APPENDIX 13.10 Long Valley Nature Park: Preliminary Management Plan

1 Introduction

1.1 Background

1.1.1 In 2003 the Hong Kong SAR Government conducted a review of its nature conservation policy. This review led to the adoption of the New Nature Conservation Policy (NNCP) in 2004. The overall objective of this policy is to 'regulate, protect and manage natural resources that are important for the conservation of biological diversity in Hong Kong in a sustainable manner, taking into account social and economic considerations, for the benefit and enjoyment of the present and future generations of the community'. As an element of this policy, twelve sites, not already protected as Country Parks or Special Areas under the Country Parks Ordinance, were identified as Priority Sites for Enhanced Conservation. One of these sites was the Long Valley and Ho Sheung Heung Priority Site, comprising the *fung shui* wood at Ho Sheung Heung together with Long Valley, a largely agricultural area around the confluence of the Sheung Yue and Shek Sheung Rivers which is widely recognized as being of high ecological value primarily due to the variety of freshwater wetland-dependent bird species that utilize its patchwork of wet agricultural habitats. The Priority Site covers an area of 151.2ha.

1.1.2 Subsequently, commencing in 2005 and continuing to the present, Management Agreements (MA) under the NNCP were implemented whereby the conservation value of the Priority Site has been enhanced by non-governmental organizations working with the public and local villagers, utilizing funding from the Environment and Conservation Fund (ECF). These conservation measures have been of direct benefit to species of conservation significance and have also been successful in raising the public's and local villagers' awareness of conservation. However, these voluntary MAs cover only variable portion of the Priority Site and do not provide a permanent means of safeguarding the conservation value of the Site.

1.1.3 Meanwhile, under the study of 'Hong Kong 2030: Planning, Vision and Strategy' (the HK2030 Study) completed by Planning Department in 2007, the NDAs previously identified in the 'Planning and Development Study on North East New Territories' (the NENT Study) completed in 2003 were revisited and recommended for implementation. The Project Profile prepared for the consequent study (this NDA Study) indicated that impacts to Long Valley would be avoided where possible, but if unavoidable, further measures to enhance habitats in Long Valley would be examined. It was noted that an option of mitigating for the loss of habitats of ecological importance by converting relatively lower quality habitats with high potential value (agricultural land) to high quality freshwater wetland habitats (marsh) at Long Valley to create a large, ecologically significant and well managed freshwater wetland would be subject to review in the EIA study and planning stage.

1.1.4 In accordance with this commitment, therefore, one important element of the EIA study for the NDAs has been to ensure the conservation of and to plan for the future of the Priority Site. In addition, the conservation of the Priority Site is of concern in the wider community. During the Stages One and Two Public

Engagement conducted in 2008 and 2009, comments were received to the effect that the important ecological resources of Long Valley should be protected, but that current MA mechanism as not sustainable in the long term and that landowners' rights were being compromised. Some respondents specifically requested that the opportunity should be taken in the NDA study to provide a more sustainable mechanism for the long-term conservation of Long Valley. In addition, as was indicated in the Project Profile, the ecological enhancement of habitats in the Priority Site provides a means of mitigating for unavoidable impacts to habitats of ecological importance elsewhere in the NDAs.

1.1.5 The present document, outlines how the NDA project will ensure that the conservation value of much of the Priority Site will be safeguarded and enhanced in the long term by the creation of the Long Valley Nature Park (LVNP) and how the creation of this Nature Park will meet some of the ecological mitigation requirements for the Project.

1.2 Proposed Nature Park boundaries and proposed zoning for Long Valley under the RODP

1.2.1 The Long Valley and Ho Sheung Heung Priority Site covers an area of 151.2 ha. This includes extensive areas which are of limited ecological value, especially in the southwest, Ho Sheung Heung *fung shui* wood, together with an area to the north of the Sheung Yue River which contains a mosaic of fish ponds and agricultural land and is of moderate to high ecological value. However, the area of highest ecological value is the agricultural land north of Yin Kong and Tsung Pak Long and south of the confluence of the Sheung Yue and Shek Sheung Rivers; much of this area is wetland of very high ecological value though pockets of other habitats (largely dry agriculture and orchards) are of lower ecological value. Accordingly, this area of 37.17ha is proposed to be zoned as Other Uses (Nature Park (OU(NP)). Thus, the OU(NP) zone will encompass those areas of Long Valley currently of highest ecological value, together with areas of high potential ecological value which can be enhanced to compensate for habitats lost or impacted elsewhere (see below), and in the process securing both the long term conservation of Long Valley and meeting much of the ecological mitigation requirement for the project under the EIAO. Meanwhile, areas to the south and north would be protected by retaining their existing AGR zoning.

1.3 EIAO requirements under NDA project

1.3.1 Under the EIAO, one of the requirements of the EIA study for the NDA project is to describe mitigation measures to avoid, minimise and compensate for impacts arising from the project. Whilst some measures to avoid and minimise direct and indirect impacts to wetland habitats and wetland dependent species of conservation significance have been implemented in the design of the Recommended Outline Development Plans (RODP-13), some residual wetland loss and some disturbance impacts remain. These impacts would require compensation through the creation or enhancement of wetland habitats.

1.3.2 As noted in paragraph 1.1.5, the LVNP will provide habitat compensation for the ecological impacts of loss of wetland (other than loss of seasonally wet grassland at Ma Tso Lung which will be mitigated *in situ*) arising from the Project. In addition to direct wetland loss, an area dry agricultural land of low to moderate ecological value for small numbers of some fauna species of conservation significance will be lost in FLN. Most of the species which will be impacted are not dependent on, or associated with, dry agricultural land; rather these are species which are associated with, and utilize, wetland habitats, especially wet agricultural land, more regularly and/or in larger numbers. Habitat loss for these species will also be compensated by habitat provision in LVNP, both in wetland and non-wetland habitats.

1.3.3 Finally, disturbance is expected to increase at certain wetland habitats due to the increased levels of human activity in the area. This is particularly the case along Sheung Yue, Shek Sheung and Ng Tung Rivers. Habitat provision for disturbance impacts on some of these species will also be made at LVNP.

