Consideration of Alternative Portal Locations for Woodland Avoidance

In **Section 9.7.2**, a variety of habitats are identified within Works Area which is subjected to permanent loss. Although the majority of the habitat is identified with low ecological value, woodland and freshwater wetlands are regarded as ecologically sensitive receivers.

As discussed in **Section 9.7.2**, a total of 6.2ha woodland would be lost permanently due to the Project. In recognizing the importance of the woodland habitat to be lost, mitigation measures for the woodland habitat has been considered in priority of avoidance, minimization and compensation. This Appendix describes the considerations for portal locations and alternatives (for woodland avoidance) and the justifications for the current alignment.

Woodland Avoided by the Current Alignment

The principle of avoiding woodland of high ecological importance has been pursued in the alignment selection stage. As detailed in **Section 2.6**, different refined alignment options have been considered and assessed. During the option assessment and selection process, one of the key considerations has been to avoid ecologically important sites, including Tan Chuk Hang Lo Wai Fung Shui Wood and Tan Shan River. As a result of the previous alignment selection process, the currently proposed alignment involves the construction of a tunnel (South Tunnel) at the Tan Chuk Hang section (see **Figures 9.9-10**) so that impacts to this highly important woodland and lowland stream can be avoided.

Woodland Impacted by the Current Alignment – Consideration of Alternatives

North Portal of the South Tunnel

For the South Tunnel, its north portal needs to be located at an area near the Sha Tau Kok Road for connection to the future Sha Tau Kok Road Interchange. The current location of the portal and alignment was derived from the extensive public consultation process following the preferred alignment selection detailed in **Section 2.6**, in which significant environmental concerns (including air quality, noise and visual issues) voiced by local villagers were taken into account as part of the selection for this section of the connecting road alignment. It can be seen from **Figure A1** that the north portal is proposed to be located in Princess Hill facing Loi Tung Village, which will encroach onto a portion of woodland (about 2.1 ha) that has been assessed to have high-moderate ecological value (see **Table 9.45**) and a small portion of the freshwater wetland (about 0.3 ha) in Loi Tung that has been assessed to have moderate ecological value (see **Table 9.50**). The loss of woodland would also cause habitat fragmentation between Princess Hill woodland and adjacent vegetated area. Therefore, further refinement of this alignment section has been considered to determine if encroachment onto the portion of woodland by the north portal could be avoided, as detailed below.

Shifting the portal further west has been considered, but this would require a very large cutting through Princess Hill in order to provide sufficient space between the tunnel portal and Sha Tau Kok Road Interchange. The cutting would remove the crest of the hill, which will constitute even more severe impact on the hillside woodland. It would also intersect an alignment of a WSD tunnel. This tunnel carries the Dongjiang water supply to the Plover Cove reservoir. The time required to plan, design and construct an alternative route for the WSD tunnel would probably result in a delay to the construction of the Connecting Road and the opening of the BCP.

In addition it is not possible to raise the alignment of the Connecting Road up to an elevated interchange with the Sha Tau Kok Road due to the constraints on road gradient, therefore the Connecting Road would be required to pass under the Sha Tau Kok Road in a cut and cover tunnel, whilst the slip roads rise up to an at-grade interchange. The cut and cover tunnel would also pass under the Ng Tung River which would require its diversion during construction and would significantly increase the construction risk factor.

On the other hand, shifting the portal towards the east can minimise the extent of encroachment onto the woodland at Princess Hill hillside. However, this would encroach onto majority (about 1.4 ha) of the freshwater wetland and cause direct habitat loss of woodland areas within Conservation Area and around the Pak Kung of Loi Tung village. In addition, the wetland habitat will be fragmented into two parts by the alternative location of portal and road section. This freshwater wetland has been assessed to be of moderate ecological value (see **Table 9.50**) and a few fauna species of conservation interest such as dragonfly species *Gynacantha subinterrupta* and butterfly species *Taraka hamada isona* were recorded in the ditch along the eastern side of the wetland. Since the geological setting of the less disturbed eastern portion of the wetland is in front of a mature woodland, the wetland (though currently of moderate ecological value) has the potential to develop into a habitat of higher ecological value. In addition, this option will affect the woodland (approx. 0.3ha) behind Loi Tung Village, which is continuous, mature and of high ecological value protected as Conservation Area (**Table 9.45**). This is because the deep hillside slope and road work in proximity requires slope stabilization works which will inevitably affect the Conservation Area. The woodland area around Pak Kung (approx. 0.2ha) will also be lost under this option due to the required slope stabilization works for the close proximity to the road section.

