

## 7. Ecology

### 7.1 Introduction

7.1.1 This section provides terrestrial ecological information of the Butterfly Valley, and assesses the potential impact on the ecological resources within the Project Limit (see *Figure 2.1e*) for the West Kowloon Section of the Route 16 Alternative Alignment. Mitigation measures are recommended where necessary. Field surveys were undertaken between July 1998 and March 1999 to establish the baseline ecological conditions of the study area.

### 7.2 Environmental Legislation and Criteria

7.2.1 A number of international and local regulations, legislation and guidelines provide the framework for the protection of species and habitats of ecological importance and those related to the Project are:

- Country Parks Ordinance (Cap 208);
- Forests and Countryside Ordinance (Cap 96);
- Wild Animals Protection Ordinance (Cap 170);
- Town Planning Ordinance (Cap 131);
- Hong Kong Planning Standards and Guidelines Chapter 10 (HKPSG);
- Technical Memorandum for the Environmental Impact Assessment Ordinance (EIAO TM) (Cap 499); and
- United Nations Convention on Biodiversity (1992).

7.2.2 The *Country Parks Ordinance* (Cap. 208) provides for the designation and management of country parks and special areas. Country parks are designated for the purpose of nature conservation, countryside recreation and outdoor education. Special Areas are created mainly for the purpose of nature conservation.

7.2.3 The *Forests and Countryside Ordinance* (Cap 96) prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. Related subsidiary Regulations prohibit selling or possession of listed rare and protected plant species. The list of protected species in Hong Kong which comes under the Forestry Regulations was last amended on 11 June 1993 under the *Forestry (Amendment) Regulation 1993* made under *Section 3* of the *Forests and Countryside Ordinance*.

7.2.4 Under the *Wild Animals Protection Ordinance* (Cap 170), designated wild animals are protected from being hunted, whilst their nests and eggs are protected from injury, destruction and removal. All birds and most mammals are protected under this Ordinance. The Second Schedule of the Ordinance which lists all the animals protected was last revised in June 1992.

7.2.5 The recently amended *Town Planning Ordinance* (Cap 131) provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Green Belt or other specified uses that promote conservation or protection of the environment, eg conservation areas. The authority responsible for administering the *Town Planning Ordinance* is the Town Planning Board.

- 7.2.6 Chapter 10 of the HKPSG covers planning considerations relevant to conservation. This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. It also addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation.
- 7.2.7 Annex 16 of the EIAO TM (Cap 499) sets out the general approach and methodology for assessment of ecological impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts. Annex 8 recommends the criteria that can be used for evaluating ecological impact.
- 7.2.8 The Peoples' Republic of China (PRC) are one of the Contracting Parties to the *United Nations Convention on Biological Diversity* of 1992. The Convention requires signatories to make active efforts to protect and manage their biodiversity resources. Hong Kong Government has stated that it will be 'committed to meeting the environmental objectives' of the Convention (PELB 1996).

### 7.3 Assessment Methodology

- 7.3.1 The establishment of the baseline terrestrial ecological profile of the Study Area and assessment of the potential impacts is based on field surveys as well as a review of the previous *EIA for the Route 16 from West Kowloon to Sha Tin: Investigation Assignment*. Representative areas of each habitat type within 500m from the proposed Alternative Alignment within Butterfly Valley (referred to as the "Study Area" in the following) were surveyed. Field surveys on ecological resources including flora and fauna were focused on areas expected to be affected either directly or indirectly by the proposed alignment within the Project Limit (see *Figure 2.1e*). Representative stream sites at Butterfly Valley that would be affected by the proposed alignment were also investigated. Ecological surveys were undertaken during wet season between July and September 1998 as well as during dry season between January and March 1999.
- 7.3.2 The area of habitat loss is estimated by a grid count method based on 1:1000 plans. Potential impacts due to the construction of proposed road were assessed in details following EIAO-TM Annex 16 guidelines and the impacts evaluated based on the criteria in EIAO-TM Annex 8, based on preliminary engineering information available at this stage.

### 7.4 Baseline Conditions

#### 7.4.1 Habitat/vegetation

- 7.4.1.1 The field surveys identified that most of the Study Area is covered by secondary woodland and shrubland (>60%), and the remaining area are either orchard/village or developed area (buildings or water service facilities). A map showing the locations of various habitat types within the Study Area is shown in *Figure 7.4a*. Lists of flora and fauna recorded are given in *Annex 7-A*.

#### Secondary Woodland

- 7.4.1.2 The secondary woodland (*Plate 7.4a*) found on both hillslopes along the Butterfly Valley is typical of young secondary woodland in Hong Kong. The vegetation ranges from 6-12m in height and is dominated by common tree species such as *Microcos peniculata*, *Sterculia lanceolata*, *Aporosa dioica*, *Acronychia pedunculata*, *Celtis sinensis*, *Litsea glutinosa*, *Ficus variegata* var. *chlorocarpa* and *Schefflera octophylla*. It is a well-grown secondary woodland of high species diversity and heterogeneity. Plant species of conservation interest include *Hemigramma decurrens* and *Ailanthus fordii*.

- 7.4.1.3 A population of *Hemigramma decurrens*, which is rare but not protected in Hong Kong, was found in the valley. One sapling of *Ailanthus fordii*, which is protected and rare in Hong Kong, was found on the hillside southeast of the Butterfly Valley. The locations of these latter two plant individuals are shown in *Figure 7.4a*, and they are well outside the Project Limit (over 50m up the slope, see *Figure 2.1e*). The plant species *Artocarpus hypargyerus* was found to occur frequently on the eastern slope of the Butterfly Valley. It is listed in the *China Plant Red Data Book Vol. 1* (appendix to *A. lakoocha*) which states that the species is "in danger of extinction". However, this species is quite common in Hong Kong and not listed in the protected plant list under the *Forestry Regulation*.

#### **Shrubland**

- 7.4.1.4 The shrubland (*Plate 7.4b*) was mainly found on the northern slopes high up the valley. The shrubland is very similar to the secondary woodland described above in species composition but with fewer tree species and the trees are of small height (1.5-3m). This habitat is of moderate to high species diversity but only moderate in heterogeneity.

#### **Orchard/Village**

- 7.4.1.5 Orchards among villages (*Plate 7.4c*) is one of the major components within the area to be directly affected by the proposed alignment. The vegetation community mainly comprises ornamental and introduced species such as *Dracaena* spp., *Livistonia chinensis*, *Archontopheonix alexandrae* and bamboo, as well as fruit trees such as *Clausena lansium*, *Dimocarpus longan*, *Litchi chinensis* and *Citrus maxima*. The orchard is of low species diversity and heterogeneity, and hence unlikely to support wildlife of ecological importance.

