

15 ENVIRONMENTAL OUTCOMES AND CONCLUSIONS

15.1 Impact Summary

15.1.1 The Project covers the following designated project (DP) elements as specified in Items A.1, A.7, A.8, A.9 and C.2(c) in Schedule 2 Part 1 of the EIAO (Cap.499):

- DP1 – A road which is an expressway, trunk road, primary distributor road or district distributor road including new roads, and major extensions or improvements to existing roads under A.1 in Schedule 2 Part 1;
- DP2 – A road tunnel more than 800m in length between portals under A.7 in Schedule 2 Part 1;
- DP3 – A road bridge more than 100m in length between abutments under A.8 in Schedule 2 Part 1;
- DP4 – A road fully enclosed by decking above and by structure on the sides for more than 100m under A.9 in Schedule 2 Part 1; and
- DP5 – Reclamation works (including associated dredging works) more than 1 ha in size and a boundary of which is less than 100m from an existing residential area under C.2(c) in Schedule 2 Part 1.

15.1.2 This EIA Report has provided an assessment of the potential environmental impacts associated with the construction and operation of the Project based on the preliminary engineering design information available at this stage, and taken into consideration of the potential cumulative impacts from other concurrent projects. The assessment has been conducted, in accordance with the Study Brief No. ESB-195/2008 under the EIAO for the Project, covering the following environmental issues:

- Air Quality Impact
- Noise Impact
- Water Quality Impact
- Waste Management
- Ecological Impact
- Fisheries Impact
- Impact on Cultural Heritage
- Landscape and Visual Impact
- Landfill Gas Hazard
- Hazard to Life

15.1.3 The findings of this EIA Study have determined the likely nature and extent of environmental impacts predicted to arise from the construction and operation of the Project. During the EIA process, specific environmental control and mitigation measures have been identified and incorporated into the planning and design of the Project in order to achieve compliance with environmental legislation and standards during both the construction and operation phases. An environmental monitoring and audit (EM&A) programme has also been developed. The Implementation Schedules listing the recommended mitigation measures are presented in the **Section 14**. A summary of the environmental impacts are presented in the sections below.

Air Quality Impact

Construction Phase

- 15.1.4 Air quality impacts from the construction works for the Project would mainly be related to construction dust from excavation, materials handling, filling activities and wind erosion. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation together with the recommended dust suppression measures, good site practices and EM&A programme, dust impact on air sensitive receivers would be minimal.

Operation Phase

- 15.1.5 For the operation phase, cumulative air quality impacts arising from vehicular emissions from open road network, portal emissions from the TKO-LT Tunnel, EHC, T2 Tunnel, proposed full enclosures, landscape decks at Lam Tin Interchange and Road P2, emissions from the ventilation exhaust buildings of TKO-LT Tunnel, EHC and T2, the background concentration within and adjacent to the Project site and the implementation of roadside noise barriers/semi-enclosures/landscape decks are assessed. Results show that the predicted maximum 1-hour and daily average NO₂, annual average NO₂ and maximum daily average and annual average RSP concentrations at the representative ASRs and within the Study Area would comply with the AQO. No mitigation measures are required.
- 15.1.6 The air pollutant concentrations in the TKO-LT Tunnel, proposed full enclosures and under the landscape decks at Lam Tin Interchange and Road P2 would comply with the EPD Tunnel Air Quality Guidelines. No mitigation measures are required.

Noise Impact

Construction Phase

- 15.1.7 This assessment examined the construction noise impacts of the Project, taking into account other concurrent projects. The predicted unmitigated noise levels would range from 54 to 88 dB(A) at the representative NSRs. With the use of quiet PME, movable barriers and temporary barriers, the noise level at the NSRs selected for construction noise impact assessment (except Kei Faat Primary School) would not exceed the construction noise standard. The affected Kei Faat Primary School has been noise insulated with air conditioners. It is recommended that the particularly noisy construction activities should be scheduled to avoid examination periods of these NSRs as far as practicable.
- 15.1.8 During the actual construction period, as much as practically possible should be done to reduce the construction noise, and on-going liaison with all concerned parties and site monitoring should also be conducted during the course of the construction period.
- 15.1.9 Ground-borne construction noise impacts pertinent to the use of breaker, drill rig and pile rig were also found to comply with relevant criteria. No adverse ground-borne construction noise impacts were predicted.
- 15.1.10 A construction noise EM&A programme is recommended to check the compliance of the noise criteria during normal daytime working hours.

Operational Phase

- 15.1.11 The potential road traffic noise impacts have been assessed based on the worst case traffic

flows in 2036. Without any noise mitigation measures in place, the predicted noise levels at the NSRs would range from 31 to 79 dB(A). Practicable traffic noise mitigation measures are therefore formulated for the NSRs with predicted noise levels exceeding the EIAO-TM traffic noise criteria.

