Trunk Road T7 in Ma On Shan
Environmental Impact Assessment

EXECUTIVE SUMMARY

February 1998

Maunsell Consultants Asia Ltd.
in association with
ERM (Hong Kong) Ltd.
Hassell Ltd.

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Prepared by: ERM

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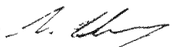
signed: 

dated: 9 February 1998

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1. INTRODUCTION

1.1 Preamble

1.1.1 On 20 March 1997, the Territory Development Department (New Territories East Development Office) of the Hong Kong Government commissioned Maunsell Consultants Asia Ltd, supported by ERM Hong Kong and Hassell Ltd, to undertake the Environmental Impact Assessment (EIA) for Trunk Road T7 in Ma On Shan. The purpose of the EIA is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the proposed project and all related activities taking place concurrently. This information will contribute to decisions on whether:

- the predicted levels of any environmental impacts that are likely to arise as a result of the proposed trunk road are within the established standards and guidelines;
- there are any specific conditions and requirements for environmental protection that should be applied to the detailed design, construction and operation of the proposed trunk road; and
- any residual impacts identified in the EIA will meet the established standards and guidelines after the proposed mitigation measures are implemented.

1.1.3 This Executive Summary highlights the issues of concern to the community, the levels of residual environmental impacts and cumulative effects, recommended mitigation measures and requirements for implementation of the project which have been identified in the EIA.

1.2 Study Area

1.2.1 In general, the boundary of the "study area" for the purpose of the EIA Study is 300 m from either side and along the full stretch of the proposed alignment. In the case of the landscape impact and air pollution assessment, the study area is defined by a distance of 500 m from the proposed alignment. All visually sensitive receivers (VSRs) will be assessed where necessary, regardless of the distance from the proposed alignment as part of the visual impact assessment.

1.2.2 With respect to noise impact assessment, the study area could be reduced accordingly, if the first layer of Noise Sensitive Receivers (NSR)s, closer than 300 m from the road, provide adequate acoustic shielding is provided to those NSRs located further behind. *Figures 1.2a and 1.2b* show the extent of the Study Area for the EIA Study.

1.3 Project Description

1.3.1 The Proposed Trunk Road T7 will connect the existing Ma On Shan Road and Sai Sha Road, allowing traffic destined for north Ma On Shan, Lok Wo Sha and Sai Kung to by-pass the busy Ma On Shan Town Centre. The current programme indicates that construction is expected to commence at the

beginning of January 2000, with a 36 month construction schedule proposed. Completion of the Project is therefore expected at the end of December, 2002.

1.3.2 The works will entail construction of both elevated and at-grade roads, as shown in *Figures 1.2a and 1.2b*. Footbridges and pedestrian subways will be constructed at appropriate locations, with all elements draining into the ground level drainage system. Elevated and at-grade road and tunnel construction details are discussed below.

1.3.3 The elevated roads will be built on prestressed concrete decking, supported by reinforced concrete columns/abutments founded on piles. The bridge deck will be built using the precast segmental balanced cantilever technique. The deck will be fabricated in segments in the casting yard, transported to the site by truck, and then lifted and placed using a launching girder and tracked-based crane.

1.3.4 The location of the casting yard is at the proposed T7 Interchange and is shown in *Figure 1.3a*. The casting yard is expected to accommodate: site offices and storage areas; concrete precasting; and storage of precast units. After the completion of Road T7, the casting yard will be landscaped and planted.

1.3.5 A section of tunnel will be created at the T7 and Sai Sha Road Interchange, to minimise the volume of excavated material and also to limit the visual intrusion of T7 into the landscape. Two tunnels will be constructed by drill and blast methods, these will be 270 m and 210 m in length (see *Figure 1.3b*).

1.4 Structure of the Executive Summary

1.4.1 After this introductory section, the remainder of the report is arranged as follows:

- *Section 2,* identifies the impacts arising from the construction of T7;
- *Section 3,* identifies the impacts arising from the operation of T7; and
- *Section 4,* discusses the overall conclusions of the EIA.

