such as planting densities, necessitated by the need for substituting species shall be at no extra cost to the Contract.

(4) No substitute shall be made without the prior written approval of the Engineer.

(5) No substitution will be permitted within 12 months prior to the actual time of planting.

Materials to be as Specified 3.29C

All plant material shall be true to species and healthy and shall not be less than the minimum sizes specified. Plants having any habit or growth other than that specified shall be considered unacceptable.

The following is added after G.S. Clause 3.30(2) :-

Soil-Mix 3.30

(3) Soil-mix delivered and installed on site shall be tested for nitrogen, phosphorus and potassium (N.P.K.) value, organic matter content, cation exchange capacity ratio, organic carbon, pH value, physical content of sand, silt and clay, and water content. Soil testing shall be arranged by the Contractor and shall be conducted in the laboratory accredited by Hong Kong Laboratory Accreditation Scheme (HOKLAS) or equivalent approved or institute at the Contractor's own cost, and the report shall be submitted to the Engineer for approval.

(4) If the results of the test show that the soil-mix does not meet the nutrient and organic status required for soil-mix, then the Contractor shall make good the soil-mix by bringing it to the nutrient and organic status specified. The Contractor shall obtain approval for his proposed remedial measures from the Engineer for approval before undertaking any work.

(5) The Contractor shall supply a representative 2 kg sample of approved soil-mix to the Engineer with a certificate indicating the source for the approval of the Engineer. Approval to the sample must be obtained before bulk delivery commences, and approval of the sample will not preclude the right of the Engineer to reject any imported material which in the opinion of the Engineer falls appreciably below the standard of the sample. The sample shall be retained by the Engineer in a location on Site which will allow inspection and comparison throughout the period of the Contract.

(6) The Contractor shall ensure that soil-mix heaps are properly maintained and that soil-mix shall be placed in its final position within 12 months of importation to Site or, for site strip material, deposition for storage on Site. Weed control shall be carried out by spraying with approved weedkiller.

(7) If the period between the analysis of the soil-mix as above and the commencement of any deposition of soil-mix exceeds 12 months then the Contractor shall carry out a second analysis of the soil-mix. If this second analysis shows that the soil-mix has deteriorated in the nutritional requirements for soil-mix the Contractor shall make good the soil-mix by bringing it to the nutrient and organic status specified.

(8) The Contractor shall give the Engineer four weeks notice of his intention to commence deposition of soiling operations in order to allow for the results of the analysis to be available before the commencement of soiling.

(9) No change in the source of soil-mix shall be allowed without the prior approval of the Engineer based on such tests and samples as specified herein.

(10) The Contractor shall prepare soil-mix on site. Mixing shall not take place during periods of heavy rain, nor when the soil is saturated. Mixing operations shall cease if the moisture content of the completely decomposed granite is too high to achieve thorough mixing with the soil conditioner.

The following is added after G.S. Clause 3.31(1) :-

Soil Conditioner 3.31

(2) Soil conditioner shall be properly composted organic material. When a composted organic material is used it shall be stable and not liable to decompose further generating heat.

(3) The Contractor shall produce a certificate of analysis stating composition and physical and chemical characteristics. The analysis shall be carried out by a laboratory approved by the Engineer.

(4) A sample of 1.0 kilogram shall be submitted to the Engineer for approval before importation and use.

G.S. Clause 3.32 is deleted and replaced by :-

Mulch 3.32

(1) Mulch shall be a mixture of shredded bark and wood chips. The mulch shall be free from impurities and be heavy enough to prevent dispersal by wind. It shall contain material with a particle volume greater than 500 mm^3 consisting at least 50% by volume of the mix.

(a) Wood chips (as opposed to bark) shall not exceed 50 mm particle size in any dimensions.

(b) Any wood content shall be inert and free of resinous toxins. The pH of the mulch shall be not less than 6.0.

(2) The Engineer shall be invited to inspect production techniques and the suppliers' facilities, prior to any approvals.

G.S Clause 3.34 (5) is deleted and replaced by :-

Fertilizer 3.34

(5) Chemical fertilizers shall be stored in waterproof sealed bags under shelter away from water and direct sunlight.

The following is added after G.S. Clause 3.34(5) :-

(6) Pre-planting fertilizer shall be in the form of tablet.

G.S. Clause 3.36(2) is deleted and replaced by :-

Stakes, Ties and Guys 3.36

(2) (a) Bamboo tripod staking shall be used as a supplemented measures in Soft planting areas and shall comprise three nos. of 50 mm diameter x 1800 mm long bamboo poles secured to the tree as not to cause any chafing, rubbing or abrasion of the tree or restrict its growth. Appropriate measures should be taken to prevent water stored in the hollow of the bamboo tripod.

(b) Stakes shall be driven into the ground before planting so as not to damage the rootball or aerial parts of the tree. Appropriate measures should be taken to prevent rusty.

(c) The method of staking shall be subject to approval by the Engineer. If required, stakes should be provided to support seedlings and whips as well as underground guying system should be provided to support large trees.

The following is added after G.S. Clause 3.36(6) :-

(7) When wire guys are required, three guys per tree shall be used and guys shall be adjustable. Wire guys shall be fixed to the tree trunk immediately above the lowest branch and to three nos. long angle iron stakes driven 600 mm into the ground and with 70 mm remaining above the ground. Appropriate measures should be taken to prevent rusty.

The following is added after G.S. Clause 3.37 :-

Root Activator 3.37A

Root activator shall be a chemical which contains plant hormones gibberellins (G.A.), and indole-3-acetic acid (IAA), and which can activate root growth such as 'Rootone' or equivalent and approved.

Sack, Bags, Containers, etc. 3.37B

The Contractor shall retain for inspection by the Engineer all sacks, bags, containers and the like in which fertiliser, mulch, grass-seed, pesticides, herbicides and the like are supplied and shall not dispose of these without the consent of the Engineer.

Temporary Protective Fencing for Newly Planted Areas 3.37C

Temporary protective fencing shall be at least 1.5m tall comprising end straining posts with struts, intermediate posts with galvanized line wire, galvanized twisted wire and approved split bamboo pales.

(1) Straining posts shall be installed at corners, ends of runs and at intermediate positions 30 metres apart maximum. Posts shall be 1000mm long by 80mm diameter or 80mm square. Struts shall be 1000mm long by 80mm diameter or 80mm square and shall be housed and securely nailed to all straining posts in the direction of each line of fencing.