1.4 Enhancement Mechanism

1.4.1 Mitigation for the direct loss of wetland habitats and increased disturbance to wetland habitats detailed above will be mitigated by compensatory habitat enhancement and management in LVNP. Long Valley is currently a mosaic of wetland and non-wetland habitats**,** the distribution and type of which changes frequently as crops are harvested and planted, and areas of land are cultivated and left fallow. These habitats are not of equally high ecological value. As such, there is considerable potential to enhance the ecological value of the habitats in LVNP by converting lower value habitats to those of higher value; as well as potential for enhancing the value of LVNP as a whole by managing human activities to reduce disturbance to wildlife. However, it should be noted that the existing mosaic of wetland and non-wetland habitats is intrinsic to the ecological value of Long Valley and that converting all non-wetland areas to wetland habitats is not desirable, or indeed practicable. Furthermore the pattern of land-use within Long Valley is dynamic and any future enhancement measures will need to review habitats present at that time and determine the exact scope of such measures.

1.4.2 Management of agricultural land, notably wet agricultural land, in such a way that the ecological value is enhanced is an accepted mechanism in Hong Kong for meeting conservation objectives (e.g. Anon 2010). Specifically, at Long Valley, monitoring of bird use of fields covered by Management Agreements under the ECF by Hong Kong Bird Watching Society and the Conservancy Association during 2006 to 2011 showed that fields under conservation management supported considerably greater numbers of birds than unmanaged fields. Indeed, apart from during the first 15 months of the period, when experimentation with management techniques was perhaps not always beneficial, managed fields supported higher bird numbers at all seasons, the average ratio ranged 1.7 in spring to 2.5 in summer. As well as the number individuals, the number of species present, especially wetland species, also increased. Mitigation for wetland loss and disturbance to wetland fauna by enhancing the value of agricultural land in Long Valley is, therefore, feasible in principle.

Table A13.10.1 Ratios of bird numbers in managed to unmanaged fields in the Long Valley and Ho Sheung Heung Priority Site, 2007 to 2011*.

Year	Spring	Summer	Autumn	Winter*
2007	0.7	1.6	0.9	1.5
2008	2.3	5.6	3.8	3.3
2009	1.9	2.3	3.6	2.4
2010	2.1	1.3	2.1	2.9
2011	1.8	1.5	2.4	2.2
Mean	**1.7**	**2.5**	**2.6**	**2.5**

Source: Hong Kong Bird Watching Society data at http://www.hkbws.org.hk/BBS/viewthread.php?tid=12044&extra=page%3D1)3er1

**Note that seasons are as follows: Spring (March to May), Summer (June to August), Autumn (September to November) and Winter (December to February) Thus Winter 2006 in the table refers to the period from December 2006 to February 2007.

1.4.3 At the present time participation in the MA in Long Valley is voluntary and coverage does not include the whole of Long Valley: the managed area within the boundary of the proposed LVNP is approximately 10ha. There is, therefore, considerable scope to increase the extent of the managed area, approx. 70% currently not being under conservation management.

1.5 Purpose and Scope of the Preliminary Management Plan

1.5.1 The purpose and scope of this Preliminary Management Plan (PMP) is to outline how Long Valley Nature Park (LVNP) will be managed in order to meet the objectives described above. The PMP provides a background to the site, explores concepts for the design of the Nature Park and provides some initial ideas for management of the site. Concepts presented as part of this PMP include habitats to be provided in the LVNP, methods of achieving and maintaining the required habitat objectives, target wetland fauna species and options for managing public access.

1.5.2 It is not intended that this document should provide a detailed design for the site or details of the management procedures and practices required to achieve the aims of the site in terms of habitat provision and visitor access. It is expected that these detailed design and management procedures will be established as part of a later study cumulating in a more detailed Habitat Creation and Management Plan (HCMP).

2 Description of the site of Long Valley Nature Park

2.1 Location of LVNP

2.1.1 Long Valley is located in the northern New Territories, approximately 1 km to the west of Sheung Shui. It is wholly within the area covered by the Kwu Tung NDA and RODP-13.

2.1.2 The site of the LVNP is to the south of Sheung Yue River and to the west of Shek Sheung River, extending from the confluence of these two rivers south to Yin Kong Village. Being located on the former floodplain of these rivers the

land at Long Valley is flat, low-lying and fertile and as a result is suitable for the cultivation of crops.

2.2 Current land use within LVNP site

2.2.1 Most of the site of the LVNP is currently occupied by agricultural land. This includes both wet and dry fields, and fields which are actively managed for crop production as well as fields which are left fallow (for various durations). The management of each individual field (water levels, types of crop grown or fields left fallow) varies according to the preferences of the individual farmer and, if covered by a MA, MA habitat objectives.

2.2.2 However, a high proportion of the site is generally managed for wetland crops (especially Water Spinach *Ipomoea aquatica* and Water Cress *Nasturtium officinale*). Other wetland crops grown as part of the MA but which are rarely cultivated commercially in Hong Kong include Water Chestnut *Eleocharis dulcis*, Rice *Oryza sativa*, Chinese Arrow-head *Sagittaria sagittifolia* subsp. *leucopetala* and Water Caltrop *Trapa natans*. Some fields are seasonally wet and may be used for cultivation of wetland crops in one season but dryland crops in another.

2.2.3 Some fields at Long Valley are used for the cultivation of dryland crops including Chinese Aloe *Aloe vera* var. *chinensis*, Chinese Chives *Allium tuberosum*, Chinese White Cabbage *Brassica chinensis*, Lettuce *Lactuca sativa*, Matrimony Vine *Lycium chinense* and Egg-plant *Solanum melongena*. As mentioned above, the cultivation of these crops may be seasonal and fields may be flooded after harvesting.

2.2.4 After harvesting of crops, individual fields may be ploughed or may be left with the remnants of the previous crop (depending upon crop species and future management). These fields may be replanted immediately but are often left fallow for a varying period of time. Fallow fields are progressively colonised by common ruderal herb and grass species. If left inactive for a prolonged period, fields generally become overgrown with vegetation and may lose some value to faunal species associated with agricultural land. Some fallow fields are intentionally flooded, some may be allowed to flood (either fully or partly) during the wet season, and others may be retained in a dry condition. Most of these long-inactive fields are located at the southern and eastern sides of the LVNP.

2.2.5 Part of the site is occupied by ponds with permanent open water. These include ponds used for the cultivation of fish and water flea *Moina macrocopa*. Some ponds scattered within the agricultural fields are used for the storage of water for irrigation or for the cultivation of Lily *Nymphaea* spp. or Lotus *Nelumbo nucifera*.

