

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 Introduction

This Environmental Impact Assessment (EIA) Report has presented the potential environmental impacts associated with the construction and operation of the widening and reconstruction of Tai Po Road (Sha Tin Section) and has comprised an assessment of noise, air quality, water quality, landscape and visual, landuse and waste impacts. The key findings and recommendations of the impact assessment are summarised below:

11.2 Noise

Noise will be generated from powered mechanical equipment during construction activities. The maximum noise levels generated during road construction and earthworks will exceed the daytime noise criteria of 75 dB(A) at dwellings and 70 dB(A) at schools unless mitigation is applied. To reduce the noise levels, mitigation measures are recommended to be implemented including the use of silencers and mufflers and installation of noise barriers. With implementation of these measures noise levels during construction will be within acceptable criteria.

Noise generated during the operation of the road was modelled using the Sound Plan package and the modelling results show that predicted Year 2021 noise levels may result in an exceedance of the standards unless mitigation is applied. Barriers, canopy and low noise road surfacing have been proposed to reduce the impacts. The maximum practicable noise mitigation scheme has been recommended to mitigate noise levels. There is no requirement for indirect noise mitigation.

11.3 Air Quality

Dust will be generated during construction works from exposed areas, stockpiles of materials, the movement of vehicles along the roadway and during excavation and handling of construction materials. Modelling results showed that with the incorporation of standard dust control measures such as watering and covering of stockpiled materials, dust levels at air quality sensitive receivers will be reduced to acceptable levels below the EPD maximum hourly limit of 500 $\mu\text{g}/\text{m}^3$ and will be within the Air Quality Objectives.

The types of air pollutants which will be generated during the operation of the road include NO_x, CO and RSP. The modelling results show that air pollution impacts will be within the standards of the Air Quality Objectives without mitigation being required.

11.4 Water Quality

Water quality impacts may occur during construction works from runoff of soil materials and construction by products, such as oil and fuel from construction plant. The EIA has recommended measures to reduce the potential for water quality impacts to occur during construction activities and, with implementation of these measures, water quality impacts are not expected to occur from the project.

Water quality impacts during operation may occur from runoff containing hydrocarbons and heavy metals or a range of pollutants in the event of a traffic accident. Mitigation of impacts from operations are particularly important because they may impact the water quality in the Shing Mun River channel. Measures have been recommended to reduce the potential for impacts by the installation of solids and oil traps within the road drainage system.

11.5 Visual, Landscape and Townscape

Landscape Impact

Overall, there will be a low degree of change to the key component features within the existing landscape. The ability of the landscape to accommodate change is high and there will be only a moderate impact on the landscape. Within the local and wider regional context the proposed road improvement works will not be significant. The road improvement works, incorporating extensive landscape mitigation measures, will not have a direct impact upon specific landscape elements or any acknowledged special landscape interests. Instead, it will have a subtle effect upon the overall pattern of landscape elements.

Visual Impact

In respect to all the adjacent sensitive receivers and some of the intermediate sensitive receivers towards the northwest, the road improvement works will not be compatible with the topography and land uses due essentially to the noise barriers. Whereas, for the intermediate sensitive receivers towards the southeast and all the distant sensitive receivers, the road improvement works will be compatible with the topography and land uses due to the distance factor and the intermediate structures and vegetation. There will be a level of visual obstruction created by the extensive noise barriers although, the visual impact created will be reduced due to the high quality design guidelines for the noise barriers and the extensive amenity planting.

Landscape Mitigation Measures

Appropriate landscape design measures will be developed in order to mitigate the assessed impacts as far as possible, increase visual quality and help blend the road and its traffic into the surrounding landscape. The mitigation measures will include consideration of; high quality design guidelines for the screen noise barriers; planting of engineered slopes, road verges, central dividers and around structures; and hard landscape treatment of the carriageway and roadside furniture. This includes the development of chromatic themes in the architectural treatment of engineering structures, and the consideration of landscape lighting and special landscape features.