Key

300m Study Area Boundary

Elevated Sections

Limit of Roadworks

TRUNK ROAD T7 EIA - THE STUDY AREA

FIGURE NO.: 1.2a

SCALE : 1 : 5500

DATE : 16/7/97

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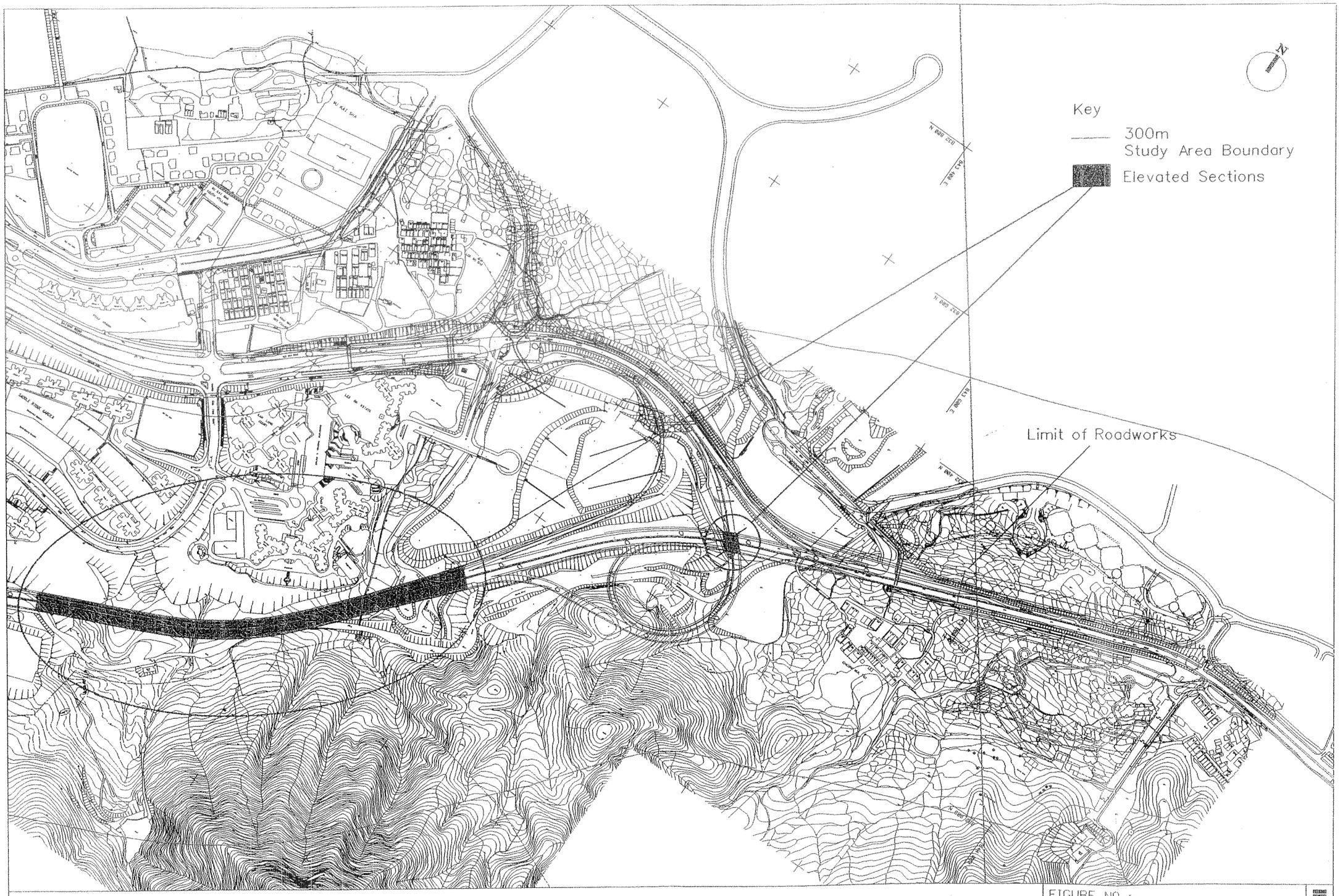

TRUNK ROAD T7 EIA - THE STUDY AREA

FIGURE NO.: 1.2b		
SCALE : 1 : 5500	DATE : 23/6/97	Maunsell

PROPOSED LOCATION OF CASTING YARD

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Date: 08 FEB 98	Coord.: Q:\PROJECTS\60695\SKETCH\SKT2.DWG
Scale: NIL	Figure No 1.3 a