(2) Intermediate posts shall be installed at 2.5 metres apart maximum and shall be 1800mm long by 100mm diameter or 100mm square.

(3) All posts and struts shall be of approved timber treated with approved preservative and shall be driven into the ground for a depth of 600mm minimum.

(4) Two strands of 3.15mm high tensile galvanised steel wire to BS 4102 shall be strained and stapled with 38 x 4mm galvanised staples and fixed 150mm from top of post and 150mm above ground level. Each line wire shall be strained tightly by means of a ratchet strainer. All line wires shall be secured to intermediate posts by one staple driven to a running fit and to straining posts by two complete turns round the post with the wire twisted back on itself and staples driven tightly into the post.

(5) Pales shall be hand-driven from bamboo poles approximately 30mm diameter. Pales shall be straight, pointed at the top as shown and notched 80mm from top and bottom.

(6) The wire for wiring shall be not less than 2mm diameter galvanised mild steel wire conforming to BS 4102. Each line of wiring shall consist of two wires twisted together between the pales.

(7) Pales to be positioned with no more than 50mm spacing between pales. One line of wire shall be fixed 80mm from the top of the pales, one in the middle and one 80mm from the bottom. Every 500mm top and bottom strained wires shall be bound to twisted wires on bamboo paling by means of wire twists of 2mm gauge galvanised wire.

Plant Name 3.37D On planting plans, where botanical names and chinese characters are given for plants; the botanical name shall always take precedence.

Notices and Instructions 3.37E (1) In respect to landscape works, the Contractor shall give forty-eight hours notice to the Engineer, of his intention to commence any one of the following operations: soiling, setting out, planting, hydroseeding, fertilising, and visits to carry out establishment works.

(2) The Contractor shall undertake any remedial landscape works within twenty-four hours of notice by the Engineer.

Uniformity of Trees 3.37F The Contractor shall ensure that individual species of trees for planters and ornamental locations are uniform in size and shape. Variations in overall height of no more than 500mm and in stem diameter of no more than 20 mm will be permitted.

SUBMISSIONS

Samples of Materials 3.40 G.S. Clause 3.40(2) is deleted and replaced by :-

(2) (a) Samples of each species of plant material to be planted on Site shall be made available at a nursery in Hong Kong for inspection and approval by the Engineer prior to delivery on Site.

(b) Any plant material which does not conform to specification or the approved standard shall be rejected by the Engineer, and will be replaced by the Contractor with appropriate standard of material.

HANDLING, STORAGE AND TRANSPORT

G.S. Clause 3.41 is deleted and replaced by :-

Handling and Storage of Rootballed Stock 3.41

(1) Root pruning and undercutting of the root system of rootballed stock to the specified size of root-ball shall be carried out as instructed by the Engineer before lifting from the nursery.

(2) Plants grown in the open ground shall be well watered prior to lifting and shall be lifted carefully to ensure the specified root ball is obtained. At the time of lifting, the root ball and the trunk from soil level to the lower branches of trees shall be securely wrapped to prevent loss of soil and moisture using hessian or straw. The wrapping material shall not be removed until the plant is required for planting.

The following is added after G.S. Clause 3.44(2) :-

Storage of Plants 3.44

(3) The Contractor shall seek the written approval of the Engineer on the storage of plants, method, equipment and storage facilities on Site.

G.S. Clause 3.45 is deleted and replaced by :-

Storage of Trees and Shrubs 3.45

(1) Trees and shrubs which are not immediately planted in their permanent positions shall be supported upright on level ground, regularly watered and maintained in good condition.

(2) Any bare-rooted plant material shall be heeled into the ground with all the roots covered by soil-mix.

PRE-PLANTING WORKS

G.S. Clause 3.53 is deleted and replaced by :-

Soiling 3.53

(1) Soil-mix shall be spread and levelled in raised planter beds to a depth of min. 500mm.

(2) Existing soil of pits for seedling trees, whip trees, climbers, groundcovers, herbaceous and shrub planting (other than in raised planter beds) shall be excavated from the pits and each pit shall be mixed with 4 litres of soil conditioner, then backfilled into the pit with 50g of pre-planting fertilizer tablet prior to planting.

(3) Placing and spreading of soil shall not take place during periods of heavy rains, nor when the soil-mix is saturated. When, in the opinion of the Engineer, conditions are unsuitable for placing and spreading of soil, operations shall cease and shall only be resumed when authorised by him. After soiling, areas are to be protected from further compaction and trafficking.

(4) The Contractor shall be responsible for ensuring that the soil-mix maintains its specified quality between the time after deposition and the planting operations.

(5) Excess soil generated from planting pits and not used as backfill, water basins, or in establishing final grades shall be removed by the Contractor from site.

The following is added after G.S. Clause 3.53 :-

Control of Erosion 3.53A The Contractor shall take all necessary preventative measures to control erosion and siltation. The Contractor shall restore or replace any portion of the Site, including those which have been both the subject of a certificate of completion of a Section or a part of the works and on which broadcast seed or hydroseeding is required to be carried out, which erodes, silts up or is otherwise damaged.

PLANTING

The following is added after G.S. Clause 3.58 :-

Setting Out 3.58A (1) The Contractor shall be responsible for accurately setting out according to the Drawings all areas to be planted to the satisfaction of the Engineer prior to the commencement of planting, and shall rectify errors in setting out at his own expense. Any discrepancy in Site area between that shown on the plans and the actual area on the ground shall be notified to the Engineer as soon as it is discovered and prior to commencement of any relevant operations.

(2) Tree and shrub areas shall be marked in outline with pegs, spaced not less than 15 m apart. The pegs shall be not less than 750 mm long and 50 mm in thickness and shall be firmly driven into the ground. The top 300 mm of each peg shall be painted white.

(3) The Contractor shall mark out the required planting interval with canes, stones, chalk or other suitable markers along the longest edge of the area to be planted.

(4) The first row of plants shall be the required distance from this edge and directly in line with each marker. In the case of planting areas edged by kerbs or walls, adequate planting space should be allowed between the edge/foundations and the first row of plants.. In the case of planting areas adjacent to other planting areas, the first row of plants shall be planted at a distance which is half the specified planting distance for that species from the edge.

(5) The second row shall be the required distance from the first. The pattern will be repeated over the whole planting area.

(6) In the case of woodland mix and shrub mix planting, the plants shall be planted in positions indicated on the Drawings.