11.6 Landuse Impact Assessment

In respect to the specific implications of the road improvement works on the land use zonings it is possible to conclude that there is no conflict with the known future planned developments. The main reason for this is that the road improvement works incorporate only modifications of the existing alignment so therefore the effect on land uses will be confined to the land use zoning for the

Shatin Section. The development potential in respect to the land uses in the vicinity of the noise barriers and additional planting will improve due to the reduction in aesthetic impact created by the existing carriageway. In the foreseeable future, any proposed development of land uses in close proximity to the Shatin Section will be confined to a single HOS residential tower.

11.7 Waste Management

The types of waste which will be generated during construction works include: excavated materials (such as soil and rock); demolition materials (such as asphalt and concrete); general construction waste (such as wood from formwork and equipment byproducts); chemical waste (including byproducts of maintenance of plant equipment); general refuse; and sewage from construction workers. These types of construction waste have the potential for impacting the surrounding environment if not managed properly. Measures are provided in the EIA for the proper waste handling and disposal during the widening and reconstruction works and implementation of these measures will reduce the potential for impacts to occur to the surrounding environment.

11.8 Beneficial Impacts

The Sha Tin Section of Tai Po Road is, at present, highly congested and during peak hour traffic, is backed up which presently results in noise and air quality impacts from queuing vehicles and reduces the enjoyment of the amenities in the area such as the bicycle lane next to the road. The project will relieve these impacts by providing free flowing traffic along this stretch of the roadway. Further, with implementation of the landscaping as recommended in the EIA, the area may benefit from improvements in amenity value.

11.9 Conclusion

With the implementation of the recommended mitigation measures in the EIA, the Project construction works and operation will not result in exceedence of the environmental criteria. Environmental monitoring and audit is recommended during construction and details are given in Chapter 12 of this report. A schedule of mitigation measures is given in Table 11.1

In accordance with Annex 10 in the Technical Memorandum on Environmental Impact Assessment Process, the adverse effects can be eliminated, reduced or offset and therefore the visual and landscape impacts on site are acceptable, with the implementation of the proposed mitigation measures,

Table 11.1 Mitigation Schedule

| Impact | Mitigation | Responsible Authority | Timing |
|---------------------------|---|-----------------------|---------------------|
| Noise during construction | <p>The construction activities should be carried out in the daytime hours (08.00-19.00). If construction is required during evening or nighttime hours, a noise control permit will be required to be obtained by the Contractor.</p> <p>Silencers should be installed at the exhaust pipes of the dump truck, lorry, concrete lorry mixers and piling plant and the noise levels can be reduced by 5 dB(A).</p> <p>Mufflers should be installed at air compressors and breakers and the noise levels can be reduced by 5 dB(A).</p> <p>Construction of temporary barrier along the construction site boundary such that the construction equipment will be totally screened.</p> <p>Because a number of the schools are very close to the construction works, it is further recommended that the Contractor contact the schools listed as sensitive receivers in the area and provide contact information for them to notify the Contractor during examinations. The Contractor should avoid work in the area of the schools until examinations are completed.</p> <p>In case the noise would be still exceeding the standard, restriction on operation time would be required. When the noise would be exceeding the standard of above noise mitigation, the construction near the school would be only conducted during school holidays.</p> <p>In addition, the following should be included in the project construction works:</p> <ul style="list-style-type: none"> (i) good site practice to limit noise emissions at source; (ii) avoidance of simultaneous noisy activities; (iii) selection of quiet plant and working methods; (iv) reduction in the numbers of plant operating in critical areas close to NSRs; and (v) environmental monitoring and audit as discussed in Chapter 12 of this report. | Contractor | During construction |