PROPOSED LOCATION OF CASTING YARK

SLIP ROAD 122/D

SLIP ROAD 122/C

TRUNK ROAD T1

SLIP ROAD 122/A

ROAD P8

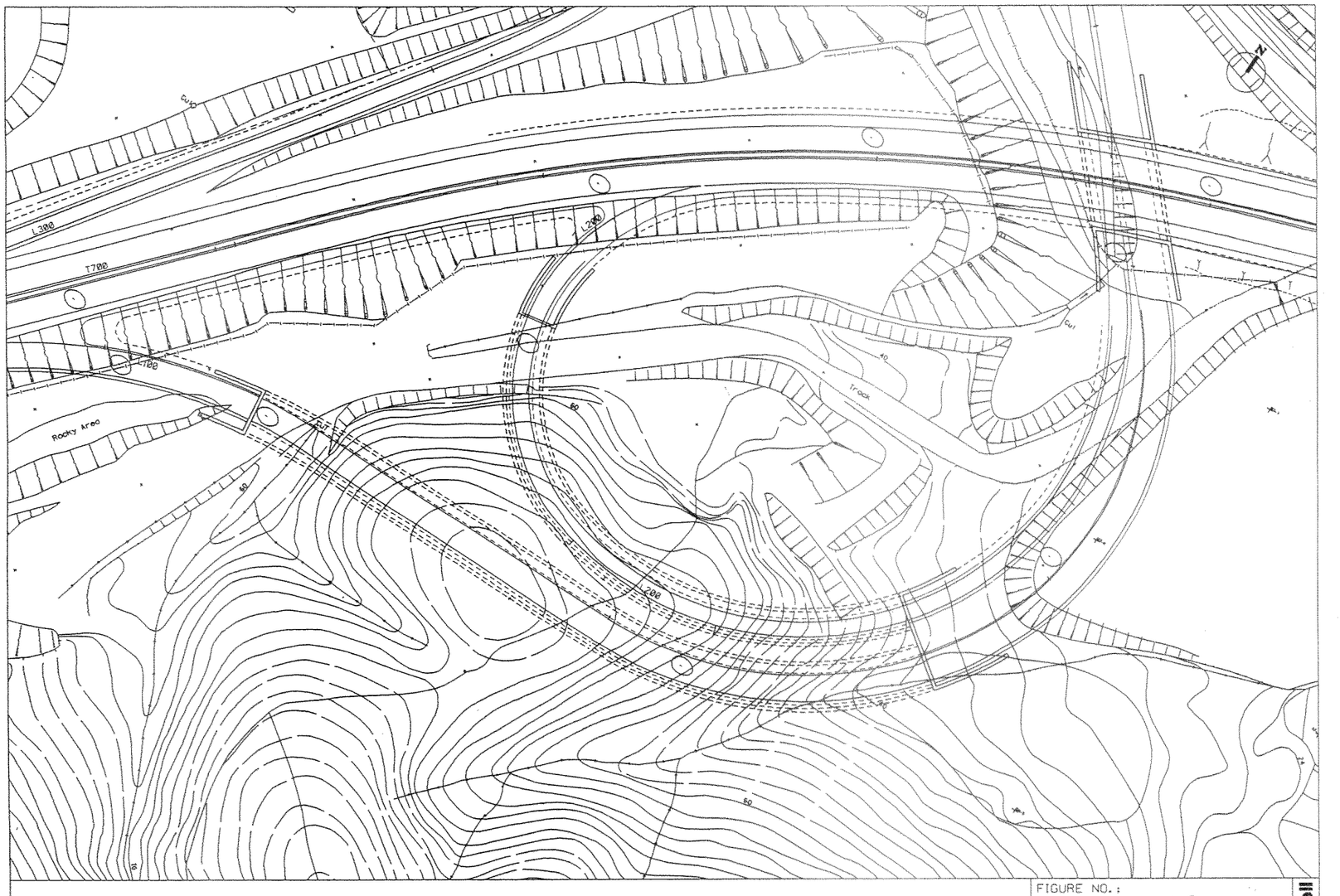
SLIP ROAD 122/B

N

832 900 N

832 000 N

832 100 E



PROPOSED TUNNEL OPTION FOR T7 INTERCHANGE

FIGURE NO.: 1.3b	
SCALE : 1 : 1500	DATE : 20/11/97

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2. CONSTRUCTION IMPACTS

2.1 Baseline Conditions

2.1.1 The area through which T7 passes can be readily divided into rural and residential sectors. To the north of the proposed route lie a number of existing and planned high rise residential estates, some of which include primary and secondary schools, while the area to the south is primarily rural, with occasional low rise dwellings.

2.1.2 Several small streams will be crossed and culverted during the construction works and the water quality in their upper stages is likely to be good, since they arise in the Ma On Shan Country Park, and flow through undeveloped countryside until they reach the road. Downstream of the road, the lower reaches of the streams are channelised and heavily sedimented.

2.1.3 The ecological habitats found in the vicinity of the T7 alignment comprise: different types of secondary and plantation woodlands; wasteland over previous quarry areas and disturbed ground; and the scrubland-woodland mosaic higher up the slopes of the Hunchbacks. Most of the area to the north-west of the proposed alignment is densely populated and highly urbanised with some landscaped areas that are of limited ecological value. The south-east part of the Study Area, i.e. the lower slopes of the Hunchbacks, however, are mainly well-vegetated with broad leaved scrubland-woodland mosaic contiguous with the woodland of the surrounding Country Park.

2.2 Noise

Unmitigated Impacts

2.2.1 The works will require a number of noisy activities including the use of heavy plant for excavation, filling, concreting and piling operations as well as on-site haul road traffic. One other construction site, located at the T7 Interchange, will be necessary to accommodate site offices, storage area and precasting yard.

2.2.2 The construction of both new roads and the alteration of existing roads, within the T7 road network, have the potential to generate noise impacts at adjacent sensitive receivers. Cumulative effects may occur where noisy construction processes take place on adjacent sections of road.

2.2.3 A section of tunnel at the T7 Interchange will be constructed by drill and blast methods. The controls on blasting likely to be required to safeguard nearby structures will provide a degree of mitigation by giving prior warning of explosions and muffling the blast noise.

Recommended Mitigation Measures

2.2.4 Noise emissions from construction sites can be minimised through good site practice, selecting quiet plant and quiet working methods and through the use of temporary barriers. These methods will be effective in providing an overall reduction in construction noise levels, however, they will not be enough to protect fully the closest noise sensitive receivers (NSRs).

2.2.5 Residual impacts are likely at the following locations:

- Shing On temporary housing area;
- schools within the Heng On Estate;
- residential blocks within Heng On Estate;
- proposed railway depot and residential development at Lee On;
- residential blocks within Kam Ying Court;
- residential block within Lee On Estate;
- residential development TPTL 146; and
- Cheung Muk Tau Village.

2.2.6 Further mitigation has been developed on a site specific basis to deal with the residual impacts and it has been identified that a combination of restricting the amount of time during which noisy plant is permitted to operate and limiting the numbers of noisy plant in use at any one time will provide sufficient additional noise control to prevent any adverse residual impacts at the affected NSRs.