2.2.6 The boundary of the LVNP contains former meanders of Sheung Yue River which were isolated during river channelization in the early 2000s. These meanders (with an area of approximately 1.4 ha) are managed by AFCD as ecological mitigation for the channelization. The meanders are used by similar wetland fauna to that found in marsh and pond areas elsewhere in Long Valley.

2.2.7 The northern and western perimeters of the site are bounded by the channelized Sheung Yue and Shek Sheung Rivers, with associated access roads. Between the agricultural land and the roads is a strip of plantation trees including *Hibiscus tiliaceus* and *Lophostemon confertus*. Some of the higher bunds within the boundary of the site also support trees, mostly fruit trees including *Litchi chinensis*, *Dimocarpus longan* and *Mangifera indica*.

2.2.8 The extreme south of the LVNP, adjacent to existing Yin Kong village, is developed land, most of which is currently used for container storage. The area of this developed land is approximately 0.5 ha.

2.3 Water supply and drainage

2.3.1 Water for irrigation of the agricultural land is currently obtained from rainfall plus water extraction from the Long Valley Watercourse (a tributary stream of the Sheung Yue River), the Sheung Yue River proper and from groundwater wells within Long Valley. Future management of the LVNP is likely to rely upon assuring the continued supply of clean water from these sources, however, alternative water supplies, including the retention of water in ponds for irrigation and the provision of clean-up wetlands to polish grey water (for example from the Visitor Centre), may also be considered appropriate for long-term management. The detailed design and HCMP should investigate the reliability and security of the existing water supply and consider mechanisms whereby water can be managed to ensure sufficient water retention for irrigation, especially during the dry season.

2.3.2 At present water is largely supplied across the site primarily by gravitational flow through a series of ditches across the site. Water flows from south to north across the site, eventually draining out of the site into the adjacent drainage channels.

2.4 Proposed surrounding land uses under RODP-13

2.4.1 Habitats to the north, east and south of LVNP would remain unchanged under the proposed design of the NDA. Current agricultural land to the north and south would retain the existing AGR zoning, while Yin Kong village and Ho Sheung Heung would be zoned as village land (V zoning).

2.4.2 Development to the west of LVNP (on the western side of Sheung Yue River) under the NDA would include village expansion site, facilities associated with the railway and commercial, research and development facilities (proposed to include hotel/conference facilities). Mitigation measures (in particular height restrictions, landscape screening and minimization of external lighting) will be implemented to ensure that these facilities would not significantly impact upon the character of the LVNP. To minimize potential disturbance impacts to LVNP public access to the existing maintenance access along the western boundary of Long Valley will need to be restricted.

2.4.3 Further to the west are residential developments at Kwu Tung North, including a proposed new railway station located approximately 1km to the west. The main pedestrian access into the LVNP would be from Kwu Tung across Sheung Yue River by a pedestrian bridge.

2.5 Cycle track from Sha Po Tsuen to Shek Sheung River

2.5.1 The boundary of the LVNP is adjacent to the route of the proposed cycle track from Sha Po Tsuen to Shek Sheung River. This cycle route would follow the western bank of Shek Sheung River (between the river and LVNP) and the northern bank of Sheung Yue River (across the river from LVNP). The EIA for the cycle track was approved without conditions on 12 March 2009 but construction has not yet commenced.

2.5.2 The presence of the cycle track provides both opportunities and constraints for the LVNP. The cycle track will provide a convenient access route for the LVNP permitting visitors to arrive by bicycle via Sheung Shui or Kwu Tung. The presence of cyclists around the perimeter of LVNP will, however, increase the potential for disturbance around the edge of the site. Such disturbance must be mitigated by suitable screening between the cycle track and LVNP as well as the difference in level between the cycle track (which will be at a higher level) and LVNP. Existing mitigation woodland planting along the rivers already provides significant screening, but it may be necessary to enhance this.

2.6 Potentially Hazardous Installation at Sheung Shui Water Treatment Works

2.6.1 The Sheung Shui Water Treatment Works (SSWTW) is located to the north of the LVNP. The SSWTW has been identified as a potentially hazardous installation (PHI) due to the storage, use and transport of chlorine for water chlorination. In order to minimise risk to life in the event of accidental release of chlorine, population centres should be located as far as possible from the PHI. The northern part of the LVNP lies within the 1 km consultation zone (CZ) for the SSWTW, within which the population forecast under the NDA requires calculation as part of the Risk Assessment of the EIA.

3 Ecological Background to Long Valley

3.1 Management Agreements under New Nature Conservation Policy

3.1.1 The NNCP encourages the conservation and enhancement of Priority Sites through the implementation of Private-Public Partnership (PPP) and Management Agreements (MA). The MA approach has been followed at Long Valley since 2005. Under the MA, funding is provided from the Environment and Conservation Fund (ECF) to a non-governmental organisation to manage the site in such a way that the conservation of the priority site is enhanced. The first MAs at Long Valley were administered by Conservancy Association (CA) and Hong Kong Bird Watching Society (HKBWS) separately from 2005-08. These two organisations have subsequently jointly managed MAs from 2008-10 (Anon 2010) and from 2010-12. The application of the 4th phase of MA at Long Valley commenced in March 2012 and will be completed in February 2015.

3.1.2 The previous MAs have investigated the effects of various agricultural practices and cropping regimes with a view to determining how these affect the ecological value of the site. Subjects previously investigated include the ways in which species are influenced by crop stage, water level, ploughing and application of fertilisers. Such data will be invaluable when determining the management strategy of the LVNP. A variety of crops have been grown under the MAs, some of which are no longer regularly grown elsewhere in Hong Kong; a comparison of the ecological value of these crops will also inform future management regarding the best crop species to be provided in the LVNP. Surveys of Long Valley by fauna, including birds, amphibians, reptiles and mammals conducted for the MAs will also provide important information for the future management of the site.

3.2 Current ecological value of Long Valley

3.2.1 Long Valley contains a diversity of microhabitats including wet and dry, inactive and fallow agricultural fields, ponds, marsh, mitigation meanders mitigation plantation and planted bunds. These diverse habitats form a complex mosaic across the site and have very strong ecological linkages. It is the presence of this diversity of habitats which provides much of the ecological value of the site, by providing wetland species with a diversity of water depths, vegetation and disturbance levels to cover a full range of breeding, foraging and roosting requirements of a high diversity of species.

