

**Agreement No. CE 79/96
Yuen Long Bypass Floodway
Feasibility Study**

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**Final
Environmental Monitoring & Audit Manual**

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For and on Behalf of
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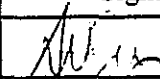


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ENVIRONMENTAL MONITORING AND AUDIT MANUAL

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1 INTRODUCTION

1.1 Purpose of the Manual

- 1.1.1 This Environmental Monitoring and Audit (EM&A) Manual is designed to guide the set up of an EM&A programme for the construction and operation of the Yuen Long Bypass Floodway project.
- 1.1.2 The purpose of this Manual is to ensure compliance with recommendations of the Environmental Impact Assessment (EIA) study, to assess the effectiveness of the recommended mitigation measures and to identify necessary additional remedial action.
- 1.1.3 This Manual outlines the EM&A programme for the Project works and provides systematic procedures for monitoring, auditing and minimising environmental impacts associated with the Project works.
- 1.1.4 Hong Kong environmental regulations for air, noise, waste and water quality, the *Hong Kong Planning Standards and Guidelines*, the *EPD Generic Environmental Monitoring and Audit Manual*, and recommendations in the EIA Report of the Project have served as environmental standards and guidelines in the preparation of this Manual.
- 1.1.5 This Manual contains the following:
- (a) duties of the Environmental Team (ET) with respect to the EM&A requirements during the Project;
 - (b) information on project organisation and programming of construction activities for the Project;
 - (c) project schedule and the synchronised EM&A programme to mitigate the environmental impacts;
 - (d) Action and Limit levels;
 - (e) event and action plans;
 - (f) requirements of reviewing pollution sources and working procedures for noncompliance with the environmental criteria;
 - (g) requirements of EM&A reports.

1.2 Background

- 1.2.1 Serious flooding has occurred in and around Yuen Long Town at least seven times over the last fifteen years. Government studies including the Northwest New Territories (NWNT) Base Strategy Studies, TELADFLOCCOSS I and II and the NWNT Village Flood Protection Study have identified the major causes of flooding and recommended appropriate mitigation measures. The studies identified that the capacity of the Yuen Long Nullah drainage system was inadequate mainly due to rapid urban growth over the last 20 years which has reduced the flood plain storage capacity and increased runoff volumes. In addition Yuen Long town has been built at a relatively low level and the drainage design standards and methods used at the time were less rigorous than present design requirements. The studies recommended the construction of a Bypass Floodway as the most cost-effective option for providing additional drainage capacity to cater for present needs and to provide additional capacity for new development in the area to the south of Yuen Long.
- 1.2.2 The Yuen Long Bypass Floodway is therefore to be designed to divert part of the flows entering the Yuen Long drainage system from the south of Yuen Long into the Kam Tin River Floodway, which is at present under construction, to reduce the risk of flooding in Yuen Long Town.
- 1.2.3 A Preliminary Project Feasibility Study (PPFS) and Preliminary Environmental Review (PER) was undertaken by Binnie Consultants Limited in 1995 in respect of the proposed Yuen Long Bypass Floodway. The PPFS noted that *There will be environmental and ecological impacts arising from the construction and operation of the Yuen Long Bypass Floodway if not mitigated* and recommended that *a full environmental impact assessment be undertaken during the feasibility study stage to address the potential construction and operation impacts of the project.*

1.3 Project Description

- 1.3.1 The project involves the construction and operation of a drainage channel (YLBF) from the south side of Yuen Long to the Kam Tin River. A summary of the preliminary design channel details is given below. For additional technical information reference should be made to the Engineering Report.


Channel Alignment

- 1.3.2 The horizontal alignment is as shown in Figure 1.1 and the preliminary design layout is given in Appendix 1. The 3.8km long channel commences at the Main Nullah servicing the large catchment to the south of Yuen Long and extends east. A maintenance access road is provided along the entire length of the channel. The first 1.9km of the channel is aligned as close as possible to the existing toe of the YLH to minimise land resumption and encroachment into existing village properties. The maintenance road between chainages 0 + 665 and 1 + 900 has been positioned between the toe of the YLH and the channel to provide sufficient working space for work associated with the YLH and YLBF and to provide a corridor for PWP Item No. 4274DS which requires vehicular access.
- 1.3.3 The alignment moves away from the YLH embankment toe at chainage 1 + 900 and meets Castle Peak Road at the only suitable crossing point which is between Pok Oi Hospital and the Sun Kong Hotel. The channel will be culverted for a distance of 130m at this crossing point to provide a crossing for Castle Peak Road and to accommodate the construction of the future Petrol Filling Station to the north of Castle Peak Road which has been given planning approval.
- 1.3.4 After the Castle Peak Road box culvert the channel keeps as close as possible to Pok Oi Hospital to minimize isolation of property and the sterilising of useful land and to ensure a fixed crossing point with the Western Corridor Railway project.
- 1.3.5 From chainage 2 + 700 to 2 + 950 the channel swings towards the Route 3 Highway box culvert which has already been constructed as entrusted work under the Route 3 project. After the box culvert the channel executes a reverse curve towards the Route 3 embankment toe to avoid disruption of active fishponds and minimize the area of sterile land between the YLBF and Route 3. The connection point of the YLBF with that of the Kam Tin River is at a point close to the Route 3 embankment but downstream of the Route 3 flyovers to minimize hydraulic losses.
- 1.3.6 Grasscrete provides the most environmentally and ecologically friendly solution and aesthetically is far superior to the artificial hard surface lining provided by concrete. Grasscrete along with careful landscaping can be used to mitigate the effects on the surrounding areas of providing channels. In the case of the YLBF where existing and future development are expected to be in close proximity to the channel the use of grasscrete is essential for environmental and aesthetic reasons. However, to reduce the land resumption of existing properties concrete has been used in some locations.

- 1.3.7 The preliminary design has adopted a trapezoidal shape along the entire length of the channel. Only at the locations of box culvert crossing points will the channel be formed to a rectangular shape. Where land resumption is to be minimized through existing villages (ch 0 to 1 + 340) a 1 in 1 side slope fully concrete lined channel has been adopted. However, where land resumption is not considered as critical (ch 1 + 340 to 3 + 545) a 1 in 1.5 (ch 1 + 340 to 2 + 700) and 1 in 2 (ch 2 + 700 to 3 + 545) side slope, fully grasscrete lined channel (both base and sides) has been adopted. A 5 m wide concrete maintenance track will be provided at the invert and along the grasscrete section of the channel to provide additional hydraulic conveyance and a clear maintenance route. The downstream section of the channel (ch 3 + 545 to 3 + 800) will be fully concrete lined as it will be downstream of the inflatable dam and within the tidal range.
- 1.3.8 For mitigation purposes, which are described throughout this report, off-line engineered wetland/marshcrete areas have been incorporated into the channel design. From ch 2 + 780 to 2 + 940 and 3 + 050 to 3 + 545, directly to the north and south of Route 3, off-line wetland areas have been provided at a higher level than the invert of the channel to prevent most brackish back water from the Kam Tin River from entering the wetland area. These off-line wetland areas will be fed from either a proportion of the pumped dry weather flow passing through the low flow pumping station or from local runoff, depending on the location of the wetland.

Pumping Station and Inflatable Dam

- 1.3.9 The downstream end of the channel connects to the Kam Tin River which is tidal. An inflatable dam and pumping station will be positioned at the downstream end of the YLBF just prior to connection with the Kam Tin River. This will be used to prevent brackish, heavily polluted and sediment rich waters from the Kam Tin River backing up into the YLBF and depositing residues in the channel which could cause undesirable pollution in existing or future urban areas with sensitive receivers. In addition, by preventing brackish waters from backing up into the YLBF, grasscrete can be used along the alignment for environmental purposes. Notwithstanding, salt tolerant species will be specified.

Legend :
 Existing and Future Watercourses

revision	date	description	initial
designed		checked	drawn
initial	07	AJT	LC
date	1/96	1/96	1/96

AGREEMENT NO. CE 79/96


project
**YUEN LONG BYPASS FLOODWAY
 FEASIBILITY STUDY**
 EM & A MANUAL

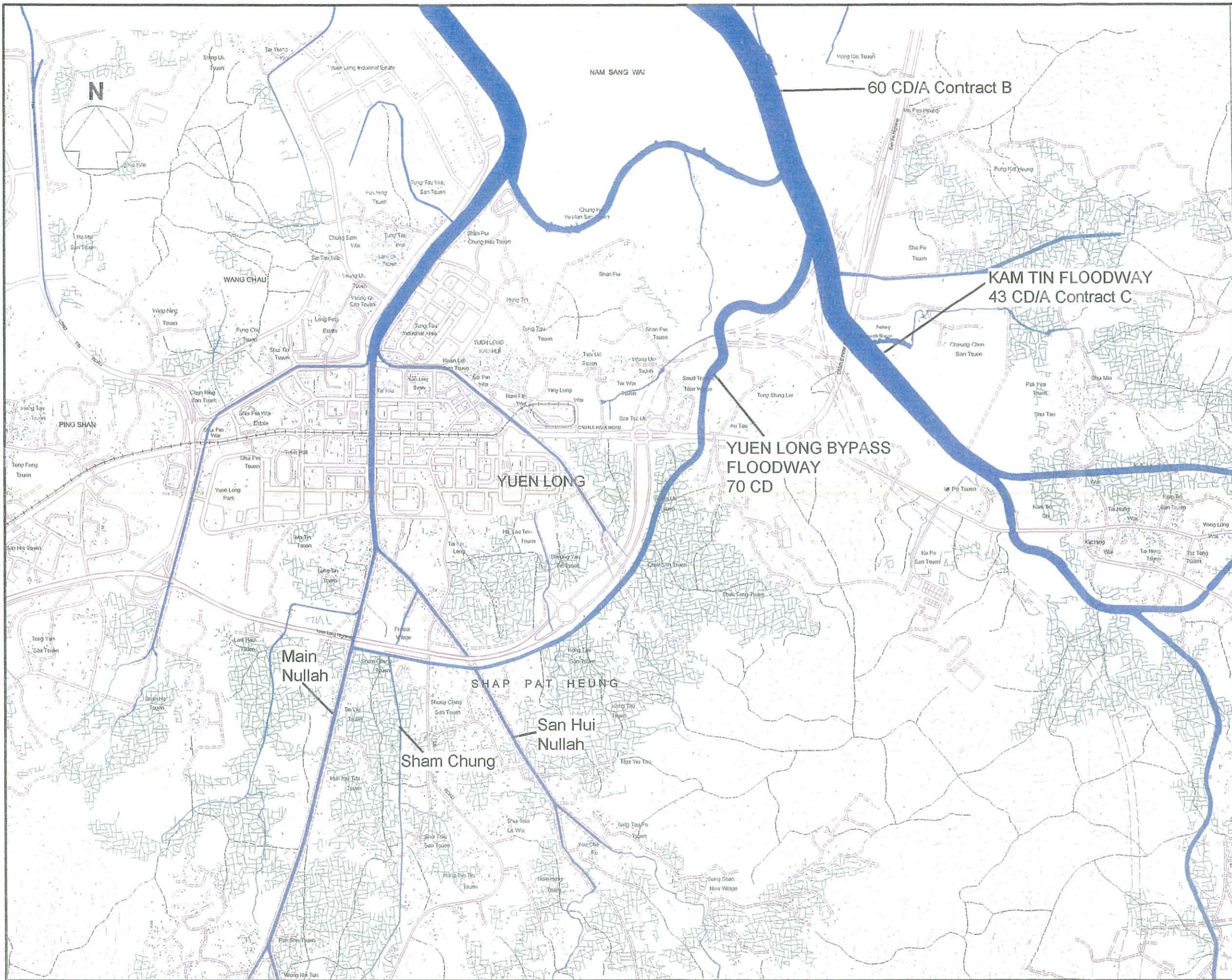
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LOCATION PLAN

figure no. **1.1** scale **N.T.S.**

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- 1.3.10 During low flow conditions the dam will be inflated and low flows in the YLBF will be pumped over the inflatable dam and into the lower section of the YLBF which will pass into the Kam Tin River. During flood conditions the inflatable dam will be deflated and storm flows from the YLBF will pass directly into the Kam Tin River. Once the storm has subsided the inflatable dam will be reinflated and low flows again pumped to the Kam Tin River. Delays in re-inflation such as to allow several tides to sweep the YLBF are inevitable. However, the levels of salinity and pollution in these tidal waters immediately after the passage of a major storm can be expected to be much lower than normal for the Kam Tin River. The Operation Manual for the inflatable dam will put in place a reflation procedure that minimises the period of tidal exposure.
- 1.3.11 The operation will be similar to the existing inflatable dam and pumping station situated in the lower reaches of the Yuen Long Central Nullah which was also designed by BCL.
- 1.3.12 The pumping station will be used to pump flows over the inflatable dam. A small proportion of these pumped flows will be taken off and allowed to gravitate through a single U-channel system which will feed the off-line wetland area.

Dry Weather Flow Channel

- 1.3.13 A dry weather flow channel will be provided from chainage 0 + 10 to 3 + 525 just short of the inflatable dam. The dry weather flow channel will maintain adequate flow velocity to minimise siltation during low flow and will confine the low flow for visual purposes. At chainage 3 + 525 the dry weather flow channel will drop into a storage pond/sump at the base of the pumping station. Low flows will be pumped around the dam and then dropped into the remaining tidal section of the YLBF channel concluding at chainage 3 + 800 where it will flow into the Kam Tin River.

Access Roads

- 1.3.14 A 3.5 m wide access road with a 1.6m wide footpath will be provided along one side of the channel. It is anticipated that all drainage channel access roads will be open to the public in future and that the HyD will take up the maintenance responsibilities. Therefore all access roads will be designed to HyD standards. Consequently, street lighting and other street furniture will be required, passing bays will be provided along the length of the access road and turning areas provided for manoeuvring of public and maintenance vehicles.

- 1.3.15 In addition to the main access road provided at the top of the channel for both public and maintenance vehicles, a 5 m wide concrete maintenance track will be provided from ch 1 + 340 to 3 + 540 within the grasscrete section of the channel. This will provide a DSD only maintenance route and a clear path for maintaining the grasscrete adopted within the channel.