2.3 Air Quality

Unmitigated Impacts

2.3.1 The principal air quality impacts during the construction phase will be fugitive dust emission impacts on the adjacent sensitive receivers. Site clearance, excavation, materials handling and vehicle movements on unpaved site roads will be the major dust sources. The only other likely source of dust will be the blasting for the construction of the two tunnels at the T7 Interchange.

2.3.2 The levels of dust predicted were within the 1-hour criterion, except for ground level impacts at four of the air sensitive receptors (ASRs). The greatest exceedances occurred at the Chiu Chow Association Secondary School and Heng On Estate (about 50% above the criterion). At Shing On Temporary Housing Area and Lot TPTL 146 the predicted concentrations were also up to 20% above the 1-hour criterion. The predicted 24-hour averages were all well within the criterion, with the highest concentration, at Heng On Estate, at 80% of the limit level.

2.3.3 If blasting is required for portal and tunnel construction, it should be noted that the impacts on even the nearest ASRs, which are located more than 200 m away from any of the portal openings, would be negligible.

Mitigation Measures

2.3.4 In order to prevent exceedances of the 1-hour criterion and to minimise impacts at all ASRs, good construction practices should be incorporated into the Contract Specification. These measures can be expected to reduce dust emissions by at least 50% and include:

- haul road watering and vehicle washing before leaving the site;
- careful handling and the containment or damping of dusty materials; and
- covering or damping exposed areas of ground.

2.4 Water Quality

Unmitigated Impacts

2.4.1 Unmitigated construction work can have a number of direct impacts upon the quality of receiving waters. Construction works involving the cutting and filling of existing topography, slope stabilisation works, tunnelling and rock excavation, can all significantly increase the quantities of suspended solid entering adjacent watercourses, whilst the temporary diversion of streams will affect both their hydrology and water quality. The operation of an on-site concrete casting yard for the pre-fabrication of bridge deck segments may also have impacts on local water quality. The uncontrolled disposal of sewage from the workforce, if unmitigated, can also affect water quality.

2.4.2 At least ten streams will be directly affected by the proposed road construction. These are mostly ephemeral watercourses which are culverted in their lower reaches. Direct impacts will include an increase in the lengths of these streams that will be culverted. Three streams to the east of the proposed trunk road will be more substantially impacted upon, as the road will be in cutting at this location and the adjacent slopes will require stabilisation. One small pond along the route of the proposed trunk road will be permanently lost.

Proposed Mitigation Measures

2.4.3 Good site management and housekeeping practices in accordance with the *Practice Note for Professional Persons - Construction Site Drainage, EPD, 1994* (ProPECC PN 1/94) should be followed to ensure that implemented mitigation measures are effective. Mitigation measures to control waste water discharges should include:

- appropriate drainage facilities to control site runoff;
- proper site management to prevent debris and harmful materials from reaching drainage facilities; and
- the provision of adequate toilet facilities and proper disposal of sewage by a recognised waste disposal company.

2.5 Waste

Unmitigated Impacts

2.5.1 Construction activities will result in the generation of a variety of wastes which can be divided into distinct categories based on their constituents, as follows: excavated inert material; construction and demolition waste; chemical waste; and general refuse.

2.5.2 Due to the nature of the topography along the alignment, the majority of any excavated materials could be reused on-site in the construction of any road embankments, and so minimal quantities are expected to require disposal offsite. The disposal of construction and demolition wastes is unlikely to raise any long term concerns because of the inert nature of most construction wastes.

2.5.3 Chemical wastes may pose serious environmental and health and safety hazards if not stored and disposed of in an appropriate manner as outlined in the *Waste Disposal (Chemical Waste) (General) Regulation* and the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

2.5.4 The storage of general refuse has the potential to give rise to adverse environmental impacts. These include odour if the waste is not collected frequently (eg. daily), windblown litter, water quality impacts if waste enters water bodies, and visual impact.

Mitigation Measures

2.5.5 Inert excavated material and construction waste can either be reused on site, taken to other reclamation or construction projects, or sent to a public fill site. Materials containing no more than 20% by volume of inert material would be sent for disposal at a landfill, whilst the inert fraction should be delivered to public filling areas or other reclamation sites. Other waste, including general refuse, should also be disposed of in a responsible manner and not give rise to adverse impacts.

2.5.6 Mitigation measures to ensure the effective management of wastes arising should include:

- the implementation of general good housekeeping practices;
- sorting and segregation of wastes for reuse and disposal;
- observing the requirements of the disposal permits; and
- meeting the requirements of the *Waste Disposal Ordinance*.

2.6 Ecology

Unmitigated Impacts

2.6.1 The major source of ecological impact associated with T7 will be direct land take for the construction of the new carriageways, excavation works and slope stabilisation. Since the proposed alignment is mostly along existing tracks bordered by either wasteland or plantation woodlands on both sides, impact to ecologically important habitat will thus be limited to those sections where secondary woodlands and old plantation woodland will be encroached upon. A small portion of scrubland-woodland mosaic will be also affected by the project.

