Woodland Compensation Plan

Contents:

1. Introduction

This Woodland Compensation Plan (WLCP) has been developed to facilitate the establishment of the proposed woodland compensation area (WLCA) to mitigate the potential woodland loss due to the implementation of the Project

The ecological impacts and corresponding mitigations are detailed in the Main EIA report Chapter 9.

2. The Objective of the Establishment of Woodland Compensation Area

The objective of the WLCA is to compensate the woodland loss by providing compensatory tree and shrub planting through the process of woodland creation on existing hillside non-woodland areas.

The proposed location of WLCA is shown in **Figure AW01**.

This plan will form the basis to guide the implementation of the proposed woodland mitigation and the information provided in the plan is subject to the findings of a detailed vegetation survey recommended in the EIA report and will be finalised during the detailed design stage.

3. Extent of Woodland Compensation Area

According to the ecological impact assessment of the EIA, a total of 6.2ha of woodland areas will be permanently lost for the construction of the portals of tunnels and some sections of the connecting road. Mitigation measure in form of woodland compensation is therefore recommended to avoid residual ecological impact.

As woodland habitat requires longer duration for establishment and it is also expected that the proposed woodland compensation area cannot be in full function when the woodland loss occurs during the construction stage of the Project, a compensation ratio of higher than 1:1 to provide a surplus on initial woodland area is recommended in the EIA.

In order to offset the time lag between the implementation of the mitigation measure and the occurrence of the ecological impact, and also the possibility of some unexpected difficulties which would hinder the progress of the compensation works during the establishment period, the WLCA at a compensation ratio higher than 1:1 (approximately 18.6ha) is hence proposed.

Hillside grasslands and shrublands close to existing woodlands have been selected to implement the woodland compensation for 1) their currently lower ecological value; 2) similar topographical condition to the existing woodland to be affected; 3) potential value for ecological enhancement through natural

succession; 4) better ecological linkage with woodlands in the vicinity; 5) site condition and soil type comparable to the that of existing woodlands; and 6) location where construction disturbance could be avoided.

In addition, the potential Woodland Compensation Area should also meet the following land status criteria to avoid potential conflict with planned 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.

The location of the WLCA is illustrated in **Figure AW01**. The WLCA is proposed on area close to the existing woodland areas to be lost, which aims to effectively mitigate the local ecological impacts. The WLCA will cover mainly grassland with some transitional shrublands adjacent to existing woodlands on the mountain Cheung Shan.

4. Planting Strategy

Planting will comprise species native to the local area, which are selected based on their suitability, stock availability in the market as well as ecological values for the area.

The establishment period is the time when the soil and plants adjust to the environment and create the habitat. The woodlands will be tolerant to change if they are allowed to stabilise over a period of time, and this will enhance the chance of survival of the plant species. The period of time for stabilisation depends various factors including rainfall, temperature, and vegetation growth.

In order to successfully establish the woodland compensation area and at the same time increase the diversity of the flora species to be planted, the planting works will be carried out in two phases, viz. initial planting phase and enhancement planting phase.

Initial Planting Phase

As not all tree species are suitable for planting on exposed areas, pioneer species are selected to be used in this stage to establish a brief canopy cover to ease the additional planting in next stage. It is estimated that this phase would take about 5 years. Thinning of exotic pioneer should be carried out where appropriate. For the purpose of the initial planting, plant species that have higher tolerance of exposed planting condition are recommended:

Species for Initial Planting Phase	**Habit**
Acacia sp.	Tree
Castanopsis fissa	Tree

Species for Initial Planting Phase	Habit
Litsea glutinosa	Tree
Mallotus paniculatus	Tree
Phyllanthus emblica	Tree
Schima superba	Tree
Sapium discolour	Tree
Gordonia axillaris	Tree/Shrub
Litsea rotundifolia	Shrub
Melastoma candidum	Shrub
Melastoma sanguineum	Shrub
Rhaphiolepis indica	Shrub
Rhodomyrtus tomentosa	Shrub

Seedlings / Whip trees are proposed for tree planting for their higher survival rate and vigor to withstand the exposed condition. The trees will be planted at 1.5m spacing in staggered pattern, while shrubs will be planted in 1m spacing.