#### **Plantation Woodland**

- 7.4.1.6 The plantation woodland (*Plate 7.4d*) is located in the northern section of the proposed alignment where a pylon is present. Species found were all exotic/introduced, and common to such habitat type in Hong Kong, such as *Acacia confusa*, *Eucalyptus* spp. and *Casuarina equisetifolia*. Owing to its simple species and structural diversity, the ecological value to wildlife is considered limited.

#### **Wasteland**

- 7.4.1.7 Wasteland habitat (*Plate 7.4e*) found to the northeast of the proposed alignment is established on previous disturbed ground and open in nature. Vegetation cover is mostly dominated by common and wide-spread weedy plants species that are typical to other disturbed areas in rural Hong Kong, such as grass *Panicum maxima*, shrub *Lantana camara* and herb *Mikania micrantha*. Owing to the disturbed nature of the wasteland, no important wildlife is expected to be supported by this habitat type.

#### **Freshwater Streams**

- 7.4.1.8 Within the Study Area, there are five fast running seasonal streams receiving water from the Kam Shan Country Park 0.5km away, flowing into the permanent stream (*Plate 7.4f*) within Butterfly Valley. The three sampled representative seasonal streams were observed with limited flow during dry season surveys. Riparian vegetation are mainly shrubland or secondary woodland as described above, including certain common stream flora such as *Cleistocalyx operculatum*, *Diplazium esculenta*, *Scleria ciliaris*, and *Fimbristylis* sp.. Stream substratum at lower elevation (< 80 m) consists of small pebbles to small boulders, while that at higher elevation (> 80 m) comprises large boulders and rocks.
- 7.4.1.9 The upper stream section of the permanent stream at Butterfly Valley, which is located to the north of the Study Area, is open in nature and the water quality is relatively good without traces of pollution. However, the naturalness of the southern lower stream and seasonal

streams within the Study Area have been altered as a result of close proximity to several villages within the valley. Garbage was noted along much of the lower stream course and the water chemistry suggested that the stream is polluted with high nitrate levels and low dissolved oxygen (see Annex 7-A).

#### 7.4.2 Area of Ecological Interest

##### Kam Shan Country Park

- 7.4.2.1 Kam Shan Country Park is approximately 0.5km to the north of the Butterfly Valley. It is covered with woodland - mainly mixed pine-box wood but some areas carry pure stands of pine and few small areas have native broad-leaved forest. All the pines and Brisbane box, and some of the native trees, have been planted since the mid 1950s. The tree canopy is mostly open and allows the development of a rich and interesting scrub flora understory. In some areas this consists of native broad-leaved shrubs such as rose myrtle, *Acronychia*, *Melastoma*, downy holly. Kam Shan Country Park is known to support a range of wildlife such as common bird species, rhesus and long-tailed macaques. Development within country parks is governed by the *Country Park Ordinance (Cap 208)*.

#### 7.4.3 Animal Wildlife

##### Mammal

- 7.4.3.1 No sign of mammal existence (such as trails, burrows), was observed or noted during the surveys. However, the secondary woodland and shrubland habitats are likely to support common mammal species such as civets and barking deer by providing shelter and other resources.

##### Avifauna

- 7.4.3.2 There were 14 and 20 species of birds recorded in the Study Area in summer (wet season) and winter (dry season) respectively (see Annex 7-A). The species recorded in the area are common and typical to the rural village habitat of Hong Kong and is also representative of the respective seasons. Except a pair of Magpies were observed building nest in the wooded area on the hillside southeast of the Butterfly Valley, no significant breeding activities were recorded.

##### Herpetofauna

- 7.4.3.3 Reptile species observed during the surveys include Changeable Lizard (*Calotes versicolor*), Long-tailed Skink (*Mabuya longicaudata*) and a dead Red-necked Keelback (*Rhabdophis submineata*), which are all common in rural Hong Kong. For amphibian, the Asian Common Toad (*Bufo melanostictus*) and Paddy frog (*Rana limnocharis*) observed are also common and widespread locally. No rare, endangered, or endemic herpetofauna were found.

##### Invertebrates

- 7.4.3.4 A total of eight butterfly species were recorded among shrubland habitat near the permanent stream at Butterfly Valley (see Annex 7-A). These are all common species in Hong Kong, among which Common White (*Pieris canidia*) was the most abundant species, while other species such as Common Bush Brown (*Mycalesis horsfieldii*), Pale Grass Blue (*Zizeeria maha*) and Lesser Grass Blue (*Zizina otis*) occurred frequently. No rare, endangered or endemic invertebrate were found.

## Stream Community

- 7.4.3.5 A total of 208 individuals of macroinvertebrate in 16 taxa were recorded during the surveys, with species richness ranged from 8 to 13 species among the three sampled sites, and abundance ranged from 50 to 82 individuals (see *Annex 7-A*). No rare or endangered species was noted. The low diversity and abundance of macroinvertebrates in the permanent and seasonal streams are likely to have resulted from the high organic pollution in water which is originated from villages in the proximity.

## 7.5 Ecological importance

- 7.5.1 The ecological importance of the habitats identified within the Study Area has been evaluated against the criteria recommended in *Annex 8* of the EIAO-TM.

### Secondary Woodland

- *Naturalness*: The secondary woodland is natural with limited anthropogenic disturbance.
- *Size*: The total area of secondary woodland within Butterfly Valley is estimated to be 15ha, with approximately 3 ha within the boundary of cut slope and alignment.
- *Diversity*: Species diversity of the secondary woodland is high.
- *Rarity*: Two locally rare/protected plant species recorded on the eastern slope of Butterfly Valley include *Hemigramma decurrens* and *Ailanthus fordii*.
- *Re-creatability*: It will take a long time for the secondary woodland to be re-created and there is uncertainty that rare/protected species can survive in the re-created woodland.
- *Fragmentation*: The woodland is generally not fragmented except a few small parts on the western slope of the Butterfly Valley.
- *Ecological Linkage*: The nearby Kam Shan Country Park is approximately 0.5km from Butterfly Valley from the Project Limit (see *Figure 2.1e*). However, there is no evidence that the present habitat is functionally linked to any highly valued habitat in the Country Park in a significant way.
- *Potential Value*: The woodland on the eastern slope of Butterfly Valley has relatively high conservation interest because of the presence of rare/protected plant species.
- *Nursery/Breeding Ground*: No record of nursery/breeding ground found.
- *Age*: The secondary woodland is mature, judging by the structure of the woodland and the size of the dominant species.
- *Abundance/Richness of Wildlife*: Low wildlife richness and abundance according to the survey results as presented in *Section 7.4.3 Animal Wildlife*.