Access Ramps

- 1.3.16 Concrete paved access ramps of width of 5 m and a slope of 1 in 12 will be provided at intervals of approximately 400 m for channel maintenance purposes. In addition access ramps will be provided between box culverts and in the case of the inflatable dam, an access ramp will be provided at both sides of the dam so as to avoid maintenance plant travelling over the dam. Lockable crash barriers will be positioned at the top of the access ramps to prevent public access into the channel.

1.4 Environmental Impact Assessment (EIA)

Sensitive Receivers

- 1.4.1 Current sensitive receivers in respect of air and noise impacts include: Pok Oi Hospital; the villages of Sham Chung Tsuen, Shung Ching San Tsuen, Tai Kei Leng, Kong Tau San Tsuen, Chuk San Tsuen, and Yeung Uk Tsuen east of the Yuen Long Highway (YLH) and south of Castle Peak Road; a number of dwellings near Ha Yau Tin Tsuen, Sheung Yau Tin Tsuen, Tai Kei Leng and Fraser Village west of YLH.
- 1.4.2 Sensitive receivers in respect of water quality impacts include: fish ponds; lotus ponds; Yuen Long Creek; several small streams flowing north across the study area between Sham Chung Tsuen and Chuk San Tsuen; Kam Tin Floodway and Inner Deep Bay.
- 1.4.3 Ecological sensitive receivers include: a wooded knoll, fish and duck ponds northeast of Pok Oi Hospital, active and fallow agricultural land, lotus ponds and several small water courses and their riparian strips south of Castle Peak Road.

Requirements of EIA

- 1.4.4 The requirements of the EIA Study for the Project are contained in Section 6.2 of the Yuen Long Bypass Floodway Feasibility Study Project Brief. They are summarised below:

- (a) to carry out the necessary background studies to identify, collect and analyse existing information relevant to the EIA study;
- (b) to carry out any necessary environmental survey, site investigations and baseline monitoring work to achieve the objectives;
- (c) quantifying, by use of models or other predictive methods, the residual and cumulative environmental impacts (specifying whether these are transient, long term and/or irreversible) arising from the construction and operation of the Project;
- (d) proposing practicable, effective and enforceable on-site/off-site measures, methods and standards to effectively mitigate any significant environmental impacts in the short and long term and prepare cost estimates using a method of Risk Analysis for each proposed method and measure; and
- (e) outlining a programme by which the environmental impacts of the Project can be assessed, monitored and audited.

Scope of the EIA

- 1.4.5 The EIA Study includes detailed investigation on construction and operational impacts of water quality, ecology, noise, air quality, waste management and landscape and visual issues.
- 1.4.6 Background studies on key issues have been undertaken. Where necessary, environmental surveys, and baseline studies have been carried out.
- 1.4.7 Sensitive receivers have been identified and potential impacts of the Project on sensitive receivers have been quantified using mathematical models where appropriate.
- 1.4.8 Assessment of the environmental impacts has been undertaken according to the *Hong Kong Planning Standards and Guidelines* and other statutory requirements.
- 1.4.9 Mitigation measures to reduce adverse impacts to acceptable levels have been proposed with consideration of practicality of enforcement, cost-effectiveness and compliance with environmental standards.
- 1.4.10 An EM&A programme has been set up to implement the recommendations of the EIA.

Summary of EIA Findings and Recommendations

Water Quality

Potential Construction Impacts

1.4.11 Potential impacts on surface water quality during construction of the Yuen Long Bypass Floodway may include:

- construction site runoff and discharge
- release of pollutants through removal of sediment
- sewage discharge and other waste from construction workforce

1.4.12 Construction site runoff has the potential to contain increased loads of sediments and other suspended solids and contaminants such as nutrients, bacteria, oil and grease, etc. Potential sources of pollution from site drainage may include:

- runoff and erosion from site surface, earthworks stockpiles and drainage channels
- fuel, oil and grease from construction vehicles
- concrete slurries runoff (washdown of waste concrete and concrete curing sprays)
- runoff into fish and lotus ponds
- release of pollutants from removal of sediment

1.4.13 An increase in organic pollution of nearby water courses could result from increased sewage load from construction workers, discarded rubbish and canteen wastewater.

Mitigation Measures

1.4.14 The following mitigation measures are proposed to reduce the potential impacts to acceptable levels:

- carry out works in the dry season
- cover areas of exposed earth

- install sand traps or catchpits at all drainage discharge points
- discharge runoff into settlement pits to allow infiltration
- provide and maintain oil interceptors in site compounds
- provide bunds around oil and fuel bunkers
- ensure immediate disposal and correct handling of chemical spills
- ensure drainage system from concrete producing area is diverted into a settlement area for infiltration or storage
- avoid all contact between concrete washings and nearby water bodies using bunding if necessary
- all concrete washings/surplus concrete should be discharged into designated settlement pits for setting and water recycling
- bunds should be constructed between the works area and remaining fish ponds
- no runoff, wastewater or chemicals should be allowed to enter fish ponds
- remove sediments with minimal disturbance during dry season and dispose of according to WBTC 2/94
- ensure proper sewage facilities are provided for construction workers
- ensure site cleanliness is maintained with rubbish bins provided and serviced properly
- canteen discharges should pass through a grease trap before discharge

Potential Operational Impacts

1.4.15 During operation of the floodway the main potential impacts include:

- hydraulic changes from creating an artificial (concrete) channel resulting in increase in transport of surface runoff and pollution downstream and
- reduction in treatment capacity because of the absence of vegetation which is present in the existing water courses

Mitigation Measures

1.4.16 The main mitigation measure is through sensitive environmental design of the floodway channel. Grasscrete is proposed for the flooring and sides of the channel as much as possible instead of concrete thus enabling a base for vegetative growth. Growth of vegetation in the channel will provide a mechanism for treatment of polluted water flowing down the channel through infiltration and absorption. In addition dry weather flows should have the opportunity to react with grasscrete rather than being confined to a narrow concrete lined dry weather flow channel. This could be achieved by:

- ensuring that tributary inflows are allowed to spread across the grasscrete floor of the floodway rather than be directed straight into the dry weather flow channel; and
- locating the dry weather flow channel along the toe of the channel sides opposite the tributary inflows thus allowing more time and surface area for infiltration.

1.4.17 Other mitigation measures recommended include:

- use of the sterile land between Route 3 and the YLBF as an engineered wetland incorporating it into the overall channel design; and
- use of the remaining pond areas immediately south of Route 3 by incorporating them into the channel design.

1.4.18 The Yuen Long Bypass Floodway project has the potential to create unacceptable water quality impacts during the construction and operation phases. However, with the implementation of specific mitigation measures these impacts can be reduced to acceptable levels such that there should be no unacceptable residual water quality impacts as a result of the project.

Ecology

1.4.19 Construction of the Yuen Long Bypass Floodway will result in the loss of, and disturbance to, a number of different habits along the 3.8km alignment of the floodway. The unmitigated Project which assumes a worst case scenario involving a concrete lined, ecologically sterile nullah along the entire length of the floodway would result in the following impacts:

- loss of 3 ha of village-type habitat through an already blighted area
low habitat value
low impact significance
- loss of 4ha of abandoned agricultural land habitat, already blighted and fragmented but providing a feeding ground for herons and egrets
low to medium habitat value
medium impact significance
- loss of 0.1ha of stream/riparian habitat through an already blighted area
low habitat value
medium impact significance
- loss of 1ha of lotus pond habitat causing fragmentation of remaining lotus ponds
medium habitat value
medium to high impact significance
- loss of 9ha of fish pond habitat already blighted and fragmented by Route 3 construction works
low to medium habitat value
low impact significance

1.4.20 Mitigation measures proposed to reduce impacts to acceptable levels comprise the following:

- (i) Amendment to the alignment of the YLBF north of Route 3 so that it runs closer to the highway. This avoids fragmentation of the active fishponds north of the floodway and moves the works further away from a *fung shui* knoll biodiversity locus located northwest of the Project area.
- (ii) Use of grasscrete for lining the sides and base of the channel (from ch 1+340 to ch 3+545 creating 6.8ha of dry grasscrete). This allows percolation to the groundwater, enables growth of grasses sedges and reeds which in turn provides a habitat for invertebrates (insects) and higher fauna (birds)
medium habitat value

(iii) Creation of offline marshland type habitat through the use of submerged grasscrete (marshcrete) making use of the swathe of land between Route 3 and the YLBF and a fish/duck pond immediately south of the Route 3 box culvert. The marshcrete (watered in part by recirculation of a proportion of the pumped flows from the low flow pumping station and also from local runoff) would be planted with selected saline tolerant and pollution tolerant wetland grasses, reeds and sedges creating 3ha of marshland habitat.
medium to high habitat value

(iv) Tree planting of over 2500 trees along the channel banks and adjacent to the access roads and footpaths with species selected for their attractiveness to the local flora and fauna
medium habitat value

1.4.21 The grasscrete and marshcrete total habitat area resulting from the Project will be 9.8ha of medium and medium to high ecological habitat. This contrasts with the loss of 14ha of largely low to medium value habitat and 3.1 ha of low value habitat which does not require mitigation. It is considered that the increased value of the created habitat (in conjunction with the landscaping trees and improved ecological linkage) at least balances/compensates for the value of the site's original habitats. Thus, with the implementation of the proposed mitigation measures it is considered that the residual ecological impact of the Project is negligible. The mitigation measures including; re-alignment, grasscreting, marshcreting and tree planting, not only result in negligible ecological impacts but will also lead to a general habitat enhancement along the entire 3.8km Project corridor.

Waste Impact

Construction Phase

1.4.22 Waste will inevitably be produced during the construction period. The Government's construction and demolition waste management hierarchy is the same as for other wastes, ie. in order of desirability: avoidance; minimisation; recycling; treatment and safe disposal of construction materials. The quantity of waste should be minimised and materials should be re-used and recycled as far as practicable, thus minimising the disposal requirement and conserving void space at landfill sites.

- 1.4.23 The delivery of 318,000 m³ (about 8% of the current annual demand public filling capacity) of surplus excavated material to public filling areas could have a significant impact on the public filling programme and on the road transportation system. The planning and the programming of the works should take into account these factors to find alternative disposal sites for such material and to prevent unacceptable traffic impacts. Notwithstanding that every effort should be made to reuse as much of the excavated material as possible on site.
- 1.4.24 Whilst the potential for contaminated land along the alignment of the YLBF is slight, during the detailed design stage a core sampling programme will be undertaken to ascertain the nature of the substratum. Should contaminated land be encountered the sediments will be tested, handled and disposed of in accordance with government requirements.
- 1.4.25 Contract arrangements should include the responsibilities of the Contractor for waste collection, on-site sorting (including separation at source) and disposal. Suitable facilities should be provided, for example, an accessible filling area with processing capabilities to ensure maximum utilisation of waste materials.
- 1.4.26 Correct storage of and, where possible, recycling of chemical and oil wastes is required to minimise environmental impacts.
- 1.4.27 In order to maximise re-use of materials and minimise the cumulative impact of waste products on the environment, on-site facilities should be set up for the separation of recyclable materials from construction and demolition waste and domestic waste to facilitate easy collection by recycling companies.
- 1.4.28 Provided that there is strict control of wastes from construction works and all arisings are stored, transported and disposed of using approved methods as described in Section 6, no significant impacts are predicted.

Operational Phase

- 1.4.29 As an integral component of the regular maintenance work of the Bypass Floodway, the low flow interceptor channel bed will be dredged on a regular basis to prevent excess sediment accumulation and to maximise the flows and capacity of the channel.
- 1.4.30 The channel should be regularly cleaned to remove litter and other general refuse. A refuse boom should be erected to prevent waste from entering receiving water courses.

Air Quality

Construction Impact Assessment

1.4.31 The Construction Impact assessment has concluded that:

- The worst case scenario will occur during the site formation of the proposed Yuen Long Bypass Floodway because there would be a large quantity of earth works and frequent truck movements over dirt roads.
- Without adequate mitigation, dust levels generated by the site formation works are likely to exceed the Air Quality Objectives at the nearby air sensitive receivers.
- The transport of material by trucks travelling over dirt haul roads is the principal source of potentially excessive dust generation.
- Mitigation measures sufficient to ensure compliance with the Air Quality Objectives have been recommended. Assuming that these mitigation measures are implemented during construction, potential dust impacts at the nearby sensitive receivers will be within the AQOs.
- An environmental monitoring and audit programme has been formulated to ensure compliance is maintained.

Operational Impact Assessment

1.4.32 The key potential air impact during the operational phase is odour nuisance from polluted water entering the channel. Odour nuisance can be mitigated through routine maintenance of the channel through the removal of odorous sediments. Furthermore, it is expected that there will be a progressive reduction in pollutant levels as the Livestock Waste Control Scheme is progressively implemented.

Noise

Construction Noise

1.4.33 Noise from the use of powered mechanical equipment on site and the haulage of fill material on- and off-site will cause a nuisance to the nearby existing noise sensitive receivers.

- 1.4.34 The construction noise assessment shows that unmitigated noise levels could exceed EPD's recommended maximum noise levels for day-time construction work when construction activities occur in close proximity to noise sensitive receivers or when several construction works occur simultaneously.
- 1.4.35 The exceedance of noise levels is unavoidable because of the close proximity between the construction works and the NSRs. Adequate mitigation measures will be necessary for the construction works to meet the criteria.
- 1.4.36 The use of quiet plant and working methods, reducing the number of equipment, restricting the number of works and the use of substantial noise barriers to protect the closest residences and schools has been recommended and should be sufficient to reduce noise levels to compliant levels at the NSRs.
- 1.4.37 A noise monitoring programme is proposed to ensure construction noise is within the recommended criteria throughout the construction period.

Operation Noise

- 1.4.38 Noise associated with the DSD maintenance/village access road and the low flow pumping station is not expected to create nuisance to the nearby noise sensitive receivers during the operational phase.