- 15.1.12 With the proposed noise barriers, semi-enclosures, full-enclosures and low noise surfacing applied on roads in place, the predicted overall noise levels at some of the NSRs would still exceed the noise limit. For these NSRs, the predicted traffic noise level due to the road sections within the Project does not exceed (i.e. new road) the criteria by 1 dB(A) or more. The 'New' road noise contribution to the overall traffic noise level would be less than 1.0 dB(A) and the 'New' road noise levels at these NSRs would all be below criterion. Furthermore, although the predicted overall traffic noise level does exceed the criteria by 1 dB(A) or more, the predicted overall noise level is not greater than that of the without Project Scenario at the design year. It should be noted that such noise exceedances at the representative NSRs are due to the existing roads. Nevertheless, there will be an overall reduction of noise brought about by the project, which may be considered an environmental benefit.
- 15.1.13 Operation noise impacts from fixed plant noise sources including ventilation buildings and pumping stations can be effectively mitigated by implementing noise control treatment at source during the design stage and adverse residual operation noise impacts are not anticipated.

Water Quality Impact

Construction Phase

- 15.1.14 The water quality impacts during the marine construction works have been quantitatively assessed by numerical modelling. It is predicted that, with the implementation of the recommended mitigation measures, there would be no unacceptable water quality impacts due to the construction of the Project and due to the cumulative effects from other concurrent marine construction activities. A water quality monitoring and audit programme will be implemented to ensure the effectiveness of the proposed water quality mitigation measures.
- 15.1.15 The key issue from the land-based construction activities would be the potential water quality impact due to the release of sediment-laden water from surface works areas and discharge of construction site effluent. Minimisation of water quality deterioration could be achieved through implementing adequate mitigation measures. Regular site inspections should be undertaken routinely to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented.

Operational Phase

- 15.1.16 During operational phase, no significant change in hydrodynamic regime is predicted according to the modelling results. No significant change in water quality regime, which associated with the hydrodynamic impact, is anticipated. Therefore no adverse hydrodynamic and water quality impacts are expected.

Ecological Impact

- 15.1.17 There is no recognized terrestrial/marine site of conservation interest (e.g. as Country Parks, Sites of Special Scientific Interest, Coastal Protection Areas, Conservation Areas, Marine Parks) within the assessment area. The ecological resources identified included mixed

woodland, disturbed woodland, grassland/shrubland mosaic, village/orchard, plantation, pond/stream, natural rocky shore, sandy shore, artificial seawall, hard substrata subtidal habitat, soft substrate subtidal habitat and pelagic subtidal habitat. Of which, hard substrata subtidal habitat has moderate and low-to-moderate ecological value. Fifteen hard coral, two black coral and 17 octocoral species were recorded within and in vicinity of marine works area. The remaining habitats were of low to low-to-moderate value.

- 15.1.18 Potential direct impacts on significant ecological resources of conservation importance (e.g. natural coastline along Chiu Keng Wan, natural coral communities with moderate to high ecological value on western coast of Junk Bay, coral recipient sites for translocation under other development projects, natural streams, and potential habitats of Philippine Neon Goby and Grassy Puffer Fish) have been avoided or minimized in the alignment option selection process.
- 15.1.19 The land-based construction works would cause a loss of approximately 3.8 ha of vegetated habitats (grassland/shrubland mosaic and plantation) with low and low to moderate ecological value. The associated flora and fauna recorded from these affected habitats are predominantly common and widespread species in Hong Kong. Terrestrial ecological impacts arising from the Project are considered low.
- 15.1.20 Reclamation works and bridge piers would result in the loss of 3.6 ha of subtidal habitat. Additionally, 19 ha of this same habitat would be lost temporarily due to marine construction works during construction phase. Existing artificial seawall of 540 m at TKO would be lost to reclamation works, however the reclaimed area would provide a surplus of 310 m of the same habitat. Direct impact on sparse coverage (<1%) of coral community would be minimized through coral translocation measures as far as possible.
- 15.1.21 Potential indirect impact due to change in water quality resulting from the proposed marine works and reclamation would be temporary and localized. Possible mitigation measures for water quality impact, such as the deployment of silt curtains around the active stone column installation points, opening of newly installed seawall and marine works area would serve to protect nearby marine ecological resources. With the proper implementation of appropriate mitigation measures, the potential impact on marine ecology due to water quality deterioration would be acceptable.

Fisheries Impact

- 15.1.22 A review on existing information on commercial fisheries resources and fishing operations within the surrounding waters has been undertaken. No important spawning or nursery grounds were identified within or in the vicinity of the proposed marine works area, while the nearest Fish Culture Zone (FCZ) (Tung Lung Chau FCZ) is located approximately 5 km from the proposed marine works area.
- 15.1.23 The importance of captured fisheries resources in the area of the proposed reclamation and bridge piers within Junk Bay WCZ is identified as low in terms of both production weight and value. Fish fry production is not expected to be affected within Junk Bay and Victoria Harbour due to the proposed works.
- 15.1.24 The Project would cause about 3.6 ha permanent loss and 19 ha temporary loss of fishing area in inner Junk Bay due to the proposed reclamation and bridge construction. Considering the generally low importance of the fishing area in inner Junk Bay as compared to the Hong Kong fishery and the low production at this area, the direct impact of the Project on fisheries resources and operations would be regarded as low.

- 15.1.25 No significant indirect impacts due to deterioration of water quality are expected. However, mitigation measures for water quality impact, such as the deployment of silt curtains around the active stone column installation points, opening of newly installed seawall and marine works area would still be implemented to protect fisheries resources. No operational phase impacts are expected.

