

A. Summary Table for Evaluation of Environmental Benefits/Dis-benefits on Western Connection Road

Environmental Factors	Option W1	Option W2	Option W3	Option W4	Option W5
General Description	As the existing New Boundary Patrol Road will still fall within the Closed Area in future, the direct use of the road as the main access to the LMC Loop may not be appropriate, as it may generate complex security and management issues. In light of this, a new access road will run parallel to the existing New New Boundary Patrol Road, outside the Closed Area boundary. For security considerations, the access road will be at least 5.5m away from the New New Boundary Patrol Road. This option makes use of the existing Lung Hau Road as the main access route, which is relatively new and wide, which should be able to handle the additional traffic generated by the LMC Loop without the need for major improvement works. The new roundabout at the LMC Loop boundary joins together the new road connection, access point to the LMC Loop, New New Boundary Patrol Road and Ha Wan Tsuen Road, allowing better accessibility to all the development and roads in the area.	Similar to Option W1, but the new road connection makes use of the new turn-around facilities as proposed in the FCA Study, to serve as a proper junction between the existing Lung Hau Road and the new connection to the LMC Loop. The new access road follows the existing tracks to limit the impact on the fish ponds. The linkage to the LMC Loop will be near the abandoned pier just off Ha Wan Tsuen Road.	This option makes use of the existing Ha Wan Tsuen Road, and a new road would branch off from Ha Wan Tsuen Road into the LMC Loop just north of the existing Ha Wan Tsuen village. Currently, Ha Wan Tsuen Road is a single track access road under one-lane-two-way configuration with passing bays, road widening works would be required to convert it as a proper road access, and the road levels will need to be raised to above the flood levels. Noting the presence of potential Old & Valuable Tree (OVTs) along the eastern edge of Ha Wan Tsuen Road, the road will be widened towards the western side, thereby requiring the resumption of the adjacent privately owned fish ponds. Nevertheless, this option is recommended as it provides the most direct route to LMC Loop.	This scheme makes use of a large section of the existing Border Road, with the connection road more at the southern side of the LMC Loop instead of the west. As the existing Border Road is only a narrow track road, significant improvement and widening works will be required to be adequate for serving as the main access route for the LMC Loop. The relatively narrow junction between LMC Road, Border Road and Lung Hau Road may need improvement to serve as the major access route. This option is not recommended as it will involve the most construction works, especially for the improvement of the existing Border Road.	This is similar to Option W4, but will utilize a shorter section of the existing Border Road, thus requiring less improvement works to the road. Consequently, the connection road through the fish ponds will be longer, thus affecting more of those ponds although the route has generally followed the existing track alignments.
Approximate Carriageway Length of the Extension (m)	At-grade: 300 Viaduct: 60	At-grade: 300 Viaduct: 50	At-grade: 40 Viaduct: 60	At-grade: 600 Viaduct: 70	At-grade: 550 Viaduct: 60
Air Quality	No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.	No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.	No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.	No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.	No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.
Noise	NSRs are subject to construction noise due to the construction of a new road, and road traffic noise during operation. Traffic noise impact could exceed the criteria and may need mitigation during full operation.	NSRs are subject to construction noise due to the construction of a new road, and road traffic noise during operation. Traffic noise impact could exceed the criteria and may need mitigation during full operation.	NSRs are subject to construction noise due to the construction of a new road, and road traffic noise during operation. Traffic noise impact could exceed the criteria and may need mitigation during full operation.	NSRs are subject to construction noise due to the construction of a new road, and road traffic noise during operation. Traffic noise impact could exceed the criteria and may need mitigation during full operation.	NSRs are subject to construction noise due to the construction of a new road, and road traffic noise during operation. Traffic noise impact could exceed the criteria and may need mitigation during full operation.
Water Quality	Site runoff to Lok Ma Chau wetlands from roadworks and disturbances to stream bed due to bridges constructions would be the major water quality impact. No construction activity is allowed to have contact with the retained	Site runoff to Lok Ma Chau wetlands from roadworks and disturbances to stream bed due to bridges constructions would be the major water quality impact. No construction activity is allowed to have contact with the retained	Site runoff to Lok Ma Chau wetlands from roadworks would be the major water quality impact. Good site practice and proper handling of temporary drainage system is required.	Site runoff to Lok Ma Chau wetlands from roadworks and disturbances to stream bed due to bridges constructions would be the major water quality impact. No construction activity is allowed to have contact with the retained	Site runoff to Lok Ma Chau wetlands from roadworks and disturbances to stream bed due to bridges constructions would be the major water quality impact. No construction activity is allowed to have contact with the retained