| Impact | Mitigation | Responsible Authority | Timing |
|-------------------------------|---|--|----------------------|
| <p>Noise during operation</p> | <p>(a) Low noise road surfacing will be used along both the widened and reconstructed section of the works, as specified in the Study Brief (Clause 2.7).</p> <p>(b) A "top bent" barrier, 11m high and with a width of 7m, 8.5m high and with a width of 7m, and 6m high and with a width of 10m will be built in front of Wai Wah Centre on the reconstructed section of the project, open on the side away from the NSR. This barrier is needed to meet the requirement of the 24 Hour NIA report. The barrier height takes account of the sight line requirement of the sign gantries.</p> <p>(c) A "top bent" barrier, approximately 11m high and approximately 5.2m wide (open on the side away from the NSRs) will be built on the widened section of the project near Shatin Plaza. This barrier is required to meet the requirements of the TM.</p> <p>(d) A 5m high barrier will be built on the central median along the widened section of the project near Pai Tau, Sheung Wo Che, Sha Tin Plaza and Lek Yuen Estate. This barrier is required to meet the requirements of the TM.</p> <p>(e) A "top bent" barrier, approximately 11m high and approximately 5m wide (open on the side away from the NSRs) will be built on the widened section of the project near Lek Yuen Estate. This barrier is required to meet the requirements of the TM.</p> <p>(f) 6m high barriers, approximately 3m wide (open on the side away from the NSRs) will be constructed along the slip road to the diamond interchange on the widened section of the project near Lek Yuen Estate. These barriers are required to meet the requirements of the TM.</p> <p>(g) 1m high barriers on the parapets (total height 2m) will be constructed along the slip road to the diamond interchange on the widened section of the project near Sheung Wo Che. These barriers are required to meet the requirements of the TM.</p> | <p>Designer to implement in the engineering design</p> | <p>During design</p> |

| Impact | Mitigation | Responsible Authority | Timing |
|--------|--|-----------------------|--------|
| | <p>(h) A 6m high barrier will be built along the widened section of the project section between Sheung Wo Che and Ha Wo Che and in front of Siu Wo Court. This barrier is required to meet the requirements of the TM.</p> <p>(i) A series of 11m high 10m wide, 6m high 10m wide and 6m high 7m wide barriers will be built on the widened and reconstructed section of the project near Lek Yuen Estate and Wo Che Estate to meet the requirement of the TM.</p> <p>(j) A "top bent" barrier, 11m high and with a width of 3m, 8.5m high and with a width of 4m, and 6m high and with a width of 5m (open on the side away from the NSRs) will be built along the reconstructed section of the road towards the eastern end of Wo Che Estate. This barrier is needed to meet the requirements of the NIA for 24 Hour Opening of Border Crossings. The barrier height takes account of the sight line requirement for the sign gantries.</p> <p>(k) A 5m high barrier will be built along the slip road connecting Fo Tan Road and Tai Po Road along the reconstructed section of the project. This barrier is required to meet the requirements of the 24 Hour NIA report.</p> | | |

| Impact | Mitigation | Responsible Authority | Timing |
|---------------------------------|--|-----------------------|---------------------|
| Air quality during construction | <p>(1) Watering of unpaved roads, which results in road dust suppression by forming moist cohesive films among the discrete grains of road surface material. An effective watering programme, i.e. twice daily watering with complete coverage, is estimated to reduce erosion of unpaved roads by 50%;</p> <p>(2) Watering at every 1.5 hours at the construction area during construction is estimated to reduce dust emissions by 70%;</p> <p>(3) Where breaking of oversize rock/concrete is required, watering should be implemented to control dust. Water spray should be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created;</p> <p>(4) Dropping heights for excavated materials should be controlled to a practical height to minimize the fugitive dust arising from unloading;</p> <p>(5) During transportation by truck, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport;</p> <p>(6) All stockpiles of aggregate or spoil should be enclosed or covered and water applied in dry or windy condition; and</p> <p>(7) Effective water sprays should be used on the site at potential dust emission sources.</p> | Contractor | During construction |

| Impact | Mitigation | Responsible Authority | Timing |
|-----------------------------------|---|-----------------------|---------------------|
| Air quality during operation | Not required | n/a | n/a |
| Water quality during construction | <p>Surface Water Run-off</p> <p>(i) Whenever possible construction works should be programmed so as to minimise excavation during the wet season (April to September). If this is not possible then measures should be taken to minimise the areas exposed by covering temporary exposed slopes with tarpaulins or similar material, the protection of temporary road surfaces with gravel or crushed stone and the early reinstatement of final surfaces with hydroseed grass/shrub mixture. This latter measure would have the added benefit of reducing the windblown dust during the dry season. Where temporary covering of slopes is required this should be carried out before the onset of the rainfall or storm.</p> <p>(ii) Existing and newly constructed open manholes should be covered and sealed to prevent run off and water borne debris entering the drainage network without having previously passed through a sediment trap.</p> <p>(iii) Stock piles of construction materials, sand and gravel, or excavated material should be covered with tarpaulins prior to rainstorms. The washing of material from the stock piles directly into the storm drains should be prevented by passing the run off through a sediment trap.</p> | Contractor | During construction |