Waste Management Implications

- 15.1.26 Different types of waste generated from the Project during the construction phase are likely to include Construction and Demolition (C&D) materials from demolition, excavation and site formation works, excavated sediment, general refuse from workforce, and chemical waste from the maintenance of equipment. During the operation phase, the major types of waste would be general refuse from staff and office activities and chemical waste from maintenance activities.
- 15.1.27 Approximately 4,170,420 m³ of inert materials and 83,000 m³ of non-inert materials would be generated during the construction phase of the Project. 814,600 m³ of inert material would be reused in the reclamation while the remaining would be recycled or disposed off-site. Non-inert waste will be recycled as far as possible before disposed to landfill. Opportunities in minimisation of generation and maximisation of reuse would be continually investigated during the detailed design and construction phases. The other materials would be disposed to designated outlets. Provided that these wastes are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be anticipated.
- 15.1.28 The total volume of excavated sediment generated from the Project is estimated to be approximately 19,360 m³. The sediment will be reused as filling material. Approximately 17,450 m³ of sediment is considered below the RBRGs. It is anticipated that the reuse of these sediments will not lead to land contamination. 1,910m³ of sediment exceeds the RBRG for lead. However, cement stabilization will immobilize metal contaminants and is capable to treat the exceedance on lead.
- 15.1.29 All sediment can be reused as filling material on-site after cement stabilization. However, stabilized materials from 1,910m³ of sediment with RBRG exceedance on lead have to comply with UTS and UCS. Final disposal/treatment on the 1,910m³ sediment has to be agreed with DEP.
- 15.1.30 Alternatively, excavated sediment can be treated with marine disposal. Based on the results of the chemical and biological screening, approximately 9,600 m³ of sediment is suitable for Type 1 – Open Sea Disposal, 60m³ of sediment is suitable for Type 1 – Open Sea Disposal (Dedicated Sites), 7,790 m³ of sediment requires Type 2 – Confined Marine Disposal and 1,910 m³ of sediment requires Type 3 – Special Treatment/Disposal in accordance with *ETWB TC(W) No. 34/2002 - Management of Dredged/Excavated Sediment*.
- 15.1.31 The final determination of the appropriate disposal options, routing and the allocation of a permit to dispose of material at a designated site shall be determined in accordance with ETWB TC(W) No. 34/2002. Three types of disposal options for excavated sediments were stipulated in the ETWB TC(W) No. 34/2002: Type 1 – Open Sea Disposal or Open Sea Disposal in Dedicated Sites, Type 2 – Confined Marine Disposal and Type 3 – Special

Treatment / Disposal. For Type 3 disposal, the Project Proponent shall be responsible for identifying and agreeing with the DEP the most appropriate treatment and/or disposal arrangement. The determination of the appropriate disposal options shall be based on the sediment classification and if necessary, the biological screening results.

- 15.1.32 Mitigation measures are recommended in this EIA to minimise potential environmental impacts associated with handling and disposal of different wastes arising from the Project. Provided that the recommended mitigation measures are properly followed, adverse environmental impacts would not be expected from the Project.

Impact on Cultural Heritage

- 15.1.33 As no terrestrial and marine archaeological potential was identified, it is thus considered no impact on archaeology and therefore no mitigation measure required. However, indirect impact on one of the built heritage resources, Cha Kwo Ling Tin Hau Temple, located within the Study Area was anticipated. Mitigation measures have been suggested to protect the concerned temple during the construction phase. As long as the recommended mitigation measures are followed, adverse impact on the temple should be largely reduced and no residual cultural heritage impact is expected.

Landscape and Visual Impact

- 15.1.34 On the TKO side, the principle landscape impact will be on the sea waterbody of Junk Bay, existing trees and vegetation. Whilst the physical impact of the TKO Interchange reclamation and bridge/slip road piers is relatively small in relation to the bay as a whole, the actual area of impact has been assessed as the footprint of the interchange as it changes the landscape character from open water to enclosed sea space. The main areas of impacts on trees will be on the existing TKO reclamation along Road D4 and at the TKO tunnel portal area. The loss of trees can be minimised through tree protection measures and mitigated through new compensatory planting.
- 15.1.35 The primary visual impacts of the project at TKO will be the addition of the TKO Interchange in Junk Bay, the tunnel portal on the western hill slopes and the road improvement works with footbridges on the TKO reclamation. Visual mitigation of the interchange can mainly be achieved through minimisation of the apparent size and scale of development through sensitive design of the visible elements. Visual mitigation of the road works will be achieved by reinstatement of streetscape and planting. The tunnel portal slopes will be partially greened with shrubs and climbers planted in toe planters on the slope berms. The primary VSRs will be the surrounding existing and planned residential blocks on the TKO reclamation which will experience elevated views of the interchange, and the users of the planned waterfront and open space facilities. It is considered that the residual visual impacts will be Moderate after mitigation in the operational phase.
- 15.1.36 For TKO, the Moderate adverse residual landscape and visual impacts at Year 10 are considered acceptable given the context of an area which is planned for large-scale development and the fact that the TKO-LT Tunnel will be integrated with the TKO Town Centre South Extensions. Impacts on the Junk Bay Landscape Resource and Character Area are unavoidable but the scale is considered acceptable in relation to the scale of the Bay.
- 15.1.37 On the Lam Tin side of the Project, many existing trees will be impacted at the ex-Cha Kwo Ling Kaolin Mine Site and on the EHC approach roads. However, it is anticipated that the

loss of the trees can be minimised though tree protection measures and mitigated with new planting around the TKO-LT Tunnel works.