Environmental Factors	Option W1	Option W2	Option W3	Option W4	Option W5
	stream beds and fish ponds. Bridge crossings or fish ponds backfilling might be taken place and the sizes of these fish ponds will be perpetually lost.	stream beds and fish ponds. Bridge crossings or fish ponds backfilling might be taken place and the sizes of these fish ponds will be perpetually lost.		stream beds and fish ponds. Bridge crossings or fish ponds backfilling might be taken place and the sizes of these fish ponds will be perpetually lost.	stream beds and fish ponds. Bridge crossings or fish ponds backfilling might be taken place and the sizes of these fish ponds will be perpetually lost.
Waste Management	Construction of new road linkage between Lung Hau Road and the LMC Loop and the new roundabout at the LMC Loop boundary would generate substantial amount of spoil materials.	Makes use of the new turn-around facilities at Lung Hau Road, would reduce the need for construction works and hence reduce waste as compared with Option 1. The construction of new road linkage between Lung Hau Road and the LMC Loop yet still generate substantial amount of waste.	Utilizes the existing Ha Wan Tsuen Road, and extends the village road further across the fish ponds to the LMC Loop, which avoids construction of new roads. This would reduce amount of waste generated as compared with Option 1 and 2.	Makes use of a section of the existing Border Road, would reduce the need for construction works and hence reduce waste as compared with Option 1 and 2.	Similar to Option 4, but utilizing a shorter section of the existing Border Road. This will increase the road construction works and more waste would be generated. However, the length of new roads needs to be constructed is less than those in Option 1 and 2, hence reduces the amount of waste generated.
Land Contamination	The proposed option would be stopped at the edge of Area A and connected with the future roads in Area A. Land contamination assessment for Area A has been carried out in accordance with the agreed CAP for Area A, and the assessment findings would be presented in the CAR and RAP for Area A. No potentially contaminated site was identified along Lung Hau Road. Although few potentially contaminated sites (i.e. metal workshop and vehicle repairing workshop) were identified along LMC Road, these proposed road options would not encroach into these potentially contaminated sites.	The proposed option would be stopped at the edge of Area A and connected with the future roads in Area A. Land contamination assessment for Area A has been carried out in accordance with the agreed CAP for Area A, and the assessment findings would be presented in the CAR and RAP for Area A. No potentially contaminated site was identified along Lung Hau Road. Although few potentially contaminated sites (i.e. metal workshop and vehicle repairing workshop) were identified along LMC Road, these proposed road options would not encroach into these potentially contaminated sites.	The proposed option would be stopped at the edge of Area A and connected with the future roads in Area A. Land contamination assessment for Area A has been carried out in accordance with the agreed CAP for Area A, and the assessment findings would be presented in the CAR and RAP for Area A. No potentially contaminated site was identified along Ha Wan Tsuen Road. Although few potentially contaminated sites (i.e. metal workshop and vehicle repairing workshop) were identified along LMC Road, these proposed road options would not encroach into these potentially contaminated sites.	The proposed option would be stopped at the edge of Area A and connected with the future roads in Area A. Land contamination assessment for Area A has been carried out in accordance with the agreed CAP for Area A, and the assessment findings would be presented in the CAR and RAP for Area A. No potentially contaminated site was identified along Border Road. Although few potentially contaminated sites (i.e. metal workshop and vehicle repairing workshop) were identified along LMC Road, these proposed road options would not encroach into these potentially contaminated sites.	The proposed option would be stopped at the edge of Area A and connected with the future roads in Area A. Land contamination assessment for Area A has been carried out in accordance with the agreed CAP for Area A, and the assessment findings would be presented in the CAR and RAP for Area A. No potentially contaminated site was identified along Border Road. Although few potentially contaminated sites (i.e. metal workshop and vehicle repairing workshop) were identified along LMC Road, these proposed road options would not encroach into these potentially contaminated sites.
Hazard to Life	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.
Cultural Heritage – Archaeology	No recorded archaeological sites. Small section of the current Lok Ma Chau Road falls within an area of archaeological potential. Road widening may have limited impacts in this area but for the majority of the alignment significant archaeological impacts are unlikely.	No recorded archaeological sites. Small section of the current Lok Ma Chau Road fall within an area of archaeological potential. Road widening may have limited impacts in this area but for the majority of the alignment significant archaeological impacts are unlikely. Small area of fish ponds with low archaeological potential may also be impacted.	No recorded archaeological sites. Small section of the current Lok Ma Chau Road fall within an area of moderate archaeological potential. Road widening may have limited impacts in this area but for the majority of the alignment significant archaeological impacts are unlikely.	No recorded archaeological sites. Large portion of this proposed option transverse areas of low-moderate archaeological potential (the Border Road) and cut the fish ponds south of the LMC Loop. Further assessment may be necessary to evaluate the impact on archaeology from road widening.	No recorded archaeological sites. Large portion of this proposed option transverse areas of low-moderate archaeological potential (the Border Road) and cut the fish ponds south of the LMC Loop. Further assessment may be necessary to evaluate the impact on archaeology from road widening.
Cultural Heritage – Built Heritage	Built heritage are not identified in close proximity. An obsolete pier (not a built heritage) is located east of water gate. The Yuen Long District Council meeting in	Built heritage are not identified in close proximity. However, option 2 proposes the use of an existing obsolete pier (not a built heritage) for the new road. The Yuen Long	Built heritage are not identified in close proximity.	Apart from the temporary impacts from road widening construction, the potential increase of traffic may bring long term impact on Lok Ma Chau Tsuen, a historical village that	Apart from the temporary impacts from road widening construction, the potential increase of traffic may bring long term impact on Lok Ma Chau Tsuen, a historical village that