Aside from ecological considerations, other environmental and non-environmental considerations (such as engineering feasibility and safety issues) have also been taken into account in order to derive the best compromise among various considerations. From the perspective of other environmental considerations such as air quality, noise and visual impact, the current alignment through Princess Hill offers a better performance compared to shifting the portal to the east, as the latter would mean that the alignment is much closer to populated areas particularly Loi Tung Village, which would experience air quality, noise and visual impacts that are worse than the current alignment as a result of the shifted alignment passing much closer to their homes and no longer naturally shielded/screened by the slopes of Princess Hill.

In terms of non-environmental considerations, shifting the portal to the east would require the Sha Tau Kok roundabout to be located much closer to the village access than the current alignment, which would result in potentially unfavourable road safety and traffic congestion issues because of the vehicles entering or exiting the village close to the roundabout entry/ exit point, and construction of the viaduct section of the Connecting Road over the existing Wo Keng Shan Road, which would result in traffic safety issues at the construction stage.

The preferred alignment, on the other hand has the roundabout located at some distance from the village access thereby relieving the traffic safety and congestion issues, whilst the Wo Keng Shan Road will be diverted to the new alignment prior to the construction of the viaduct section, thereby avoiding the issue of construction over a live trafficked road.

As a summary, **Table A1** compares the ecological impacts, other environmental impacts and traffic safety issues between the preferred north portal option of the South Tunnel and the alternative option of shifting the portal to the east. It can be seen from the Table that while the preferred option would not be better than the alternative option from the ecological perspective, the preferred option would perform better than the alternative option in air, noise, visual and traffic safety aspects. Therefore, after balancing the ecological considerations with

the potential traffic safety issue and other environmental concerns, it has been assessed that the preferred portal location offers the best overall compromise among all considerations.

Table A1 Summary of Comparison of the Preferred and Alternative Option for South Tunnel North Portal

Key Considerations		**Preferred Option**	**Alternative Option of shifting the South Tunnel North Portal to east**
Ecological Impacts	Impact on Woodland	Totally 4.3 ha of the Princess woodland will fall within the proposed project limit, in which about 2.1 ha of the woodland will be permanently lost while the remaining 2.2 ha will be preserved.	Totally 2.3 ha of woodland areas will fall within the project limit, in which about 1.6 ha of woodland (0.3 ha of woodland within the Conservation Area, 0.2 ha of Pak Kung wooded area and about 1.1 ha of other areas in Princess Hill woodland) will be permanently lost while 0.7 ha of the remaining woodland in Princess Hill and CA will be preserved.
	Impact on Freshwater Wetland	Direct impact on only a small area (about 0.3 ha) of the freshwater wetland area	Most of the freshwater wetland area (about 1.4 ha) will be removed permanently
	Fragmentation	Ecological linkage between Princess Hill woodland and adjacent vegetated habitat will be affected; woodland around Pak Kung shrine will be preserved but become isolated from the remaining part of Princess Hill	Ecological linkage between Conservation Area woodland, freshwater wetland and Princess Hill woodland will be affected; The freshwater wetland will be fragmented into two disconnected sections permanently.
Air, Noise and Visual Impact		Naturally shielded/ screened by slopes of Princess Hill, resulting in less air, noise and visual impacts to nearby village	Much closer to populated area such as Loi Tung Village, which would be subject to more air, noise and visual impacts
Safety Issues		Sha Tau Kok roundabout not close to village access, thereby relieving traffic safety and congestion issues	Sha Tau Kok roundabout close to village access, resulting in potentially unfavourable road safety and congestion issues
		Existing Wo Keng Shan	Construction of viaduct

Key Considerations	Preferred Option	Alternative Option of shifting the South Tunnel North Portal to east
	Road to be diverted to the new alignment prior to construction of viaduct section, thereby avoiding construction over a live trafficked road	section over existing Wo Keng Shan Road, resulting in potential traffic safety issues during construction phase

North Portal of the North Tunnel (Cheung Shan)

For the North Tunnel (at Cheung Shan), its north portal is proposed to be located on the north western face of Cheung Shan, which is a woodland assessed to be of moderate ecological value (see **Table 9.46**). Further refinement of this alignment section has been considered to determine if encroachment onto the portion of woodland by the north portal could be avoided, as detailed below.