Existing trees and shrubs present on the proposed WLCA should be retained and disturbance should be avoided by the proposed planting works.

Enhancement Planting Phase

After the initial planting phase, the planting condition established by the pioneer species are considered to be more suitable for planting additional species to enhance the plant diversity. Species used in this stage are native species to Hong Kong, but cannot be planted in the first phase for their lower tolerance to exposed condition.

Native plant species selected to be used are listed in following table:

Species for Enhancement Planting Phase	Habitat
Acronychia pedunculata	Tree
Alangium chinense	Tree
Aporusa dioica	Tree
Aquilaria sinensis #	Tree
Bischofia javanica	Tree
Celtis sinensis	Tree
Choerospondias axillaris	Tree
Cinnamomum parthenoxylon	Tree
Endospermum chinense	Tree
Reevesia thyrsoidea	Tree
Schefflera heptaphylla	Tree
Sterculia lanceolata	Tree
Syzygium levinei	Tree
Ficus hirta	Shrub
Ilex asprella	Shrub
Melicope pteleifolia	Shrub

Psychotria rubra	Shrub

#: 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.

Seedlings / Whip trees are proposed for planting for their anticipated higher vigor to be established. The trees will be planted at 2m spacing, while shrubs will be planted in 1m spacing.

As shelter will be provided by the trees and shrubs established in the initial planting phase, the plants in enhancement planting phase are expected to have a higher survival rate. Therefore the enhancement planting phase is estimated to take about 3 years. This planting phase can commence after 3 years of the initial planting phase.

The specifications for pre-planting and planting works will follow the General Specification for Civil Engineering Works (2006) Section 3 – *Landscape Softworks and Establishment Works*.

5. Planting Management

The proposed planting management will includes monitoring and establishment softworks which aim to ensure the compensation meets the planting performance in accordance with the requirements of the planting strategy.

The specifications for standard practices of inspection and establishment works will follow the General Specification for Civil Engineering Works (2006) Section 3 – *Landscape Softworks and Establishment Works*. The inspection of planting works shall be carried out at bi-weekly intervals to determine the maintenance/establishment works which are required.

To ensure the establishment of the WLCA, a 6-year ecological monitoring covering both initial and enhancement planting phases is proposed, apart from the standard practices and site inspections regularly conducted by the landscape contractors. The necessity for further monitoring would be reviewed after the 6-year ecological monitoring programme.

The monitoring of planting includes parameters of: general health condition and survival rate; while establishment works would include basically replacement of dead plants, weeding and watering.

Due to the large size of the WLCA (approx.18.6ha in total), monitoring is proposed to be carried out by means of inspection walk and quadrat sampling. Monitoring in inspection walk aims to observe the overview / progress of the

planting within the whole WLCA; while monitoring in quadrats aims to collect quantitative information.

6. Ecological Monitoring

The monitoring shall be supervised by a qualified botanist/ecologist (Project Botanist/Ecologist) who will be formed as a member of Environmental Team (ET).

As the monitoring conducted through inspection walk aims to observe the overview and general condition of the WLCA, the routes of general inspection walk should be selected to cover all representative areas of the WLCA as far as possible. The general health condition (good/fair/poor/dead) and survival (%) of individual species of planted trees and shrubs will be recorded by direct observation.

9 fixed quadrats in size of 20mx20m are proposed for monitoring. These quadrats shall be evenly distributed throughout the WLCA. Parameters to be measured within quadrats include health condition (good/fair/poor/dead), and survival rate (%) of individual species. Proposed locations for the fixed quadrats are shown in **Figure AW01**.