Environmental Factors	Option W1	Option W2	Option W3	Option W4	Option W5
	December 2008 suggested the preservation of piers for their collective memories.	District Council meeting in December 2008 suggested the preservation of old piers for their collective memories.		carries traditional culture and historical buildings.	carries traditional culture and historical buildings.
Landscape	<p>Loss of landscape resources</p> <ul style="list-style-type: none"> Loss of recently planted roadside plantation along Lung Hau Road. Majority affected trees are relatively young and good candidates for transplantation hence would be considered to be transplanted in proposed new roadside planting areas. Loss of roadside vegetation at proposed section along New Boundary Patrol Road and roundabout to the north of Ha Wan Tsuen. <p>Response to landscape character</p> <ul style="list-style-type: none"> Slight change of roadside and infrastructure landscapes in the context of Lok Ma Chau Control Point, Spur Line and New Boundary Patrol Road which are man-made and dominated by engineered forms. Utilise existing river crossing from New Boundary Patrol Road to the LMC Loop. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> High potential to reinstate the roadside landscape through preservation of trees and provision of new roadside landscape areas. 	<p>Loss of landscape resources</p> <ul style="list-style-type: none"> Loss of remnant fishponds located to the north of Ha Wan Tsuen and to the east of cross-boarder facilities. Loss of vegetation alongside of existing track and on fishpond bunds. Loss of riverbank vegetation. <p>Response to landscape character</p> <ul style="list-style-type: none"> Moderate change of rural landscape through introduction of engineered structures. Fragmentation of low laying fishpond and rural landscape characters <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> Slight potential to locally reinstate fishpond character, shall be off-site compensation. Due to spatial limitation and reduce the disturbance to the remnant fishponds, extensive roadside planting is not feasible. 	<p>Loss of landscape resources</p> <ul style="list-style-type: none"> Loss of fishponds located to the east of Ha Wan Tsuen Road. Direct impact to potential OVT has prevented. <p>Response to landscape character</p> <ul style="list-style-type: none"> Slight change of roadside landscape resulting from road widening at the entrance of Ha Wan Tsuen and Ha Wan Tsuen Road. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> High potential to reinstate the roadside landscape through preservation of trees and provision of new roadside landscape areas. 	<p>Loss of landscape resources</p> <ul style="list-style-type: none"> Loss of a few roadside plantation along Boundary Patrol Road. Loss of mature trees on fishpond bunds adjacent to the river band. Slightly loss of reedbed due to introduction of river crossing. Loss of fishponds. <p>Response to landscape character</p> <ul style="list-style-type: none"> Slight change of roadside landscapes in the context of Boundary Patrol Road. Slight change of riverside landscape due to introduction of river crossing. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> Moderate potential to reinstate the roadside landscape provision of new roadside landscape areas. Reinstate of fishpond character shall be off-site due to spatial limitation. 	<p>Loss of landscape resources</p> <ul style="list-style-type: none"> Loss of a few roadside plantation along Boundary Patrol Road. Loss of mature trees on fishpond bunds adjacent to the river band. These specimens could be preserved through minor adjacent on the road alignment. Slightly loss of reedbed due to introduction of river crossing. Loss of fishponds. <p>Response to landscape character</p> <ul style="list-style-type: none"> Slight change of roadside landscapes in the context of Boundary Patrol Road. Slight change of riverside landscape due to introduction of river crossing. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> Moderate potential to reinstate the roadside landscape provision of new roadside landscape areas. Reinstate of fishpond character shall be off-site due to spatial limitation.
Visual	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of the elevated road at Lok Ma Chau Control Point and villagers living at the western periphery of Ha Wan Tsuen. Slight change of the visual amenity through upgrading existing road. Transient views when travelling along the road will be changed. No blockage of views. 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of the elevated road at Lok Ma Chau Control Point and villagers living at the northern and western periphery of Ha Wan Tsuen. Significant change of the visual amenity through introduction of engineered road in rural areas. No blockage of views. 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of the elevated road at Lok Ma Chau Control Point and villagers living at Ha Wan Tsuen and users of Ha Wan Tsuen Road. Slight change of the visual amenity through upgrading existing road. Transient views when travelling along the road will be changed. No blockage of views. 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of Boundary Patrol Road and villagers living at Lok Ma Chau Tsuen. Slight change of the visual amenity through upgrading existing road. Moderate change of riverside amenity due to introduction of river crossing and loss of fishponds. Transient views when travelling along the road will be changed. No blockage of views. 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of Boundary Patrol Road and villagers living at Lok Ma Chau Tsuen. Slight change of the visual amenity through upgrading existing road and tracks. Slight change of riverside amenity due to introduction of river crossing. Transient views when travelling along the road will be changed. No blockage of views.
Landscape & Visual Common for all options along Lok Ma Chau Road	<p>Loss of landscape resources</p> <ul style="list-style-type: none"> Some mature trees (over 500mm DBH) along Lok Ma Chau Road would be preserved in-situ as far as technically feasible along Lok Ma Chau Road through locally narrowing of proposed new carriageway and responsive local adjustment of proposed alignment of footpath, cycle track and noise barrier. Loss of trees at central median and alongside of Lok Ma Chau Road. Loss of vegetation at the lower slope adjacent to the junction of Lok Ma Chau Road and access road to Lok Ma Chau Tsuen. <p>Response to landscape character</p> <ul style="list-style-type: none"> Moderate change of roadside landscape due to road widening and introduction of noise barrier. <p>Potential for mitigation measures</p> <p>Medium potential to reinstate the roadside landscape through preservation of trees and provision of new roadside landscape areas due to constraints of private lands along the road.</p> <p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users along the road and villagers living adjacent to the road. 				