- 15.1.38 The primary visual impacts at Lam Tin come from the construction of the Lam Tin Interchange with its elevated slip roads and associated tunnel portal and service buildings within the ex-Cha Kwo Ling Kaolin Mine Site. The existing quarry walls provide a high degree of visual containment and extensive mitigation planting will in time offset the loss of existing trees and the visual impact on surrounding elevated VSRs will be reduced. The principal VSRs are the surrounding high rise residential blocks which define the ZVI to the west, north and east which will experience Substantial visual impacts during construction. It is considered that the residual impacts to these VSRs and those in the planned residential development at Cha Kwo Ling to the west and the CDA development in Yau Tong Bay to the east will be reduced from Moderate with the implementation of mitigation measures.
- 15.1.39 For Lam Tin, the Moderate adverse residual landscape and visual impacts are also considered acceptable given the planning intent for the area which includes major redevelopment of the waterfront and the abandoned ex-Cha Kwo Ling Kaolin Mine Site. The number of VSRs affected is relatively low due to the visual containment of the site. In addition, the existing visual quality of the proposed site for the interchange is relatively low and the proposed development can be integrated into the overall development of the area with impacts reduced to acceptable levels provided the recommended mitigation measures are implemented.
- 15.1.40 In accordance with the criteria and guidelines for evaluating and assessing impacts as stated in Annex 10 and 18 of the TM- EIAO, it is considered that overall the residual landscape and visual impacts of the proposed TKO-LT Tunnel are acceptable with mitigation during the construction and operation phases.

Landfill Gas Hazard Assessment

- 15.1.41 The results of the qualitative risk assessment of landfill gas hazard to the Project posed by Sai Tso Wan Landfill suggested that the overall level of the landfill gas hazard would be “medium”.
- 15.1.42 Some appropriate precautionary measures have been proposed to minimise the landfill gas hazard at the Project sites during the construction phase and operational phase. In particular, it is noted that landfill gas membrane should be installed at the tunnels, underground structures, and basement & ground floor of the buildings within the Consultation Zone of the Sai Tso Wan Landfill. Routine monitoring is recommended as a precautionary measure..
- 15.1.43 Provided that the recommended precautionary measures are implemented properly, the health and safety of the site workers/personnel working at the Project sites would be safeguarded and there would be no adverse impact on the feasibility of the Project.

Hazard to Life

- 15.1.44 As there is no overnight storage of explosives on site, no hazard assessment of the storage and transport of explosives is deemed necessary.

15.2 Summary of the Measures taken for the Minimization of Environmental Impacts

- 15.2.1 The various chapters and appendices of this EIA report have presented the measures to minimize pollution in the planning, design, construction and operation stages. The key

measures to minimize pollution are summarized below for easy reference and they are not exhaustive. For details, please refer to the relevant chapters and appendices as appropriate.

- 15.2.2 The following measures are considered during project investigation and preliminary design stage.

Alignment Option

- 15.2.3 For the main tunnel alignment, the alignment option “straight tunnel option without toll plaza” is adopted as the Recommended Scheme. Under this Scheme, the tunnel is in a straight alignment in TKO section. The main road’s length is reduced by about 600m as compared with the conforming S-curve tunnel under Further Development of Tseung Kwan O – Feasibility Study.
- 15.2.4 Toll plaza is not required in the Recommended Scheme. Thus, minimizing the extent of reclamation and construction works when compared with other options.
- 15.2.5 Depressed road with Landscape deck is proposed at Road P2 to minimize the visual and noise impact to the nearby residential area.
- 15.2.6 At Lam Tin Interchange (LTI), a noise shelter covering the main line is introduced. The noise shelter comprises of a landscape deck and translucent noise cover. This noise shelter serves to minimize the noise and visual impact from the main road.
- 15.2.7 To further abate the visual impact, part of the 3 slip roads at the northeast area of LTI will be in tunnel form instead of at-grade roads.
- 15.2.8 At Lam Tin Interchange and Cha Kwo Ling Section, tunnel scheme is adopted instead of the depressed road. By adopting tunnel option, the environmental impact to the surroundings will be less than that in the depressed road option as the construction works will be carried out underground in the tunnel option. Furthermore, less natural hillside will be affected by the tunnel option than depressed road.
- 15.2.9 For Cha Kwo Ling Section, the alignment option H1b is adopted in which the tunnel will pass through the middle of Cha Kwo Ling Village (CKLV). Under this alignment, the tunnel will be away from Tin Hau Temple and previous Four Hills Public School when compared with Option H2a/H2b.
- 15.2.10 Also, the tunnel alignment under H1b is further away from Yau Lai Estate when compared with Option H2a/H2b.

Ventilation Building

- 15.2.11 To minimize the visual impact to the surrounding residential area, green roof is applied at the ventilation building as far as practical.