(7) The approximate numbers of plants to be planted per half day shall be set out by laying them down beside the hole in which they are to be planted. Plants shall not be removed from their containers until planting is taking place. All setting out shall be to the approval of the Engineer.

(8) During the setting out of the planting, the Contractor shall notify the Engineer of the position of any tree or group of trees which occur within the following tolerance:

(a) large shrubs to be planted within 1.0m of the road edge.

(b) medium shrubs to be planted within 0.6m of the road edge

(c) small shrubs to be planted within 0.3m of the road edge.

The above dimensions do not apply where crash barriers are provided between the planting and the carriageway or where planting is located within a raised planting bed.

The Contractor shall notify the Engineer of any of the above situations prior to carrying out any relevant works in those areas.

The following is added after G.S. Clause 3.61(3)

Staking, Tying and Guying 3.61

(4) The Contractor shall carry out regular checking, adjusting, replacing and removing of tree stakes, ties or guys as necessary. .

(5) All staking, tying and guying shall be removed before the expiry of the establishment period.

G.S. Clause 3.62 is deleted and replaced by :-

Mulching 3.62

(1) After planting and watering, mulch shall be spread to a consolidated thickness of at least 50 mm in planters and all planted areas not previously hydroseeded. Finish level of mulch shall be 25mm below adjacent finished surfaces.

(2) Mulch shall be dished around the base of the plants. The Contractor shall take care not to damage the plant material during mulching operations. Mulch shall be applied after planting and watering have taken place.

The following is added after G.S. Clause 3.64(3) :-

Pit Planting of Seedings, Shrubs, Whips, Climbers, Ground Covers and Herbaceous Plants 3.64

(4) Whip planting shall be carried out in areas which have been hydroseeded as part of this Contract. The Contractor shall allow in his programming of planting works sufficient time for the hydroseeding to establish and provide 90% cover to the satisfaction of the Engineer before whip and shrub mix planting operations commence. Grass shall be mown to 50mm before pit planting commences.

The following is added after G.S. Clause 3.68 :-

Watering 3.68A

Immediately after planting, all plants shall be thoroughly watered with fresh water such that the roots of the plants are soaked.

Bamboo/Plastic Fencing to Planted Areas 3.68B

(1) Protective fencing shall be erected where newly planted areas are adjacent to public footpaths and as indicated on the drawings.

(2) Protective bamboo/plastic lattice fencing shall be 1200mm high and consist of a bamboo/plastic lattice and frame of approximately 25mm bamboos, lashed to 25mm x 25mm x 4mm thick M.S. angle posts, and approximately 50mm bamboo top rail; the bamboo to be placed on the footpath side of the posts. Contractor shall submit drawing for Engineer's approval prior to erection.

GRASSING

The following is added after G.S. Clause 3.72(5) :-

Application of Hydroseeding 3.72

(6) The area to be treated shall be moistened immediately prior to hydroseeding.

(7) After spraying, the Contractor shall water the hydroseeded areas as often as is required to keep the ground evenly moist.

ESTABLISHMENT WORKS

The clause 3.79(1) is deleted and replaced by :-

Establishment Works 3.79

(1) Except for the planting works of woodland compensation, the Contractor shall be required to maintain the planting works of all planted areas for a period of 365 days as specified after the date certified by the Engineer and recognised by taking-over maintenance department that the landscape works have been satisfactory completed and in that time the Contractor shall be required to carry out establishment works whether or not instructed by the Engineer. The requirements of establishment works for woodland compensation shall refer to Clause 3.104.

The following is added after G.S. Clause 3.79(3) :-

(4) The Contractor shall report to the Engineer before and after carrying out any establishment works. Reports shall be submitted in duplicate on forms provided by the Contractor and of a style approved by the Engineer.

(5) The Contractor shall submit a programme to the Engineer for approval before the commencement of establishment works. The programme shall include all the items of operations as defined below. Other than the items of mulching, pruning and fertilising, the Contractor shall propose in the programme the number of operations for the other items to be carried out during the establishment period. Once the programme is approved, the Contractor shall carry out all the operations unless subsequently instructed otherwise by the Engineer.

(6) Establishment works for hydroseeded areas shall be carried out immediately after the application of hydroseeding until the end of the establishment period.

(7) Where part of an existing planting area has been partially reinstated under this Contract, the reinstated area shall be subject to establishment works as specified herein.

G.S. Clause 3.83 is deleted and replaced by :-

Firming up Plants 3.83

(1) Plants which become loose as a result of wind rock or other causes shall be firmed up.

(2) The Contractor shall inspect the Site regularly for this purpose and after each storm or typhoon, to assess damage, which shall be reported to the Engineer. Any damaged branches shall be carefully pruned or as required by the Engineer.

G.S. Clause 3.84(1) is deleted and replaced by :-

Watering 3.84

(1) Any inspection of watering requirements shall be made in dry weather by the Contractor and the Engineer twice weekly or as required by the Engineer.

The following is added after G.S. Clause 3.84(3) :-

(4) The Contractor shall complete watering operations within 24 hours of an inspection which deems watering to be necessary.

(5) When required, an analysis of water to be used shall be obtained by the Contractor for approval by the Engineer.

The following is added after G.S Clause 3.85(3) :-

Weeding 3.85

(4) All areas within 300mm radius of the base of each planting shall be kept in a weed/grass free and tidy condition.

(5) The Contractor shall weed areas as necessary and shall complete weeding within seven days of inspection.

G.S. Clause 3.87 is deleted and replaced by :-

Grass Cutting 3.87

(1) Grassed areas shall be cut by manual or mechanical methods agreed by the Engineer and in a manner that does not cause pulling of roots or damage to planting in or near the grassed area. All cuttings shall be raked off and disposed of within 24 hours after cutting.

(2) Grass in all hydroseeded areas shall be reduced by cutting to a height of 100mm when it reaches 300m high. The Contractor shall cut as often as necessary to maintain the height in this range.

(3) Grass areas shall be weed free in accordance with G.S. Clause 3.81 before any grass cutting is carried out.

G.S. Clause 3.88 is deleted and replaced by :-

Litter Collection 3.88

(1) All litter exposed by grass cutting shall be gathered up and disposed of within 24 hours.

(2) All litter/rubbish in the planting areas shall be removed from the site. Litter/rubbish removal shall be completed within seven days of inspection.