Environmental Factors	Option W1	Option W2	Option W3	Option W4	Option W5
	<ul style="list-style-type: none"> Moderate change of the visual amenity through upgrading existing road. Transient views when travelling along the road will be changed. Lower level views looking towards the road will be blocked by proposed noise barrier. 				
Ecological	Use of Lung Hau Road avoids severe impacts arising from use of Border Road. Access point to Loop furthest from main area of flight lines. Minimises impacts on Meander. Minimises impacts on terrestrial ecological corridor and existing wildlife underpass. Alignment largely follows existing roads and uses proposed roundabout under FCA study; both minimise cumulative impacts. Mitigation required for potential impacts on Rose Bitterling habitat (stream and fish pond) south of Lung Hau Road. Loss of and disturbance to existing fish ponds, requires compensation.	Use of Lung Hau Road avoids severe impacts arising from use of Border Road. Access to Loop avoids most flight lines. Minimises impacts on terrestrial ecological corridor and existing wildlife underpass. Alignment largely follows existing roads. Mitigation required for potential impacts on Rose Bitterling habitat (stream and fish pond) south of Lung Hau Road. Direct and indirect impacts on Meander require mitigation. Loss of and disturbance to existing fish ponds, requires compensation. Impacts on natural stream require mitigation.	Use of Ha Wan Tsuen Road avoids severe impacts of using Border Road. Direct fish pond loss involves ponds of relatively low ecological value. However, main entry/exit for birds in flight occurs just north of junction with Lung Hau Road, and mitigation essential to minimise cumulative impact. Direct and indirect impacts on Meander require mitigation, especially in respect of potential use by Eurasian Otter. Potential impacts on terrestrial ecological corridor and existing wildlife underpass require mitigation.	Potential severe disturbance impacts on flight line corridor arising from use of Border Road and alignment across narrowest part of corridor. Potential impacts on terrestrial ecological corridor require mitigation. Significant loss of and disturbance to fish ponds requires compensation. Direct and indirect impacts on Meander require mitigation. Potentially severe construction impacts.	Potential severe disturbance impacts on flight line corridor arising from use of Border Road and alignment across narrowest part of corridor. Potential impacts on terrestrial ecological corridor require mitigation. Significant loss of and disturbance to fish ponds requires compensation. Direct and indirect impacts on Meander require mitigation. Potentially severe construction impacts.
Fisheries	Significant impacts unlikely. Mitigation required for impacts on water quality of Meander, which is water source for adjacent fishponds.	Significant impacts unlikely. Mitigation required for impacts on water quality of Meander, which is water source for adjacent fishponds.	Significant impacts unlikely. Mitigation required for impacts on water quality of Meander, which is water source for adjacent fishponds.	Significant impacts unlikely if mitigation measures provided. Mitigation required for direct impacts on Pond 22 and 23. Mitigation required for indirect impacts on water quality of Meander, which is water source for adjacent fishponds.	Significant impacts unlikely. Mitigation required for impacts on water quality of Meander, which is water source for adjacent fishponds.
Landfill Gas	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.

Key:

Color codes for general evaluation of each road option:

	Preferred
	Average
	Not Preferred

B. Summary Table for Evaluation of Environmental Benefits/Dis-benefits on Eastern Connection Road

Environmental Factors	Option E1		Option E2		Option E3		Option E4		Option E5		Option E6	
General Description	New road is to be constructed from the proposed road network of KTN NDA to the existing Border Road near Tse Koo Hang. Linkage to the LMC Loop branches off from Border Road near Horn Hill Police Operational Base. Apart from the short section across SZ River, the entire route will be at-grade road. For the sections along fishponds, the road will be slightly above grade on marshland near the fishpond bunds. There are concerns that the alignment over the fish ponds for this road option may pose potential disruption to the flight path of birds. Nevertheless, this option could reduce the direct loss of wetland among all other options, except Option E6.		Similar to Option E1, but the route will not utilize the existing Border Road, thus no major improvement works for that road is envisaged. The routing over the fish ponds is different from Option E1, thereby avoiding direct and indirect impacts on the core area of Eurasian Otter distribution. This scheme is one of the preferred option due to its distinction of providing a more direct road connection to the LMC Loop via the fish ponds near Horn Hill.		Similar to Option E1 in terms of the utilization of the existing Border Road and the alignment for connection to the LMC Loop, but the road connection under this scheme passes through the existing village of Ma Tso Lung San Tsuen, bringing improved accessibility to the villages. By making use of the existing Ma Tso Lung Road for connection to the KTN NDA, the construction works required and the cost implications of the scheme can be reduced. This scheme is not adopted mainly due to noise and air quality issues arising from having the access road passing through the existing villages. The widening of the village roads to a proper road may also generate complex land resumption issues.		This option provides the most direct route between the LMC Loop and the road network of KTN NDA, by tunnelling through the hill of Ma Tso Lung. No need to make use of the existing Border Road and Ma Tso Lung Road. Minor fishpond loss is anticipated since the routing will mainly align with fishpond bunds. Thus, this option could minimize the project footprints and the associated direct and indirect impacts. The long road tunnel means the maintenance and operation responsibility of the tunnel is not anticipated to be straightforward. It is also highlighted that a tunnel option will require large amount of energy for the lighting and ventilation operation.		Similar to Option E1, but this scheme has a straighter alignment near Tse Koo Hang by constructing a tunnel, which will bring better sightline visibility for the road. Nevertheless, the presence of a short tunnel brings the concerns similar to Option E4.		Similar to Option E4, but this scheme passes through the fish ponds via underground tunnel to provide the most direct route between the LMC Loop and the KTN NDA road network. Passing through the fish ponds via underground tunnel will mean utilizing more precious space inside the LMC Loop to accommodate the tunnel ramps. From a level of -15mPD up to +5.9mPD, the tunnel will take more than 500m length to raise to the site formation level. This will pose a major constraint to the land use within the Loop. To minimize the space required, the ramp curvature may be designed to be very tight, which may cause sightline issues. The extremely high cost involved in the construction and operation of the tunnel, and the possibility of occupying too much space inside the LMC Loop for the ramp, makes this scheme not recommended.	
Total Approximate Carriageway Length in km (Tunnel length in brackets)	At-grade	2.3	At-grade	2.1	At-grade	2.5	At-grade	-	At-grade	1.6	At-grade	-
	Viaduct	0.4	Viaduct	0.3	Viaduct	0.6	Viaduct	0.9	Viaduct	0.9	Viaduct	0.4
	Tunnel	-	Tunnel	-	Tunnel	-	Tunnel	0.9	Tunnel	0.1	Tunnel	1.5
Air Quality	No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.		No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.		No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.		No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.		No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.		No adverse impact generated from the construction dust and operational vehicular emission is expected with mitigation measure and in compliance with the criterion in TM-EIAO and HKAQO.	
Noise	NSRs are subject to construction noise due to the construction of a new road, and road traffic noise at a close distance.		NSRs are subject to construction noise due to the construction of a new road, and road traffic noise at a close distance.		NSRs are subject to construction noise due to the construction of a new road, and road traffic noise. Considerable traffic noise impact would be expected at some NSRs as they are located immediately next to some sections of the existing road. Traffic noise impact could exceed the		NSRs are subject to construction noise due to the construction of a new road and tunnel, and road traffic noise at a close distance. Ventilation buildings at the portals of the tunnel can impose fixed noise impact during operating hours but at a distance to NSRs.		NSRs are subject to construction noise due to the construction of a new road and tunnel, and road traffic noise at a close distance. Ventilation buildings at the portals of the tunnel can impose fixed noise impact during operating hours.		NSRs are subject to construction noise due to the construction of a new road and tunnel, and road traffic noise at a close distance. Ventilation buildings at the portals of the tunnel can impose fixed noise impact during operating hours at a distance to NSRs.	