### Shrubland

- *Naturalness*: The shrubland is relatively natural with limited anthropogenic disturbance due to its high altitude.
- *Size*: The total area of shrubland within the Butterfly Valley is estimated to be 10ha, with approximately 0.7 ha within the boundary of cut slope and alignment.
- *Diversity*: Species diversity of the shrubland is moderate.
- *Rarity*: No rare or protected species was found in the shrubland.

- *Re-creatability*: It will take some time for the shrubland to be re-created.
- *Fragmentation*: The shrubland on the eastern slope of Butterfly Valley is generally not fragmented, while that on the western slope occurs in smaller patches.
- *Ecological Linkage*: The nearby Kam Shan Country Park is approximately 0.5km from Butterfly Valley from the Project Limit (see *Figure 2.1e*). However, there is no evidence that the present habitat is functionally linked to any highly valued habitat in the Country Park in a significant way.
- *Potential Value*: Low to moderate value for terrestrial habitat.
- *Nursery/Breeding Ground*: No record of nursery/breeding ground found.
- *Age*: The shrubland is considered secondary in nature judging by the smaller size of the dominant species.
- *Abundance/Richness of Wildlife*: Low wildlife richness and abundance according to the survey results as presented in *Section 7.4.3 Animal Wildlife*.

### **Freshwater Streams**

- *Naturalness*: The upper section of the permanent stream at Butterfly Valley is relatively natural, while the lower stream section and the seasonal streams have been subjected to severe anthropogenic disturbance and observed to be polluted.
- *Size*: Within the boundary of cut slope and alignment, the permanent stream in Butterfly Valley is approximately 650m in length; The total length of the five seasonal streams extends for approximately 250 m.
- *Diversity*: The diversity of stream fauna observed was low.
- *Rarity*: No rare or endangered species was found.
- *Re-creatability*: The stream habitats could be re-created.
- *Fragmentation*: Not applicable.
- *Ecological Linkage*: A few seasonal streams receive water from the Kam Shan Country Park 0.5km away, flowing into the permanent stream within Butterfly Valley. However, there is no evidence that the present habitat is functionally linked to any highly valued habitat in the Country Park in a significant way.
- *Potential Value*: The lower stream section may have a higher potential value if the sources of disturbance and pollution are removed.
- *Nursery/Breeding Ground*: No record of nursery/breeding ground found.
- *Age*: Not applicable.
- *Abundance/Richness of Wildlife*: Low wildlife richness and abundance according to the survey results as presented in *Section 7.4.3 Animal Wildlife*.

### **Orchard/Plantation Woodland/Wasteland**

- *Naturalness*: Orchard, plantation woodland and wasteland are man-made habitats.
- *Size*: Small patches of orchard among villages within Butterfly Valley are approximately 4ha in total and the plantation woodland is approximately 1ha in size. The area of

wasteland is approximately 0.4ha in size. Approximately 0.8ha orchard, 0.3ha plantation and 0.1ha wasteland are located within the boundary of cut slope and alignment.

- **Diversity:** The plant species diversity of these three habitats are low.
- **Rarity:** No rare or endangered species was found.
- **Re-creatability:** The man-made habitats can be re-created easily.
- **Fragmentation:** These habitats are not fragmented.
- **Ecological Linkage:** The present habitats are not functionally linked to any highly valued habitat in close proximity in a significant way.
- **Potential Value:** Low value for man-created habitats.
- **Nursery/Breeding Ground:** No record of significant nursery/breeding ground found.
- **Age:** Not applicable.
- **Abundance/Richness of Wildlife:** Low wildlife richness and abundance according to the survey results as presented in Section 7.4.3 Animal Wildlife.

**Table 7.5a Summary of Evaluation on Ecological Importance of Habitat Types within the Boundary of Cut Slope and Alignment in Butterfly Valley of the Alternative Alignment**

	Secondary woodland	Shrubland	Freshwater stream	Orchard/ Plantation woodland/ Wasteland
Naturalness	Natural	Natural	Upper section of the permanent stream at Butterfly Valley is natural, while the lower section and seasonal streams have been disturbed and polluted	Man-made habitats
Size	~ 3 ha	~ 0.7 ha	~ permanent stream 650 m in length ~ seasonal stream 250m in length	Orchard: ~ 0.8 ha Plantation woodland: ~ 0.3 ha Wasteland: ~ 0.1 ha
Diversity	High plant species diversity	Moderate plant species diversity	Low stream fauna diversity	Low plant species diversity
Rarity	Two rare plant species on eastern slope: <i>Hemigramma decurrens</i> and <i>Ailanthus fordii</i>	Not recorded	Not recorded	Not recorded

	<b>Secondary woodland</b>	<b>Shrubland</b>	<b>Freshwater stream</b>	<b>Orchard/ Plantation woodland/ Wasteland</b>
Re-creatability	Possible to be re-created	Take some time to be re-created	Possible to be re-created	Can be re-created easily
Fragmentation	Not fragmented in general	Shrubland on the eastern slope of Butterfly Valley not fragmented, while that on the western slope occurs in small patches	Not applicable	Not fragmented
Ecological linkage	No evidence	No evidence	No evidence	No evidence
Potential value	High	Low to moderate	Moderate value for upper stream section, while low value for lower section and seasonal streams	Low
Nursery/ breeding ground	No record	No record	No record	No record
Age	Mature, secondary in nature	Young, secondary in nature	Not applicable	Not applicable
Abundance/ richness of wildlife	Low	Low	Low	Low
Ecological importance	Moderate - high	Low	Low - moderate	Low

7.5.2 Based on the ecological conditions presented in the above sections, it is considered that the secondary woodland has relatively higher ecological importance compared to the other habitat types in the Butterfly Valley because of the well-established characteristic plant communities, in particular the secondary woodland on the eastern slope of the Butterfly Valley that support both rare and protected species. The upper stream section of the permanent stream within Butterfly Valley, which is relatively natural and may provide potential habitats for aquatic wildlife, are considered to have moderate ecological value whereas the southern lower stream section and the seasonal streams are considered to have low importance due to severe disturbance and pollution. Shrubland habitat is considered to have low to moderate value, while man-made habitats including orchard, plantation woodland and wasteland which are subjected to heavy human intervention possess low ecological value.