3.2.2 Long Valley has good ecological links to surrounding wetland areas, especially adjacent wet agricultural land and drainage channels but also extending to the more extensive wetlands at Deep Bay. The LVNP would aim to take advantage of these ecological linkages to maintain and enhance the existing ecological value of the site.

3.3 Presence of egretries

3.3.1 The LVNP is located close to two egretries, at Ho Sheung Heung and Man Kam To Road. Flight-line surveys at these egretries indicate that some of the birds breeding at each site fly to Long Valley to forage.

3.3.2 In some years Ho Sheung Heung egretry is one of the largest egretries in Hong Kong. In 2010, the egretry supported at total of 86 nests including 42 nests of Little Egret, 25 of Cattle Egret and 19 of Chinese Pond Heron, though there were only 49 nests in 2012 (Anon 2011, Anon 2012).

3.3.3 Man Kam To Road egretry will unavoidably be impacted by the NDAs project and compensatory provision of habitat suitable for establishment of an egretry is proposed in area A1-7 of the Fanling North NDA. This location is closer to the LVNP than the existing egretry; hence if egretry re-establishment is successful it is highly likely that birds from there will forage in LVNP.

4 LVNP Management Methods and Objectives

4.1 Site opportunities and constraints

4.1.1 Wet agricultural land of the type present in Hong Kong is in nature a very dynamic habitat ecologically. Crop rotation in individual fields is common, with individual fields planted with different crops in different seasons. The different growth stages (from planting to harvesting) of certain crops also require different management methods and water levels. As a result the wildlife associated with agricultural land in Hong Kong is adapted to frequent changes in conditions at a scale of individual fields. This provides considerable flexibility in the management of LVNP so that different crops can be grown at different times. It also provides the opportunity to objectively review the existing composition and distribution of habitats at Long Valley; areas which are currently marsh could easily be drained and ploughed for use in agriculture, whereas fields which are currently active and dry could be flooded and left to evolve marshy conditions. Given this dynamism, a design for the LVNP need not necessarily rely on the existing conditions as a basis for determining the optimum layout.

4.1.2 Under the current system, individual fields at Long Valley are under the control of individual land owners or farm operators. As a result the layout of Long Valley has evolved in a somewhat haphazard manner in terms of the distribution of active and inactive fields, wet and dry land, marshes and ponds, and this process of change remains on-going today. Accordingly, the comprehensive plan for the whole of the LVNP will review the overall layout of Long Valley and consider the redistribution of habitats to the most appropriate location. This may involve consolidation of marshy areas into a particular part of the site, redistribution of crops to create either blocks of a single crop or a mosaic of different crops, management of water flow and water levels to maximise wetland areas, or other procedures. The overall management of the site as a single unit therefore has the potential to retain the value of individual fields but enhance the overall value by adjusting the proportion of particular habitats/crops and by redistributing these within the site.

4.1.3 Some parts of the site currently have relatively high bunds enclosing ponds and former meanders of Sheung Yue River. These higher areas limit the open country value of the site and may limit the current suitability of the site for some species which prefer open country habitats (especially waterbirds). A comprehensive plan for LVNP would allow for an assessment as to whether these higher bunds are appropriate for the site, and these could be removed during site enhancement works, if desired.

4.2 Ecological value of agricultural land

4.2.1 Agricultural land, especially wet agriculture, is of considerable importance ecologically, supporting a faunal community unlike that found in other habitats in Hong Kong. This is particularly notable among birds and amphibians.

4.2.2 Wet agricultural land provides shallow water habitats, usually with emergent vegetation and areas which are seasonally wet. The faunal community differs significantly from that found in wetlands in Deep Bay, where wetlands are

derived from areas of deeper water (especially fish ponds and *gei wai*), often with tidal or brackish influence. Although the species occurring in the wet agricultural land at Long Valley are similar to those recorded in Deep Bay, the relative abundance of these species differs according to the conditions present.

4.3 Potential habitat types and target species for LVNP

4.3.1 Potential target species for LVNP include species for which the area covered by the proposed LVNP is currently of importance, species which are particularly associated with agricultural land, especially wet agricultural land, and species where potential significant impacts may arise as a consequence of the NDA project. The EIA has identified a number of Key Species for which habitat management measures in the LVNP are required; Key species were identified according to the following criteria:

- Species of conservation significance based upon criteria detailed in **Section 13.4.3.8**, which have been reported in the impacted areas/habitats (including the proposed LVNP) in numbers considered to be of significance since 1998; or

- Any species that, although not of conservation significance, has been recorded in the impacted areas/habitats in numbers sufficiently high to indicate that the distribution and abundance in Hong Kong or assessment area as a whole would be significantly impacted by the proposed development;

Key Species for LVNP are listed in **Table A13.10.2**.

Table A13.10.2 - Key species requiring mitigation measures in Long Valley

Species	Basis of qualification	Area where significant impacts predicted	Area for mitigation for which species is a Key Target	Mitigation measures for Key Target species
Eastern Cattle Egret	LC as a breeding species: breeds at Ho Sheung Heung egretry and forages in Long Valley.	Long Valley foraging areas; flight-lines from Ho Sheung Heung egretry to foraging areas.	Long Valley foraging areas; flight-lines from Ho Sheung Heung egretry.	Enhancement of wetland habitats and non-wetland habitats at LVNP; measures to minimise disturbance impacts on Long Valley and flight-lines.
Grey Heron	PRC, but moderate numbers use river channels.	Long Valley and Sheung Yue River foraging areas.	Long Valley and Sheung Yue River foraging areas.	Enhancement of wetland habitats at LVNP; measures to minimize disturbance impacts on Long Valley; measures to minimise disturbance impacts on Sheung Yue River.
Great Egret	PRC, but moderate numbers use river channels.	Long Valley and Sheung Yue River foraging areas.	Long Valley and Sheung Yue River foraging areas.	Enhancement of wetland habitats at LVNP; measures to minimize disturbance impacts on Long Valley; measures to minimise disturbance impacts on Sheung Yue River.