Environmental Factors	Option E1	Option E2	Option E3	Option E4	Option E5	Option E6
			criteria and may need mitigation during full operation.			
Water Quality	General water quality impact such as runoff to nearby waterbodies and sewerage from workforce will be generated by at-grade road and viaduct construction. Prevention of tunnel option can avoid the groundwater seepage.	General water quality impact such as runoff to nearby waterbodies and sewerage from workforce will be generated by at-grade road and viaduct construction. At-grade section passing Horn Hill wetland is not preferred as the construction activity will directly disturb the retained stream beds and fish ponds for the roadworks.	General water quality impact such as runoff to nearby waterbodies and sewerage from workforce will be generated by at-grade road and viaduct construction. Prevention of tunnel option can avoid the groundwater seepage.	Apart from the general water quality impact, groundwater seepage pumped out from the tunnel would have high suspended solid content. Nevertheless, the high levels and short alignments for these options would minimize the water quality impact due to tunnelling.	Apart from the general water quality impact, groundwater seepage pumped out from the tunnel would have high suspended solid content. Nevertheless, the high levels and short alignments for these options would minimize the water quality impact due to tunnelling.	Apart from the general water quality impact, groundwater seepage pumped out from the tunnel would have high suspended solid content. This option would have a longer span and the segments would be majority under the sea-levels. The amount of groundwater pumped out would be the largest among the other options and additional groundwater treatment is required before discharge.
Waste Management	New road to be constructed passing through the pond area of Horn Hill. Substantial amount of soil and sediment materials would be generated.	Similar to Option E1. Linkage to the LMC Loop cuts through the pond area in Horn Hill and would generate substantial amount of soil and sediment materials. However, as the existing border road is not used as the part of this scheme, more spoil materials are anticipated.	Substantial amount of soil and sediment materials would be generated. A large portion of the proposed scheme makes use of existing Ma Tso Lung Road for connection to KTN, hence less spoil materials are anticipated as compared with Option E1 and E2.	Substantial amount of rock materials would be generated which has high potential to be reused. Similar to Option E1, linkage to the LMC Loop cuts through the pond area in Horn Hill. Substantial amount of soil and sediment materials would be generated.	Similar to Option E1, but makes use of a short tunnel through the hill at Tse Koo Hang. As the linkage to the LMC Loop cuts through the pond area in Horn Hill, substantial amount of soil and sediment materials would be generated.	Consists of the largest section of tunnelling from the LMC Loop to KTN. This will generate the large amount of rock materials which has high potential to be reused.
Land Contamination	The proposed alignment may run through few open storage areas in KTN NDA, which may have land contamination concern.	The proposed alignment may run through few open storage areas in KTN NDA, which may have land contamination concern.	The proposed alignment may run through few open storage areas and warehouses in KTN NDA, which may have land contamination concern.	No potentially contaminated site along the proposed alignments.	The proposed alignment may run through few open storage areas in KTN NDA, which may have land contamination concern.	No potentially contaminated site along the proposed alignment.
Hazard to Life	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.	It is not anticipated that overnight storage of explosives will be planned for the Project. The Project is therefore not subject to any hazard impact from overnight storage of explosives.
Cultural Heritage – Archaeology	No recorded archaeological sites identified. Areas of archaeological potential include lower slopes near Horn Hill, Tse Koo Hang, Ma Tso Lung and Kwu Tung North.	No recorded archaeological sites identified. Areas of archaeological potential include lower slopes near Horn Hill, Tse Koo Hang, Ma Tso Lung and Kwu Tung North. Low potential within Horn Hill fish pond area.	No recorded archaeological sites identified. Areas of archaeological potential include lower slopes near Horn Hill, Tse Koo Hang, Ma Tso Lung Shun Yee San Tsuen, Ma Tso Lung San Tsuen and Fung Kong Shan.	No recorded archaeological sites identified. Areas of archaeological potential include lower slopes near Horn Hill and lower slopes south of Ma Tso Lung east of the tunnel entrances.	No recorded archaeological sites identified. New road and tunnel construction is proposed on areas of archaeological potential include lower slopes near Horn Hill, Tse Koo Hang, Ma Tso Lung and Kwu Tung North.	No recorded archaeological sites identified. Areas of archaeological potential include lower slopes near Horn Hill, and lower slopes east of the tunnel entrance near Kwu Tung north.
Cultural Heritage – Built Heritage	Built heritage are not identified in close proximity.	Built heritage are not identified in close proximity.	Built heritage are not identified in close proximity.	Built heritage are not identified in close proximity. Some graves may be impacted.	Built heritage are not identified in close proximity. Some graves may be impacted.	Built heritage are not identified in close proximity. Some graves may be impacted.
Landscape	<i>Loss of landscape resources</i> <ul style="list-style-type: none"> Loss of vegetation in the agricultural fields to the north west of Fund Kong Shan and the lower vegetated slopes along 	<i>Loss of landscape resources</i> <ul style="list-style-type: none"> Loss of marshland and fishpond in Horn Hill. Other impacts on landscape resources are similar to Option 	<i>Loss of landscape resources</i> <ul style="list-style-type: none"> Loss of mature tree clusters behind Ma Tso Lung San Tsuen. Other Impacts on landscape resources are similar to Option 	<i>Loss of landscape resources</i> <ul style="list-style-type: none"> Loss of mature trees at the lower vegetated slopes to the east of Ping Hang and to the southwest of Ma Tso Lung as a result of the 	<i>Loss of landscape resources</i> <ul style="list-style-type: none"> Loss of vegetation in the agricultural fields to the north west of Fund Kong Shan and the lower vegetated slopes along 	<i>Loss of landscape resources</i> <ul style="list-style-type: none"> Limited Loss of landscape marshland and fishpond in Horn Hill'.. Other impacts on landscape