7.5.3 Altogether two ecological important plant species were found outside the Project Limit (see Figure 2.1e) and the evaluation of these species according to the EIAO TM are given below :

**Table 7.5b Evaluation of Ecological Important Species**

Species	Location	Protection status	Distribution	Local rarity
<i>Hemigramma decurrens</i>	Eastern slope of Butterfly Valley	Not protected	Luk Keng & Wu Kau Tang	Rare
<i>Ailanthus fordii</i>	Eastern slope of Butterfly Valley	Protected	Lantau Peak & Ma On Shan	Rare

## 7.6 Impact assessment

7.6.1 Ecological impact resulting from the proposed alignment is mainly associated with landtake that would lead to direct habitat loss. The potential sources of impact and the severity of such impact are indicated below.

### Potential Sources of Impact

7.6.2 Potential sources of impact associated with the proposed Route 16 Alternative Alignment are:

- direct loss of habitat and associated wildlife including secondary woodland, shrubland, freshwater stream, plantation woodland, orchard and wasteland as a result of road construction and the related temporary work sites, and hence fragmentation of habitat mainly to the secondary woodland on the western slope of Butterfly Valley;
- indirect impact to the surrounding habitats and associated wildlife, because of increased human activities/disturbance during construction and operational phases;
- potential damage to the permanent stream and seasonal streams within Butterfly Valley including the requirement for water during construction and run off of construction wastes into stream courses, leading to sedimentation; and
- the presence of highway may restrict movement of wildlife inhabiting the surrounding habitat once the highway is in operation.

### Impact Evaluation

7.6.3 Potential impacts on ecology evaluated according to Annex 8 of EIAO-TM are given below:

- **Habitat quality:** There will be direct loss of secondary woodland mainly on the western slope of the Butterfly Valley which is less ecologically important than that on the eastern slope which supports 2 rare species. It is considered that the impact on the secondary woodland is moderate. The alignment will pass through the bottom of Butterfly Valley where a permanent stream and a few seasonal streams are present. The stream habitat within the boundary of cut slope and alignment will be lost and the impact on the more natural upper stream section is moderate, while that on the disturbed lower stream section and the seasonal streams is considered low. The ecological value of the shrubland, orchard and plantation habitats were identified to be limited and only small areas of these habitats will be affected by the proposed alignment; no significant ecological impact is therefore anticipated from the loss of these habitats. No impact is expected due to loss of wasteland.

- **Species:** There may be potential direct or indirect impact to the low abundance and richness wildlife inhabiting the areas. No impact is expected on the rare/protected plant species because they will not be affected by the Route 16 project.
- **Size/Abundance:** The area loss of secondary woodland and shrubland due to land take for the road construction are approximately 3ha and 0.7ha respectively, whereas the area loss of low ecological important orchard/village and plantation areas are 0.8ha and 0.3ha respectively. For freshwater stream habitat, the whole permanent stream within Butterfly Valley (approximately 650m) and lower sections of the seasonal streams (approximately 250 m) will be lost, while less than 0.1ha wasteland will be loss due to the project.
- **Duration:** The duration of impact will persist during construction and operational phases.
- **Reversibility:** The impact will be permanent and irreversible.
- **Magnitude:** Except the loss of the permanent stream within Butterfly Valley which is a significant change, the scale of other habitat loss is small in the context of the surrounding similar habitats.

The habitats of the affected lower Butterfly Valley would be fragmented by the proposed highway structure, particularly the secondary woodland on the western slope, but considering the low wildlife abundance recorded the fragmentation impact is expected to be low.

- 7.6.4 Based on the above discussion, potential significant impact is related to the loss of 3ha of secondary woodland and 650m permanent freshwater stream within Butterfly Valley with moderate ecological importance. The loss of 0.7ha shrubland, 0.3ha plantation and 0.8ha orchard/village area, as well as 250 m of seasonal streams is considered to have low impact owing to their limited ecological value. Given the low abundance and richness of animal wildlife recorded as presented in *Section 7.4.3 Animal Wildlife*, it is considered that the potential impacts on animal wildlife, such as from habitat loss, increased human activities or restricted movement, is expected to be low.

## 7.7 Mitigation Measures

- 7.7.1 In general, the Butterfly Valley area is currently zoned as Green Belt and it is expected that the present landuse would remain similar to the present condition in the absence of the project.
- 7.7.2 As discussed in Section 7.6.3 and 7.6.4 the potential impact due to landtake by the Route 16 project would affect the secondary woodland and permanent stream within Butterfly Valley, while ecological impact on the other low quality habitats is limited.
- 7.7.3 For the loss of the 3ha of secondary woodland, it is recommended that the extent of cut slope along Butterfly Valley to be investigated further at the following Design and Construct stage to explore further options to minimise the loss of secondary woodland and stream habitat. There is approximately 3 ha cut/fill slope area within the boundary of cut slope and alignment in Butterfly Valley available as shown in *Figure 7.7a* and has been recommended for compensatory tree planting (see also *Figure 9.9a*). Tree species used for planting should take reference of the species in the surrounding and, using native species as far as possible.
- 7.7.4 Woodland loss and corresponding compensation due to the section from West Kowloon to Sha Tin of Route 16 has been stated in the previous EIA report. However, it has been confirmed with Highways Department that more area is identified available for compensatory replanting in Ching Cheung Road Interchange and Pak Shek area. For completeness, the entire Route 16 alignment is considered and the total woodland loss and compensation is summarised in *Table 7.7a*. Their locations are shown in *Figure 7.7b* and *7.7c* respectively.

**Table 7.7a Summary on Woodland Loss and Compensation for the Entire Route 16 Alignment**

Location of woodland loss	Area of loss (ha)	Location of compensatory replanting	Area of compensation (ha)
Butterfly Valley	3	Cut/fill slopes at Butterfly Valley	3
Ventilation Building & Toll Plaza in Shatin	5.6	Ching Cheung Road Interchange	2.5
		Wai Man Tsuen	1
		Pak Shek area	5
<b>Total</b>	<b>8.6</b>		<b>11.5</b>