Species	Basis of qualification	Area where significant impacts predicted	Area for mitigation for which species is a Key Target	Mitigation measures for Key Target species
Intermediate Egret	RC; small numbers regularly occur at Long Valley.	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP.
Little Egret	PRC; breeds at Ho Sheung Heung and Man Kam To egretries (latter to be directly impacted by Project); large numbers forage in river channels and in Long Valley.	Long Valley, Sheung Yue and Ng Tung Rivers foraging areas; flight-lines from Ho Sheung Heung egretry to foraging areas. Man Kam To Road egretry, (and flightlines and foraging areas).	Long Valley, Sheung Yue and Ng Tung Rivers foraging areas; flight-lines from Ho Sheung Heung egretry; egretry relocation site (FLN A1-7).	Enhancement of wetland habitats at LVNP; measures to minimise disturbance impacts on Long Valley, Sheung Yue and Ng Tung Rivers and flight-lines.
Chinese Pond Heron	PRC; breeds at Ho Sheung Heung and Man Kam To egretries (latter to be directly impacted by Project); large numbers forage in river channels and in Long Valley.	Long Valley and Sheung Yue and Ng Tung River foraging areas; flight-lines from Ho Sheung Heung egretry to foraging areas. Man Kam To Road egretry, (and flight-lines and foraging areas.	Long Valley and Sheung Yue and Ng Tung River foraging areas; flight-lines from Ho Sheung Heung egretry; egretry relocation site (FLN A1-7).	Enhancement of wetland habitats at LVNP; measures to minimise disturbance impacts on Long Valley and flight-lines.
Black-crowned Night Heron	LC; utilises a variety of wetland habitats in Long Valley, Ho Sheung Heung and Sheung Yue and Ng Tung Rivers.	Long Valley and Sheung Yue River foraging areas.	Long Valley and Sheung Yue River foraging areas.	Enhancement of wetland habitats at LVNP; measures to minimize disturbance impacts on Long Valley and Sheung Yue Rivers.
Yellow Bittern	LC; regularly occurs in densely vegetated wetland areas in Long Valley	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Von Schrenck's Bittern	RC; regularly occurs in densely vegetated wetland areas in Long Valley	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Cinnamon Bittern	LC; regularly occurs in densely vegetated wetland areas in Long Valley	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Eurasian Teal	RC; occurs in pond and watercourses including at Long Valley	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Eurasian Hobby	LC; regularly occurs in open country areas including Long Valley	Long Valley	Long Valley	Enhancement of habitats at LVNP
Japanese Quail	LC; regularly occurs in open country, grassland and dry agriculture including at Long Valley	Long Valley	Long Valley	Enhancement of habitats at LVNP
Ruddy-breasted Crake	LC; regularly occurs in small numbers in heavily vegetated habitats at Long Valley.	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Pheasant-tailed Jacana	LC; regularly occurs in small numbers in heavily vegetated habitats at Long Valley.	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP

Species	Basis of qualification	Area where significant impacts predicted	Area for mitigation for which species is a Key Target	Mitigation measures for Key Target species
Black-winged Stilt	RC; significant numbers forage in Long Valley, some forage in Sheung Yue River.	Long Valley, some in Sheung Yue River.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance impacts on Long Valley and Sheung Yue River.
Pied Avocet	RC; large numbers forage in Long Valley, some forage in Sheung Yue River.	Long Valley	Long Valley	
Greater Painted-snipe	RC; cryptic and not highly sensitive to disturbance but Long Valley is of high significance in a Hong Kong context.	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP.
Oriental Pratincole	LC; regularly occurs in small numbers in wetland habitats at Long Valley.	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Pacific Golden Plover	LC; regularly occurs in small numbers in wetland habitats at Long Valley.	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Little Ringed Plover	LC as a breeding species; qualification because of large numbers using river channels.	Sheung Yue Rivers.	Long Valley and Sheung Yue and Ng Tung Rivers.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance impacts on Long Valley; measures to minimise disturbance impacts on watercourses.
Marsh Sandpiper	RC; regularly occurs in small numbers in wetland habitats at Long Valley	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Common Greenshank	RC; regularly occurs in small numbers in wetland habitats at Long Valley	Long Valley	Long Valley	Enhancement of wetland habitats at LVNP
Wood Sandpiper	LC; significant numbers forage in Long Valley.	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Swinhoe's Snipe	LC;Long Valley is of significance in a Hong Kong context.	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Temminck's Stint	LC; regularly occurs in small numbers in wetland habitats at Long Valley	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Long-toed Stint	LC; regularly occurs in small numbers in wetland habitats at Long Valley	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Pied Kingfisher	(LC); regularly occurs in small numbers in ponds at Long Valley where it probably	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance

Species	Basis of qualification	Area where significant impacts predicted	Area for mitigation for which species is a Key Target	Mitigation measures for Key Target species
	breeds			to Long Valley.
White-throated Kingfisher	LC; regularly occurs in small numbers in wetland habitats at Long Valley	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Citrine Wagtail	LC; regularly occurs in small numbers in wetland habitats at Long Valley	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Red-throated Pipit	LC; regularly occurs in a mixture of wet and dry habitats at Long Valley.	Long Valley.	Long Valley.	Enhancement of habitats at LVNP; measures to minimise disturbance to Long Valley.
Pechora Pipit	LC; regularly occurs in small numbers in wetland habitats at Long Valley	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Buff-bellied Pipit	LC; regularly occurs in a mixture of wet and dry habitats at Long Valley.	Long Valley.	Long Valley.	Enhancement of habitats at LVNP; measures to minimise disturbance to Long Valley.
Bluethroat	LC; regularly occurs in marsh and wet agriculture at Long Valley.	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Pallas's Grasshopper Warbler	LC; regularly occurs in in wetland habitats at Long Valley	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.
Zitting Cisticola	LC; regularly occurs in a mixture of wet and dry habitats at Long Valley.	Long Valley.	Long Valley.	Enhancement of habitats at LVNP; measures to minimise disturbance to Long Valley.
Golden-headed Cisticola	LC; regularly occurs in small numbers in a mixture of wet and dry habitats at Long Valley.	Long Valley.	Long Valley.	Enhancement of habitats at LVNP; measures to minimise disturbance to Long Valley.
Chestnut-eared Bunting	LC; regularly occurs in small numbers in a mixture of wet and dry habitats at Long Valley.	Long Valley.	Long Valley.	Enhancement of habitats at LVNP; measures to minimise disturbance to Long Valley.
Yellow-breasted Bunting	RC, VU. Regularly occurs in a mixture of wet and dry habitats at Long Valley.	Long Valley.	Long Valley.	Enhancement of habitats at LVNP; measures to minimise disturbance to Long Valley.
Japanese Yellow Bunting	GC, VU. Regularly occurs in small numbers in a mixture of wet and dry habitats at Long Valley.	Long Valley.	Long Valley.	Enhancement of habitats at LVNP; measures to minimise disturbance to Long Valley.
Collared Crow	LC, NT. Occurs in small numbers in ponds and watercourse including	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance

Species	Basis of qualification	Area where significant impacts predicted	Area for mitigation for which species is a Key Target	Mitigation measures for Key Target species
	at Long Valley			to Long Valley; measures to minimise disturbance impacts on watercourses.
Reptiles	See Table 13.10 of the EcoIIA	See Table 13.10 of the EcoIIA	Long Valley	Provision of habitat for snakes species in general to benefit the species of conservation concern recorded from Long Valley (Buff-striped Keelback, Many-banded Krait, Chinese Cobra, King Cobra).
Chinese Bullfrog	PRC; widespread in the Study Area, albeit not in large numbers. Present in a number of locations where direct or indirect impacts are predicted.	Long Valley; Ma Tso Lung; and development areas in KTN and FLN.	Long Valley; Ma Tso Lung.	Enhancement of wetland habitats at LVNP.;
Two-striped Grass Frog	LC; uncommon and restricted to a few sites in Hong Kong.	Long Valley.	Long Valley.	Enhancement of wetland habitats at LVNP; measures to minimise disturbance to Long Valley.

4.3.2 The Hong Kong Bird Watching Society (HKBWS) and the Conservancy Association (CA) have been investigating ways to enhance the conservation value of bird and amphibian habitats at Long Valley since 2006. This initiative which is funded by the Environment and Conservation Fund operates via a Management Agreement (MA) with the local farming community and aims to conserve and enhance the agricultural freshwater wetland and habitat diversity for avifauna and amphibians and other freshwater wetland-dependent species in Long Valley.

4.3.3 The results have shown that bird numbers present in those fields which fall under the MA are consistently higher than those fields which do not fall under the MA (see table A13.10.1 above). Furthermore, within the different field treatments adopted, less intensively managed wet agriculture and shallow water habitats had higher species richness than other habitats (Figure A13.10.1 below). Provision of shallow water habitats was identified as a major priority in the future management of Long Valley as it provides important habitats to various target bird species, especially waders and that planting of rice was also effective in increasing numbers of birds including species of conservation importance (Sung *et al.* undated).

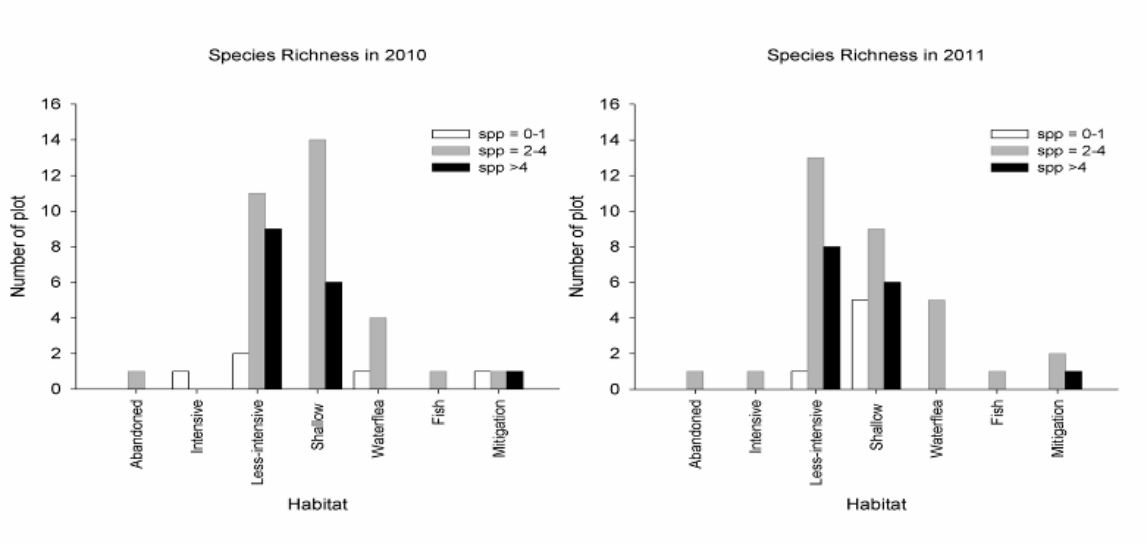

Figure A13.10.1.
Key: Species richness (spp = species number) by each managed habitat type in 2010 and 2011. Habitat types are: **abandoned** farm plots, **intensive** wet agricultural land, **less intensive** wet agricultural land, **shallow** water habitat, **waterflea** pond, **fish** pond and **mitigation** wetland. (Source: CA & HKBWS).

4.3.4 Ten species of amphibian have been recorded at Long Valley Table A13.10.3) with less intensive agriculture and various water crops attracting a relatively high number of species. Waterflea ponds and fishponds were also important for amphibians and important breeding habitats for amphibians were less intensive wet agriculture, shallow water habitats, mitigation wetlands and concrete-lined ponds. Table A13.10.3. Ten amphibian species recorded in Long Valley. Abundance refers to the ease of observation of the species (CA in litt.)

Table A13.10.3 – Ten species of amphibian have been recorded at Long Valley

Species name	Common name	Abundance
Duttaphrynus melanostictus	Asian Common Toad	++
Polypedates megacephalus	Brown Tree Frog	++++
Fejervarya limnocharis	Paddy Frog	++++
Hoplobatrachus rugulosus	Chinese Bullfrog	++
Hylarana guentheri	Günther's Frog	+++
Microhyla fissipes	Ornate Pigmy Frog	++++
Microhyla pulchra	Marbled Pigmy Frog	++
Microhyla butleri	Butler's Pigmy Frog	+
Kaloula pulchra	Asiatic Painted Frog	+
Kalophrynus interlineatus	Piebald Narrow-mouthed Frog	+

4.3.5 Current management measures at Long Valley being undertaken by CA and HKBWS form part of an on-going project covering the period 2012-2015 and draw on the findings of previous studies (CA and HKBWS in litt). Under this project Shallow Water Habitat (including marsh and open water) will have as management targets Wood Sandpiper, ardeids, *Gallinago* snipe, Greater Painted-snipe, crakes and rails and amphibians. Previous MA projects demonstrated that management of shallow water habitats is the most cost

effective way in which to increase bird diversity and abundance. However, it has been demonstrated that this effectiveness starts to drop after about four years and that rotation of habitats is important for attracting birds to Long Valley.