Environmental Factors	Option E1	Option E2	Option E3	Option E4	Option E5	Option E6
	<p>Boundary Patrol Road from Ma Tso Lung to Ping Hang.</p> <ul style="list-style-type: none"> Impact on mature tree clusters within village settlements to the west of HKP-Lo Wu Range. Preservation of this tree clusters through adjustment of road alignment. Loss of trees on fishpond bunds at Ping Hang. Loss of fishpond and agricultural fields. <p>Response to landscape character</p> <ul style="list-style-type: none"> Largely utilised existing Boundary Patrol Road and tracks and agricultural fields away from village settlements could minimise the impact as a result of introduction of engineering structures in rural area. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> High potential to reinstate the roadside and rural landscape through preservation of trees and provision of new roadside landscape areas. 	<p>E1 with exception of no impact on roadside vegetation along Boundary Patrol Road.</p> <p>Response to landscape character</p> <ul style="list-style-type: none"> Fragmentation of Horn Hill fishpond and marshland landscape. Other impacts on Ma Tso Lung village landscape are similar to Option E1. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> The landscape features of Horn Hill are not regional significant, these could be mitigated to an extent through the restoration of marshland upon ecologist's advise 	<p>E1.</p> <p>Response to landscape character</p> <ul style="list-style-type: none"> Fragmentation of Ma Tso Lung rural landscape through introduction of viaduct on existing low laying agricultural fields. Other impacts on Ma Tso Lung village landscape are similar to Option E1. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> Slight potential to reinstate rural landscapes adjacent to proposed viaduct. 	<p>introduction of tunnel portals.</p> <ul style="list-style-type: none"> Relative less local impact on landscape resource through the utilisation of tunnel options with exception of tunnel portal areas. Loss of trees in agricultural fields and fishpond bund along proposed viaduct sections. <p>Response to landscape character</p> <ul style="list-style-type: none"> Tunnel option has a relatively better integration with existing landscape characters however the viaduct section will significantly fragmentise the low laying fishpond character at Horn Hill and rural character at Ma Tso Lung. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> Moderate potential to reinstate the vegetation in proposed portal areas. Slight potential to reinstate rural landscapes adjacent to proposed viaduct sections. 	<p>Boundary Patrol Road from Ma Tso Lung to Ping Hang.</p> <ul style="list-style-type: none"> Impact on mature tree clusters within village settlements to the west of HKP-Lo Wu Range. Preservation of this tree clusters through adjustment of road alignment. Loss of trees on fishpond bunds at Ping Hang. Loss of fishpond and agricultural fields. <p>Response to landscape character</p> <ul style="list-style-type: none"> Largely utilised existing Boundary Patrol Road and tracks and agricultural fields away from village settlements could minimise the impact as a result of introduction of engineering structures in rural area. <p>Potential for mitigation measures</p> <ul style="list-style-type: none"> High potential to reinstate the roadside and rural landscape through preservation of trees alongside Boundary Patrol Road and provision of new roadside landscape areas. Slight potential to reinstate the affected sloping area to the north of Ma Tso Lung. 	<p>resources are similar to Option E1 with exception of no impact on roadside vegetation along Boundary Patrol Road.</p> <p>Response to landscape character</p> <ul style="list-style-type: none"> Fragmentation of Horn Hill fishpond and marshland landscape. Other impacts on Ma Tso Lung village landscape are similar to Option E1. <p>Potential for mitigation measures</p> <p>Slight potential to reinstate the fishpond and marshland landscapes.</p>
Visual	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of Boundary Patrol Road and Ma Tso Lung Road and villagers living in Ma Tso Lung and Kwu Tung North. Least visual intrusion to the rural context due to its shortest proposed viaduct section, road alignment designed away from major village settlements and largely utilised existing road and tracks in agricultural fields. Transient views when travelling along the road will be changed. Slight change of visual amenity of villagers at Shun Yee San Tsuen and Ma Tso Lung San Tsuen whilst moderate change of local amenity of villagers living at the lower slopes of Ma Tso Lung to the west of HKP-Lo Wu Range who are located adjacent to the viaduct and road alignment. View looking east towards the 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of Boundary Patrol Road and Ma Tso Lung Road and villagers living in Ma Tso Lung and Kwu Tung North. Moderate to significant visual intrusion of at-grade structures in Horn Hill low laying fishpond areas Other impacts are similar to Option E1. 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of Boundary Patrol Road and Ma Tso Lung Road and villagers living in Ma Tso Lung and Kwu Tung North. Visual context looking from Shun Yee San Tsuen and Ma Tso Lung San Tsuen will be largely disturbed through introduction of viaduct. Other impacts are similar to Option E1 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of Boundary Patrol Road and Ma Tso Lung Road and villagers living in Ma Tso Lung and Kwu Tung North. Visual context looking from Shun Yee San Tsuen and Ma Tso Lung San Tsuen will be largely remain unchanged due to locating viaduct section and tunnel portals far away from their locations. Visual context of Horn Hill low laying fishpond areas will be altered due to introduction of viaduct section across the river. 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of Boundary Patrol Road and Ma Tso Lung Road and villagers living in Ma Tso Lung and Kwu Tung North. Visual intrusion to the rural context due to its shortest proposed viaduct section, road alignment designed away from major village settlements and utilized existing road and tracks in agricultural fields. However, the proposed tunnel portals and their associated viaduct sections to the west of Shun Yee San Tsuen will have significant impact in the view for adjacent VSRs within the nearby villages. Transient views when travelling along the road will be changed. Slight change of visual amenity of villagers at Shun Yee San Tsuen and Ma Tso Lung San Tsuen whilst moderate change of local amenity of villagers living 	<p>Visual amenity/integration</p> <ul style="list-style-type: none"> Potential VSRs are vehicular users of Boundary Patrol Road and Ma Tso Lung Road and villagers living in Ma Tso Lung and Kwu Tung North. The use of the shortest viaduct section and the large portion of tunnel section lead to the least visual impact preferred option. Other impacts are similar to Option E1.