Construction Method

- 15.2.12 For the reclamation at TKO, non-dredged reclamation method is adopted in lieu of dredged method in order to minimize sediment generation.
- 15.2.13 At Cha Kwo Ling section, the construction method for the adopted option H1b are drill and blast and mechanical breaking method or other non-blasting methods. Compared with the

cut and cover tunnel construction method adopted in other options, the drill and blast and mechanical breaking method or other non-blasting methods are relatively environmental friendly as there is no excavation works from the ground level thus minimizing the construction noise and dust generation.

15.2.14 Mitigation measures requirements specified for other environmental aspects are summarized below.

Measures for Air Quality Impact

- Implementation of dust suppression measures stipulated in Air Pollution Control (Construction Dust) Regulation. The mitigation measures and good site practices as mentioned in Section 3.8 would be strictly followed. A comprehensive dust monitoring and audit programme are recommended to minimize cumulative dust impacts.

Measures for Noise Impact

- Good site practices to limit noise emissions at source and use of quiet plant and working methods, whenever practicable.
- Provision direct noise mitigation measures on project roads such as noise barriers, semi-enclosures, full-enclosures and landscape deck.
- Provision of noise control treatment at the Ventilation Buildings and Pumping Stations during the design stage and implementing the same during operation phase for fixed plant noise.

Measures for Water Quality Impact

- Mitigation measures have been recommended for land-based and marine-based construction activities. Provided the recommended mitigation measures as mentioned in Section 5.8 are implemented, and all construction site / works area discharges comply with the TM-DSS standards, no unacceptable residual water quality impact is anticipated

Measures for Waste Management

- Reduction measures have been recommended to minimise the amount of materials generated in the Project.
- Implementation of recommended mitigation measures, no adverse environmental impacts would be expected.

Measures for Ecological Impact

- The mitigation measures as mentioned in Section 6.8, in order of priority, avoidance, minimization, and compensation approaches, have been recommend to alleviate the potential ecological impacts on important habitats and the associated wildlife caused by the proposed development.

Measures for Fisheries Impact

- By minimizing the extent of reclamation and the application of non-dredge method, the direct loss of fishing ground in Junk Bay due to reclamation has been largely avoided.
- Implementation of mitigation measures proposed in water quality impact assessment include the installation of single floating silt curtain at the opening of the newly installed seawall during the reclamation of Road P2 and the proposed marine works, protects fisheries resources from indirect impacts and ensure no unacceptable impact on fisheries resources and operations.

Measures for Cultural Heritage

- For preventing dust and visual impacts to the Cha Kwo Ling Tin Hau Temple and its fung shui rocks (Child-given Rocks) during the construction phase, mitigation measure in the form of a temporarily fenced off buffer zone (about 5 meters from the edge of Rocks and about 15m from the edge of Rocks alter) with allowance for public access (minimum 1m) should be provided around the temple and the fung shui rocks. The open yard in front of the temple should be kept as usual for annual Tin Hau festival. Such mitigation measures should be consulted with Cha Kwo Ling Villagers during the detailed design stage and before construction stage. In addition, monitoring of vibration impacts should be conducted when the construction works are less than 100m from the temple.
- In case indirect vibration impact occurs during the construction phase, vibration level is to be controlled within a peak particle velocity (ppv) limit of 5mm/s measured inside the historical buildings to prevent potential damage to built heritage. Monitoring of vibration should be carried out during construction phase.

Measures for Landscape and Visual Impact

- A number of measures have been recommended for the Project during the construction and operational phases to minimize impacts on existing trees, freshwater streams and ponds, natural coastline and sea waterbody areas. Mitigation measures have also been proposed to reduce visual impacts..
- Compensatory tree planting, slope greening works, sensitive design and greening of buildings and structures, streetscape and highway elements of the Project, noise barriers and enclosures are recommended.

Measures for Landfill Gas Hazard

- A number of measures have been recommended for the Project to safeguard the safety of all personnel and the general public (i.e. passengers of vehicles using the TKO-LT Tunnel) present at the Project site. These include site safety measures, installation of gas barrier, routine monitoring of landfill gas at excavation area during construction phase, and buildings and enclosures (e.g. administration building, ventilation building, workshop, tunnel etc) during operation phase.

Measures for Hazard to Life

- Since no overnight storage of explosive on site is required for the construction of the Project and no hazard to life impact, no mitigation measure is proposed.

15.3 Environmental Outcomes

15.3.1 The major environmentally sensitive areas within the study area include the existing urban districts in Lam Tin and Tseung Kwan O areas, the seawater intakes at the waterfront of the Junk Bay and coral communities. With the implementation of the proposed environmental control and mitigation measures, the environmentally sensitive receivers within the Study Area would be protected from adverse environmental impacts arising from the proposed Project. A summary of the key environmental outcomes arising from the EIA Study and environmental benefits of the environmental protection measures recommended are presented in **Table 15.1** below.