2.6.2 It is estimated that 900 m^2 of the shrubland-woodland mosaic within the Ma On Shan Country Park will be lost, in addition to about 2.5 ha of secondary woodland and 2.5 ha of old plantation woodland. The impact from the loss of the shrubland-woodland mosaic is minimal, whilst the impact arising from the direct land-take of the secondary woodlands and old plantation woodland is considered to be moderate. The impact to wildlife is considered to be limited.

2.6.3 The construction work may also affect the surrounding habitat indirectly, due to uncontrolled storage or dumping of construction material, disposal of surplus fill, and increased human activities. This indirect impact is considered to be moderate if woodland habitats are affected.

Mitigation Measures

2.6.4 Since the feasibility and practicability for any alternative alignment is limited because of the constraints of the Ma On Shan Country Park and the Water Services Department facilities, the "moderate" direct impact on the woodland habitats is unavoidable. However, such impact could be mitigated on-site through advance/compensatory tree replanting along both sides of the proposed alignment during or after completion of the construction process, particularly over the temporary work area where wasteland can be planted, and the fringe between the T7 alignment and the Ma On Shan Country Park. Plant species selected should be similar to the scrubland-woodland mosaic nearby, or other native grass, herbs, shrub and tree species that bear fruits preferred by birds and/or palatable to larval or adult butterflies. A tree survey should also be conducted before the work so as to fulfill the requirement of the WBTC 24/94 and PELBTC 3/94.

2.6.5 In order to minimise any adverse ecological impact to the surrounding environment due to uncontrolled construction activities, fences should be erected and maintained along the boundary of construction sites to prevent encroachment into adjacent areas and the areas of vegetation to be cleared should be clearly defined and minimised as far as possible. Sufficient fire-fighting equipment should also be provided at regular intervals along the alignment.

2.7 Landscape and Visual

Unmitigated Impacts

2.7.1 In the area of the Hunch Backs and Ma On Shan Country Park, minor modifications to the local topography will be required between Ma On Shan Road and the T7 Interchange. A number of new slopes would be introduced, particularly at the western end to the south of the road, although these are relatively minor in the context of the scale of the local hillside and areas of the local natural vegetation would also be removed, mainly comprising the tree / scrub matrix. Public pedestrian access to the hillside and Country Park would be severely curtailed due to the road blocking the existing trails from the urban areas and a relatively minor section of the Country Park adjacent to the reservoirs and Lee On Estate, would be lost.

2.7.2 The scheme proposals would require the removal of relatively small sections of recreational and amenity woodland, particularly adjacent to Kam Ying Court and Lee On Estate. However, the woodland that would be lost is within the vegetated buffer zone between the hillside and Ma On Shan. This buffer zone would be replaced by a major man-made landscape element that would be a harsh edge to the residential areas rather than the existing vegetated one, although the substantial amount of woodland that remains would counteract this harshness.

2.7.3 The scheme would change the nature of the southern edge of the high-rise residential areas, although this would be localised to particular parts only. The Heng On and Yiu On Estate and areas adjacent to them, would only be affected minimally as the scheme is relatively remote and beyond the existing major

transport corridor. The main townscape impacts would occur to those areas at Kam Ying Court, Lee On Estate and STTL 446 where the scheme will be a major harsh element through the interface zone between the residential areas and hillside. The road will be detrimental to the existing residential townscape of these areas. However, in the context that these effects are remote to these estates, and that the majority of the Ma On Shan residential townscape will be unaffected, the impact would be limited.

2.7.4 The proposals will introduce a major landscape element within the quarry area, with an access slip road connected to Sai Sha Road being located to the west. It will require relatively minor modifications to the quarry topography and the removal of a small amount of young plantation trees. The quarry is of low landscape value and this will provide an opportunity for the implementation of mitigation measures.

2.7.5 The scheme will be a major visual element along the base of the Hunch Backs south of Ma On Shan. This will result in severe intrusion to all views to the south and east from the Primary High Rise Residential VSRs and for trail walkers in close proximity to the alignment. This will be due to the introduction of dominant visual elements along the hillside replacing the vegetated slopes with a road and associated structures. The noise barriers will reinforce the effect, particularly at the lower levels. Similar impacts of a lesser intensity will also affect more distant high rise, low rise, pedestrian and vehicular VSRs.

Mitigation Measures

2.7.6 Dense tree and shrub planting on both sides of the road should be implemented. This will provide a visual screen helping to obscure the road from the Primary High Rise Residential VSRs. However, it must be accepted that mitigating the visual impacts to Kam Ying Court are limited due to its proximity and elevation. The planting will also replace any buffer zone lost during works and help to segregate the road from the surrounding landscape. Noise barriers should be designed to create elements that are integrated within the scheme and the surrounding landscape should be considered. Consideration should be given to the design of, and hard materials finishes to, all elevated sections of road.

2.7.7 Dense tree and shrub planting on any new cut slopes and the casting yard to create a landscape buffer zone and visual screen is also recommended.

3. OPERATIONAL PHASE

3.1 Noise

Unmitigated Impacts

3.1.1 Traffic travelling along the T7 Trunk Road has the potential to generate noise impacts at nearby residential properties and education establishments. Potential impacts are likely to be greatest during the peak hour flow and, therefore, this has been considered in this assessment. Traffic noise impacts above the *Hong Kong Planning Standards and Guidelines* criteria of 70 dB(A) for residential dwellings and 65 dB(A) for educational establishments are predicted.