Environmental Factors	Option E1	Option E2	Option E3	Option E4	Option E5	Option E6
	Range will be interrupted by proposed viaduct whilst no blockage of views at other proposed road sections due to their low profile and extent of upgrading works.				at the lower slopes of Ma Tso Lung to the west of HKP-Lo Wu Range who are located adjacent to the viaduct and road alignment. <ul style="list-style-type: none"> View looking east towards the Range will be interrupted by proposed viaduct whilst no blockage of views at other proposed road sections due to their low profile and extent of upgrading works. 	
Ecological	Loss of and disturbance to fish ponds and marsh at Horn Hill , and impacts on ecological corridor; mitigation essential but feasible (some off site). Runs through core area of Eurasian Otter records. Mitigation required for impacts on Ping Hang stream and Ma Tso Lung stream and marsh. Location of crossing over LMC Meander has greatest adverse impact in respect of flight lines. Construction impacts on ecological corridor serious and cannot be entirely mitigated.	Loss of fish ponds similar to E1, but disturbance impacts greater. Loss of marsh greater. Substantial, but feasible, mitigation required for impacts on marsh at HORN HILL, and impacts on ecological corridor. Mitigation required for impacts on MTL stream and marsh. Less impact on flight lines. Avoids core area for Eurasian Otter. Construction impacts on ecological corridor serious and cannot be entirely mitigated ,	Loss of and disturbance to fish ponds and marsh at HORN HILL, and impacts on ecological corridor; mitigation essential but feasible (some off site). Runs through core area of Eurasian Otter records. Mitigation required for impacts on MTL stream and marsh. Location of crossing over LMC Meander has greatest adverse impact in respect of flight lines. Construction impacts on ecological corridor serious and cannot be entirely mitigated.	Tunnels mean much lower disturbance impacts on fish ponds at HORN HILL, and less pond loss. Smaller area of MTL stream and marsh impacted. Runs through core area of Eurasian Otter records. Potential severe impacts, especially construction phase, on habitat of Three-banded Box Turtle. Mitigation required for impacts on marsh at HORN HILL, and impacts on ecological corridor. Mitigation required for impacts on MTL stream and marsh. Avoidance of impacts on riparian woodland at MTL is needed. Location of crossing over LMC Meander has greatest adverse impact in respect of flight lines. Construction impacts on ecological corridor serious and cannot be entirely mitigated.	Very similar to E3, but avoids impact on Tse Koo Hang stream. Loss of and disturbance to fish ponds and marsh at HORN HILL, and impacts on ecological corridor; mitigation essential but feasible (some off site). Mitigation required for impacts on MTL stream and marsh. Location of crossing over LMC Meander has greatest adverse impact in respect of flight lines. Construction impacts on ecological corridor serious and cannot be entirely mitigated.	Avoids all impacts at HORN HILL and grassy hills adjacent. Potential severe impacts on riparian habitat of Three-banded Box Turtle. Mitigation required for impacts on MTL stream. This is preferred option.
Fisheries	Minor fish pond loss south of the Meander.	Lesser fishpond loss than Option E1. Only minor fishpond loss near Horn Hill.	Level of fishpond loss same as Option E1, i.e. minor fish pond loss south of the Meander.	Routing mainly aligns with fishpond bunds. Thus, minor fish pond loss anticipated.	Level of fishpond loss same as Option E1, i.e. minor fish pond loss south of the Meander.	No fishpond loss.
Landfill Gas	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.	Not fall within the 250 Consultation Zone of Ma Tso Lung Landfill, so no landfill gas hazard concern.