Table 15.1 Summary of Key Environmental Outcomes / Benefits

Area/Issue	Environmental Outcomes / Benefits and Mitigation Measures
The Project	<p>The Project is to provide a highway connecting TKO at Po Shun Road in the east and Trunk Road T2 in the west with the associated interchange. It comprises the following key elements:</p> <ul style="list-style-type: none"> (a) a dual two-lane highway approximately 4.8 km long. About 2.6 km of the highway is in the form of tunnel; (b) slip roads, depressed roads, viaducts, TKO Interchange, ventilation building, tunnel portal facilities and around 3 ha reclamation on TKO side; (c) slip roads, branch tunnels, viaducts, Lam Tin Interchange, tunnel portal facilities, ventilation and administration buildings on Kowloon side; and (d) the associated building, civil, structural, marine, electrical and mechanical, traffic control and surveillance system (TCSS), landscaping, and environmental protection and mitigation works.
Environmentally Friendly Design Considered and Recommended to Avoid Environmental Problems	<ul style="list-style-type: none"> • The recommended preferred option would avoid the clearance of vegetation on the disturbed woodland located between the Kwong Tin Estate and Lei Yue Mun Road by relocating the tunnel portal to urbanized developed area with lower ecological value. • The option with minimal reclamation extent (approximately 3 ha) has been selected. Potential environmental impacts such as water quality, marine ecology, and waste associated with the reclamation would be avoided or minimized. • The selected alignment option would avoid the direct impact and disturbance to the natural habitats (rocky shore and stream) along the coastline of Chiu Keng Wan where fish of conservation interest (Philippine Neon Goby and Grass Puffer Fish) were previously recorded. With the natural coastline along Chiu Keng Wan preserved, there would be no blockage to the passage between the stream habitat and coastal water where potential migration of Philippine Neon Goby may occur.

Area/Issue	Environmental Outcomes / Benefits and Mitigation Measures
	<ul style="list-style-type: none"> Section of Road P2 at the eastern side of Ocean Shores has been designed as depressed road covering with landscape deck to minimize potential environmental impacts on the nearby sensitive receivers.
Population and Environmentally Sensitive Areas Protected	With the adoption of environmentally friendly design mentioned above, major environmentally sensitive receivers would be protected.
Construction Dust	<p>Environmental benefits of environmental protection measures recommended:</p> <p>The unloading process of spoil materials at barging point would be undertaken within a 3-sided screen with top tipping hall. Water spraying and flexible dust curtains would be provided at the discharge point for dust suppression.</p> <p>Watering 8 times a day on active works areas, exposed areas and paved haul roads.</p> <p>Dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation.</p> <p>Compensation areas included:</p> <p>N/A</p> <p>Population and environmentally sensitive receivers protected:</p> <p>Existing ASRs within 500m of the project boundary, including residential premises, schools, temple and institutional uses.</p>
Air Quality (Operation Phase)	<p>Environmental benefits of environmental protection measures recommended:</p> <p>N/A</p> <p>Compensation areas included:</p> <p>N/A</p> <p>Population and environmentally sensitive receivers protected:</p> <p>Existing and planned ASRs within 500m of the project boundary, including residential premises, schools, temple and institutional uses.</p>

Area/Issue	Environmental Outcomes / Benefits and Mitigation Measures
Airborne Noise	<p>Environmental benefits of environmental protection measures recommended:</p> <p>NSRs are protected with implementation of quiet PME, movable barriers and full enclosure as well as good site practices during construction stage. The predicted mitigated noise levels complied with the noise standards at all NSRs except Kei Faat Primary School. However, this affected NSR is school and has been noise insulated with air conditioners. By keeping the windows closed during construction activities, noise impacts at the indoor environment of these NSRs can be avoided. Notwithstanding this, it is recommended that the particularly noisy construction activities should be scheduled to avoid examination periods of these NSRs as far as practicable.</p> <p>The following mitigation measures would be recommended for operational traffic noise:</p> <p><u>Existing NSRs</u></p> <ul style="list-style-type: none"> • VB4-1: about 6m of 4m High Vertical Noise Barrier on Cha Kwo Ling Road; • VB4-2: about 40m of 4m High Vertical Noise Barrier on Cha Kwo Ling Road; • CT1: about 100m of 6m High Cantilever Noise Barrier with 4.2m Cantilever (at 45 °) on Cha Kwo Ling Road; • CT2: about 80m of 6m High Cantilever Noise Barrier with 3.7m Cantilever (at 90) on road EHC2; • FE1: about 400m Landscape deck provided on the entire extent of the Main line (Cha Kwo Ling Side); • FE2: about 130m of Full-enclosure provided on road S2; • FE3: about 120m of Full-enclosure provided on road EHC4; • FE4: about 200m of Landscape Deck provided on road P2 • SE1: about 260m of Semi-enclosure provided on road EHC2; • SE2: about 180m of Semi-enclosure provided on road S2; • SE3: about 30m of Semi-enclosure provided on road EHC4; • VB5-1: about 130m of 5m High Vertical Noise Barrier provided at road EHC4; • VB5-2: about 50m of 5m High Vertical Noise Barrier provided at road EHC4; • VB5-3: about 80m of 5m High Vertical Noise Barrier provided at road EHC1; • VB5-4: about 70m of 5m High Vertical Noise Barrier provided at road EHC1; • VB5-5: about 170m of 5m High Vertical Noise Barrier provided at road S3;