- 7.7.5 To compensate for the permanent stream habitat loss, approximately 450 m long of future drainage channel is recommended to be designed and constructed to mimic natural stream habitats (see *Figure 7.7d* for location). The created stream course should have natural substrate so as to provide suitable habitats for the colonization of stream invertebrates. The stream habitat will be restored partly by natural silting due to flow from upper stream. Selected substratum should resemble the existing stream conditions and large granite boulders may be placed at the upstream section so that these boulders will be weathered naturally to smaller pebbles and finer particles, forming natural stream substrate. In addition, stream fauna from upper stream will also colonise lower stream naturally after stream re-creation. The habitat creation aims to provide and maintain high quality stream habitat, in particular with the removal of village areas which are sources of pollution. A schematic cross-section of the re-created stream is shown in *Figure 7.7e*. Details of the natural drainage channel design to provide stream habitats will be developed in the following Design and Construct Stage.
- 7.7.6 Stream sedimentation during construction should be prevented by erection of sediment barriers and operation of stilling ponds in the streams within the Project Limit (see *Figure 2.1e*).
- 7.7.7 A tree survey should be conducted during the subsequent detailed design stage, in accordance with the technical requirements of the *Works Branch Technical Circular (WBTC) No. 24/94* & *Planning Environment and Lands Branch Technical Circular (PELBTC) No. 3/94 on Tree Preservation*, for the Tree Felling Application, which will also form the basis for the compensation planting recommended above.
- 7.7.8 Given the proximity of the secondary woodland to the boundary of the proposed alignment, it is also recommended that the following good practice be adopted during the construction phase to avoid any unnecessary impact due to uncontrolled construction activities:
- the woodland area to be encroached upon by the development should be well-defined and minimised;
  - fences should be erected along the boundary of construction sites before the commencement of works to prevent tipping, vehicle movements, and encroachment of personnel into adjacent wooded areas, particularly near the two rare/protected plant species (location see *Figure 7.4a*);

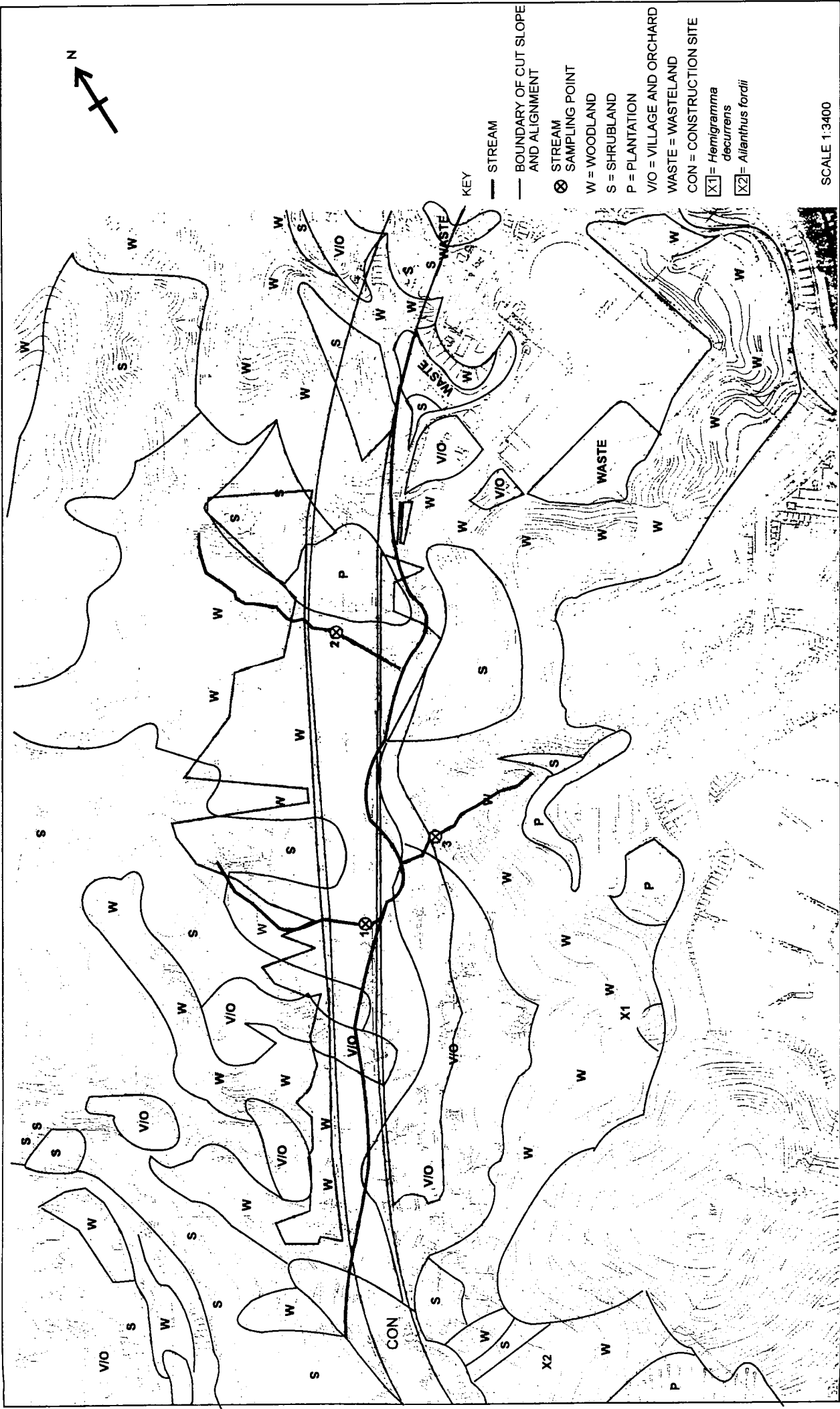
- regular checks should be made to ensure that the work site boundaries are not exceeded and that no damage caused to the surrounding areas;
- if there is any loss of the adjacent woodland because of the temporary landtake during the construction phase, the area should be returned to the original status immediately after completion of the road construction by on-site tree replanting, using tree species recommended as above; and
- wild and uncontrolled open fires should be strictly prohibited within the work site boundary, and appropriate fire control measures should be provided for preventing potential fire damage to the woodland area.

## **7.8 Residual Impacts**

- 7.8.1 With the implementation of the mitigation measures recommended above, no adverse residual ecological impacts from the road construction are anticipated. Compensation planting on the 3ha cut/fill slope should be undertaken for compensation of the loss of 3ha secondary woodland. Potential impact due to loss of 650 m permanent stream habitat with low to moderate value within Butterfly Valley will be compensated by the recommended stream habitat creation (approximately 450m long) with an objective to provide high quality habitats. The residual impact due to the net loss of approximately 200 m of low to moderate value permanent stream is considered minimal. For the other habitat types, given their low ecological importance and small areas affected, the residual impact is considered minimal.