| Impact | Mitigation | Responsible Authority | Timing |
|--------|---|-----------------------|--------|
| | <p>iv) The surface water from the site should be discharged into storm water drains after passing through sand and silt traps designed to accommodate the maximum discharge from the site. Within the site channels, bunds or sand bags should be used to direct run off into the traps. Storm water from out with the site should be prevented from washing over the site by the construction of interceptor channels at the site boundary. Both perimeter channels and the sedimentation traps should be constructed prior to the commencement of site formation and earthworks.</p> <p>(v) The efficiency of the interceptor channels, traps and sedimentation chambers should be maintained by regular cleaning of accumulated silt and sand. Particular attention should be paid to maintenance following heavy rainfall and immediately after the issue of heavy rainfall warning by the Hong Kong Observatory.</p> <p>(vi) The ingress of rainwater into trenches should be minimised by the construction of bunds to prevent water flowing into the trench and covering by tarpaulins to prevent direct entry. The lengths of excavated trenches should be minimised and backfilled at the earliest opportunity. Water pumped from the trenches should be discharged to the storm water drains following passage through a suitable silt trap.</p> <p>Groundwater - Any ground water seeping into any trenches or foundation works should be passed through a silt trap prior to discharge to the storm water drains.</p> <p>Wastewater from Concrete Batching - The water used for the washing down of mixing drums used for onsite batching of concrete and delivery lorries for off site batched concrete should be recycled whenever possible. Wastewater generated from the washing which is discharged should be passed through a silt trap before discharge to the storm water system.</p> | | |

| Impact | Mitigation | Responsible Authority | Timing |
|--------|---|-----------------------|--------|
| | <p>Water from Wheel and Subframe Washing - The waste water from the washing of the wheels and subframe of vehicles returning from the site onto public roads will contain suspended solids and debris. A washing bay should be provided at the exit from the site and should, where practicable, incorporate water recirculation. Water from the washing bay which is discharged to the storm water system should first be passed through a silt trap which also includes an oil/grease removal weir.</p> <p>Wastewater from Site Facilities</p> <p>(i) Run off from plant maintenance area will carry fuel and lubricating and hydraulic oils adsorbed on the suspended solids. Plant maintenance areas should be paved to prevent waste oils soaking into the ground. Where possible the area should be undercover to minimise to formation of run off and any run off from the paved area passed through an oil trap before being discharged to the storm drains. Fuel storage tanks should be surrounded by bunds with a capacity of at least 150% of the storage capacity. The bunded areas should be able to be drained of rain water through the petrol interceptor and accumulated rain removed at regular intervals.</p> <p>(ii) Waste oils from the site should be collected and stored for recycling or disposal in accordance with the Waste Disposal Ordinance and absorbent cloths and granules should be available for the clean up of spillages.</p> <p>(iii) Sewage from toilets and kitchens should be discharged directly into a foul sewer. If it is not possible to locate the site offices within easy access of a foul sewer a septic tank and soakaway should be constructed before the offices are occupied. If only toilets are provided then chemical toilets will be more appropriate. Chemical toilets should be emptied on a daily basis and the contents taken to a foul sewer or the Sha Tin Sewage Treatment Works for disposal. Wastewater collected from canteen kitchens should be discharged to the foul sewers via grease traps which provide a minimum of 20 minutes retention during peak flow.</p> | | |