If the alignment section is shifted to the east, it would need to cut through Wo Keng Shan requiring a large amount of slope cutting and would also encroach onto a portion of woodland on the northern face of Cheung Shan. This option would also bring the alignment too close to a Declared Monument – Cheung Shan Monastery. As a result, this option is clearly not preferable from both ecological and cultural heritage perspectives.

If the alignment section is shifted to the west (indicated as Alternative Option II in **Figure A2**), it would require a sharp reverse curve in the tunnel section and a further reverse curve in the open section of the alignment between Ping Che and Ping Yeung Villages, which are both particularly undesirable because of the potential risks of increasing traffic accidents. Such undesirable sharp/reverse curvatures in the alignment would still be present even if the portal location was located at the developed area in-between the currently proposed location and the assumingly west-shifted location (indicated as Alternative Option I in **Figure A2**), with the additional complication that the portal would be in a valley where the rock quality may be expected to be degraded and the potential for large water inflows during tunnelling would create extreme difficulties during construction. This option also requires encroachment onto woodland on the hillside slope. In addition, the tunnel portal in Option II would be located on the western face of Cheung Shan, which would create a problem for drivers in the late afternoon as the setting sun will be shining directly into the tunnel and will affect their visions. The portal is also located at some distance from the nearest major road, which will affect the ability of the emergency services to reach the location rapidly in case of accidents within the tunnel section. Therefore, while Options I and II could avoid encroachment onto the portion of woodland on the north western face of Cheung Shan, they are not desirable from the safety perspective.

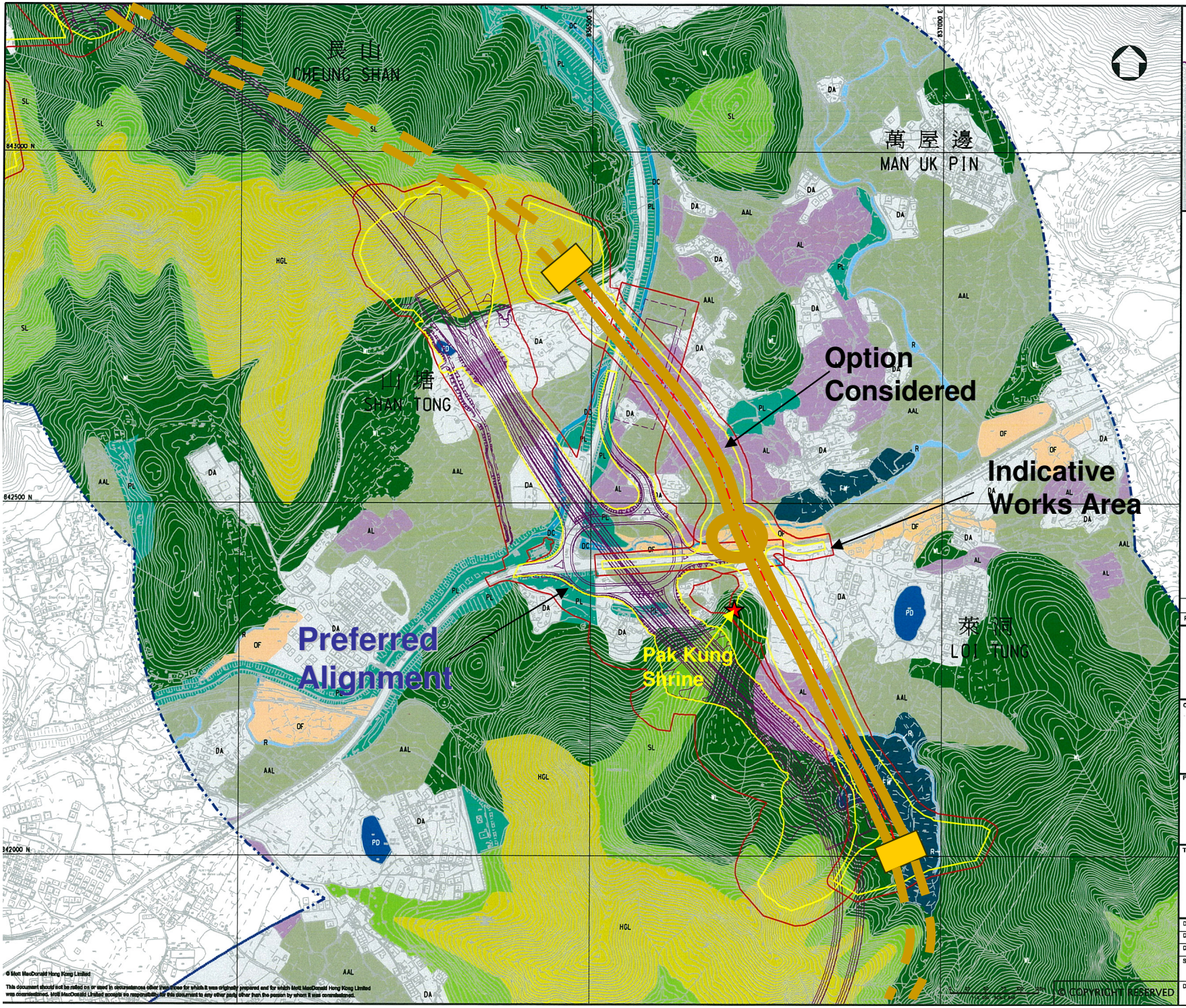
From the perspective of other environmental considerations, the presence of the Ping Che Archaeological Site immediately west of the current portal location means that any shift of the portal westward would lead to encroachment onto the Ping Che Archaeological Site. As the core part of the archaeological site (where Ming and Qing Dynasty cultural layers have been identified) is located directly in the path of the shifted alignment, avoidance of woodland at Cheung Shan would instead result in potential cultural heritage impacts to a core part of the Ping Che Archaeological Site which is also undesirable from an environmental perspective.