Mitigation Measures

3.1.2 In addition to the use of a low noise road surface, it is recommended that direct mitigation measures are also incorporated into the design of T7 in order to minimise potential traffic noise impacts at local NSRs. These measures will take the form of roadside noise barriers and a single semi-enclosure and are presented in *Figures 3.1a* and *3.1b*.

3.1.3 The results indicate that even with the recommended mitigation, adverse noise impacts are still expected to occur at eighteen of the Assessment Points considered. However, at fifteen of these the dominant source will be traffic using the existing unaltered roads. These noise impacts are, therefore, not attributable to T7 and consequently any further mitigation applied to T7 would be of no benefit.

3.1.4 Residual impacts attributable to T7 are predicted at three of the Assessment Points considered. Two of these points represent residential developments (STTL446 and TPTL146) which are currently under construction. In each case the affected facades will be provided with noise insulation by the developer. The third residual impact due to T7 is at a proposed residential development above the proposed railway depot at Lee On. Since this development is still at the planning stage, it is likely that potential impacts can be prevented by optimising the design and layout of the residential blocks.

3.1.5 The effectiveness of the mitigation which has been proposed can be measured in terms of the number of NSRs which will benefit from it. If unmitigated T7 may contribute to noise impacts at a total of approximately 1750 dwellings and 70 classrooms. Implementation of the proposed mitigation is likely to protect 1650 dwellings and all of the classrooms affected.

3.1.6 No NSRs will be eligible for equitable redress under the ExCo directive.

3.2 Air Quality

Unmitigated Impacts

3.2.1 T7 is a dual-2 carriageway connecting Sai Sha Road and Ma On Shan Road. Bypassing the town centre of Ma On Shan, it will ease the traffic congestion of

the town and should lead to an overall decrease in pollutant levels in the town centre. However, T7 will also generate additional traffic and the exhaust emissions from the new road will affect the identified ASRs.

3.2.2 T7 runs around the south of the town centre of Ma On Shan with a buffer distance of more than 40 m from the nearest ASRs, thereby satisfying the HKPSG recommended requirement for a trunk road. This buffer distance is designed to permit the adequate dilution of vehicle emissions and prevent the potential for adverse impacts on ASRs.

3.2.3 Two tunnels are planned at the T7 Interchange, with one spanning approximately 210 m and the other about 270 m. Ventilation fans will be installed along both tunnels to ensure that the criteria will be met.

3.2.4 There were no exceedances of the criteria for any of the three critical pollutants modelled with the maximum predicted concentrations all well within the limits.

Mitigation Measures

3.2.5 The set back distance of T7 has been designed to comply with the HKPSG and even with the proposed noise barriers in place, no adverse air quality impacts are predicted and no mitigation measures are, therefore, required.

3.3 Water Quality

Unmitigated Impacts

3.3.1 Runoff from the trunk road will enter the stormwater drainage system before discharging to Tolo Harbour. This will contain a number of pollutants that result from the normal wear and tear of road vehicles, including suspended solids, chemicals (especially heavy metals) and hydrocarbons (oil and fuel).