4.3.6 Less intensive agriculture is managed for buntings, *Gallinago* snipe, Wood and Green Sandpipers and Chinese Bullfrog. Rice paddy in particular has proved especially effective in attracting buntings including the globally vulnerable Yellow-breasted Bunting and Chinese Bullfrog.

4.3.7 Intensively managed agriculture has as targets Yellow and Citrine Wagtails, ardeids, and *Gallinago* snipe. A decrease in the area of watercress fields (due to warmer winters and an increase in fertilizer costs) had been detrimental to wagtail and *Gallinago* snipe numbers and incentives are proposed under the MA to reverse this trend.

4.3.8 Fish and marsh ponds are managed for ardeids, crakes and rails and amphibians. Management of fish ponds is effective in attracting ardeids although any such attraction is relatively short-lived (1-2 months) and is dependent upon pond drain-down which in turn requires resources and man-power and hence is less cost-effective than the enhancement of other habitats. Planting of water lilies is proposed for fishponds to further increase bird diversity and to attract amphibians.

4.3.9 Water flea ponds are managed to attract Black-winged Stilt and Chinese Bullfrog. This is another habitat type which is declining due to market forces and the MAs are important in ensuring this habitat remains at Long Valley. Further measures to attract amphibians in this habitat are proposed, specifically vegetation management along bunds.

4.3.10 Clearly much has been learnt regarding wildlife driven management of habitats at Long Valley under previous MA and the current 2012 -2015 project can be expected to provide additional information which will be critical for the long-term management of Long Valley for birds and amphibians

4.4 Approach to water management

4.4.1 Under current hydrological conditions, water for irrigation is derived from a mixture of rainfall, the Long Valley Watercourse (a tributary stream of the Sheung Yue River), the Sheung Yue River and from wells within Long Valley, and is distribution across Long Valley from south to north by gravity via a network of ditches. Provision of water to individual fields and control of water levels within the fields is mostly achieved by temporary dams, sluices and pipe networks. The sustainability of a water supply will be critical for the successful long-term management of the LVNP and whilst it is expected that a similar water control system will be required and this will need to be considered at the detailed design/HCMP preparation stage. Consideration should be given at that stage to the reprofiling of parts of Long Valley (to improve water circulation), upgrading/modifying the existing drainage network (to improve water distribution), provision of water retention ponds (to retain excess wet season surface run-off) and construction of a water treatment system (with the use of wetland for water polishing to be considered).

4.5 Site Security

4.5.1 Despite being located on private land, Long Valley can currently be accessed from any direction without restrictions. Under the proposed concept design, the LVNP would require that the boundary of the site is clearly delineated by a fence with access restricted and controlled by AFCD. The entire LVNP will be fenced and as such ecological connectivity with adjoining habitats, including for wild mammals, will need to be considered at the detailed design/HCMP preparation stage. Options for visitor management are discussed further in Section 5 below.

5 Visitor Centre and Management of Access

5.1 Visitor Centre

5.1.1 A Visitor Centre, which will be managed by AFCD, will be located on the west side of the Sheung Yue River in RODP-13 area B3-16. This location is appropriate for the reception of visitors arriving by train (at Kwu Tung MTR Station) and also those using the proposed cycle track. Visitor access would then be by means of a pedestrian bridge over the Sheung Yue River.

5.1.2 Due to the limited space available at the Visitor Centre and the proximity of public transport access from the proposed station at Kwu Tung it is not expected that a car park would be provided for public access, with visitors to the LVNP encouraged to arrive using public transport or to use nearby parking facilities and arrive on foot. Limited parking facilities (potentially in the basement due to limitations on space) would be available for staff working at the LVNP or for deliveries to the visitor centre. This arrangement is similar to the situation at HKWP, where only limited public parking is provided and visitors are encouraged to arrive by public transport. Given the proximity to the proposed cycle track, it would be desirable to provide bicycle parking space at the visitor centre for visitors arriving along the cycle track.

5.2 Visitor Access

5.2.1 Access into the LVNP would be via the Visitor Centre and would be managed and controlled by AFCD. At present, despite the land at Long Valley being privately-owned, there is no restriction on access to most of Long Valley. This lack of restriction on access does result in much of Long Valley being disturbed by visitors, especially at weekends in the winter months when the area is most visited by hikers, bird-watchers and photographers. Control of access and/or is visitor numbers will, therefore, be required in order to protect the ecological value of the LVNP, enable site management and will benefit visitors as it will ensure that the fauna that they wish to observe is present.

5.2.2 A decision as to the how access will be managed and controlled will require to be made at the detailed HCMP stage (as it will have both design and management implications) and will require detailed consultation between stakeholders, but is likely to involve a combination of escorted visits for those with a general interest and a controlled number of personal permits for those with a specialist interest (as is currently the case at Mai Po Nature Reserve).

5.2.3 The layout of the LVNP site imposes certain opportunities and restrictions related to the location of the visitor centre and the presence of the PHI hazard zone in the north of the site. These affect the number of visitors expected in different parts of the site, which in turn has a knock-on effect on the suitability of habitats to be provided. The exact boundary of each of these zones, access to and within each of the zones, habitat mix and distribution and target species within each zone will need to be determined as part of the detailed design/HCMP preparation stage for the LVNP.

5.2.4 Access into the LVNP would be via the visitor centre to be located on the west side of the Sheung Yue River in RODP-13 area B3-16. This site provides easy access to visitors from the Kwu Tung North and is also easily accessible from San Tin Highway or from Sheung Shui. Given the location of the visitor centre immediately to the west of Long Valley, it is expected that most visitor access would be in this part of the site. Consequently, habitats there should be suitable for species tolerant of human disturbance, such as amphibians, dragonflies and butterflies. As part of the cultural experience of LVNP it is also expected that the area close to the visitor should also demonstrate a diversity of agricultural practices and crops.

5.2.5 The northern part of LVNP is located within the 1 km CZ for the potential hazard from the chlorine storage facility at SSWTW. It is proposed that only limited access should be permitted within this 1 km CZ, in order to minimise risk of hazard to life arising in the event of a chlorine leak from the SSWTW. By limiting human access into this northern part of the site, this area would be subject to very low levels of human disturbance. This northern part of the site may be suitable as a refuge for more disturbance-sensitive birds such as large waterbirds, including ducks and larger ardeids, when disturbed from the rest of the site. The north of the site has the strongest ecological linkage to Deep Bay (via Hoo Hok Wai) and to the egretry at Ho Sheung Heung, furthering the potential for large waterbirds within this part of the site. Habitat provision should be appropriate for these disturbance-sensitive species and should allow for visitors to view from suitable vantage points.