Area/Issue	Environmental Outcomes / Benefits and Mitigation Measures
	<ul style="list-style-type: none"> • VB5-6: about 180m of 5m High Vertical Noise Barrier provided at road S1; • LNS1: about 190m of Low Noise Surfacing on North and South Bound P2 Road ; • LNS2: about 240m of Low Noise Surfacing on East and West Bound Po Yap Road; and • LNS3: about 200m of Low Noise Surfacing on East and West Bound Po Yap Road. <p><u>Planned NSRs</u></p> <ul style="list-style-type: none"> • FE5: about 80m of Full-enclosure on road EHC4; and <p>With the proposed noise mitigation measures in place, the ‘New’ road noise contributions to the overall noise levels at all representative NSRs would be less than 1.0 dB(A) and the ‘New’ road noise levels would all be below the relevant noise criteria. Although the predicted overall noise levels at some of the NSRs does exceed the criteria by 1 dB(A) or more, the predicted overall noise level is not greater than that of the without Project scenario at the design year. No adverse noise impacts arising from the ‘New’ roads would be predicted at any of the representative NSRs. Noise exceedances at the representative NSRs, if any, would be due to the existing roads.</p> <p>Acoustic louvers and silencer were proposed for ventilation buildings & pumping station, no residual operation noise impact is anticipated.</p> <p>Compensation areas included: N/A</p> <p>Population and environmentally sensitive receivers protected: Existing and planned NSRs within 300m of the project boundary, including residential premises, schools, temple and institutional uses.</p>
Water quality	<p>Environmental benefits of environmental protection measures recommended:</p> <p>Implementation of the proposed mitigation measures including adopt non-dredged method by constructing steel cellular caisson structure with stone column for construction of seawall foundation, deployment of floating type silt curtain around the active stone column installation points, formation of seawall enclosing the reclamation for Road P2 (notwithstanding an opening of about 50m for marine access) prior to the filling activities, seawall opening of about 50m wide for marine access shall be selected at a location as indicatively shown in Appendix 5.10, no more than 3 filling barge trips per day with a maximum daily rate of 3,000m³ (i.e. 1,000 m³ per trip) for the filling operation at the reclamation area for Road P2, and carry out all filling works behind the seawall with the use of single silt curtain at the marine access. Floating single silt curtain shall be employed for construction of piers for TKO Interchange and all other marine works.</p> <p>Compensation areas included:</p>

Area/Issue	Environmental Outcomes / Benefits and Mitigation Measures
	<p>N/A</p> <p>Population and environmentally sensitive receivers protected: Coral communities at Junk Bay near Chiu Keng Wan, Junk Bay and Junk Island (refer to Appendix 5.5).</p>
<p>Waste management implication</p>	<p>Environmental benefits of environmental protection measures recommended:</p> <p>Implementation of the proposed waste control and mitigation measures would avoid the potential water quality, dust, odour, and noise impacts associated with handling, transportation and disposal of the identified wastes arising from the construction phase of the Project.</p> <p>It is estimated that approximately 4,170,420 m³ of inert C&D materials would be generated from the project, which are proposed to be reused at reclamation, disposed at PFRFs or recycled into aggregates and other rock products. About 83,000 m³ of non-inert C&D materials would be generated and disposed of at landfill.</p> <p>Methods to minimise the volume of sediment generated have been explored and implemented. The total volume of excavated sediment generated from the Project is estimated to be approximately 19,360 m³. All sediment will be reused on site after cement stabilization. Based on the results of the chemical screening result, approximately 17,450 m³ of sediment is considered below the RBRGs of heavy metals, TBT, PCBs and PAHs. It is anticipated that the reuse of these sediments will not lead to land contamination. Some 1,910m³ of sediment exceeded the RBRG for lead and will be suitable to reuse after cement stabilization. Further agreement on final treatment on this 1,910m³ of sediment has to be sought from DEP.</p> <p>With the implementation of the recommended mitigation measures, no adverse environment impacts would be expected.</p> <p>Compensation areas included: N/A</p> <p>Population and environmentally sensitive receivers protected: Water quality, air, and noise sensitive receivers in the vicinities of Project sites, the waste transportation routes and the waste disposal site(s).</p>
<p>Ecology</p>	<p>Environmental benefits of environmental protection measures recommended:</p> <p>Adjustment of the alignment option would avoid the clearance of vegetation on the disturbed woodland and the blockage of the streams where Philippine Neon Goby previously recorded, and minimize the loss of marine habitat.</p> <p>Implementation of good site practice would minimize the disturbance</p>

Area/Issue	Environmental Outcomes / Benefits and Mitigation Measures
	<p>to the nearby terrestrial habitats and associated wildlife.</p> <p>Coral translocation would reduce the loss of coral.</p> <p>The installation of silt curtain at the opening of the newly installed seawall and around the proposed marine works area would control water quality deterioration within acceptable level.</p> <p>Compensation areas included:</p> <p>Felling of mature trees would be compensated by planting of standard or heavy standard trees. Such compensatory planting for trees should be provided with at least a 1:1 ratio.</p> <p>The loss of hard substrata subtidal and artificial seawall intertidal habitat would be largely compensated through the provision of new artificial seawall with surface for recolonization of intertidal fauna and corals.</p> <p>The affected coral colonies except <i>Oulastrea crispata</i> within the reclamation area and bridge footprint would be translocated to the other suitable locations as far as practicable.</p> <p>Population and environmentally sensitive receivers protected:</p> <p>Vegetation, wildlife and their associated habitats at and in the vicinity of the project site.</p>
Fisheries impact	<p>Environmental benefits of environmental protection measures recommended:</p> <p>The installation of silt curtain at the opening of the newly installed seawall and the proposed marine works areas is recommended to protect fisheries resources. With implementation of the proposed mitigation measures, the potential impact on fisheries due to water quality deterioration would be controlled within an acceptable level.</p> <p>Compensation areas included:</p> <p>Not required (no significant adverse fisheries impact is anticipated).</p> <p>Population and environmentally sensitive receivers protected:</p> <p>Fisheries resources near the project site</p>