## **7.9 Conclusions**

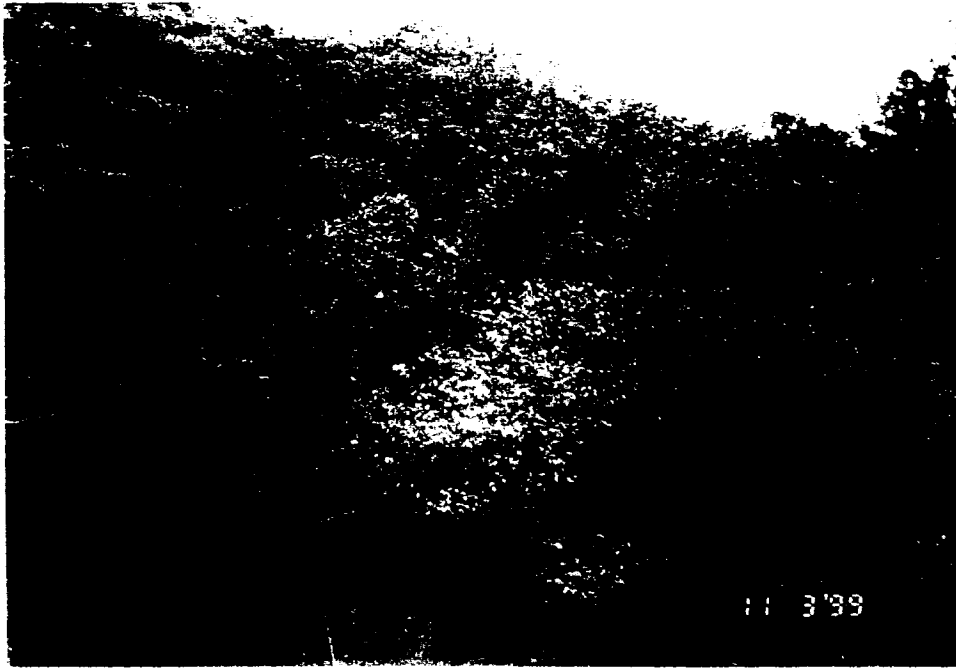
- 7.9.1 The ecological resources within the Study Area comprises secondary woodland, shrubland, orchard/village, plantation woodland, wasteland and freshwater stream. Field surveys identified that the secondary woodland and upper stream courses are relatively more ecological important habitats. The secondary woodland on the eastern slope of the Butterfly Valley supports two rare/protected plant species - *Hemigramma decurrens* and *Ailanthus fordii*, but they are well outside the work limit and will not be affected. The other identified habitats within the Study Area are mostly disturbed with low ecological importance, and animal wildlife recorded within the Study Area was limited and no species of conservation interest was found.
- 7.9.2 Although the proposed alignment will encroach into part of the secondary woodland, on-site compensatory planting on the cut slope will adequately mitigate the impact. Stream habitat creation is also recommended to compensate for the loss of the permanent freshwater stream within Butterfly Valley. For the other habitats, given their low ecological value and small size to be affected, the residual impact is considered limited. No significant residual impact is therefore anticipated.



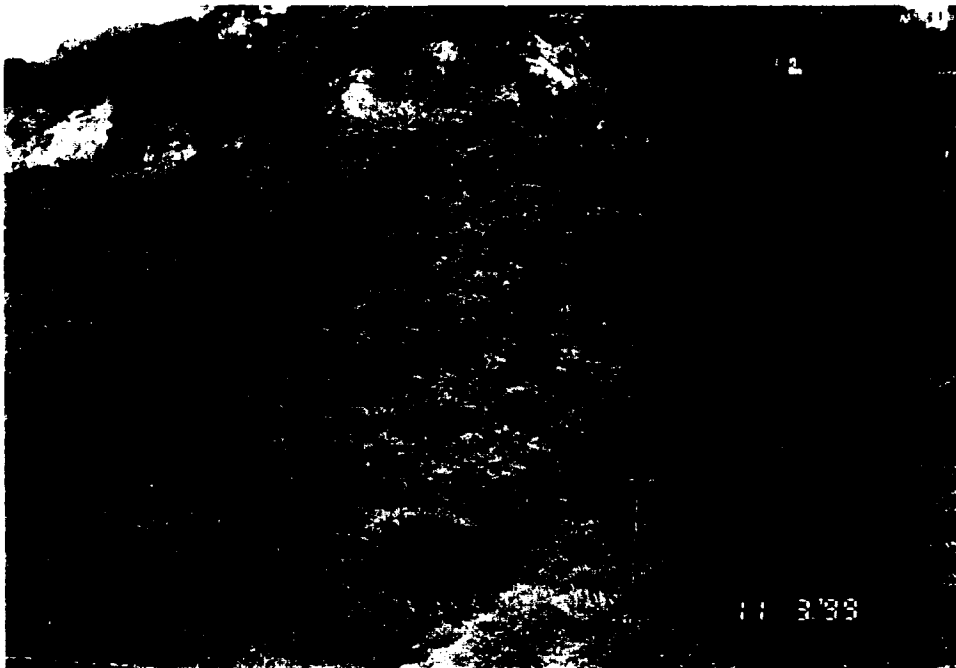
HABITAT MAP FOR BUTTERFLY VALLEY

FIGURE 7.4a

*Plate 7.4a : Secondary Woodland at Butterfly Valley*



*Plate 7.4b : Shrubland at Butterfly Valley*



*Plate 7.4c : Orchard at Butterfly Valley*

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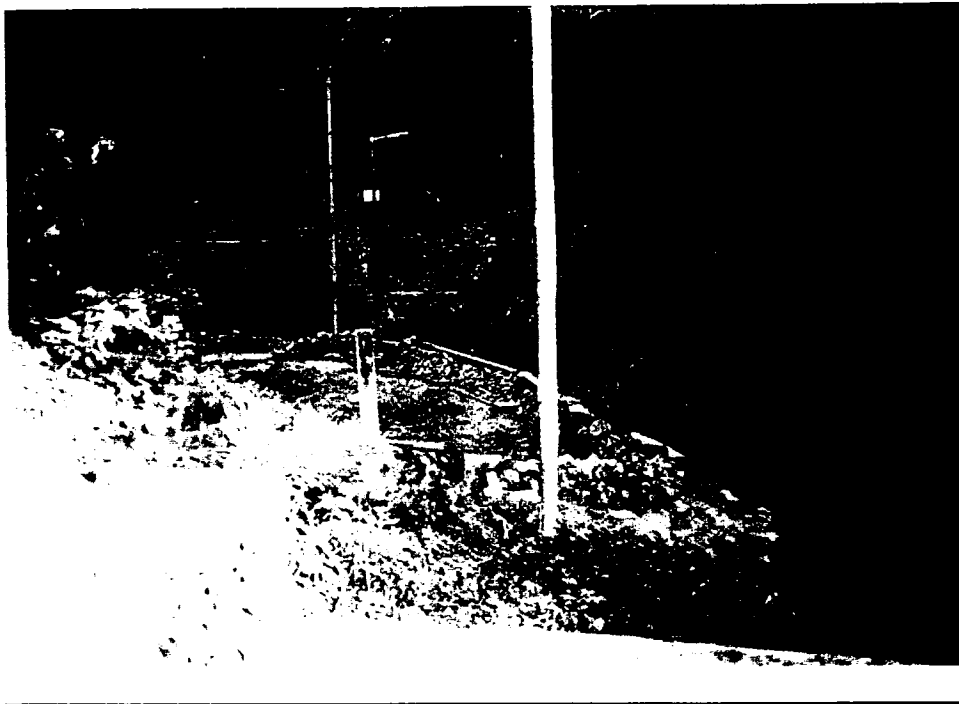