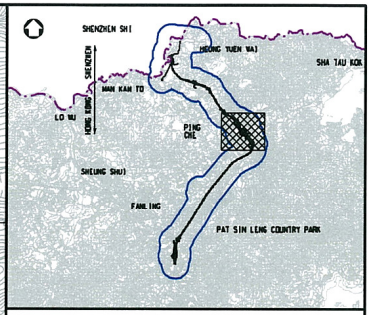
As a summary, **Table A2** compares the ecological impacts and traffic safety issues between the preferred north portal option of the North Tunnel and the alternative options of shifting the

portal to the west. It can be seen from the Table that while the preferred option would not be better than the alternative options from the ecological perspective, the alternative options I and II are both not preferable from the traffic safety perspective. Therefore, after balancing the ecological considerations with the traffic safety issues, it is considered that the current location of north portal of the North Tunnel is more preferable in overall terms and hence encroachment onto the portion of woodland by the portal would be deemed as unavoidable.

Table A2 Summary of Comparison of the Preferred and Alternative Options for North Tunnel North Portal

Key Considerations	Preferred Option	Alternative Option I of Shifting the North Tunnel North Portal to west	Alternative Option II of Shifting the North Tunnel North Portal to further west
Ecological Impact	Totally 4 ha of woodland will fall within the proposed project limit, in which about 2.5 ha (1.9 ha on Cheung Shan and 0.6 ha on other areas) of the woodland will be permanently lost while the remaining 1.5 ha will be preserved.	Totally 2.1 ha of woodland will fall within the proposed project limit, in which about 1.5 ha (0.8 ha on Cheung Shan and 0.7 ha on other areas) of the woodland will be permanently lost while the remaining 0.6 ha will be preserved.	Totally 1.8 ha of woodland will fall within the proposed project limit, in which about 1.3 ha (0.1 ha on Cheung Shan and 1.2 ha on other areas) of the woodland will be permanently lost while the remaining 0.5 ha will be preserved. The core habitat of the Cheung Shan woodland can be avoided.
Safety Issue due to undesirable sharp/ reverse curvatures	No undesirable sharp/reverse curvatures in the alignment, and thereby relieving potential traffic accident risk	Undesirable sharp/ reverse curvatures in the alignment due to potential risk of increasing traffic accidents	Undesirable sharp/ reverse curvatures in the alignment due to potential risk of increasing traffic accidents
Safety Issue due to shining of setting sun into the tunnel	Not a major issue	Not a major issue	Shining of setting sun into the tunnel creating problems to drivers during late afternoon