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

The Trigger and Action Levels for monitoring and Action Plan of the WLCA are presented in the following Table:

Parameters	**Trigger and Action Level**	**Action Plan**
General Health Condition	Trigger Level: % of individual plant species in poor health condition >20%	- the ET should inform Contractor and IEC immediately; - identify the cause(s) of the exceedance; - advise Contractor the necessity of replanting.

Parameters	Trigger and Action Level	Action Plan
	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.
Survival of Plants	Trigger Level: Survival rate of individual plant species < 80%	- the ET should inform Contractor and IEC immediately; - identify the cause(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

The monitoring findings, site observations and recommendations on woodland management shall be reported in periodic EM&A reports. Agriculture, Fisheries and Conservation Department shall be included in the circulation list of the EM&A reports.

8. Implementation and Maintenance Arrangement

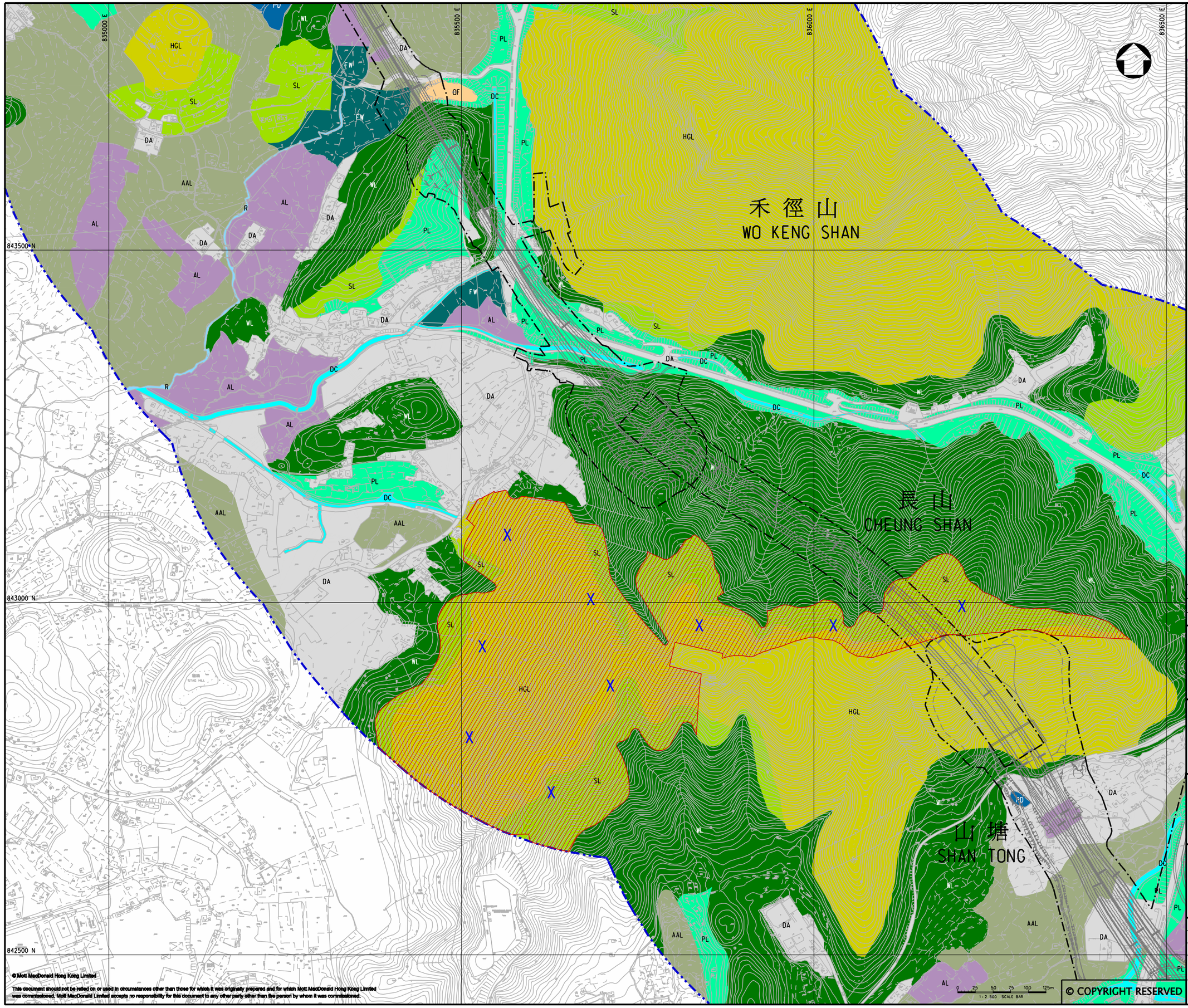
As the woodland compensation is proposed on areas where no construction works are carried out, the implementation of the woodland compensation can start once the Project commences and not necessary to wait the completion of works. This has an advantage of shorter time lag between the occurrence of the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