*Plate 7.4d : Platation Woodland at Butterfly Valley*

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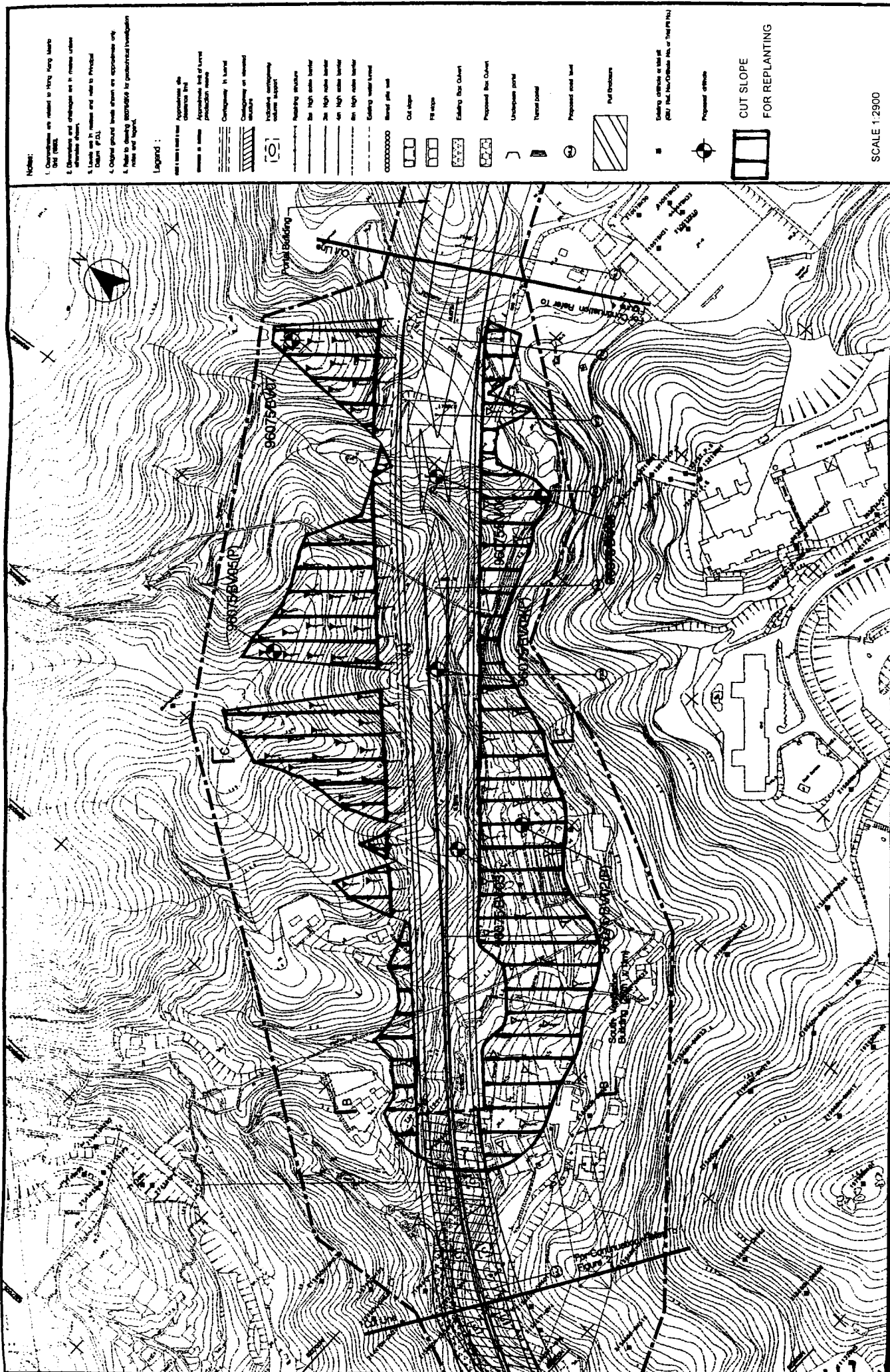
*Plate 7.4e : Wasteland at Butterfly Valley*