G.S. Clause 3.89 is deleted and replaced by :-

Post-Planting Fertiliser 3.89

Post-planting fertilizer shall be applied not less than 100 days, and not more than 300 days, after grassing or planting. The fertilizer shall be applied at a rate of :

(a) $100g/m^2$ for shrub and ground cover planting in raised planter;

(b) 50g for each whip tree and shrub on hydroseeded area; and

(c) Post-planting fertiliser shall be applied to all hydroseeded areas at a rate of $40g/m^2$ during the periods specified in G.S. Clause 3.75.

The following is added after G.S. Clause 3.90 (2)(d) :-

Control of Pests, Fungi and Disease 3.90

(2) (e) Use of all pesticides, insecticides, fungicides and chemicals are to be with care and to have due regard to the safety and convenience of the general public and be in accordance with the Hong Kong Government Environmental Guidelines. It shall be carefully controlled to avoid unnecessary dispersion.

G.S. Clause 3.92 is deleted and replaced by :-

Mulching 3.92

(1) All mulch which is disturbed by replacement planting, weeding or watering shall be made good. Additional mulching over areas of forking over and over areas disturbed by others shall be carried out if instructed by the Engineer.

(2) During the establishment period, the Contractor shall carry out two applications of mulch each to a thickness necessary to bring the total depth of mulch of 50 mm unless otherwise specified after the application. The final mulching operation is to be carried out in the last month of the establishment period.

The following is added after G.S. Clause 3.92 :-

Removal of Temporary Protective Fencing 3.92A

The Contractor shall remove the temporary protective fencing at the end of the establishment period unless otherwise directed by the Engineer.

Insect and Disease Control 3.92B

The Contractor shall report to the Engineer any such occurrence and shall carry out remedial eradication by use of sprayed insecticide or fungicide, used in accordance with the manufacturer's instructions. Use of such sprays is to be with care and to have due regard to the safety and convenience of the general public and be in accordance with the Hong Kong Government Environmental Guidelines. It shall be carefully controlled to avoid unnecessary dispersion.

Treatment on Red Imported Fire Ant 3.92C

(1) The Contractor shall inspect the plants for Red Imported Fire Ants (RIFA) before they are planted on site and inspect the planted areas regularly.

(2) The Contractor shall maintain and protect all the existing planting from invasion of RIFA. Whenever such maintenance or protection is not possible, the Contractor shall report to the Engineer with alternative proposal and resume the original condition at his own cost.

(3) The Contractor shall report immediately to the Engineer upon discovery of mound(s) of suspected RIFA and employ a pest control specialist as specified in the list of "Pest Control Companies in the control of Red Imported Fire Ant" issued by Agriculture, Fisheries and Conservation Department ("AFCD") on 27/12/2007 to provide treatment services for the RIFA including their mound(s).

(4) The treatment services shall include collection services of the suspected RIFA; controlling service against confirmed RIFA; and surveillance monitoring on the RIFA as stated in the technical note – Red Imported Fire Ant Control Methods, issued by AFCD on 15/5/2008.

TREE TRANSPLANTING

G.S. Clause 3.97 (2) & 3.97 (7) are deleted and replaced by :-

Transplanting of Existing Trees 3.97

(2) Before the commencement of any work to the trees on the Site, the Contractor shall inspect all the trees to be transplanted and prepare the detailed method statement and works programme for the transplanting works with the incorporation of the expert advice from the independent tree specialist (ITS). The ITS shall have qualification or certification offered by a professional institution or industry organisation on arboriculture after successful completion of examination or assessment process conducted within or accredited by the institution or organisation such as Certified Arborist of the International Society of Arboriculture, Professional Member or Fellow of the Arboricultural Association of the UK, or equivalent and shall have at least 3 years' working experience on tree transplanting works. The Contractor shall agree with the ITS prior to submit and obtain approval from the Engineer a detailed method statement and works programme for transplanting the existing trees, outlining the method, sequencing, timing of operations, and the location and type of machinery to be used for the following operations:

(a) Protection before lifting and transplanting,

(b) Root pruning, including the rootball size, and the number of stages, the operations involved in each stage, and the period between each stage of root pruning,

(c) Crown pruning including the extent of crown pruning,

(d) Excavating trenches for rootball preparation including the size of trenches,

(e) Design and construction of supporting measures,

(f) Attaching lifting gear to the trees,

(g) Protection during transit,

(h) Temporary holding nursery, if required,

(i) Lifting,

(j) Transportation to new location, including routing,

(k) Backfilling and making good the donor site,

(l) Securing and supporting measures.

(2)A In addition to sub-clause (2) above, the Contractor shall complete the Vegetation Survey and Vegetation Survey Report for approval by EPD and AFCD as specified in EP and/ or EM&A Manual by a qualified ecologist/ botanist.

(7) Root activator, where necessary, shall be applied at regular intervals in accordance with the manufacturer's instruction. Root activator shall be a chemical which contains plant hormones GA, and IAA, and which can activate root growth such as "Rootone" or equivalent and approved by the Engineer.

The following is added after G.S. Clause 3.97(17) :-

(18) Trees to be transplanted shall be inspected for dead, diseased or damaged branches in the presence of the ITS. All crown pruning works shall be maintainedkept to ensure that a balanced crown is preserved in keeping with the character of the tree species. The extent of the crown pruning works shall be determined by the ITS on site and agreed by the Engineer.

(19) The Contractor shall also comply with the general requirements as set out in the Appendix 3.1 for carrying out the tree transplanting works under this Contract.

The following is added after G.S. Clause 3.97 :-

Root Pruning 3.98

(1) Root pruning should normally take place during the wet season with a minimum of one month allowed for root regeneration between each stage of root pruning.

The period of root pruning shall be determined by the ITS and agreed by the Engineer. Three months or more should be allowed between each stage of pruning to ensure maximum fibrous root regeneration prior to the actual uplifting/transplanting operations.

The period of root pruning may be adjusted to suit specific tree species and/or imposed contract constraints.

(2) The diameter of the rootball to be cut shall be determined by the ITS and approved by the Engineer. Normally, the rootball to be cut should be 10 times the trunk diameter at breast height and not less than 1500mm diameter, and 1000 – 1200mm deep to enhance survival rate for transplanting. Method statements should be submitted by the Contractor taking into account the size and species of trees, site constraints, arboricultural practices, etc for particular tree(s) for the approval of the Engineer.

(3) After determining the size of the rootball and after obtaining the approval of the Engineer, the proposed circumference of the rootball shall be marked on the ground around the tree.