Proposed Mitigation Measures

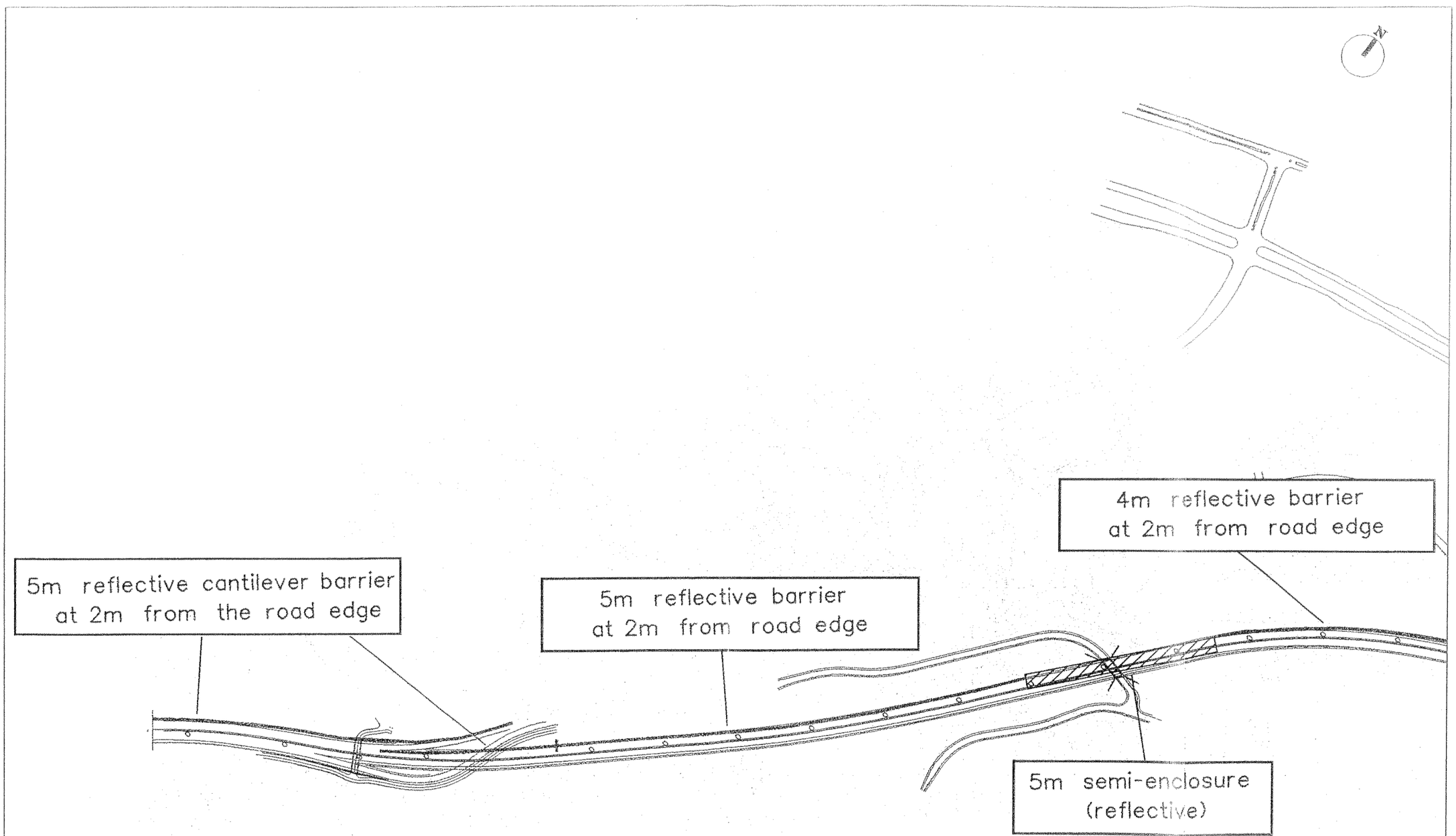
3.3.2 Despite the low risk of watercourse contamination resulting from the operation of the road, a number of mitigation measures could be introduced to protect the water quality of the Tolo Harbour and Channel WCZ. This can be achieved through the collection and discharge of all road runoff via a stormwater drainage system which incorporates, where appropriate, regularly cleaned oil and grit interceptors, silt traps or sedimentation tanks.

3.4 Ecology

Operational Phase

3.4.1 The carriageway will fragment the ecological habitats located along the alignment, and would form a physical barrier to hamper the movement of certain wildlife, and hence their local distribution range. However, as identified earlier, no wildlife of recognised ecological importance is expected to be present in the immediate vicinity of the surrounding environment, and the stream courses that cut across the alignment are poor in their ecological value and unlikely to

support important wildlife. The potential ecological impacts arising from the operation of T7 are, therefore, considered negligible.



LOCATION OF NOISE BARRIERS

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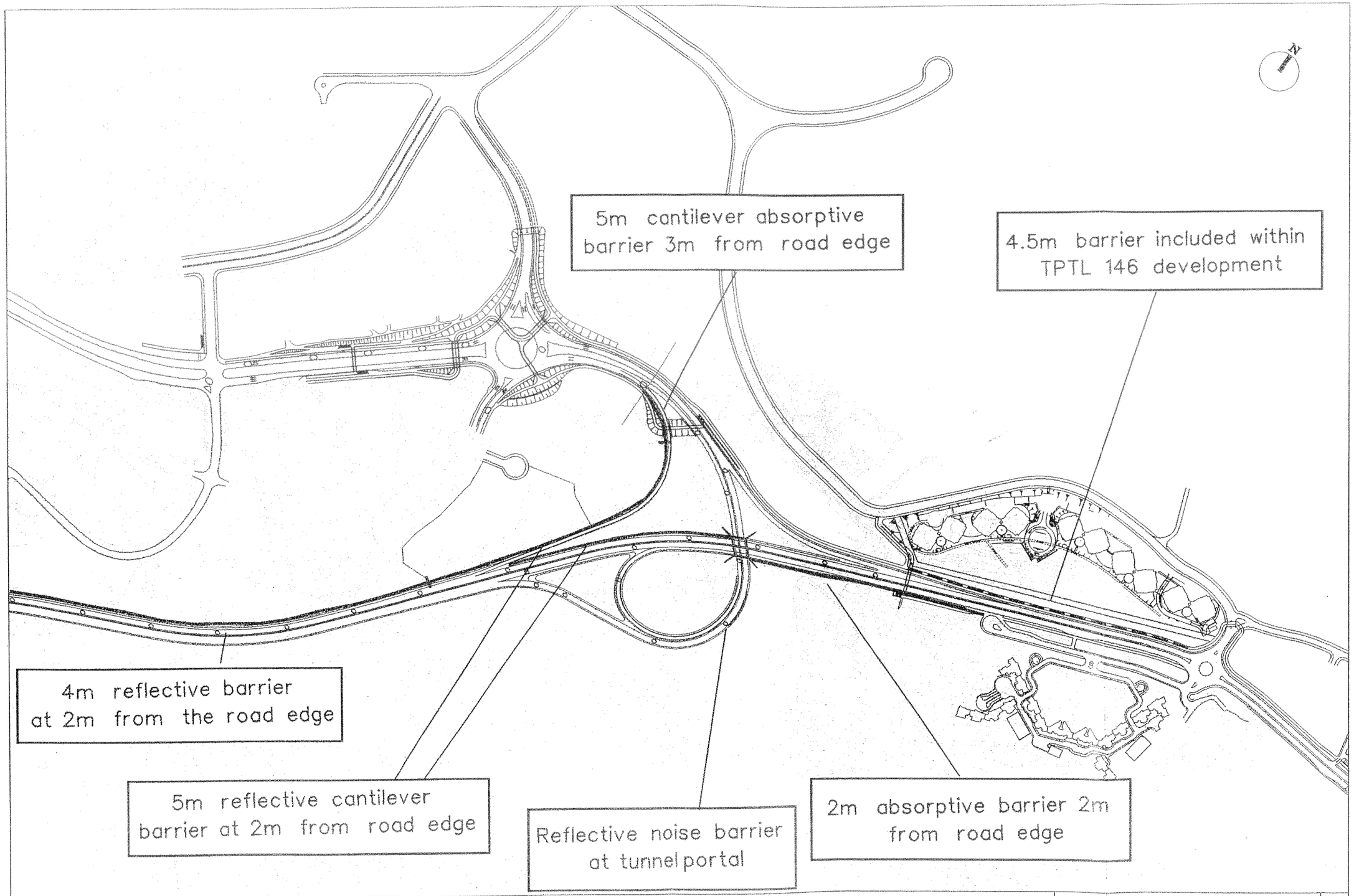