1.5 Environmental Monitoring and Audit Requirements

- 1.5.1 The Final EIA Report concluded that the construction and operation of the Yuen Long Bypass Floodway will give rise to adverse impacts on the environment but that such impacts can be mitigated to acceptable levels through the implementation of a suite of environmental mitigation measures. These mitigation measures were specified in the report summarised above and are reproduced in the following sections of this EM&A Manual.
- 1.5.2 To ensure that the specified mitigation measures are implemented and that the resultant environmental impacts of the works are acceptable the Final EIA Report recommended that an environmental monitoring and audit programme be undertaken during the project implementation. All details regarding the scope, management structure and implementation of the proposed EM&A programme are presented in the following sections and are based on the information provided during the preliminary design stage. The EM&A Manual should be reviewed during the detailed design and periodically throughout the project implementation to ensure that it remains relevant and effective in respect of the detailed design and changing site conditions.

1.6 Project Organisation and Identification of Key Responsibilities

The project organisation and lines of communication with respect to environmental protection works is shown in Figure 1.2.

The Environmental Team (ET) shall not be in any way an associated body of the Contractor. The ET leader shall have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the Engineer's Representative (ER) and the Environmental Protection Department (EPD).

Appropriate staff shall be included in the ET, under the supervision of the ET Leader, to fulfil the EM&A duties of the ET Leader specified in this manual. Basically, the duties comprise the following:

- (a) To monitor the various environmental parameters as required in the Final EIA study report.
- (b) To investigate and audit the Contractors' equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise.
- (c) To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions.
- (d) To report on the environmental monitoring and audit results to the Contractor, the ER, and the EPD or its delegate.

Appropriate resources shall also be allocated under the Contractor and the ER to fulfil their duties specified in this manual.

1.7 Project Implementation and Construction Programme

1.7.1 The project is programmed to commence in March 2001 and will be completed in December 2003.

1.7.2 Construction of the YLBF will generally be carried out from the downstream end to the upstream to facilitate simple draining of the works site. However, the contractor may start at isolated sections to suit his allocation of resources and to maintain access across the channel banks. It is likely that the box culverts for the project may be built early.

Client
Contact person:-----
Organisation:-----
Phone no:-----
Fax no:-----





Engineer	
Contact person:-----	
Organisation:-----	
Phone no:-----	
Fax no:-----	
Environmental Team Leader	Engineer's Representative(s)
Contact person:-----	Contact person:-----
Organisation:-----	Organisation:-----
Phone no:-----	Phone no:-----
Fax no:-----	Fax no:-----



Environmental Team
Contact person:-----
Organisation:-----
Phone no:-----
Fax no:-----

Contractor(s)
Contact person:-----
Organisation:-----
Phone no:-----
Fax no:-----

Project Organisation and Lines of Communication	 TERRITORY DEVELOPMENT DEPARTMENT	Figure no. 1.2	
	YUEN LONG BYPASS FLOODWAY FEASIBILITY STUDY EM&A MANUAL	Prepared AJT	Checked AS
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- 1.7.3 The contractor will not be able to connect the YLBF channel to the Kam Tin River until the end of the project to ensure the tidal waters of the Kam Tin River do not enter the new channel. Alternatively the contractor will be able to proceed with the construction of this connection point but will have to provide a temporary bund to bar the tidal water. In either situation a temporary pumping system will be required to drain the new channel. It is not expected that the inflatable dam or pumping station could be completed early for temporary diversion purposes due to the need to finish all the works including E&M works associated with the pumping station and inflatable dam.
- 1.7.4 It will also be necessary to carry out careful phasing of the connecting incoming watercourses to ensure satisfactory diversion of flows without the risk of flooding adjacent areas. It is proposed that connection of watercourses should be carried out during the dry season to minimize such risks.
- 1.7.5 The section crossing Castle Peak Road will take the most time as a three stage traffic diversion is expected. The need to divert large diameter watermains, high pressure gas mains and other utilities during the stage construction will make this section critical to completion. In addition a proposed Petrol Filling Station to be located to the north of Castle Peak Road may need to be closed if constructed before the YLBF to allow construction of the extended section of the Castle Peak Road box culvert. To minimize the length of time this Petrol Filling Station will need to be closed if it is constructed first and to provide adequate time for all the diversion works in this area, it is anticipated that construction will start here at the contract commencement.
- 1.7.6 Figure 1.3 is the tentative works programme for the project. This programme is for information of the ET Leader to get an initial idea of the projection of the works. The ET Leader shall make reference to the actual works progress and programme during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective information to the ET Leader for formulating the EM&A schedule.

**YUEN LONG BYPASS FLOODWAY FEASIBILITY STUDY
PRELIMINARY IMPLEMENTATION PROGRAMME**

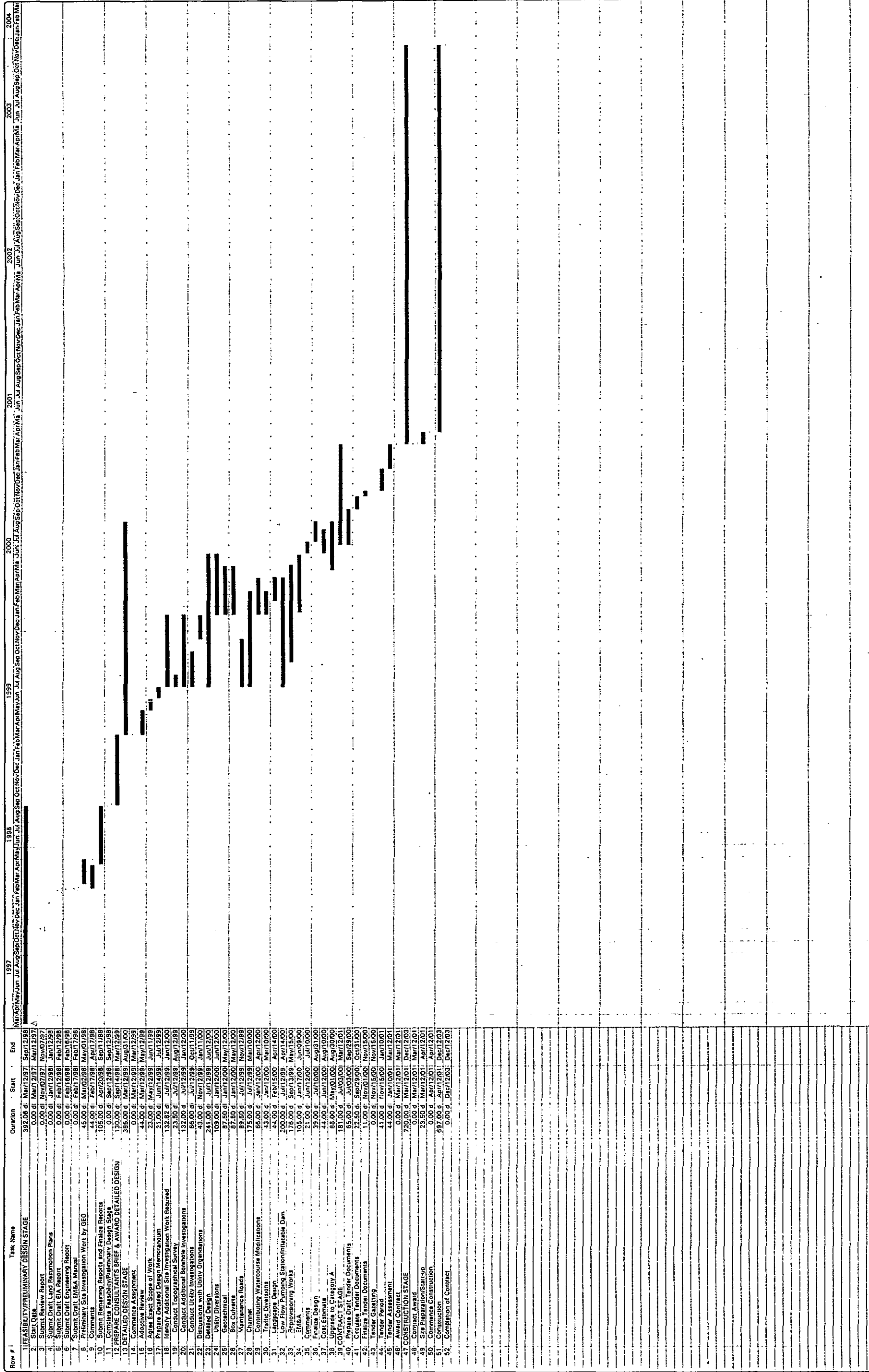


FIGURE 1.3



2 AIR QUALITY

2.1 Air Quality Parameters

- 2.1.1 Monitoring and audit of the Total Suspended Particulates (TSP) levels shall be carried out to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.
- 2.1.2 1-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B. Upon approval of the ER, 1-hour TSP levels can be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.
- 2.1.3 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. shall be recorded in detail. A sample data sheet is given in Figure 2.1.

2.2 Monitoring Equipment

- 2.2.1 High volume samplers (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:
- (a) 0.6-1.7 m³/min (20-60 SCFM) adjustable flow range;
 - (b) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
 - (c) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
 - (d) capable of providing a minimum exposed area of 406 cm² (63 in²);
 - (e) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
 - (f) equipped with a shelter to protect the filter and sampler;
 - (g) incorporated with an electronic mass flow rate controller or other equivalent devices;
 - (h) equipped with a flow recorder for continuous monitoring;
 - (i) provided with a peaked roof inlet;
 - (j) incorporated with a manometer;
 - (k) able to hold and seal the filter paper to the sampler housing at horizontal position;
 - (l) easy to change the filter; and
 - (m) capable of operating continuously for 24-hr period.

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time Meter Reading	Start (min.)	
	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Site Conditions		
Initial Flow Rate, Qsi	Pi (mmHg)	
	Ti (°C)	
	Hi (in.)	
	Qsi (Std. m ³)	
Final Flow Rate, Qsf	Pf (mmHg)	
	Tf (°C)	
	Hf (in.)	
	Qsf (Std. m ³)	
Average Flow Rate (Std. m ³)		
Total Volume (Std. m ³)		
Filter Identification No.		
Initial Wt. of Filter (g)		
Final Wt. of Filter (g)		
Measured TSP Level (µg/m ³)		

	<u>Name & Designation</u>	<u>Signature</u>	<u>Date</u>
Field Operator :	_____	_____	_____
Laboratory Staff :	_____	_____	_____
Checked by :	_____	_____	_____

TSP Monitoring Data Record Sheet



TERRITORY
DEVELOPMENT
DEPARTMENT

Figure no.

2.1

YUEN LONG BYPASS FLOODWAY
FEASIBILITY STUDY
EM&A MANUAL

Prepared
AJT

Checked
AS



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寶尼工程顧問有限公司 寶尼
CONSULTING ENGINEERS

Date
2/98

Scale
NTS

- 2.2.2 The ET Leader is responsible for provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit must be available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled.
- 2.2.3 Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference. All the data should be converted into standard temperature and pressure conditions.
- 2.2.4 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded in the data sheet.
- 2.2.5 If the ET Leader proposes to use a direct reading dust meter to measure 1-hr TSP levels, he shall submit sufficient information to the ER to prove that the instrument is capable of achieving a comparable result as that of the HVS and may be used for the 1-hr sampling. The instrument should also be calibrated regularly, and the 1-hr sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.
- 2.2.6 Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the ET Leader and agreed with the ER. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- (a) the wind sensors should be installed on masts at an elevated level 10 m above ground so that they are clear of obstructions or turbulence caused by the buildings;
 - (b) the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
 - (c) the wind data monitoring equipment should be re-calibrated at least once every six months; and
 - (d) wind direction should be divided into 16 sectors of 22.5 degrees each.
- 2.2.7 In exceptional situations, the ET Leader may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from EPD.
-

2.3 Laboratory Measurement / Analysis

- 2.3.1 A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments, to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.
- 2.3.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER and the measurement procedures shall be witnessed by the ER. The ET Leader shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.
- 2.3.3 Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes, and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.
- 2.3.4 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper is then returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 2.3.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

2.4 Monitoring Locations

- 2.4.1 The dust monitoring locations are shown in Figure 2.2 (A, B & C). The status and locations of dust sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from EPD on the proposal.
- 2.4.2 When alternative monitoring locations are proposed, the following criteria, as far as practicable, should be followed:
- (a) at the site boundary or such locations close to the major dust emission source;
 - (b) close to the sensitive receptors; and
 - (c) take into account the prevailing meteorological conditions.

2.4.3 The ET Leader shall agree with the ER on the position of the HVS for installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:

- (a) a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- (b) no two samplers should be placed less than 2 meter apart;
- (c) the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- (d) a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
- (e) a minimum of 2 metre separation from any supporting structure, measured horizontally is required;
- (f) no furnace or incinerator flue is nearby;
- (g) airflow around the sampler is unrestricted;
- (h) the sampler is more than 20 metres from the dripline;
- (i) any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- (j) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- (k) a secured supply of electricity is needed to operate the samplers.

2.5 Baseline Monitoring

2.5.1 The ET Leader shall carry out baseline monitoring at monitoring location C (Pok Oi Hospital) for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24 hour TSP samples. 1-hour sampling shall also be done at least 3 times per day while the highest dust impact is expected.

2.5.2 During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.

2.5.3 In case the baseline monitoring cannot be carried out at the designated monitoring location during the baseline monitoring period, the ET Leader shall carry out the monitoring at an alternative location which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring location shall be approved by the ER and agreed with EPD.

2.5.4 In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, the IC shall liaise with EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.

2.5.5 Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the ET Leader considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with EPD.

2.6 Impact Monitoring

2.6.1 The ET Leader shall carry out impact monitoring during the course of the Works. The routine sampling frequency should be once in every six-days for 24-hr TSP monitoring and at least 3 times in every six days for 1-hr TSP monitoring (undertaken when the highest dust impact occurs) at each monitoring station that is currently affected by the works. Owing to the elongate nature of the site and the likelihood that works will be undertaken progressively from one end to the other, one or more of the monitoring stations may be redundant at any one time during the course of the works. The schedule for activating/deactivating each of the three monitoring locations during the course of the works shall be established during the detailed design in accordance with the construction programme. It will be the responsibility of the ET Leader in consultation with EPD to decide which monitoring stations should be operated/activated during the course of the works.