The trenches that are made for rootball preparation shall be backfilled with backfilling materials to be approved by the Engineer, to encourage new growth of root tips. Rootball shall be kept moist from time to time during the preparatory period to stimulate new-root.

Roots shall be cut with a clean sharp knife or similar sharp implement to prevent tearing of the roots.

The Contractor shall make regular checks to ensure the stability of the tree and adjustments made accordingly throughout the entire root pruning/crown pruning stages.

Trees shall be inspected every 28 days by the Contractor to check the health of the tree. Any sign of deterioration shall be notified to the Engineer and remedial action taken. The Contractor shall water regularly, remove weed growth, fertilize, aerate the soil, folia feed, carry out insecticide treatment and any other horticultural work as necessary and as instructed by ITS.

Tree Lifting and Protection 3.99

(1) Transplanting shall be carried out during early morning or late afternoon when the sun is not directly overhead. No lifting shall take place during rainfall. Tree shall be transplanted within 2 hours of lifting.

(2) Wrap trunk and lower branches with approved hessian and tie with jute string at least one day prior to rootball preparation. Before lifting, the outer edge of the previously dug trenches shall be loosened from the surrounding soil and the rootball undercut to allow the tree to be lifted free from the ground with the rootball intact.

(3) A crane or lifting device shall be used to secure the tree and support its full weight when lifted without damaging the branches or trunk. No items of hardware shall be inserted into the trunk or branches for lifting or other purposes. Cables used for lifting shall be wrapped with protective rubber sheaf to prevent damage.

(4) Plants shall be lifted carefully to avoid damage to rootball. Roots shall be cut free from ground, not pulled, using a suitable implement to give a clean cut.

(5) Where suggested by the ITS, a board shall be placed under the rootball or a rootball box shall be constructed to support the full width and depth of the rootball.

(6) The ITS shall be present to supervise the work.

Planting at Receptor Site 3.100

(1) Plants transplanted directly to the receptor sites are to be planted in accordance with the General Specification.

(2) Prior to the lifting of the trees, tree pits at their receptor sites shall be already prepared and agreed on site. All pits shall be 300-500mm greater than the size of the rootball of the tree to be transplanted at on all sides and bottom. Tree pit base shall be scarified to a depth of 150mm. Loosen the base and sides of the tree pit and fill with water 24 hours before planting to ensure free drainage. Trees shall be transplanted to the new tree pits within 2 hours after being lifted.

(3) Place tree in the pit allowing the top of the ball to be at least 100mm above the surrounding paving level to allow consolidation of the backfill soil. After settlement the top of the root collar shall be level with the surrounding ground level. Backfill in layers, each layer being firmly consolidated to eliminate air pockets. The backfilling materials proposed by the Contractor shall be agreed by the ITS and approved by the Engineer.

(4) Add fertilizer to the backfilling materials at the rate determined by ITS. Alternatively, liquid fertilizer may be use as approved by the Engineer. Fertilizer shall be thoroughly mixed with the backfilling materials. Hormone powder may be applied to the rootball and alginates and polymer gels mixed into the backfilling materials in accordance with the manufacturer's instructions if suggested by ITS and approved by the Engineer.

(5) Securing and supporting measures for the transplanted trees shall be submitted by the Contractor and approved by the Engineer.

Holding Nursery for Transplanted Trees 3.101

(1) Contractor's holding nursery for transplanted plants should meet the following requirements:-

General:

(a) The holding nursery shall be for the purpose of temporary storage of transplanted plant materials under this Contract. The nursery may not be used for any purpose not directly related with this Contract.

(b) Holding nursery shall be Contractor's own proposed off-site nursery.

(c) Not used.

(d) The Contractor shall be responsible for the arrangement of land status, utility connections, and

any necessary fee payment for the satisfactory operation of the holding nursery within the contract period.

(e) The Contractor's holding nursery shall be within the territory of Hong Kong Special Administrative Region, and be capable to hold at any time all the transplanted trees under this Contract and allowance of passageway for maintenance works without disturbance to the transplanted plants. The total area of off site holding nursery shall not be less than $25m^2$ times the total number of transplanted trees in one location. The Contractor shall allow access to other contractors to transplant trees to this holding nursery.

The Contractor shall carry out necessary arboricultural work to maintain the stocked trees in a good and healthy condition during the holding period prior to replanting.

(f) Prior to forming the holding nursery, the Contractor shall submit documents including location plan, updated survey plan with contours information, photographic records, and any other information to demonstrate the nursery can adequately accommodate all the transplanted trees under this Contract in a protected environment, for the approval by the Engineer within 30 days after the commencement of the Contract.

(g) Once approved, the holding nursery site shall not be amended without fully justified reasons which are beyond the control of the Contractor. Resubmission to the Engineer for approval at least six months in advance, is required on proposal of alternative site.

(h) The Contractor shall bear all expenses related with the transit of the plant materials between the holding nurseries.

(i) The boundary of the holding nursery shall be clearly demarcated by minimum 1.2m height fencing, securely erected on the ground without interference to the transplanted plant materials.

(j) Each transplanted trees shall be tagged with a weather proof label with information on the contract number, tree number, originated location and arrival date to the nursery.

(k) The Engineer shall have rights to inspect the holding nursery at regular intervals and at any one time to verify the condition of the nursery and/or health of the transplanted plant materials.

(l) The Contractor shall maintain the holding nursery in neat, tidy and litter-free condition at all times.

(m) The Contractor shall provide supply of non-toxic water for the watering of the plant materials within the holding nursery. The Contractor shall make allowance in the rates for importing of non-toxic water suitable for irrigation during periods of water supply restrictions and/or pipework failure.

(2) Storage of transplanted trees in Contractor's holding nursery:

(a) Upon arrival in the holding nursery, the transplanted trees shall stand upright on level ground, in a position where it will be protected from damage and unnecessary movement.

(b) If transplanted trees are delivered to the plant nursery with shoots and branches bundled, remove all tyings immediately.

(c) Each transplanted tree shall occupy a certain plot of land as determined by the ITS, exclusive of passageway in between for maintenance works. The total occupied area to be used for the holding nursery for the transplanted trees shall be reported by the Contractor for approval and record by the Engineer.

(d) The Contractor shall carry out necessary arboricultural work to maintain the transplanted trees in healthy condition during the holding period.

(e) The Contractor shall water all the transplanted trees as often as required to keep the soil moist around the roots of the plants.

(f) Watering shall be carried out either in early morning and/or later afternoon, or both as required.