5.2.6 Between the disturbed southern part of the LVNP and the undisturbed northern area lies an area expected to have intermediate levels of public use. It is expected that this area would be accessible to the public in some form. The nature of public access into this zone should be determined as part of the management of the site and could be considered further at the detailed design/HCMP preparation stage. Possible options for access into this area include:

5.2.7 ***Access for all visitors to the LVNP***. This would permit access by anyone from the visitor centre. Access would not be unrestricted in that visitors would be required to keep to paths and the path network could be managed such that some parts of the area would receive fewer visitors. Such a system might permit the greatest level of public enjoyment of the site, but would give reduced scope for control of the number of visitors (and thus disturbance levels) and may result in high levels of disturbance in this part of the site. This is similar to the system in place at Hong Kong Wetland Park (HKWP).

5.2.8 ***Access by pre-arranged group visits only***. This would limit the number of people accessing the site, and would therefore permit a control over the levels

of disturbance experienced. The system may be similar to that currently used for most visitors to Mai Po Marshes Nature Reserve (MPNR).

5.2.9 ***Issue of individual permits***. Certain individuals could apply for permits to freely access this part of the site. This allows a greater freedom for permit-holders through the site but limits access by other members of the public. Again, a similar system is in place at MPNR.

5.2.10 ***Pre-booked individual permits***. This could involve a limited number of day permits to be issued each day. If all permits for the day have been issued, it would be necessary for the individual to try to obtain a permit for another day.

5.2.11 ***A combination of some of the systems outlined above***. This may involve limiting numbers of visitors using one entry method, either spatially (by dividing this zone into two or more smaller zones) or temporally (by restricting access from one method to particular days or times).

5.2.12 **Figure A13.10.2** provides a summary of this concept for the site layout, showing an indicative access hierarchy for the LVNP. Options for visitor management will need to be considered as an element of the further study.

5.3 Management Access

5.3.1 Access for management purposes and vehicle access to materials and equipment store and, if appropriate, staff facilities will be from Yin Kong in the south as the pedestrian footbridge access will not be appropriate for this purpose.

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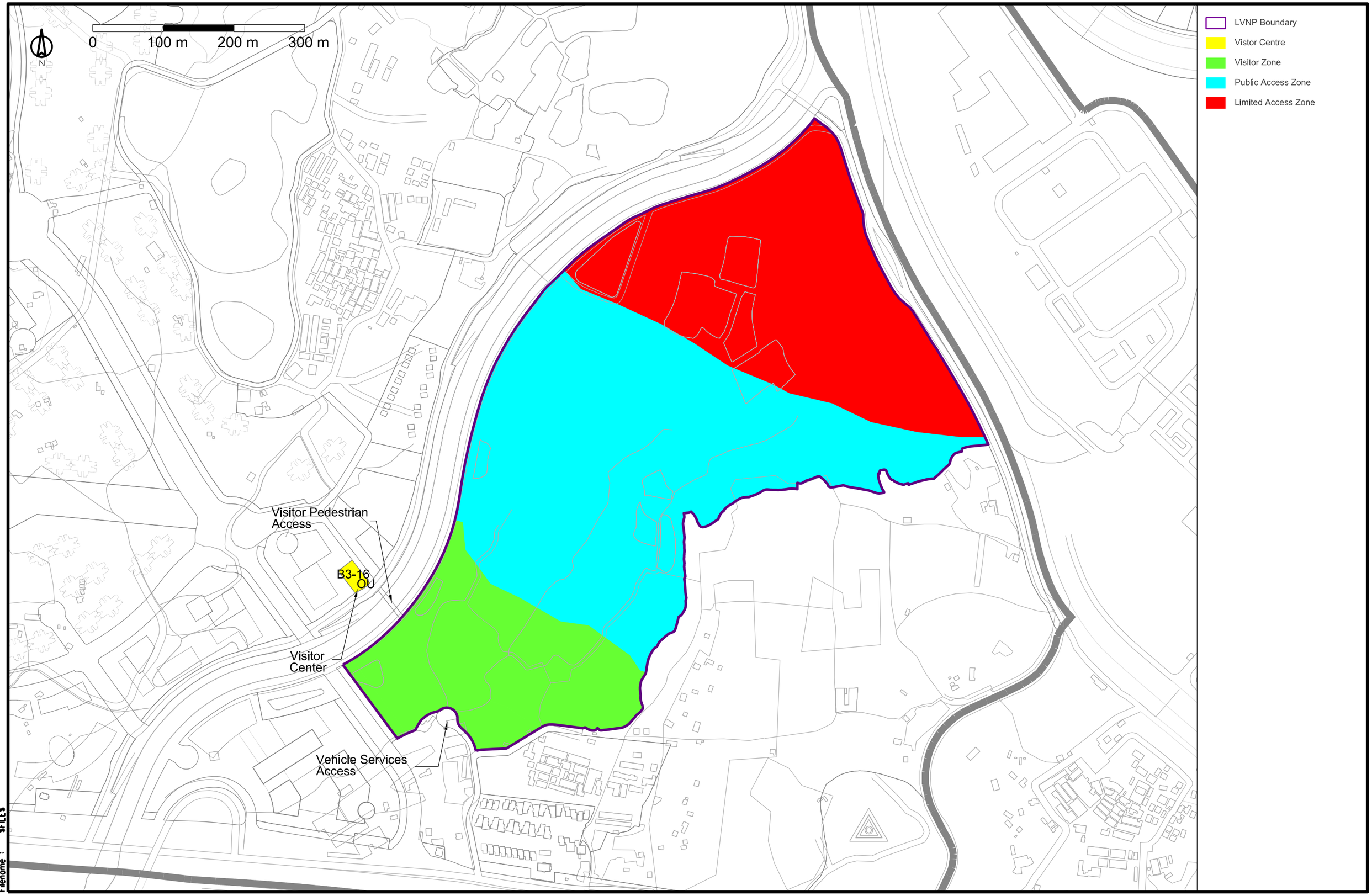

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Drawing No.: Figure A13.10.2

Rev.