Key:

Color codes for general evaluation of each road option:

	Preferred
	Average
	Not Preferred

C. Summary Table for Evaluation of Environmental Benefits/Dis-benefits on further options for Eastern Connection Road

Further Option of ECR	Environmental Benefits	Environmental Dis-benefits
<p>Option E7 – Deep Tunnel Option (With Landing to Ground Level Public Road)</p>	<ul style="list-style-type: none"> • Minimal impact to the fishponds and meander during both construction and operational stages; • More direct alignment between LMC Loop and the external areas. 	<ul style="list-style-type: none"> • As the eastern tunnel ramp would stretch to the western area of the LMC Loop, the road configuration would bring significant constraints to the arrangement of PT services and the parking control strategies of the LMC Loop; • The long tunnel ramp compels users on eastern connection road intended for the eastern side of LMC Loop to make a significant detour. This will significantly undermine the attractiveness of the eastern connection road. Preliminary study indicates that the detour would cause nearly half of the eastern road users to shift to use the western connection road, thereby significantly increasing the burden on the western connection road and adversely affecting the effectiveness of having an eastern connection road; • Location of the eastern Transport Interchange will need to be relocated significantly to the west, very close to the currently proposed western Transport Interchange; • The scale of the road infrastructure required becomes much more significant than viaduct or underpass schemes, mainly due to: 1) dual-tube configuration for traffic and fire safety reasons; 2) adequate horizontal clearance required between tunnel tubes; 3) carriageway width need to be locally widened to allow adequate sight-line at tight curves; 4) significant space required for utilities and tunnel services; and 5) large amount of provisions need to be allowed for tunnel operators. The required road infrastructure is disproportional to the overall scale of the LMC Loop development itself; • Due to the need of maintaining proper horizontal turning radius of the long approach ramp, the tunnel alignment would encroach a large number of development plots in the LMC Loop, thereby significantly affecting the land-use of the development; • Unit rate for construction of tunnel (including E&M) is at least 3 times higher than viaduct construction. TBM through uncertain geotechnical conditions at wetland may require an even higher rate. The provision of dual-tube tunnel instead of single 2-lane viaduct makes the option 2 times more expensive. The cost for the extensive cofferdam / diaphragm wall for the ramp construction is also significant; • High energy consumption and maintenance costs for tunnel operation; • Cycle track and footpath generally cannot go through road tunnel. May need to be designed as proper pedestrian / cycle subways, perhaps with travellators for pedestrians; • Ventilation shafts require additional land-take and may pose environmental concerns; • Construction requires larger works area, especially for temporary storage and disposal of excavated materials. The mucking out of excavated materials may have significant waste impact during construction; • Separate compartments will be required for utilities, and gas main cannot be provided along the deep tunnel; • Tunnel will require round-the-clock traffic control and surveillance, may require provisions for operators and rescue & recovery vehicles; • Extensive drainage and pumping systems will need to be provided to prevent possible flooding; • Only very limited amount of GI information are now available for Area B. Deep tunnel scheme may be subject to major changes once GI information are subsequently made

Further Option of ECR	Environmental Benefits	Environmental Dis-benefits
<p>Option E8 Deep Tunnel Option (With Landing to Building Basement)</p>	<ul style="list-style-type: none"> Minimal impact to the fishponds and meander during both construction and operational stages; Better accessibility for the adjoining villages; Better connection with transport interchange facility in the development when compared with the ground-landing option (Option E7). 	<p>available;</p> <ul style="list-style-type: none"> Less accessibility for the adjoining villages. <ul style="list-style-type: none"> All the drawbacks of a deep tunnel as presented for Option E7 are applicable for this option; By placing the eastern connection road at a basement level, it will become completely detached from the internal roads, and significantly hamper the effectiveness of the LMC Loop's overall road network. This disconnection in the road network goes against the core principle of having a seamless and people-oriented transport system for the LMC Loop development; As the main external connection road would end at the basement level with a dead-end configuration, there will be potential concerns on the rescue plan and emergency access for the tunnel and the underground transport interchange; Complex management, operation and maintenance arrangements will be required for the deep tunnel and the interfacing underground transport interchange; Although a long ramp to ground level will not be required, this road configuration will still cause some detour for people accessing the eastern portion of the LMC Loop, as the underground transport interchange is located 600m away from the eastern end of the development.
<p>Option E9 – Shallow Underpass Option (Recommended Option)</p>	<ul style="list-style-type: none"> Use of underpass to cross underneath the meander avoids permanent operational phase impacts, in particular relating to disturbance to Eurasian Otter and the bird flight line corridor; The combined use of shallow underpass and depressed road under the fish ponds and Meander is a significant advantage over the open access road option, and minimizes any ecological impact of the operational phase to the maximum practical extent; Potential visual impact of the depressed road could be effectively mitigated by providing shrubs and trees on both sides; The short length of the shallow underpass strikes out the need for a full tunnel design. This means significantly lower maintenance costs and resources, keeps the scale of road infrastructures more compatible with the overall scale of development, maintains a high-integrated road system, and is a significant advantage over the deep tunnel option; Can adopt a compact design, i.e. 2-way single carriageway configuration, whereas deep tunnel options requires dual 2-lane and double tube for safety reason which is overdesigned; Shallow underpass option allows a higher flexibility for arrangement of public transport services for the Loop and the associated parking control strategy without causing major detours for Loop users, and does not undermine the effectiveness and attractiveness of the eastern connection road; and Minimal impact to the land use planning of the LMC Loop. 	<ul style="list-style-type: none"> While mitigation measures could be implemented, there will be higher ecological impact during the open-cut construction; Although this option does not require long approach ramps, the TI will still needed to be shifted westward by approximately 400m to suit the underpass configuration; Potential drainage impact and disturbance to groundwater flow have to be carefully designed and mitigated; Higher construction and maintenance cost than Option E1.