(g) The watering frequency shall be determined by the ITS to ensure the transplanted trees are in healthy condition during the holding period.

(h) All the transplanted trees that temporarily stored within the holding nursery will be transplanted off site to the permanent receptor prior to the expiry of the Contract period.

(4) Submission of record:

(a) The Contractor shall submit separate monthly report in a format to be agreed with the Engineer prior to tree transplanting works for the transplanted trees held in the holding nursery including information, but not limited to:

(i) Individual transplanted tree with reference to works order number, tree number, species name, originated location, date of arrival in the nursery, expected date for subsequent transplant to permanent location, area of land occupied;

(ii) Total quantity of transplanted trees in the holding nursery;

(iii) Total area of land occupied by the transplanted trees, excluding maintenance passageway;

(iv) Special matters to be reported, such as typhoon damages; and

(v) Photographic record of the overall holding nursery.

Post Transplanting / Establishment Work 3.102

(1) The transplanted trees shall be maintained immediately after transplanting works, from existing location and maintenance shall continue for a period of time till the expiry of the Maintenance Period or such earlier dated as instructed by the Engineer.

Such maintenance shall include all measures necessary to establish and maintain all the transplanted trees in an acceptable vigorous and healthy growing condition until the expiry of the establishment Period.

(2) Immediately after transplanting, the base of all the transplanted trees shall be well watered, using enough water to thoroughly soak the rootball. The transplanted trees should be well watered in evenings and early morning only.

(3) Watering shall be carried out daily during the dry season, generally September to April.

(4) Watering shall be carried out as required during the wet season to maintain a vigorous and healthy growing condition.

(5) Firming up of the transplanted trees and the supporting materials shall be undertaken from time to time during the period and particularly after heavy rain and/or wind.

(6) Root activator, if instructed, shall be applied regularly according to manufacturer's recommendations.

(7) Fertilize in March and September each year or as directed by the Engineer.

(8) Rootball shall be kept free of weeds at all times.

(9) The transplanted trees shall be pruned to remove dead or dangerous branches follow the advice of the ITS.

Tree Surgery Works 3.103

(1) Tree surgery works shall cover the removal of dead, dying and diseased branches and stumps, cleaning out cavities, raising and thinning the crown for transplanting purposes and generally improving the shape of the transplanted trees.

(2) All tree surgery works shall be in accordance with good horticultural practice and BS 3998 – Recommendations for Tree Works. No work shall be carried out without the direct supervision of the ITS on site.

(3) The Contractor shall allow and assure all necessary safety precautions/measures are taken to protect those engaged in the operations, as well as people and property in the vicinity (both from within and/or outside site boundary).

(4) (a) Tree limbs shall be removed in pieces, no more than 400 mm in length;

(b) To prevent tearing the bark, cut limbs in three operations. The first cut is a shallow notch made on the underside of the branch, outside the branch collar. This cut will prevent a falling branch from tearing the stem tissue as it pulls away from the tree. The second cut should be outside the first cut, all the way through the branch, leaving a short stub. The stub is then cut just outside the branch bark ridge/branch collar, completing the operation;

(c) Cut all limbs sloping away from the main trunk at an angle of approximately 60° from the horizontal on a line above the branch bark ridge and the branch collar without leaving a stub;

(d) Carefully lower all cut branches to the ground to prevent any damage to limbs being retained.

WOODLAND COMPENSATION PLANTING

Woodland Compensation Planting 3.104

(1) Unless otherwise specified, the Contractor shall carry out woodland compensation planting in accordance with the requirements of the EP and EM&A Manual. The tentative boundaries of Portions WC1 and WC2 are shown on Drawings. The exact boundaries shall be confirmed by the Engineer.

(2) The Contractor shall programme the initial and enhancement planting works to suit the actual dates of handing over of Portion WC1, WC2 or any part of Portion WC1 or WC2 for completion within the specified period at no extra costs to the Employer. The Engineer will give an advance notice of at least 30 days prior to commencement of initial or enhancement planting works in any areas.

(3) The woodland compensation planting involves initial planting, enhancement planting and their respective establishment works. The requirements of these planting and establishment works shall refer to relevant clauses of this PS Section.

(4) The Contractor shall prepare and submit a detailed implementation programme of the woodland compensation planting complying the relevant requirements to the satisfaction of the Independent Environmental Checker (IEC), the Engineer and AFCD within 2 months after commencement of the Works.

(5) Subject to the provision in sub-clause 6 below, the Contractor shall retain and avoid disturbance to all existing trees, shrubs, graves and other existing features within the woodland compensation area when planting. Seedlings shall be planted in space between existing trees and shrubs.

(6) The Contractor is required to carry out thinning works. The objective of thinning process is to control the amount and distribution of available growing space within the woodland by the selective removal of exotic trees to improve the growth rate and health of the targeted native trees as well as allowing space for enhancement planting. The detailed requirements of the thinning process are as follows:

(a) Thinning of exotic pioneer species shall be carried out when the crown and root of the native trees planted have been developed during the establishment period of Initial Planting phase to withstand the exposed conditions.
(b) Regular thinning shall also be carried out where appropriate during the establishment period of Initial Planting phase. The frequency of the regular thinning process shall be agreed with the IEC and AFCD.
(c) Exotic species, Acacia confusa and Acacia mangium, shall be removed from the woodland compensation area to provide space for the native species for further growth and for the enhancement planting. The Contractor shall obtain consent from the IEC, AFCD and the Engineer before removal of those trees.
(d) The thinning process shall be carried out before the growing season prior to the commencement of planting works for enhancement planting.
(e) Thinning works shall only be carried by using hand tools. The Contractor shall provide detailed method statement for the thinning process prior to commencement of any thinning works. Trial thinning shall be carried out in selected area in the presence of the IEC, AFCD and the Engineer before the proposed method statement is accepted.
(f) The thinned trees shall be reduced to wood chips and shall be left on the woodland floor.

(7) Enhancement planting in any areas shall only commence after the implementation of the initial planting for 3 years and after thinning of exotic species have been completed to the satisfaction of the IEC, AFCD and the Engineer. The exact commencement date of enhancement planting in any areas shall be agreed or as directed by the IEC, AFCD and the Engineer.

(8) Not used.

Sodium bentonite waterproofing composite 3.105

(1) The sodium bentonite waterproofing composite shall be a proprietary product and shall consist of one woven and one non-woven polypropylene interlocked geotextiles encapsulating a minimum of 4.88kg/m^2 of granular natural sodium bentonite, with permeability not exceeding 1 x 10^{-9} cm/sec and puncture resistance of 500N.