Area/Issue	Environmental Outcomes / Benefits and Mitigation Measures
Cultural Heritage	<p>Environmental benefits of environmental protection measures recommended:</p> <p>There would be indirect impact on Cha Kwo Ling Tin Hau Temple due to their close proximity to the work site of the Project. With implementation of the proposed mitigation measures, adverse impact on the temple should be largely reduced</p> <p>Compensation areas included:</p> <p>N/A</p> <p>Population and environmentally sensitive receivers protected:</p> <p>Cha Kwo Ling Tin Hau Temple</p>
Landscape and visual	<p>Environmental benefits of environmental protection measures recommended:</p> <p>The project works will result in adverse impacts to landscape resources and visually sensitive receivers. The proposed mitigation measures on the TKO side will reduce and offset the physical impacts on existing trees and vegetation, natural hillsides, natural coastline and sea waterbody areas. They will also mitigate the visual impacts on surrounding visually sensitive receivers in TKO. The creation of a landscaped deck over the road P2 will enhance the outlook of the existing reclamation area and new public waterfront access will be provided on the reclamation for the TKO interchange slip road landings. On the Lam Tin side of the project mitigation measures will reduce and offset the physical impacts on existing trees and vegetation on the site of the ex-Cha Kwo Ling Kaolin Mine site. They will also reduce the visual impact of the Lam Tin interchange on surrounding visually sensitive receivers through sensitive design of the new structures and extensive planting and greening.</p> <p>Compensation areas included:</p> <p>The landscaped deck over the depressed Road P2 will provide additional public open space. Public waterfront access will also be provided on the reclamation for the TKO Interchange. Streetscapes will be reinstated along Road P2 where it integrates with the TKO road system. The Lam Tin Interchange will be extensively planted to create a compensatory green outlook for surrounding residents.</p> <p>Population and environmentally sensitive receivers protected:</p> <p>The existing residents in TKO from elevated and at-grade viewpoints, the planned visually sensitive receivers on the TKO reclamation and surrounding area and recreational users of the surrounding country parks and Junk Bay will benefit from the landscape and visual mitigation measures. On the Lam Tin side, existing and planned visually sensitive receivers from at grade and elevated viewpoints will benefit from the mitigation measures. These will primarily be those residents of Lam Tin, however residents on the north shore of Hong Kong Island and seaborne travelers within Victoria harbour will also benefit.</p>

Area/Issue	Environmental Outcomes / Benefits and Mitigation Measures
Landfill Gas Hazard	<p>Environmental benefits of environmental protection measures recommended:</p> <p>A qualitative assessment of the potential hazards associated with landfill gas migration from Sai Tso Wan Landfill to the tunnels, roads and associated facilities during the construction and operation phases has been undertaken. The potential landfill gas hazards associated with the Project are evaluated using the source-pathway-target model in accordance with the EPD's Guidance Note on Landfill Gas Hazard Assessment. Sai Tso Wan Landfill has been restored under the Urban Landfills Restoration Contract commenced in April 1997 and were completed in May 1998. The restoration works at Sai Tso Wan Landfill has created a recreation ground which was opened for public use in April 2004. Sai Tso Wan Landfill is considered as a "medium" source of gas migration. The source-pathway-target analysis shows that overall landfill gas risk posed by Sai Tso Wan Landfill to the Project will be "medium" for both construction phase and operational phases.</p> <p>Landfill gas protection measures and monitoring requirements have been recommended for the construction and operation of the Project. It is expected that with the proposed protection measures in place, the potential risk of landfill gas migration to the Project will be minimal.</p> <p>Compensation areas included:</p> <p>N/A</p> <p>Population and environmentally sensitive receivers protected:</p> <p>Construction workers, operational staffs, maintenance workers, vehicles from general public</p>
Hazard to life	<p>Environmental benefits of environmental protection measures recommended:</p> <p>As there is no overnight storage of explosives on site, hazard assessment of the storage and transport of explosives is not required as per Section 3.4.10 of the EIA Study Brief No. ESB-195/2008.</p> <p>Compensation areas included:</p> <p>N/A</p> <p>Population and environmentally sensitive receivers protected:</p> <p>N/A</p>

15.4 Overall Conclusion

15.4.1 The findings of this EIA have provided information on the nature and extent of environmental impacts arising from the construction and operation of the Project. The EIA

has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards.

- 15.4.2 Overall, the EIA Report has predicted that the Project would be environmentally acceptable with the implementation of the proposed mitigation measures for construction and operation phases. An environmental monitoring and audit programme has been recommended to ensure the effectiveness of recommended mitigation measures.