2.6.2 In the case of non-compliance with the air quality criteria, more frequent monitoring as specified in the Action Plan shall be conducted within 24 hrs after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or deterioration in air quality is rectified.

2.7 Event and Action Plan

2.7.1 The baseline monitoring results form an important part of the basis of the air quality criteria for the impact monitoring. The impact monitoring results shall be compared with the air quality criteria set up for 24-hour TSP and 1-hour TSP. Table 2.1 shows the air quality criteria, namely Action and Limit levels. Should noncompliance with the air quality criteria occurs, the EM, the ER and the Contractor shall undertake the corresponding action in accordance with the Action Plan illustrated in Table 2.2.

Table 2.1
Action and Limit Levels for Air Quality

Parameters	Action Levels	Limit Level
24 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For Baseline Level $\leq 200 \mu\text{g}/\text{m}^3$, Action Level = (Baseline Level * 1.3 + Limit Level)/2; For Baseline Level $> 200 \mu\text{g}/\text{m}^3$, Action Level = Limit Level	260
1 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For Baseline Level $\leq 384 \mu\text{g}/\text{m}^3$, Action Level = (Baseline Level * 1.3 + Limit Level)/2; For Baseline Level $> 384 \mu\text{g}/\text{m}^3$, Action Level = Baseline Level	500

Table 2.2
Actions in the Event of Exceedance of Action/Limit Levels

Event	Actions		
	ET	ER	Contractor
Action Level			
Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 	<ol style="list-style-type: none"> 1. Notify Contractor 2. Check monitoring data and Contractor's working methods 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice 2. Amend working methods if appropriate
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER 3. Repeat measurements to confirm findings 4. Increase monitoring frequency to daily 5. Discuss with ER for remedial actions required 6. If exceedance continues, arrange meeting with ER 7. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check monitoring data and Contractor's working methods 4. Discuss with EM and Contractor on potential remedial actions 5. Ensure remedial actions are properly implemented 	<ol style="list-style-type: none"> 1. Submit proposals for remedial actions to ER within 3 working days of notification 2. Implement the agreed proposals 3. Amend proposal if appropriate
Limit Level			
Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER and EPD 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 5. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check monitoring data and Contractor's working methods 4. Discuss with EM and Contractor the potential remedial actions 5. Ensure remedial actions are properly implemented 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER and EPD the causes & actions taken for the exceedances 3. Repeat measurement to confirm findings 4. Increase monitoring frequency to daily 5. Investigate the causes of exceedance 6. Arrange meeting with EPD and ER to discuss the remedial actions to be taken 7. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results 8. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented 4. Discuss amongst EM and the Contractor the potential remedial actions 5. Review Contractor's remedial actions whenever necessary to assure their effectiveness 6. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

2.8 Dust Mitigation Measures to be Implemented by the Contractor

2.8.1 The following dust control measures as part of good construction practice should be incorporated in the Contract Specification and implemented to reduce dust nuisance arising from the works to within acceptable levels.

- (i) The Contractor shall undertake at all times to prevent dust nuisance as a result of his activities. Effective dust suppression measures as are necessary should be installed to ensure that the air quality, at the boundary of the site and at any sensitive receivers, complies with the Hong Kong Air Quality Objectives.
- (ii) The Contractor shall frequently clean and water the Site to minimise fugitive dust emissions.
- (iii) Effective water sprays shall be used during the delivery and handling of all raw sand and aggregate, and other similar materials, when dust is likely to be created and to dampen all stored materials during dry and windy weather.
- (iv) Areas within the Site where there is a regular movement of vehicles must be regularly watered as often as is necessary for effective suppression of dust or as often as directed by the Engineer. In most instances it will be necessary to water haul roads on an hourly basis.
- (v) Should a conveyor system be used, the contractor shall implement the following precaution measures. Conveyor belts shall be fitted with windboards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize dust emission. All conveyors under the contractor's control and carrying materials which have the potential to create dust shall be totally enclosed and fitted with belt cleaners.
- (vi) Where dusty materials are being discharged to vehicles from a conveying system at a fixed transfer point, a three-sided roofed enclosure with a flexible curtain across the entry shall be provided. Exhaust fans shall be provided for this enclosure and vented to a suitable fabric filter system.
- (vii) The Contractor shall confine haulage and delivery vehicles to designated roadways inside the Site. If in the opinion of the Engineer, any motorized vehicle is causing dust nuisance, the Engineer may require that the vehicle be restricted to a maximum speed of 15 km per hour while within the Site.

- (vii) Wheel washing facilities shall be installed and used by all vehicles leaving the Site. No earth, mud, debris, dust and the like shall be deposited on public roads. Water in the wheel cleaning facility shall be changed at frequent intervals and sediments shall be removed regularly. The Contractor shall submit details of proposals for the wheel cleaning facilities to the Engineer prior to construction of the facility. Such wheel washing facilities shall be usable prior to any earthworks excavation activity on the Site. The Contractor shall also provide a hard-surfaced road between any washing facility and the public road.

- (ix) All site vehicle exhausts should be directed vertically upwards or directed away from ground.

Legend :

Existing and Future Watercourses

Air Monitoring Station

- A Village House
- B Pok Oi Hospital
- C Village House

revision	date	description	initial
designed	07/05/95	AJT	UC
checked	10/05/95	UC	CWC
initial	10/05/95	UC	UC
date	10/05/95	UC	UC

AGREEMENT NO. CE 79/96

project
YUEN LONG BYPASS FLOODWAY
FEASIBILITY STUDY

EM & A MANUAL

figure title

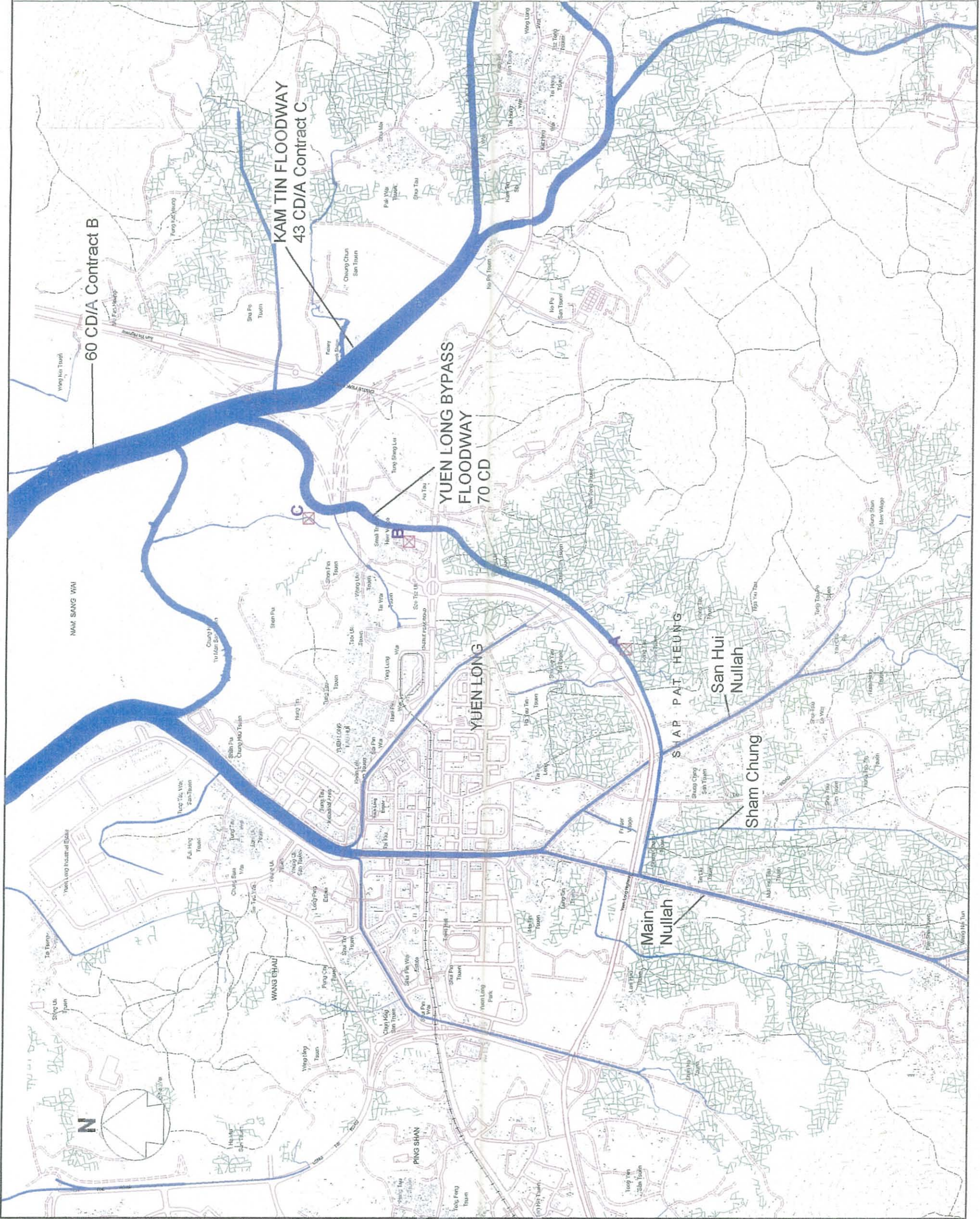
AIR MONITORING LOCATIONS

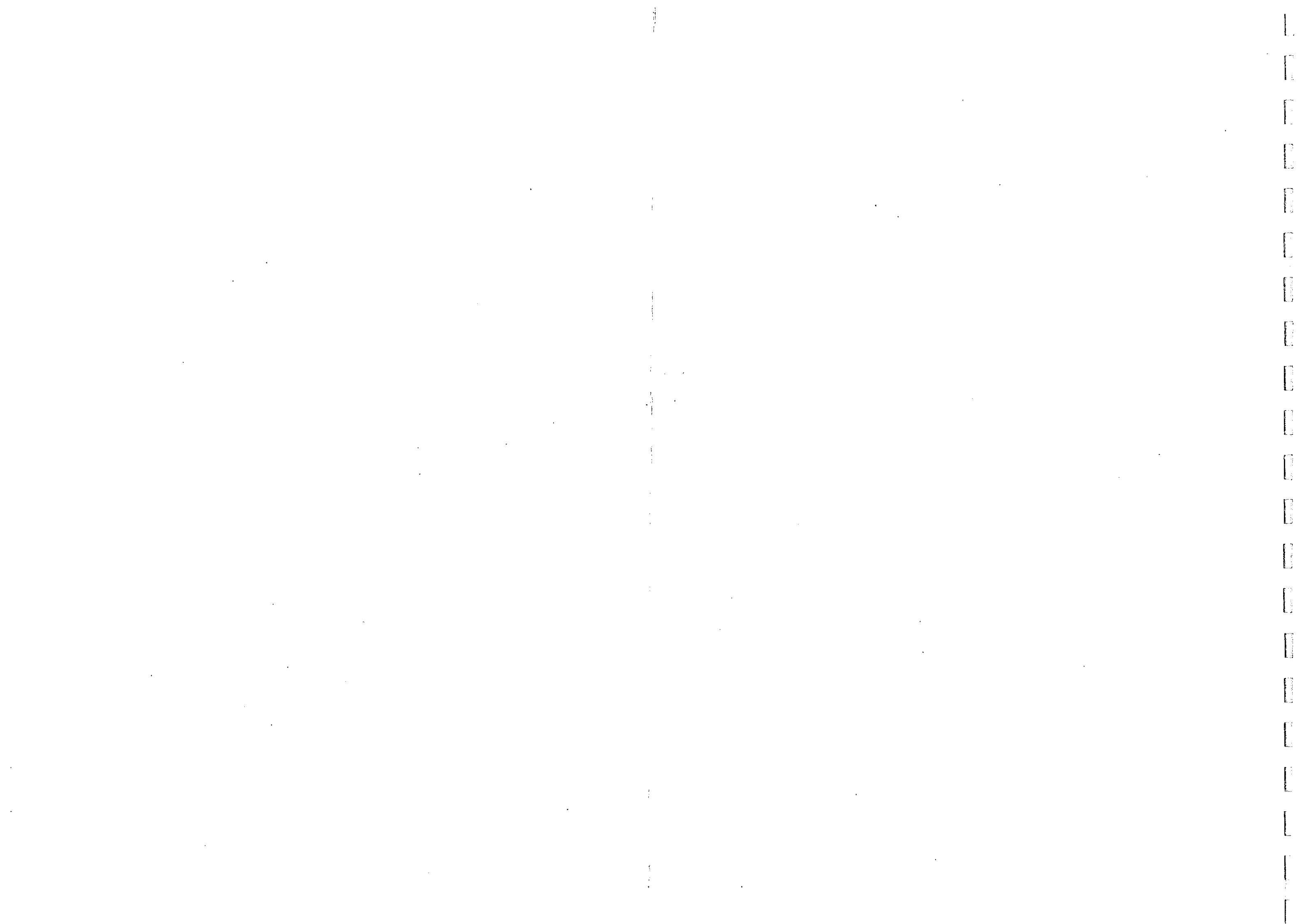
figure no. 2.2 scale N.T.S.

新界北拓展處
NEW TERRITORIES NORTH
DEVELOPMENT OFFICE

拓展署
Territory Development
Department, Hong Kong

BINNIE CONSULTANTS LIMITED
新尼工程師有限公司
ENGINEERS AND SCIENTISTS





3 NOISE

3.1 Noise Parameters

3.1.1 A-weighted equivalent continuous sound pressure level (Leq) shall be monitored and audited by the ET to ensure compliance with the criteria of the Noise Control Ordinance (NCO). Leq (30 min) shall be measured during the time period between 0700-1900 hours on normal weekdays. For other time periods, Leq (5 min) shall be measured for comparison with the NCO criteria.

3.1.2 All relevant information including date, time and locations of the monitoring, weather condition, calibration and measurement data, and other special phenomena and works occurring in the monitoring locations shall be recorded in detail on the Noise Monitoring Field Record Sheet (Figure 3.1).

3.2 Monitoring Equipment

3.2.1 Sufficient numbers of noise equipment and associated calibration kit and accessories shall be available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled and properly maintained.