LOCATION OF NOISE BARRIERS

FIGURE NO. : 3.1b

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DATE : 06/02/98

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4 CONCLUSIONS

4.1 Construction Phase

Noise

4.1.1 Potential noise impacts resulting from the general construction works for T7 can be avoided through the use of suitable mitigation measures. While it is unlikely that noise impacts from blasting or the two tunnels near the interchange can be prevented altogether, it is possible to minimise potential impacts by adopting appropriate blasting techniques and the implementation of a good public relations programme.

Air Quality

4.1.2 A limited number of exceedances of the established criterion were predicted for 1-hour dust levels, however, no exceedances of the 24-hour criterion were identified. Mitigation measures have been identified which will control the predicted exceedances to within the established criteria.

Water Quality

4.1.3 It is considered that, with the implementation of the recommended mitigation measures, controls on discharge from land based construction activities and proper site management procedures will minimise residual water quality impacts to the acceptable levels stipulated in the WPCO criteria. Thus, no adverse water quality impacts are expected to arise from the construction activities.

Waste

4.1.4 After re-use of excavated materials on-site, it is likely that only small quantities of surplus spoil, if any, will require disposal off-site in either public dump or landfill and only small volumes of construction, demolition and chemical wastes will be generated. Mitigation measures relating to good practice have been recommended to ensure that adverse environmental impacts are prevented and that opportunities for waste minimisation and recycling are followed. It is, therefore expected that, if the recommendations put forward in this report are conscientiously acted upon, the storage, handling, collection, transport and disposal of waste should present minimal environmental impacts.

Ecology

4.1.5 The key ecological issue associated with the proposed T7 relate to the loss of 900 m^2 of scrubland/woodland mosaic, 2.5 ha of secondary woodland and 2.5 ha of old plantation woodland. The Ma On Shan Country Park and Ma On Shan SSSI will also not be affected by the current project due to the great distance from the alignment. Mitigation measures have been recommended to limit the potential impacts, including advance and compensatory on-site replanting over the area in between the proposed alignment and the Ma On Shan Country Park during or after completion of the construction work. Other mitigation measures,

such as minimising the woodland to be encroached upon and good construction practice, are also recommended.

Landscape and Visual

4.1.6 The scheme proposals, in the context of its design, location and the overall character area have resultant adverse landscape and townscape impacts, however these are generally localised.

4.1.7 The scheme proposals, in the context of its visual character, will have adverse impacts on existing views for a limited number of VSRs. There will also be a number of impacts to other visually sensitive receivers, however these are generally only minor as T7 is only a small extension of the existing urbanisation within their views or is screened.

4.2 Operational Phase

Noise

4.2.1 Potential noise impacts attributable to the operation of T7 can be successfully mitigated through the use of low noise road surfaces, road side barriers and a single semi-enclosure.

Air Quality

4.2.2 All predicted pollutant levels are well within the established criteria and, therefore, no mitigation measures are necessary.

Water Quality

4.2.3 The adoption and incorporation of an appropriate drainage collection system will ensure that no residual detrimental operational water quality impacts arise.

Ecology

4.2.5 The potential impact during the operational phase is mainly related to fragmentation of habitat, but as no important wildlife is expected to be affected, the impact is considered as negligible.

4.3 Future Requirements

Environmental Monitoring and Audit

4.3.1 During the construction phase, monitoring will be required for noise and dust. A tree survey should also be conducted before the works commence to fulfill the requirements of WBTC 24/94 and PELBTC 3/94. Auditing of the implementation of the recommended construction phase measures for noise, dust, water quality, waste, ecology, landscape and visual impact mitigation will also be necessary. Operational water quality and ecology mitigation measures should be audited during commissioning and during the operational phase, the

monitoring of air quality within the tunnels and the development of the newly vegetated areas will be required.