(2) The geotextiles shall be interlocked using a needle punching process, which shall push the fibers of the non-woven geotextile through the bentonite layer and integrate into the woven geotextile.

(3) Before application of the waterproofing composite, the substrates shall be compacted to a minimum of 85% modified proctor density for uniform support of waterproofing composite. The installation surfaces shall be free of excessive standing water, large voids, and projections.

(4) The sodium bentonite waterproofing composite shall be installed in strict accordance with the manufacturer's instructions.

- End of PS Section 3 -

P.S. APPENDIX 3.1

TREE TRANSPLANTING

(P.S. CLAUSE 3.97(19))

APPENDIX 3.1

TREE TRANSPLANTING

1.1 TRANSPLANTING OF EXISTING TREES

All transplanting works should ideally be undertaken in early spring (March to October) to increase the chances of the trees' successful re-establishment. Transplanting operation should be timed so as to avoid strong sun or drying winds. The new position or storage facilities should be prepared before the tree is moved, so that the tree can be repositioned within two hours of lifting. The trunk and major boughs should be wrapped in damp hessian to protect from damage in transport and to reduce transpiration. Anti-transpiration spray can also be used on foliage. Crown thinning before transplanting is recommended. All stages of transplanting should be supervised or preferably undertaken by qualified arboriculturalists. The method to be adopted by the Contract shall be submitted for approval of the Engineer prior to work execution.

1.2 TREE SURGERY WORKS

Tree pruning and thinning should be carried out as instructed by the Engineer during the preparation period before transplanting. All tree surgery work should be in accordance with British Standard 3998 (1989) "Recommendations For Tree Work". Minor pruning of additional limbs may be required after replanting.

1.3 SEQUENCE OF TRANSPLANTING OPERATIONS

Transplanting operations should be in accordance with British Standard 4043 (1989) "Transplanting Root-balled Trees". Preparation for moving should ideally begin several months before the transplanting operation is required (See Fig. 2.1).

(a) A root ball area which incorporates at least half of the area of the tree crown should be marked out and later a trench is dug around this area. Roots should be carefully pruned and treated with an approved fungicidal gel. Ideally this operation should be completed at least 6 months before moving so that the tree can establish new fibrous root within the rootzone. The root zone should be watered. A root feed with an approved slow release fertiliser is recommended.

(b) Crown thinning and shaping should be undertaken during this period.

(c) The rootball size for transplanted trees should be a minimum of 1000mm in diameter and 700mm in depth.

(d) Precautions against desiccation can include hessian wrapping or anti-transpiration paints and these should be applied before transplanting operations begin.

(e) The rootball should be kept intact with all soil. At lifting, a spade or specialised lifting bucket can be slipped under the rootball and a strip of hessian or geotextile fabric pulled around the rootmass. The rootball and tree should be kept moist at all times.

(f) The whole tree should be lifted, using specialised equipment if necessary, and moved to its new position within 2 hours. The new planting position should be prepared as for any new tree, using fertiliser in the backfill material and soil conditioner as necessary. The tree should be orientated to best suit the new position and thoroughly watered in.

(g) The tree should be firmly secured using either well anchored guys, with ratchet turnbuckles for adjustment, or a sturdy bamboo tripod arrangement (with poles of a minimum diameter of 75mm), as instructed by the Engineer. Ties should be adjustable and should include wrapping to prevent chafing.

(h) Watering should be thorough and regular (at least twice a week) for the first months of establishment.

(i) Any damaged or additional branches should be pruned after planting.

(j) The contractor should keep an accurate photographic record (dated), of all stages of the transplanting operation for submission to the Engineer.

(k) Transplant trees of special conditions such as over-mature size, Leaning growing form, wall tree etc. to be subject to special requirements as listed below and method statement for Engineer prior approval is a must:

(i) Over-Mature Size (DBH over 500mm)

- at least 6 months of time or more shall there be for root-ball preparation works before transplanting operations to be carried out;
- size of prepared root ball shall conform to clause 1.03 (a) and with the minimum size not below 2500mm width and 1000mm depth;
- due to weight of the tree exceeding normal situation, the anchor point for tree lifting during transplanting might not on the tree main trunk on the opinion of the Engineer and/or depend on situation (i.e. tree species);
- extensive pruning shall be avoided and pruning works shall be under Engineer supervision;

(ii) Leaning Tree

- adequate temporary support shall be provided to severe leaning tree during preparation period, at where anchor roots are severed for root ball preparation;
- after transplanting, tree shall be positioned in manner of up-straight and without suffocation of the root zone;
- tree pruning to be carried out as necessary to encourage balance and symmetric tree form.

(l) For transplanting of tree at vicinity of residents or public road etc., the Contractor shall be responsible to the public safety and exercise maximum effort to avoid causing any damage and disturbance to the mentioned; unless solid proof is provided by the Contractor that the situation is out of their control, the Contractor shall assume any cost and liability incurred.

(m) The overall shape of the tree should be maintained after pruning.

(n) Photo record of the complete tree transplant process should be submitted for Engineer review.

1.4 MAINTENANCE WORKS

(a) Maintenance in Temporary Position

When transplanted plants cannot be immediately re-planted in the intended final position, a secure, sheltered and otherwise suitable storage nursery should be designated by the Contractor for approval by the Engineer. Keeping transplanted trees in the temp position within this period will be the same as for the Establishment Works, (see below), but will not constitute part of the Establishment Period. The length of temporary off-site maintenance will vary from contract to contract.

(b) Establishment Works

Establishment Works are those works to establish the transplanted tree and to be carried out during the Establishment Period. These works are treated as outstanding works when the transplanting tree is replaced.

(c) Establishment Period

The Establishment Period should extend through at least one growing season from the date of the completion of the replanting works certified by the Engineer. This would normally correspond to a period of 12 months as required.

(d) Dead Plants

The contractor will replace, at own expense, any plant which in the opinion of the Engineer dies, is seen to be dying, or fails to thrive, during this period as a result of bad workmanship, poor quality maintenance or neglect.

(e) Replacement Planting

Replace dead or ailing plants as Clause 1.04(d) within two (2) weeks of being identified, the largest available good quality nursery stock, but at least Mature size, of similar species unless otherwise instructed by the Engineer.