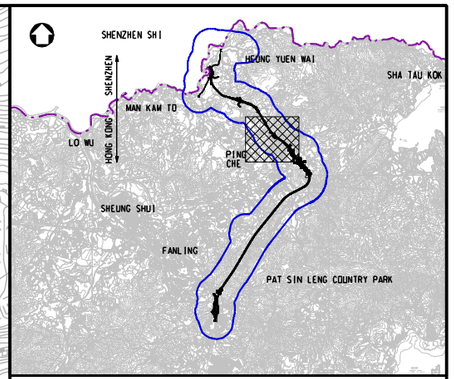
Both the implementation and maintenance of the compensatory planting will be fully funded by the Project department.

The management and maintenance of the woodland compensation area will 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 will maintain the ecological planting as recommended by EIA till the vegetation is fully established, which normally takes 9 years. The Project department should properly establish the designated Woodland Compensation Area before handing over and provide necessary recurrent cost for the maintenance and monitoring works.

9. Conclusion

The Woodland Compensation Plan has been developed to facilitate the establishment of the Woodland Compensation Area to mitigate the loss of woodland habitats due to the implementation of the Project - Liantang/Heung Yuen Wai Boundary Control point and Associated Works. The proposed Woodland Compensation Area will be provided with a compensation ratio higher than 1:1. The planting works are proposed to be carried out in two phases, viz. initial planting phase and enhancement planting phase. The initial planting aims to establish a brief canopy cover on existing exposed grasslands/shrublands by using pioneer species. After the establishment of a brief canopy cover, planting of additional native tree and shrub species to increase the plant diversity will be carried out in the following enhancement planting phase. To ensure the planting works are properly implemented, ecological monitoring conducted throughout the two planting phases is proposed. The monitoring findings and recommendations will be included in periodic EM&A reports.





KEY PLAN

SCALE 1:100000

LEGEND:

- ECOLOGICAL ASSESSMENT AREA
- WORKS AREA
- 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
- POTENTIAL WOODLAND COMPENSATION AREA
- X — QUADRAT FOR WOODLAND MONITORING

Rev	Date	Drawn	Description	Ch'k'd	App'd
P2	NOV 10	MING	GENERAL REVISION	ST	HT
P1	OCT 10	MING	FIRST ISSUE	ST	HT

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CEDD — CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Project

AGREEMENT NO. CE45/2008(CE)
LIANTANG/HEUNG YUEN WAI BOUNDARY CONTROL POINT AND ASSOCIATED WORKS

Title

POTENTIAL WOOLAND COMPENSATION AREA

Designed	ST		Eng.Chk.	EC	
Drawn	MING		Coordination	EC	
Dwg.Chk.	ST		Approved	HT	

Scale at A1: 1:2500

Project: 255228

CAD file: J:\255228\report\env\em&o\0115\FIG AW01.dgn

Status: PRE

Drawing No: FIGURE AW01

Rev: P2