3.2.2 The sound level meters used for noise monitoring shall comply with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1).

3.2.3 The sound level meters shall be calibrated immediately before each noise measurement using an acoustic calibrator which generates a known sound pressure level at a known frequency. The sound level meters shall be checked after each measurement using the same acoustic calibrator. Measurements shall be accepted as valid only if the calibration levels before and after the noise measurement agree to within 1.0 dB.

3.2.4 Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5 ms^{-1} or wind with gusts exceeding 10 ms^{-1} . The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L ₉₀ (dB(A))	
	L ₁₀ (dB(A))	
	L _{eq} (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

	<u>Name & Designation</u>	<u>Signature</u>	<u>Date</u>
Recorded By :	_____	_____	_____
Checked By :	_____	_____	_____

Noise Monitoring Field Record Sheet	 TERRITORY DEVELOPMENT DEPARTMENT	Figure no. 3.1	
	YUEN LONG BYPASS FLOODWAY FEASIBILITY STUDY EM&A MANUAL	Prepared AJT	Checked AS
	 BINNIE CONSULTANTS LIMITED 寶尼 <small>寶尼工程顧問有限公司</small> <small>CONSULTING ENGINEERS</small>	Date 2/98	Scale NTS

3.3 Monitoring Locations

3.3.1 The noise monitoring locations for construction of the Yuen Long Bypass Floodway are shown on Figure 3.2. The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations which are:

- (a) close to the major site activities where adverse noise impacts are likely to occur;
- (b) close to the NSRs which include any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre;

3.3.2 When monitoring the noise level at locations in the vicinity of the sensitive receivers, care should be taken to minimise disturbance to the occupants.

3.3.3 The noise level metres shall be set at 1.2 m above the ground level.

3.3.4 Normal requirements for the distance between the noise level meter and the exterior facade of the sensitive receiver building is 1 m.

3.3.5 Where the normal requirement is found impracticable, an alternative position may be selected. A correction shall be made to the result of the noise measurement at the alternative position. For reference, a correction of +3 dB(A) shall be made to the field free measurement.

3.3.6 The ET Leader shall agree with the ER on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

3.4 Baseline Monitoring

3.4.1 The baseline noise monitoring shall be carried out at the noise monitoring locations as shown on Figure 3.2 for a period of two weeks prior to the commencement of the construction works. A schedule on the baseline monitoring shall be submitted to the ET Leader before the monitoring starts.

3.4.2 There shall not be any construction activities in the vicinity of the noise monitoring locations during the baseline monitoring.

3.4.3 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall propose an appropriate set of data to be used as a baseline reference and submit to the ER.

3.5 Impact Monitoring

3.5.1 Noise monitoring shall be carried out once per week between 0700-1900 on normal weekdays at all the designated monitoring locations as shown on Figure 3.2. Owing to the elongate nature of the site and the likelihood that works will be undertaken progressively from one end to the other, one or more of the monitoring stations may be redundant at any one time during the course of the works. The schedule for activating/deactivating each of the three monitoring locations during the course of the works shall be established during the detailed design in accordance with the construction programme. It will be the responsibility of the ET Leader in consultation with EPD to decide which monitoring stations should be operated/activated during the course of the works.

3.5.2 In case of noncompliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in Section 3.6 shall be carried out. The additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

3.6 Event and Action Plan

3.6.1 The Action and Limit levels for construction noise are defined in Table 3.1. Should noncompliance with the criteria occur, action in accordance with the Action Plan in Table 3.2, shall be carried out.


Table 3.1
Action and Limit⁽¹⁾ Levels for Noise Measured at NSRs during Construction

Period	Weekdays ⁽²⁾ 0700 to 1900 hours $L_{Aeq(30\ min)}$ (dB(A))	Evenings 1900 to 2300 hours Sundays and General Holidays $L_{Aeq(5\ min)}$ (dB(A))	Night-time 2300 to 0700 hours $L_{Aeq(5\ min)}$ (dB(A))
Action Level	Baseline + 5 dB(A)	Baseline + 5 dB(A)	Baseline + 5 dB(A)
Limit Level	75 ⁽⁴⁾	45 ⁽³⁾	30 ⁽³⁾

Notes:

- (1) Limit levels may be adjusted according to the baseline data collected.
- (2) At schools AL levels are 5 dB(A) lower, 10 dB(A) lower during examinations.
- (3) *Technical Memorandum on Noise from Construction Work other than Percussive Piling* issued under the *Noise Control Ordinance*. The finalisation of target levels is subject to the Area Rating of the NSR to

Legend :

 Existing and Future Watercourses

 Noise Monitoring Station

N1 Village House at Shung Chung San Tsuen

N2 Village House at Chuk San Tsuen

N3 Pok Oi Hospital

revision	date	description	initial
initial	GY	AJT	LC CWC
date	1/96	1/96	1/96 1/96

AGREEMENT NO. CE 79/96

project
YUEN LONG BYPASS FLOODWAY
FEASIBILITY STUDY

EM & A MANUAL

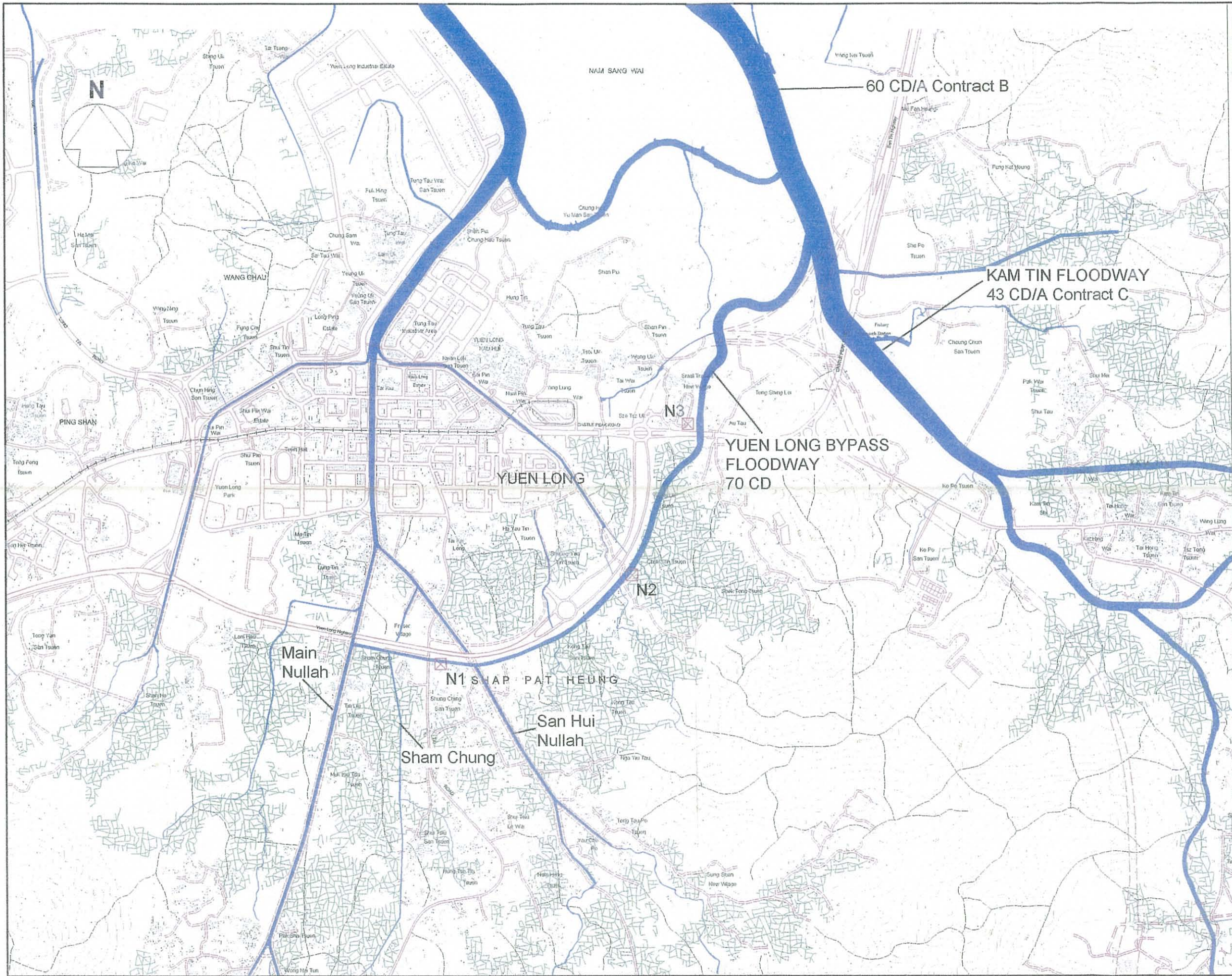
figure title
LOCATIONS OF
NOISE MONITORING STATIONS

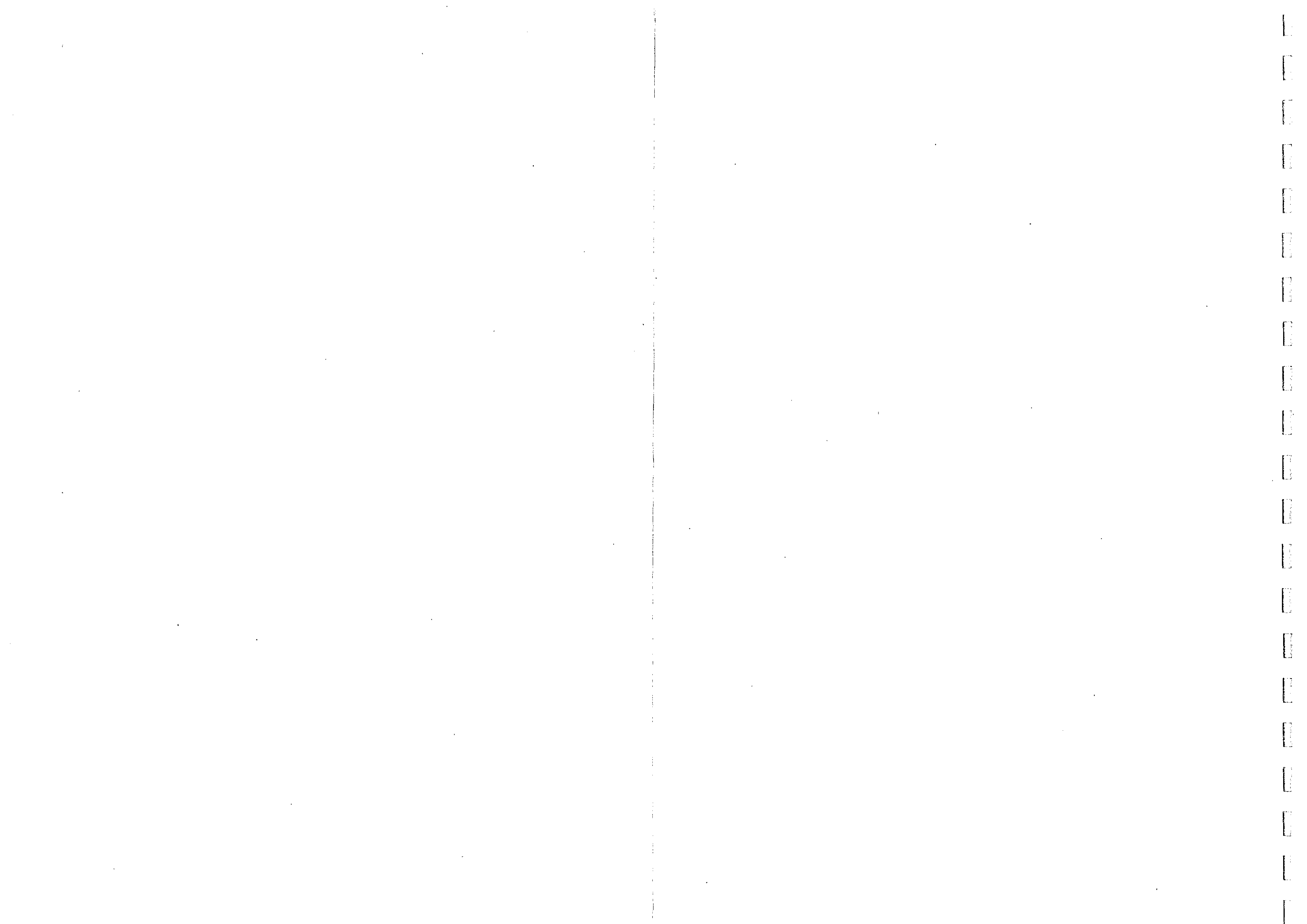
figure no. 3.2 scale N.T.S

新界北拓展處
NEW TERRITORIES NORTH
DEVELOPMENT OFFICE

 拓展署
Territory Development
Department, Hong Kong

consultant
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ENGINEERS AND SCIENTISTS 寶尼





be determined by EPD. Area Rating 'B' is suggested, as most of the NSRs are high rise buildings without any nearby Influencing Factors. If the following equipment or processes were in use then the levels will be 15 dB lower:

- . bulldozer
- . hand held breakers
- . vibrator concrete poker
- . dump truck
- . concrete lorry mixer
- . hammering
- . any process concerning scaffolding or formwork making.

(4) EPD Internal Guideline.

Table 3.2
Event/Action Plan for Construction Noise

Event	Action	
	EM or ER	Contractor
Action Level	<ol style="list-style-type: none"> 1. Notify Contractor 2. Analyse investigation 3. Require Contractor to propose measures for the analysed noise problem 4. Increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to Environmental Manager/Engineer's Representative 2. Implement noise mitigation proposals
Limit Level	<ol style="list-style-type: none"> 1. Notify Contractor 2. Notify EPD 3. Require contractor to implement mitigation measures. Increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Implement mitigation measures 2. Prove to Environmental Manager/ER effectiveness of measures applied

3.7 Noise Mitigation Measures to be Implemented by the Contractor

3.7.1 The Contractor should consider noise as an environmental constraint in the planning and execution of the Works.

3.7.2 The Contractor should comply with the *Noise Control Ordinance (Cap 400)* and with any regulations made under the Ordinance, including restrictions placed on noise from construction work and the requirements to seek Construction Noise Permits (CNPs). Before commencing work which requires CNPs, the Contractor should obtain these permits and display them appropriately.