(f) Mature Trees

Mature Trees to have all the following characteristics:

(i) a sturdy, straight stem, not less than 2000mm in height from soil level to the lowest branch,

(ii) a stem diameter, greater than 300mm when measured at a point one metre above the root collar.

(iii) a well balanced branching head, or a well defined straight and upright leader with branches growing out from the stem with good symmetry, and a minimum length of 1500mm,

(iv) a total height above soil level greater than 7000mm,

(v) "grown on" in China,

(vi) a root ball not less 1200mm in diameter and 1000mm in depth,

(vii) a root system previously under cut a minimum of one year prior to lifting, to encourage compact fibrous growth.

(g) Damaged Plants due to Vandalism

The contractor is not responsible for replacing dead or damaged stock resulting from proven vandalism. The onus is at all times on the Contractor to prove that death or damage was so caused by circumstances beyond his control and in any event, no claim shall be considered unless submitted in writing to the Engineer within three working days of the event happening.

(h) Damaged Plants due to Typhoons

Within 48 hours of Typhoon signal No. 8 or above being lowered, replant all plants blown over, firm up all other plants, provide the Engineer with a photographic record of the Site, and prepare a detailed report of all plants which have suffered structural damage. As soon as practical thereafter remove dead plants and clear the Site of all debris providing the replanting works are carried out each day. "The Employer" will accept responsibility for dead or dying plants recorded one month after the typhoon, excepting those plants recorded as being dead or dying prior to the typhoon. Thereafter responsibility reverts to the contractor. Should the replanting not be carried out within the time period, or the works not carried out satisfactorily, than the Contractor shall be held responsible for all plant re-placements.

(i) Records

Ensure that the Approved Foreman reports to the Engineer's office before and after carrying out the day's maintenance work and make a countersigned record of the work carried out available for inspection at that office. These reports shall contain operations undertaken or specific tree locations and materials used. Provide monthly photo record showing the condition of the plants.

(j) Water

The Contractor is required to provide non-toxic water throughout the establishment period.

(k) Weeding

Keep all planted areas weed-free. Undertake a weeding operation at least once a month. Replace any aggregate or soil disturbed or removed during this process.

(l) Weed Disposal

Collect all weeds and rubbish during these operations and remove from the Site to a properly designated tip.

(m) Firming Up

Undertake firming-up of plants from time to time during the period and particularly after heavy rain and/or wind.

(n) Tree Ties

Tighten, or slacken tree ties as necessary for the healthy growth of the tree, and adjust or replace the protective pad as necessary to prevent chafing of the bark.

(o) Pruning

Carry out pruning when instructed during the Establishment Period, to encourage bushy growth good form. Remove dead, damaged or crossing branches.

(p) Pests and Fungal Growth

Regularly check for any insect attack or fungus infestation particularly during known periods of activity. Report to the Engineer any such occurrence and carry out remedial measures by use of sprayed effective approved insecticide or fungicide in strict accordance with the manufacturer's instruction. Take due care and have regard to the safety and convenience of the general public and carefully control the spraying to avoid unnecessary dispersion.

(q) Final Handover

Carry out an inspection and formal check of the Works at the end of the Establishment Period, with the Engineer. Carry out the final visit for all regular operations included in the specification, immediately prior to the final handover of the transplanted trees.

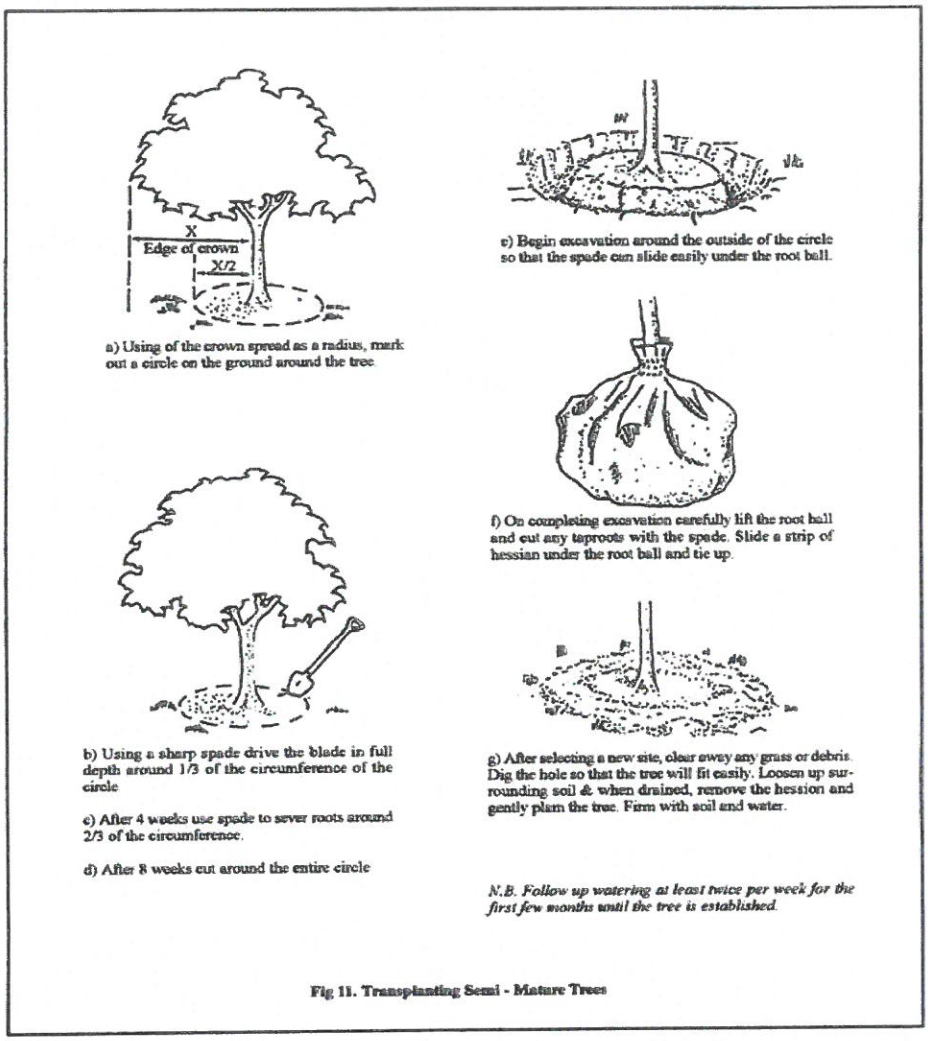

Fig.2.1 Transplanting Stages