| Impact | Mitigation | Responsible Authority | Timing |
|---------------------------------------|--|--|----------------------|
| | <p>iv) Run off from roofed surfaces of site facilities should be collected and diverted to a storm water drain. Passage through a silt trap is only required if the water is diverted via open channels which might accumulate solids during non rainy periods or which intercept surface run off from unpaved areas.</p> <p>Licensing of Site Discharges – Discharges into foul sewers or storm water drains, other than domestic sewage and unpolluted water, and the discharge of septic tank effluent into the ground are controlled under the Water Pollution Control Ordinance (WPCO). The discharge from the construction site will therefore be controlled under the Ordinance. Discharges from the site will be required to meet the terms and conditions of a valid WPCO licence. The application for a WPCO licence is made through the EPD or District Office. The application for the licence should contain details of the points of discharge of the wastewater and storm water, and the volumes to be discharged and should be made before the commencement of any discharge. A minimum of twenty days is required for an application for a discharge to a foul sewer of storm drain and a minimum of fifty days for a discharge directly to surface waters.</p> | | |
| <p>Water quality during operation</p> | <p>Contaminants present in the run off during normal operation normal will, by their chemical nature, be strongly adsorbed onto the particulate phase. The use of silt or sand traps, preferably built into the road drainage system will control both the suspended solids in the run off and the contaminants adsorbed onto them. These traps should be maintained regularly and frequently cleaned to prevent the accumulation of solids with the resultant reduction in retention time and thus efficiency.</p> <p>In the event of an accident giving rise to the spillage of fuel or vehicle load from a vehicle permitted to use the roadway, the primary objective should be to contain the spillage for removal from the road and its subsequent safe disposal. If this is not possible and the spillage enters the surface water drainage system, it should be held back by interceptor tanks with both under and overspill weirs to retain floating and settleable material. These should be readily accessible for emptying in the event of an accident.</p> | <p>Designer to implement in the engineering design</p> | <p>During design</p> |

| Impact | Mitigation | Responsible Authority | Timing |
|---|--|-----------------------|----------------------------|
| <p>Waste management during construction</p> | <p>Excavated/Demolition Waste – Excavated material consisting of soil and rock, the materials should be balanced on site as much as possible and remaining waste not used on site should be disposed of at a public fill site. The excavated and demolition materials should be stockpiled in designated areas away from the streams and drainage areas. The material should be covered at all times to avoid run off during rain storms and dust generation during windy conditions.</p> <p>General Construction Waste – General construction waste material should be sorted on-site to remove material which is suitable for re-cycling or use in public dumps. The remainder will be disposed of at the nearest landfill site. A designated sorting area should be established on the site to carry out sorting activities in such a manner to avoid safety hazards. Materials should be collected on a regular basis. Vegetation waste arising from works should be composted or chipped and then recycled for plantings or disposed of at landfill.</p> <p>Chemical Waste - For the handling and disposal of chemical waste, the Contractor should register with EPD as a chemical waste producer under the Waste Disposal (Chemical Waste) (General) Regulation. A licensed Contractor should be employed to collect chemical waste for delivery to a licensed treatment facility. Suitable chemical waste storage areas should be formed on the site for temporary storage pending collection. Chemical waste materials should be kept covered and should be sited well away from drainage areas (watercourses) and contained within paved and bunded areas.</p> <p>General Refuse - Temporary storage areas for general refuse should be provided which are enclosed to avoid the attraction of pests. General refuse should be stored on site for the minimum time practical and should be disposed of to the nearest landfill.</p> <p>Sewage - If chemical toilets are used on site, nightsoil should be removed on a regular basis to reduce the potential for odours and the generation of pests.</p> | <p>Contractor</p> | <p>During construction</p> |

| Impact | Mitigation | Responsible Authority | Timing |
|-----------------------------------|---|---|----------------------------|
| Waste management during operation | Not required | n/a | n/a |
| Construction impacts generally | Monitoring and audit in accordance with Chapter 12 of the EIA and the EM&A Manual | Engineer | During construction |
| Soft Landscape Works | <ul style="list-style-type: none"> • Protection of retained trees, replanting of transplanted trees and conservation of topsoil. • Compensatory planting for the loss of existing woodland. • Planting of engineered slopes, road verges, central dividers and around structures. | Highways Department/Contractor | During construction |
| Hard Landscape Works | <ul style="list-style-type: none"> • Installation of screen barriers. • Hard landscape treatment of the carriageway and roadside furniture, including the development of chromatic themes in the architectural treatment of engineering structures, and the consideration of landscape lighting and special landscape features. | Highways Department Maintenance Division/Structures Division/Contractor | During construction |
| Trees to be Retained | <ul style="list-style-type: none"> • Fencing shall be provided to protect the existing trees that will be affected; • No part of the trees shall be used for support and the fence must be firmly secured to keep all parts of the tree protected from any dust and physical damage. • Guy wires shall be used for firming up the existing trees in case of any excavation near the trees that might affect the stability of the trees. • Extra care should be given to existing trees in close proximity to the excavation area. | Contractor | During construction period |