KEY PLAN
SCALE 1:100000

LEGEND:

- ECOLOGICAL ASSESSMENT AREA
- WORKS AREA
- CONSTRUCTION FOOTPRINT
- WL WOODLAND
- SL SHRUBLAND
- PL PLANTATION
- FW FRESHWATER WETLAND (WET AGRICULTURAL LAND (ACTIVE/ABANDONED))
- AL AGRICULTURAL LAND
- AAL ABANDONED AGRICULTURAL LAND
- HGL HILLSIDE GRASSLAND
- PD POND
- DC DRAINAGE CHANNEL
- R WATERCOURSE
- OF OPEN FIELD
- DA DEVELOPED AREA

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	OCT 10	MING	FIRST ISSUE	DC	HT

Mott MacDonald
20/F Two Landmark East
100 How Ming Street
Kwun Tong, Kowloon
Hong Kong
t +852 2828 5757
f +852 2827 1823
w www.mottmac.com.hk

Client

CEDD
CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Project

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

Title

Alignment Considerations at North Portal of South Tunnel

Designed	ST		Eng.Chk.	EC	
Drawn	MING		Coordination	EC	
Dwg.Chk.	ST		Approved	HT	
Scale at A1	1:2500	Project	255228		Status PRE
		CAD file	J:\255228\REPORT\ENV\DIA\I00924\FIG 9-B418.dgn		
Drawing No	FIGURE A1				Rev P1

© Mott MacDonald Hong Kong Limited
This document should not be relied on or used in circumstances other than those for which it was originally prepared and for which Mott MacDonald Hong Kong Limited was commissioned. Mott MacDonald Limited accepts no responsibility for this document to any other party other than the person by whom it was commissioned.
© COPYRIGHT RESERVED