3.7.3 For restricted hours (1900 - 0700 hours) from Monday to Saturday, and all day on Sunday and public holidays, the construction noise is controlled by the Construction Noise Permit system under the Noise Control Ordinance. The noise criteria used for assessing construction noise during restricted hours are given below in Table 3.3.

Table 3.3
Construction Noise Criteria during Restricted Hours

Time Period	Basic Noise Levels, dB(A) ⁸	
All days during the evening (1900 to 2300 hours), and general holidays (including Sundays) during the day-time and evening (0700 to 2300 hours)	60/65/70 ⁽¹⁾	45/50/55 ⁽²⁾
All days during the night-time (2300 to 0700 hours)	45/50/55 ⁽¹⁾	30/35/40 ⁽²⁾

- * To be selected based on Area Sensitivity Rating.
 (1) TM on Noise from Construction Work Other than Percussive Piling.
 (2) TM on Noise from Construction Work in Designated Areas.

3.7.4 In addition to the requirements imposed by the *Noise Control Ordinance*, to control noise generated from equipment and activities for the purpose of carrying out any construction work other than percussive piling, during the time period from 0700 to 1900 hours, on any day not being a general holiday (including Sundays), the following requirements shall also be complied with:

- (a) The noise level measured at 1 m from the most affected external facade of the nearby noise sensitive receivers from the construction work alone during any 30 minute period shall not exceed an equivalent noise level (Leq) of 75 dB(A).
- (b) The noise level measured at 1 m from the most affected external facade of the nearby schools from the construction work alone during any 30 minute period shall not exceed an equivalent noise level (Leq) of 70 dB(A) [65 dB(A) during school examination periods].

The Contractor shall liaise with the schools and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

- (c) The Contractor shall, before the start of the Project, inform and liaise with the authority of the Pok Oi Hospital on the timing, duration of the Project, the noise to which the Hospital may be exposed to and the measures being taken to limit the nuisance.

The Contractor shall do all practical measures so as to minimize the noise impact on the Hospital and ensure that noise from the Project be kept to a minimum as far as practicable.

- (d) Should the limits stated in the above sub-clauses (a) and (b), be exceeded, the construction shall stop and shall not recommence until appropriate measures acceptable to the Engineer, that are necessary for compliance, have been implemented.

Any stoppage or reduction in output resulting from compliance with this clause shall not entitle the Contractor to any extension of time for completion or to any additional costs whatsoever.

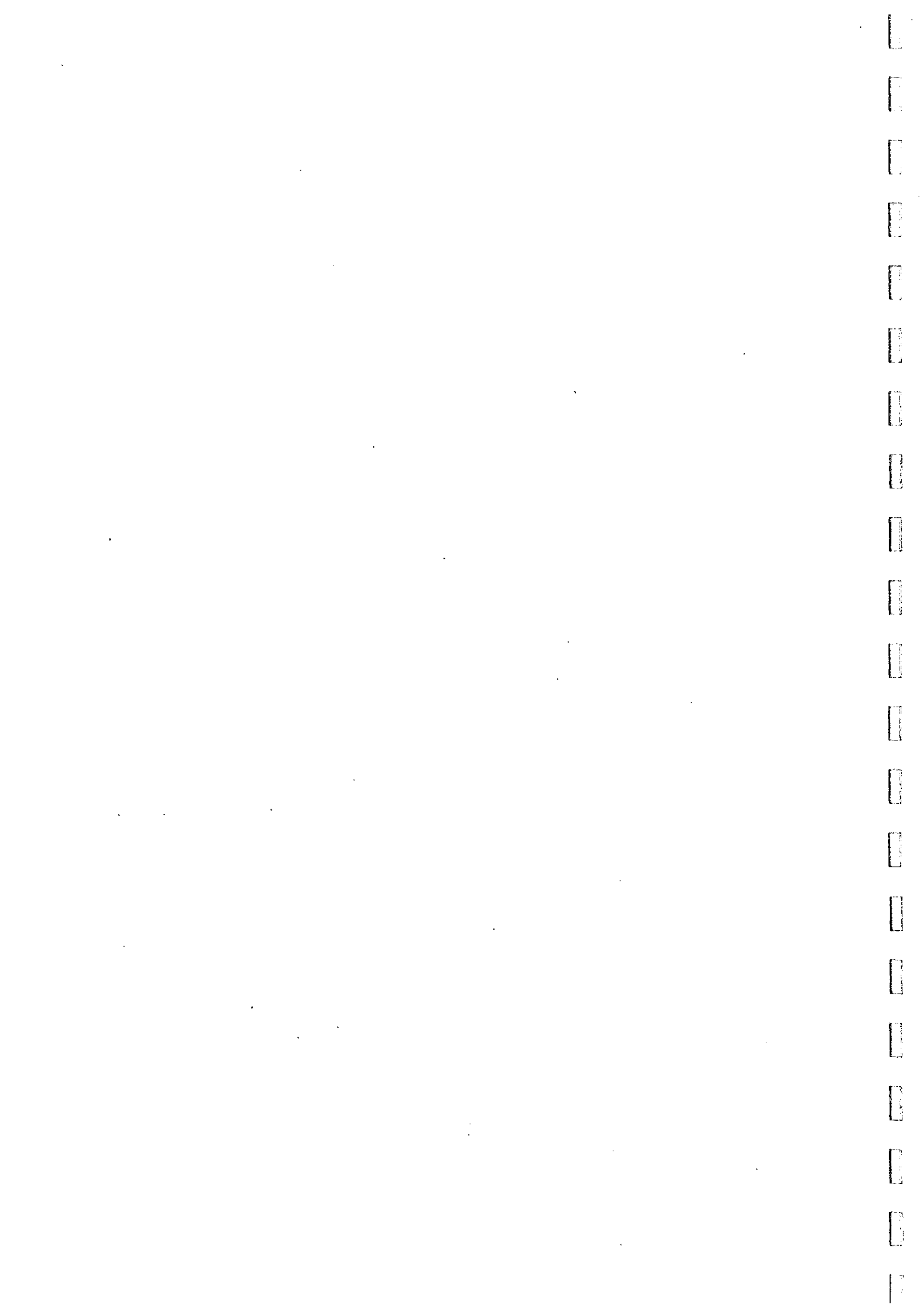
- 3.7.5 The Contractor shall devise, arrange methods of working and carry out the Works in such a manner so as to minimise noise impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these methods are implemented.
- 3.7.6 Before the commencement of any work, the Engineer may require the methods of working, equipment and sound-reducing measures intended to be used on the Site to be made available for inspection and approval to ensure that they are suitable for the project.
- 3.7.7 The Contractor shall ensure that all plant and equipment to be used on the Site likely to cause excessive noise be effectively sound-reduced by means of silencers, mufflers, acoustic linings or shields, acoustic sheds or screens or other means to avoid disturbance to any nearby NSRs. All hand-held percussive breakers and air compressors will comply with the *Noise Control (Hand-held Percussive Breakers) Regulations and Noise Control (Air Compressors) Regulations* respectively under the *Noise Control Ordinance (Ordinance No. 75/88, NCO Amendment 1992 No. 6)*.
- 3.7.8 The Contractor shall ensure that all plant and equipment to be used on site are properly maintained in good operating condition.

- 3.7.9 It is recommended that construction noise should be mitigated using a suitable combination of the following measures:
- (a) Noisy equipment and activities should be sited by the Contractor as far from close-proximity sensitive receivers as is practical. Prolonged operation of noisy equipment close to dwellings and school should be avoided.
 - (b) Noisy plant or processes should be replaced by quieter alternatives where possible. Silenced diesel and gasoline generators and power units, as well as silenced and super-silenced air compressors, can be readily obtained.
 - (c) Noisy activities should be scheduled to minimise exposure of nearby sensitive receivers to high levels of construction noise. For example, noisy activities can be scheduled for midday, or at times coinciding with periods of high background noise (such as during peak traffic hours).
 - (d) Idle equipment should be turned off or throttled down. Noisy equipment should be properly maintained and used no more often than is necessary.
 - (e) The power units of non-electric stationary plant and earth-moving plant should be quietened by vibration isolation and partial or full acoustic enclosures for individual noise-generating components.
 - (f) Construction activities should be planned so that parallel operation of several sets of equipment close to a given receiver is avoided thus reducing the cumulative impacts between operations. The numbers of operating items of powered mechanical equipment should be minimised.
 - (g) Construction plant should be properly maintained and operated. Construction equipment often has silencing measures built in or added on, e.g. bulldozer silencers, compressor panels, and mufflers. Silencing measures should be properly maintained and utilised.
 - (h) Equipment known to emit sound strongly in one direction, should, where possible, be oriented so that the noise is directed away from nearby NSRs.
 - (i) Material stockpiles and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

- (j) A noise barrier in the form of a 2.5 m high site hoarding should be built along the site boundary in the vicinity of nearby noise sensitive receivers as required. These temporary noise barriers should be gap free and have a surface mass density of 20 kg/m². The Contractor should ensure that the noise barrier is properly maintained at all times and that any gaps or openings should be repaired promptly to ensure its effectiveness.

3.7.10 For the purposes of the above clauses, any domestic premises, hotels, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing arts centre or office building shall be considered a noise sensitive receiver.

3.7.11 Notwithstanding the requirements and limitations set out and subject to the clauses above, the Engineer may upon application in writing by the Contractor, allow the use of any equipment and the carrying out of any construction activities for any duration provided that he is satisfied with the application which, in his opinion, to be of absolute necessity and adequate noise insulation has been provided to the educational institutions to be affected, or of emergency nature, and not in contravention with the *Noise Control Ordinance* in any respect.



4 WATER QUALITY

4.1 Water Quality Parameters

4.1.1 Monitoring of dissolved oxygen (DO), turbidity, temperature, pH suspended solids and grease shall be made of all site discharges. Monitoring of pH, Temperature and Nitrogen (Ammonia) DO and turbidity shall be undertaken in the immediate mixing zone of the YLBF and Kam Tin River. The rationale and methodology for the parameters are summarised in Table 4.1.

4.1.2 In association with the water quality parameters, the following data shall also be provided: monitoring location/position, time, water depth (if relevant) weather conditions, tidal stage (if relevant) and any special phenomenon and work underway at the construction site.

Table 4.1
Rationale and Methodology for Water Quality Parameters

Parameters	Rationale	Method Reference
1. Dissolved Oxygen (DO)	<p>DO is a key water quality parameter in water pollution and waste treatment process control. It indicates ability of a water body to support a well balanced aquatic fauna.</p> <p>Sufficient DO in water is required for protection of aesthetic quality of water as well as maintenance of fish and other aquatic life. Insufficient DO develops septic conditions, causing malodorous emission resulted from anaerobic decomposition of organic and other oxygen-demanding matters present in water. Insufficient DO also adversely affects aquatic insects and other animals upon which fish and waterbirds feed, causing eventually loss of the ecological balance.</p> <p>A minimum DO level of 4 mg/l is set as limit level in this EM&A.</p> <p>DO could be reduced by the pollutants in site run-off.</p>	<p>Standard Methods for the Examination of Water and Waste Water 17th Edition (APHA, AWWA, WEF) 4500-0 G</p>
2. Turbidity	<p>Turbidity is an expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines. Optically black particles increase turbidity.</p> <p>Turbidity in water may be caused by suspended matter such as clay, silt, finely divided organic and inorganic matter, soluble organic compounds, plankton and other microscopic organisms as are likely in site runoff.</p> <p>Turbidity is a measure of clarity which indicates the condition and productivity of a water body. It may be used as a quick reference to the amount of total suspended solids (TSS) in water, although the correlation of turbidity with TSS is difficult because the size, shape and reflective index of the particulates affect the light-scattering properties of the suspension.</p>	<p>Standard Methods for the Examination of Water and Waste Water 17th Edition (APHA, AWWA, WEF) 2130</p>

Table 4.1
Rationale and Methodology for Water Quality Parameters (cont'd)

Parameters	Rationale	Method Reference
3. Temperature	<p>Water temperature regulates to some extent the metabolism and ability to survive and reproduce effectively of aquatic life.</p> <p>Temperature also affects the self-purification phenomenon in water bodies and henceforth affects the aesthetic and sanitary qualities of the water bodies. Increased temperatures accelerate biodegradation of organic matters both in water and in bottom deposits, demanding more dissolved oxygen. This is exacerbated by the fact that oxygen becomes less soluble as water temperature increases. Increased temperatures also increase the odour of water because of the increased volatility of odour-causing compounds.</p> <p>Temperature affects many chemical equilibriums, therefore, it is used in calculation of various laboratory studies and chemical operations. In this EM&A, interpretation of monitoring results of some water quality parameters such as pH, DO etc. require temperature data.</p> <p>In conclusion, "Temperature, a catalyst, a depressant, an activator, a restrictor, a stimulator, a controller, a killer, is one of the most important and most influential water quality characteristics to life in water." (FWPCAC (1967))</p>	<p>Standard Methods for the Examination of Water and Waste Water 17th Edition (APHA, AWWA, WEF) 2550</p>

Table 4.1
Rationale and Methodology for Water Quality Parameters (cont'd)