| Impact | Mitigation | Responsible Authority | Timing |
|--------------------------|---|-----------------------|----------------------------|
| | <ul style="list-style-type: none"> • Proper procedures such as gradual root and crown pruning should be performed where one third of the root ball extends into the excavated area. • If extensive pruning is required, pruning in several steps should take place prior to subsoil disturbances adjacent to the trees. • Any tree surgery works shall be undertaken according to acceptable horticultural practice. • All retained tree specimens to be inspected on a three-monthly basis. • Compensatory tree planting for excess felling of any specimens recommended for retaining. | | |
| Trees to be Transplanted | <ul style="list-style-type: none"> • Trees shall be pruned to remove one third of branches and to produce a well-shaped, balanced head. • All pruning work shall be carried out in accordance with good horticultural practice and B.S. 3998 • Safety precautions shall be taken to protect those engaged in operations as well as people and property in the vicinity. • Any material pruned from trees shall be collected and removed from site. • Tree lifting work shall be carried out in accordance with good horticultural practice. • Trees shall be wrapped and protected to prevent mechanical and climatic damage during lifting and transportation. • Trees transplanted to the holding nursery are to be containerised prior to planting, using a root ball container. • Transport the trees with care to the new site and plant in accordance with good horticultural practice. • Staking of trees is required immediately after the tree has been transplanted. • Maintenance of the trees shall be undertaken following transplantation in accordance with good horticultural practice. | Contractor | During construction period |

| Impact | Mitigation | Responsible Authority | Timing |
|--|--|-----------------------|-----------------------------------|
| <p>Trees to be Felled</p> | <ul style="list-style-type: none"> • Trees can only be felled following approval by the relevant District Lands Officer. • Diseased and / or dead trees can only be felled as specified or as instructed / supervised on Site. • Completely remove the tree including removal of the stump to the extent of the depth of the root system below ground. • Any felled timber and waste material shall be collected and removed from site and deposited in a designated tip. • Back-fill holes or pit left as a consequence of the tree felling operation with cement stabilised soil, compacted to 95% of the B.S. maximum dry density. • Surface of the back-filled hole or pit shall be made level with the surrounding slope. | <p>Contractor</p> | <p>During construction period</p> |
| <p>12-Month Maintenance Schedule for Landscape Works</p> | <ul style="list-style-type: none"> • Plant materials shall be maintained immediately after planting works, and maintenance shall continue for a one calendar year Defects Liability Period beyond the date of certified Practical Completion. • Water all planting and grassed areas as often as is required to keep the soil moist. • Hoe and weed all planting areas at least once every month during the growing season and every 3 months otherwise and apply mulch as necessary. • Fertilise all plants once every six to eight months. • Grass cutting/mowing of hydro-seeded areas shall be carried out at least once every 2 months • Pruning should be carried out for trees and shrubs and disease / insect control carried out as is required. • Replace dead and dying plants as often as is required. • Check protective fencing, tree grates and guards monthly. • Check at the end of Defects Period for overcrowding conditions leading to unhealthy growth. • Firming up of plants shall be undertaken from time to time, particularly after a heavy rainstorm or typhoon. • Planting areas and plants subject to 12-Month Maintenance Schedule for Landscape Works shall all be protected at all times against trespassing and damage of any kind. • The works shall be jointly inspected at the end of the 12-month Maintenance Schedule before hand-over to the maintenance authority. Highways Department will seek agreement with RSD for the subsequent maintenance | <p>Contractor</p> | <p>After construction period</p> |