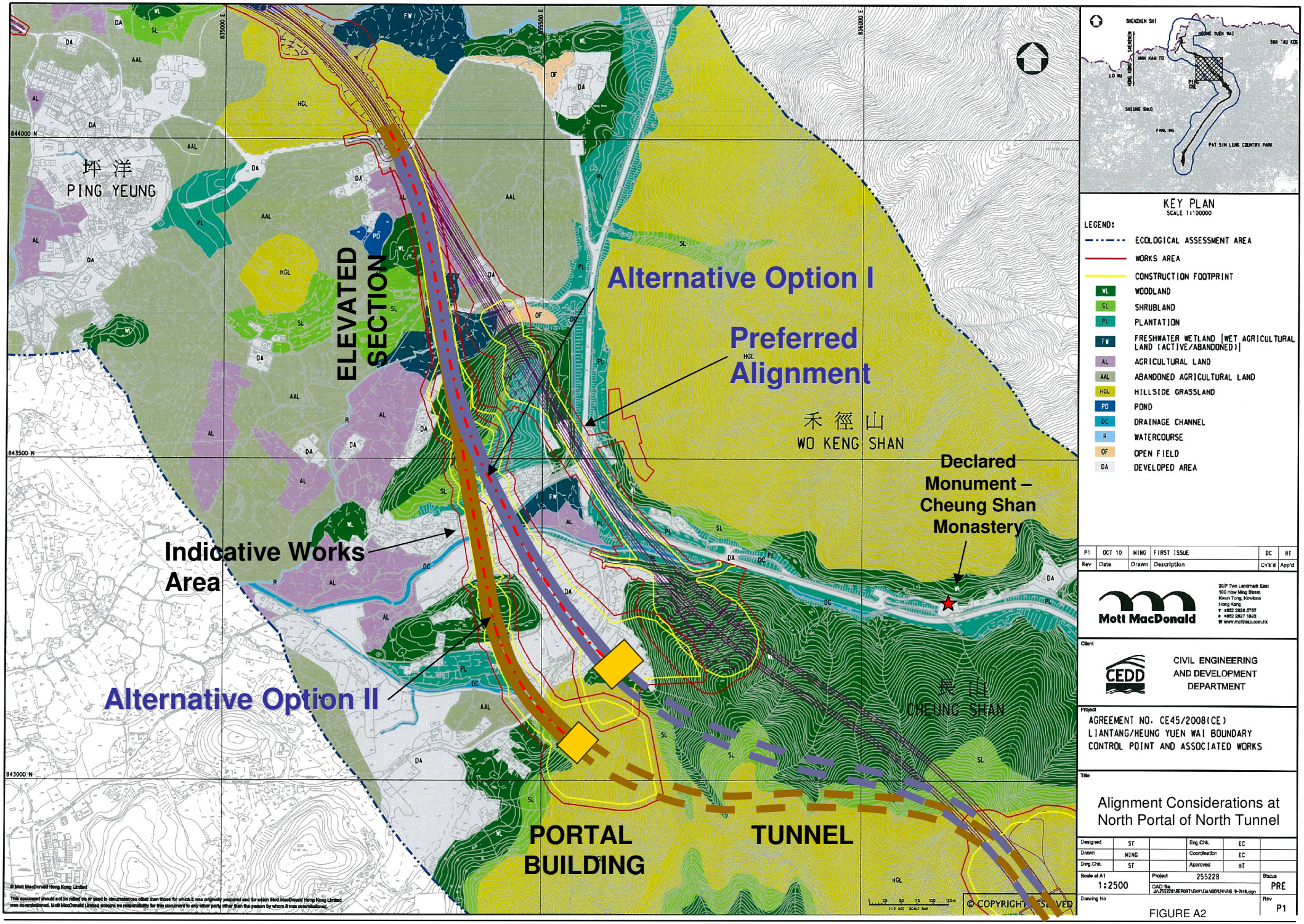

坪洋
PING YEUNG
ELEVATED SECTION
Alternative Option I
Preferred Alignment
禾徑山
WO KENG SHAN
Declared Monument – Cheung Shan Monastery
Indicative Works Area
Alternative Option II
長山
CHEUNG SHAN
PORTAL BUILDING
TUNNEL
835000 E
836000 E
844000 N
843500 N
843000 N
SHENZHEN SHI
HEUNG YUEN WAI
SHA TAU KOK
MAN KAM TO
LO WU
PING CHAU
SHEUNG SHUI
FANLING
PAT SIN LENG COUNTRY PARK
KEY PLAN
SCALE 1:100000
LEGEND:
ECOLOGICAL ASSESSMENT AREA
WORKS AREA
CONSTRUCTION FOOTPRINT
WL WOODLAND
SL SHRUBLAND
PL PLANTATION
FW FRESHWATER WETLAND (WET AGRICULTURAL LAND (ACTIVE/ABANDONED))
AL AGRICULTURAL LAND
AAL ABANDONED AGRICULTURAL LAND
HGL HILLSIDE GRASSLAND
PD POND
DC DRAINAGE CHANNEL
R WATERCOURSE
OF OPEN FIELD
DA DEVELOPED AREA
P1 OCT 10 MING FIRST ISSUE DC HT
Rev Date Drawn Description Ch'k'd App'd
Mott MacDonald
20/F Two Landmark East
100 How Ming Street
Kwun Tong, Kowloon
Hong Kong
T +852 2828 5757
F +852 2827 1823
W www.mottmac.com.hk
Client
CEDD
CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT
Project
AGREEMENT NO. CE45/2008(CE)
LIANTANG/HEUNG YUEN WAI BOUNDARY CONTROL POINT AND ASSOCIATED WORKS
Title
Alignment Considerations at North Portal of North Tunnel
Designed ST Eng.Chk. EC
Drawn MING Coordination EC
Dsg.Chk. ST Approved HT
Scale at A1 1:2500
Project 255228
Status PRE
Drawing No
Rev P1
© COPYRIGHT RESERVED
© Mott MacDonald Hong Kong Limited
This document should not be relied on or used in circumstances other than those for which it was originally prepared and for which Mott MacDonald Hong Kong Limited was commissioned. Mott MacDonald Limited accepts no responsibility for this document to any other party other than the person by whom it was commissioned.

FIGURE A2