*Plate 7.4f : Main Stream (lower section) at Butterfly Valley*







LOCATION OF CUT SLOPE FOR COMPENSATORY REPLANTING

FIGURE 7.7a



INDICATIVE LOCATION OF WOODLAND LOSS FOR THE ENTIRE ROUTE 16 ALIGNMENT

NOT TO SCALE

FIGURE 7.7b



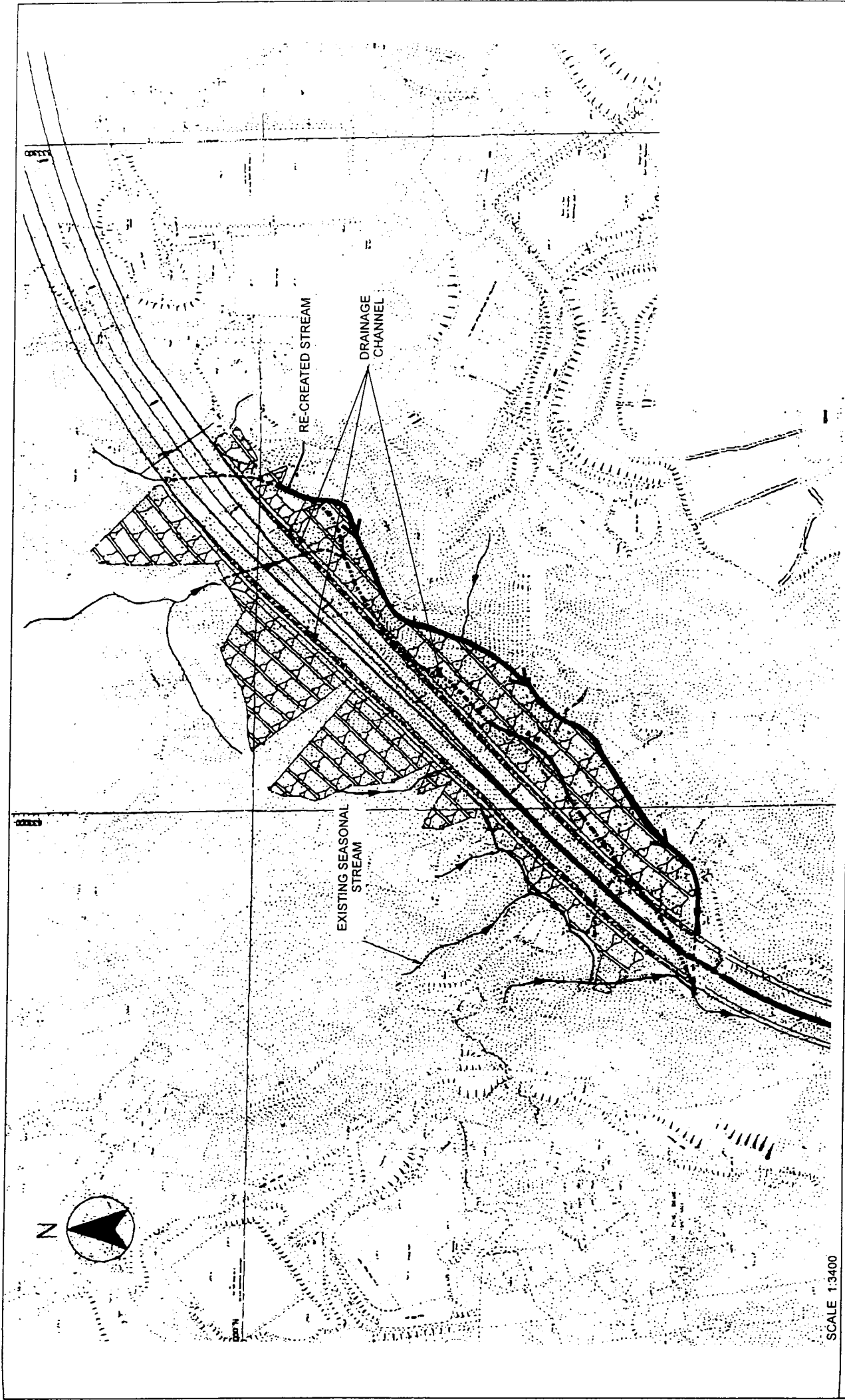
NOT TO SCALE

FIGURE 7.7c

INDICATIVE LOCATION OF WOODLAND COMPENSATION FOR THE ENTIRE ROUTE 16 ALIGNMENT

Environmental  
Resources  
Management

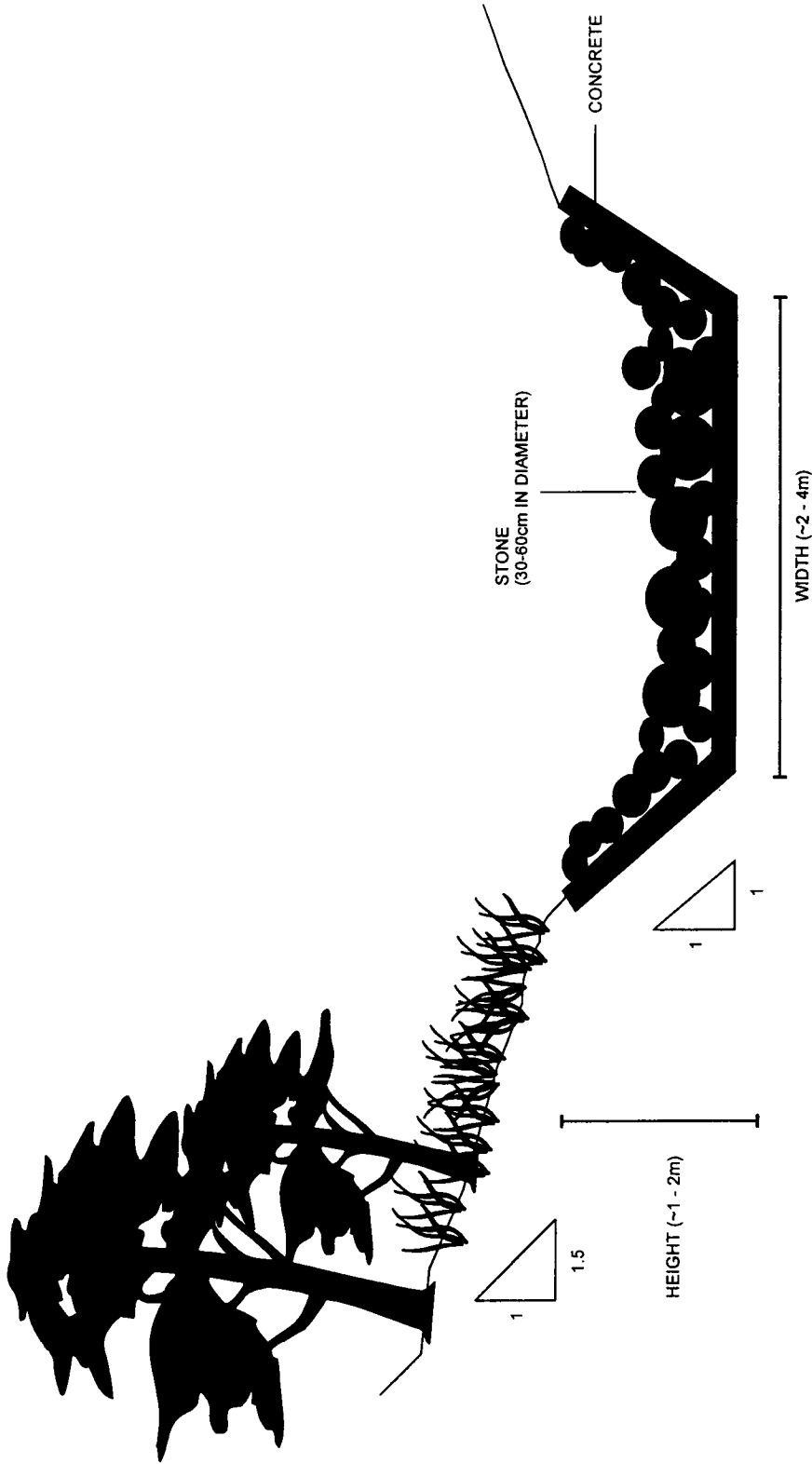




SCALE 1:3400

FIGURE 7.7d

LOCATION OF RE-CREATED STREAM AT BUTTERFLY VALLEY



NOTE: HEIGHT AND WIDTH TO BE DETERMINED AT DETAILED DESIGN STAGE TO CATER FOR THE EXPECTED FLOW

NOT TO SCALE

FIGURE 7.7e

TYPICAL SCHEMATIC CROSS-SECTION OF RE-CREATED STREAM