Parameters	Rationale	Method Reference
4. pH	<p>pH is a measure of hydrogen ion activity in water. The mathematical expression of pH is:</p> $\text{pH} = -\log_{10} [\text{H}^+], \text{ where } [\text{H}^+] \text{ is the activity of hydrogen ion}$ <p>The pH value of natural waters is a measure of acid-base equilibrium of various dissolved compounds, salts or gases. It does not indicate the ability of a water to neutralized additions of acids or bases due to the 'buffering capacity' of the water. However, it affects the degree of dissociation of weak acids and bases, causing variation of toxicity of many compounds, typical examples of which being toxicity of cyanides, sulphides and ammonia. In the case of ammonia, the chemical equilibrium is shifted towards an increased concentration of toxic un-ionized ammonia as pH is increased.</p> <p>pH is raised by concrete washings.</p>	<p>Standard Methods for the Examination of Water and Waste Water 17th Edition (APHA, AWWA, WEF) 4500-H'</p>
5. Total Suspended Solids (TSS)	<p>Water high in TSS may aesthetically be unsatisfactory for many purposes such as bathing. More significantly, TSS affects fish and fish food populations. Being components of TSS, clay, silt and other settleable particulates blanket the bottom of water bodies, damaging invertebrate populations and blocking gravel spawning beds. The organic parts of TSS remove dissolved oxygen from overlying water, causing another adverse effect to aquatic life (refer to DO).</p> <p>High TSS levels can occur in runoff from site formation works, removal of material, concrete washings. etc.</p>	<p>Standard Methods for the Examination of Water and Waste Water 17th Edition (APHA, AWWA, WEF) 2540D</p>
6. Ammonia	<p>Ammonia is present at high levels in the nearby water bodies. It is a component of the nitrogen cycle which consists of nitrates, nitrites, nitrogen gas, ammonia and organic nitrogen. It is biochemically interconvertible. When disturbed, ammonia can be leached from bottom deposits. Ammonia is toxic to aquatic life. The toxicity of ammonia is attributed to the un-ionized NH_3 species which increase as pH and temperature of water are increased. In most natural waters, especially in waters with high salinity, the non-toxic ionized fraction of ammonia predominates.</p>	<p>Standard Methods for the Examination of Water and Waste Water 17th Edition (APHA, AWWA, WEF) 4500-NH₃</p>

- 4.1.3 Samples collected for the analysis of Nitrogen (Ammonia) and TSS should be transported to the laboratory upon collection and preserved immediately upon arrival at the laboratory. Remaining samples should be kept until analytical results are confirmed or maximum storage times are reached, whichever is shorter. In the event of noncompliance, extra analyses can be checked on the remaining preserved sample.
- 4.1.4 Sample presentation and maximum storage times shall be in accordance with Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF.
- 4.1.5 All laboratory measurement shall be carried out in a laboratory accredited under Hong Kong Laboratory Accreditation Scheme (HOKLAS) or other international accredited laboratory. All methodology shall follow that set out in the *Standard Methods for the Examination of Water and Wastewater*, APHA-AWWA-WEF. Results should be made available to the EM and ER as soon as possible.
- 4.1.6 If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by the DEP. All the analysis shall be witnessed by the ER. The EM shall provide the ER with one copy of the relevant chapters of the "Standard Methods of the Examination of Water and Wastewater" updated edition and any other relevant document for his reference.
- 4.1.7 Un-ionised ammonia levels shall be calculated as in the Lotus file NH3SALT.WKI supplied by the USEPA through internet. The calculation uses pH, salinity, temperature and total ammoniacal-nitrogen levels.

4.2 Monitoring Equipment

Dissolved Oxygen/Temperature Meter

- 4.2.1 The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and be operable from a DC power source. It shall have a membrane electrode with automatic temperature compensation complete with a cable of sufficient length. It shall be capable of measuring:
- (i) a dissolved oxygen level in the range of 0-20 mg/L and 0-200% saturation; and
 - (ii) a temperature of 0-45 degree Celsius.

Turbidity Meter

- 4.2.2 A portable turbidity-measuring instrument operating on a nephelometric principle. It shall contain a photoelectric sensor(s) and come with comprehensive operation manuals. The equipment shall be operable from a DC power source. It shall have a photoelectric sensor capable of measuring turbidity at least between 0-200 NTU and shall be calibrated using a set of secondary turbidity standards in each range the equipment can measure (Hach 2100P Turbidimeter or similar approved).

Suspended Solids

- 4.2.3 A drying oven capable of maintaining a temperature within 103° - 105° shall be available for drying filter papers in the processes of TSS determination. The oven shall be maintained and calibrated according to the requirements of the quality system of the HOKLAS or the equivalent.
- 4.2.4 A desiccator capable of maintaining a relative humidity below 50% shall be used for cooling and equilibrating the filter papers before weighing.
- 4.2.5 An electronic balance readable to not less than 0.1 mg (i.e. 0.0001 g) shall be available for weighing filter papers. The balance shall be maintained and calibrated according to the requirements of the quality system of the HOKLAS or the equivalent.
- 4.2.6 High density polythene or glass bottles shall be used for sample container.
- 4.2.7 Glass fibre filter paper recommended in the APHA 2540D shall be used for TSS determination.

pH Meter

- 4.2.8 The instrument shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It shall be readable to 0.1 pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 shall be used for calibration of the instrument before and after use. Details of the method are given in APHA, 17th ed. 4500-H⁺B. Temperature of measurement shall always be reported with pH results.

Thermometer

- 4.2.9 A certified mercury-in-glass thermometer with an accuracy of at least 0.5 degree Celsius shall be used for measuring the ambient (air) temperature.
- 4.2.10 All in-situ monitoring instruments shall be checked, calibrated and certified by an approved laboratory, preferably HOKLAS accredited, before use on the Works. The instruments shall be subsequently re-calibrated at 3 month intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use.
- 4.2.11 A set of backup equipment must be available to ensure that if any of the monitoring equipment is sent for repair or re-calibration, the monitoring programme can continue uninterrupted. In addition, sufficient stocks of spare parts and consumables for the equipment such as electrodes, membranes and cable shall be maintained.

4.3 Monitoring Locations

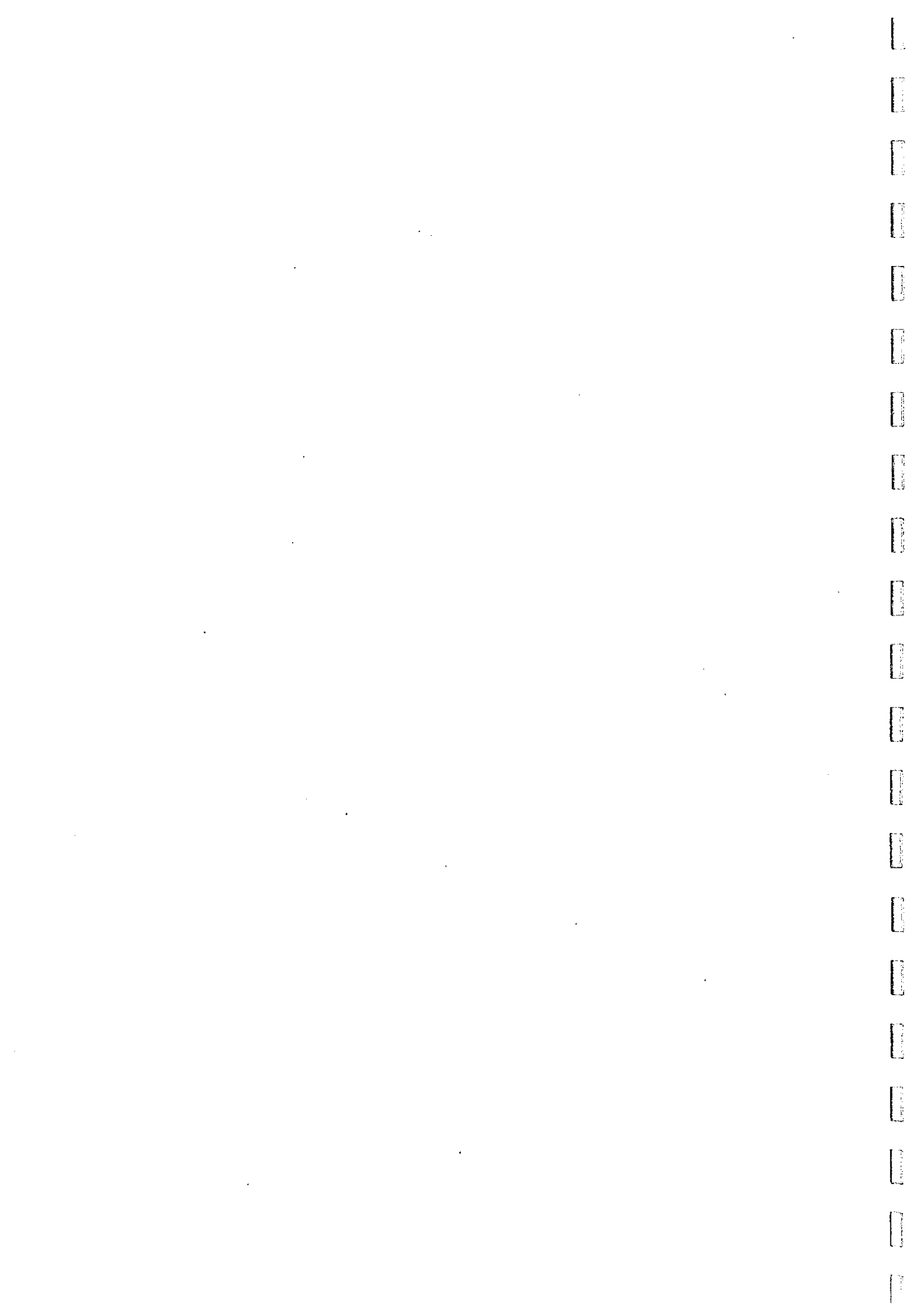
- 4.3.1 From the commencement of excavation works water quality monitoring shall be carried out at all points where construction site runoff enters the surface drainage system. The monitoring location at the ultimate discharge point of the YLBF is either at the sump from where water is pumped over the temporary construction dam or at the pipe through which the water is pumped. The monitoring location for the mixing zone with the Kam Tin River is taken to be 10m downstream from the point at which the discharge waters meet the Kam Tin River (Figure 4.1) This may be immediately below the temporary construction dam at high tide, or in the Kam Tin River channel at low tide. Other discharge monitoring points shall be determined during the detailed design.

4.4 Baseline Monitoring

- 4.4.1 Baseline monitoring of DO Turbidity, pH, NH₄-N and Temperature at the immediate mixing zone (W₁) shall be undertaken by the ET, during mid ebb tide for a period of two consecutive weeks at a frequency of once per day. the samples shall be taken at mid depth.

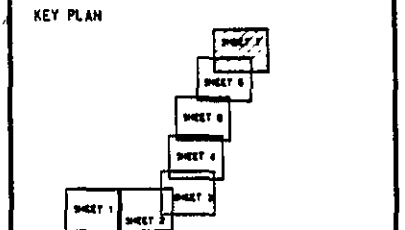
4.5 Impact Monitoring

- 4.5.1 Water quality monitoring should be taken according to the schedule given in Table 4.2 or more frequently if site inspections indicate deteriorating conditions as agreed between the ET Leader and the ER.



- NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
 2. ALL LEVELS ARE IN METERS ABOVE PRINCIPAL DATUM (mPD).
 3. GRID LINES ARE HONG KONG METRIC GRID 1980.

- LEGEND:
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - [Hatched Box] BOX CULVERT
 - [T Symbol] PROPOSED SLOPE
 - [Dotted Box] EXISTING SLOPE
 - [Diagonal Lines] AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - [Wavy Lines] ENGINEERED WETLAND/MARSHCRETE AREA
 - - - - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - ▲ PROPOSED LEVEL
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - - - - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION
 - 0.5m HIGH WALL



CAUTION
THIS MAY BE A REDUCED SIZE DRAWING. VERIFY SCALES SHOWN BEFORE SCALING THE DRAWING.

revision	date	description		initial	
		designed	checked	drawn	checked
initial	AJT	CWC	YLL	CWC	
date	01/98	01/98	01/98	01/98	

AGREEMENT NO. CE 79/98

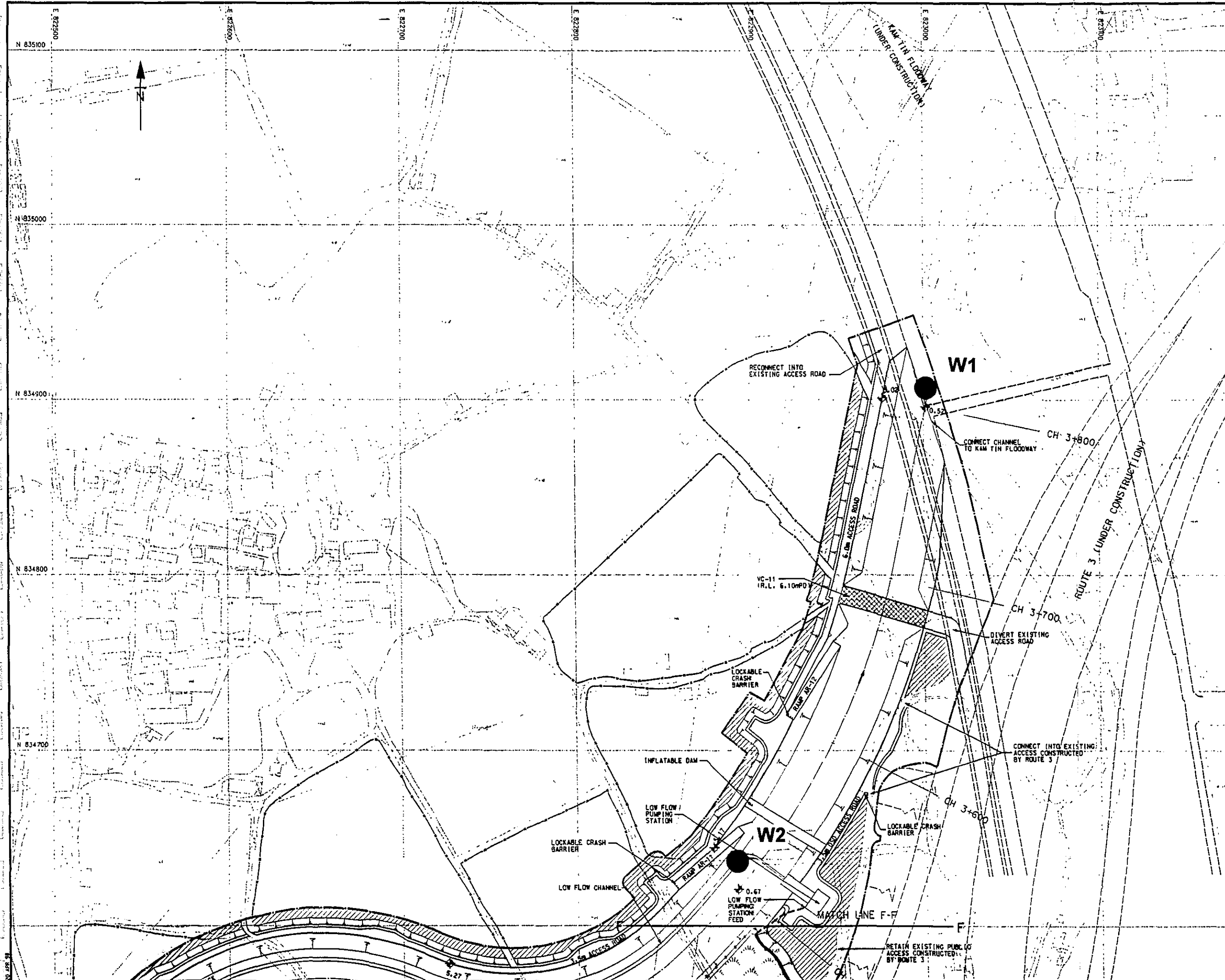
project
**YUEN LONG BYPASS FLOODWAY
FEASIBILITY STUDY**
EM & A MANUAL

Figure title
**WATER MONITORING
LOCATIONS**

Figure no. **4.1** Scale **1:1000**

新界北拓展處
**NEW TERRITORIES NORTH
DEVELOPMENT OFFICE**
拓展署
Territory Development
Department, Hong Kong

MINNIE CONSULTANTS LIMITED **寶尼**
寶尼工程顧問有限公司
ENGINEERS AND SCIENTISTS



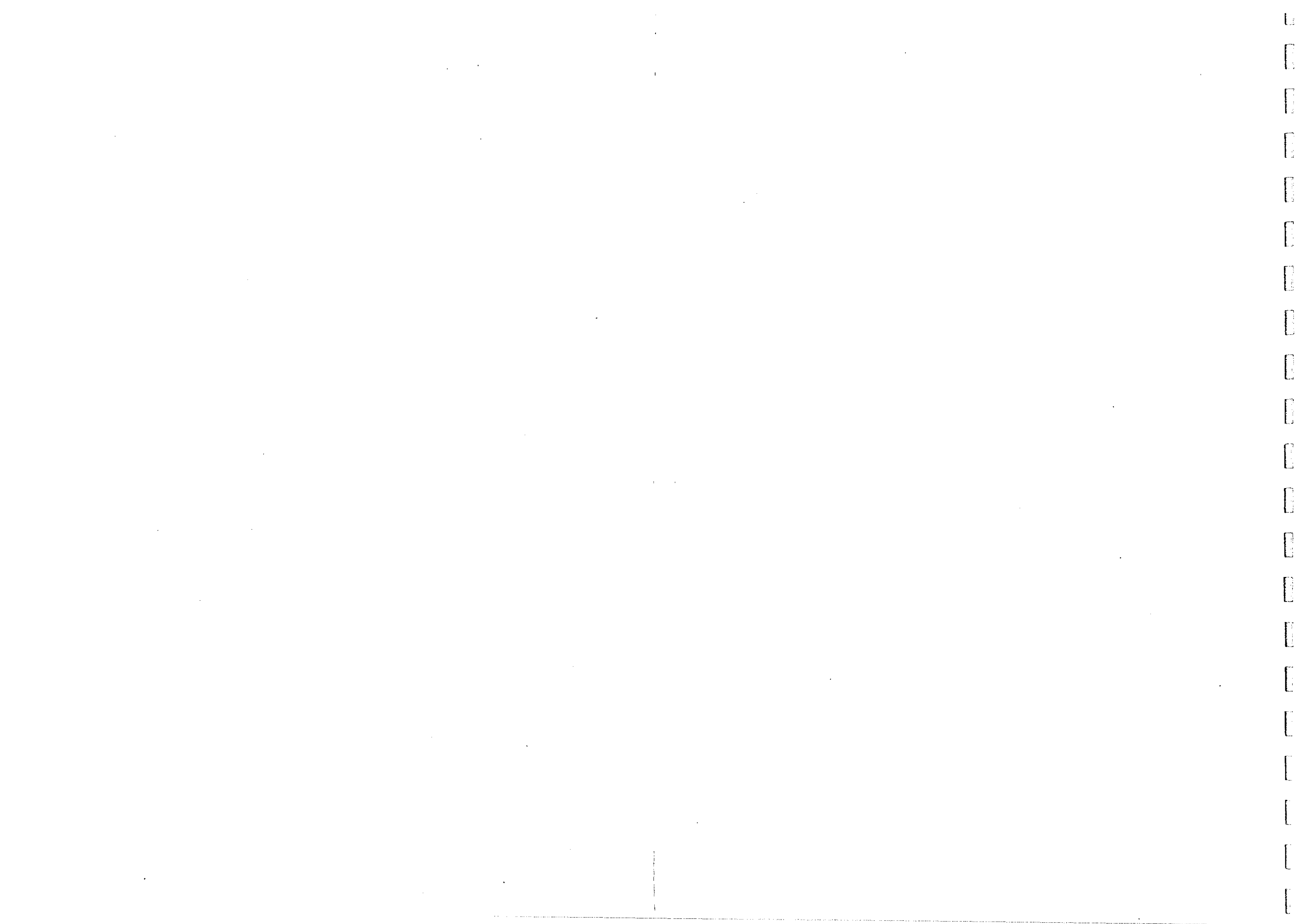


Table 4.2
Schedule of Water Quality Impact Monitoring

Location	Parameters	Frequency
All Site Discharges including ultimate discharge into Kam Tin River	Turbidity, DO, pH, Temperature	Once per week (during mid ebb at ultimate discharge)
	oil and grease, SS	Once per month (during mid ebb at ultimate discharge)
Mixing Zone of YLBF and Kam Tin River ¹	pH, Temperature, NH ₄ -N, DO Turbidity	Once per week during mid ebb

¹ Mixing zone is taken to be 10m downstream from the floodway discharge part

4.5.2 A Standard Operation Procedure for monitoring of each parameter shall be prepared and validated prior to commencement of the monitoring. Monitoring data sheets shall also be prepared for each parameter. All monitoring shall follow strictly the validated SOP.

4.5.3 All monitoring information including date and time, weather conditions, operator, identification and description of the monitoring locations, works, progress and construction activities, sample ID, method, analytical data and calculation etc. shall be recorded in the monitoring data sheet as shown on Figure 4.2.

4.6 Event and Action Plan for Water Quality

4.6.1 The water quality monitoring programme is centred around the monitoring of site discharges to ensure compliance with discharge standards set out in the Technical Memorandum on Standards for Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters. The relevant water quality criteria are shown in Table 4.3.

Location				
Date				
Start Time (hh:mm)				
Weather				
Sea Conditions				
Tidal Mode				
Water Depth (m)				
Monitoring Depth		Surface	Middle	Bottom
Salinity				
Temperature (°C)				
DO Saturation (%)				
DO (mg/l)				
Turbidity (NTU)				
SS Sample Identification				
SS (mg/l)				
Observed Construction Activities	<100m from location			
	>100m from location			
Other Observations				

Name & Designation

Signature

Date

Recorded By :

Checked By :

Note: The SS results are to be filled up once they are available from the laboratory.



Water Quality Monitoring Data Record Sheet	 TERRITORY DEVELOPMENT DEPARTMENT	Figure no. 4.2	
	YUEN LONG BYPASS FLOODWAY FEASIBILITY STUDY EM&A MANUAL	Prepared AJT	Checked AS
	 BINNIE CONSULTANTS LIMITED 寶尼 CONSULTING ENGINEERS	Date 2/98	Scale NTS

Table 4.3
Compliance Criteria for Water Quality

Parameter	Compliance Level (Group D Inland Waters)
Turbidity	N/A (to be determined) ¹
Suspended solids	30 mg/l
Dissolved oxygen	4 mg/l ²
pH	<8 ³
Temperature	30° C
Oil and grease	10 mg/l
NH ₄ -N ⁴	20 mg/l

¹ It is suggested that during the first month of compliance monitoring SS samples be undertaken weekly at all stations along with turbidity in order to determine a correlation between these parameters. A turbidity value corresponding to an SS value of 30 mg/l should be extrapolated from the SS/turbidity correlation (best fit) and used as the compliance level for turbidity. The SS sampling frequency would subsequently be reduced to monthly.

² As recommended in EPD's Generic EM&A Manual EIA.

³ As recommended in EIA.

⁴ For reference only because the NH₄-N level in KT River cannot be altered or mitigated under this project. This level serves as an indication of the importance of pH in the floodway discharge.

4.6.2 Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria are exceeded, the actions in accordance with the Action Plan in Table 4.4 shall be carried out.

Table 4.4
Actions in the Event of Non-compliance with Discharge Standards

Event	ET Leader	ER	Contractor
Discharge standard exceeded by one sampling day	Repeat in-situ measurement to confirm findings; Identify source(s) of impact; Inform contractor and EPD; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with ER and Contractor; Ensure mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Limit level.	Discuss with ET and Contractor on the proposed mitigation measures; Request Contractor to critically review the working methods; Make agreement to the mitigation measures to be implemented; Assess the effectiveness of the implemented mitigation measures.	Inform the Engineer and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment; consider changes of working methods; Propose mitigation measures to ER within 3 working days and discuss with ET and ER; Implement the agreed mitigation measures.
Discharge standards exceeded by more than two consecutive sampling days	Repeat in-situ measurement to confirm findings; Identify source(s) of impact; Inform contractor and EPD; Check monitoring data, all plant equipment and Contractor's working methods; Discuss mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	Discuss with ET and Contractor on the proposed mitigation measures; Request Contractor to critically review the working methods; Make agreement on the mitigation measures to be implemented mitigation measures; Assess the effectiveness of the implemented mitigation measures; Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of Limit level.	Inform the Engineer and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment; consider changes of working methods; Propose mitigation measures to ER within 3 working days and discuss with ET and ER; Implement the agreed mitigation measures; As directed by the Engineer, to slow down or to stop all or part of the marine work or construction activities.

4.7 Water Quality Mitigation Measures to be Implemented by the Contractor

- 4.7.1 The Contractor shall be aware of and comply with the *Buildings Ordinance*, the *Water Pollution Control Ordinance* and the *Technical Memorandum Standards for Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*.
- 4.7.2 The Contractor shall not discharge directly or indirectly (by runoff) any effluent or foul or contaminated water or cooling or hot water without the prior consent of the Engineer and the ET Leader to the drainage system.
- 4.7.3 Construction site runoff shall be discharged into storm drains or other discharge points via sand/silt removal facilities such as sand traps, silt traps and sediment basins.
- 4.7.4 The Contractor shall not permit any sewage and waste water to flow from the site onto any adjoining land or allow any waste matter to be deposited anywhere within the site or onto any adjoining land. The Contractor shall collect, remove and dispose of such wastewater according to the regulatory requirements set out in the documents stated in 4.7.1.

- 4.7.5 The Contractor shall be liable for any damages caused to adjoining areas through his failure to comply with the previous clause 4.7.4.
- 4.7.6 Silt removal facilities, channels and manholes shall be maintained and the deposited silt and grit shall be removed regularly, at the onset of, and after each rainstorm to ensure that these facilities are functioning properly at all times. Disposal of material shall be carried out properly and with the knowledge and approval of the ER and ET Leader.
- 4.7.7 Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on site shall be protected from erosion during rainstorms. Measures shall be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- 4.7.8 Discharge of surface runoff into foul sewers shall be prevented in order not to unduly overload the foul sewerage system.
- 4.7.9 Precautions to be taken at any time of year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecast and actions to be taken during or after rainstorms are summarized in the following:
- (1) Precautions to be taken at any time of year when rainstorms are likely
 - (a) Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly.
 - (b) Temporary access roads should be protected by crushed stone or gravel.
 - (c) Intercepting channels should be provided (e.g. along the crest/edge of excavation) to prevent storm runoff from washing across exposed soil surfaces.
 - (2) Actions to be taken when a rainstorm is imminent or forecast
 - (a) Silt removal facilities, channels and manholes should be checked to ensure that they can function properly.
 - (b) Open stockpiles of construction materials (e.g. aggregates, sand and fill materials) on Site should be surrounded by suitable bunds and temporary channels.

(3) Actions to be taken during or after rainstorms

- (a) Silt removal facilities, channels and manholes should be checked and maintained to ensure satisfactory working conditions. Attention should be given to safety when carrying out this work.

- 4.7.10 All vehicles and plant shall be cleaned before they leave the site to ensure no earth, mud, debris and the like is deposited on roads. A wheelwash shall be provided at every exit and the washwater shall be maintained regularly. The wastewater from wheelwash shall be settled before discharging into the site drainage system. The section of construction road between the wheelwash and the public road shall be paved to reduce vehicle tracking of soil and to prevent site runoff from entering public road drains.
- 4.7.11 Erosion of any stockpile of spoil or fill materials shall be prevented. A separate settlement system for a large stockpile will be provided as necessary to collect contaminated surface water prior to release to the drainage system of the works area.
- 4.7.12 All compounds in works areas shall be located on areas of hardstanding with provision of drainage channels and settlement ponds where necessary to allow interception and controlled release of settled/treated water; and provision of bunding for all potentially hazardous materials on site including fuels. The Contractor shall establish emergency procedures in the event of any spills of hazardous materials.
- 4.7.13 Oil interceptors shall be provided in site compounds and regularly emptied.
- 4.7.14 No runoff wastewater or chemicals shall be allowed to enter any adjacent fish ponds.
- 4.7.15 The Contractor shall construct bunds between the works area and any adjacent fish pond to avoid water quality impacts.
- 4.7.16 The Contractor shall take all necessary steps to ensure there will be no release of pollutants during channel excavation. These include, inter alia:
- carrying out works in the dry season or during periods of low flow in the stream;
 - removing sediments with minimal disturbance;

- removing sediment from dried areas first, and carrying out concrete lining work in these sections. Divert water flow into prepared channel lining, dry sediment in other sections and remove from behind bund or dam; and
- care should be taken to avoid disturbance of wet sediment.

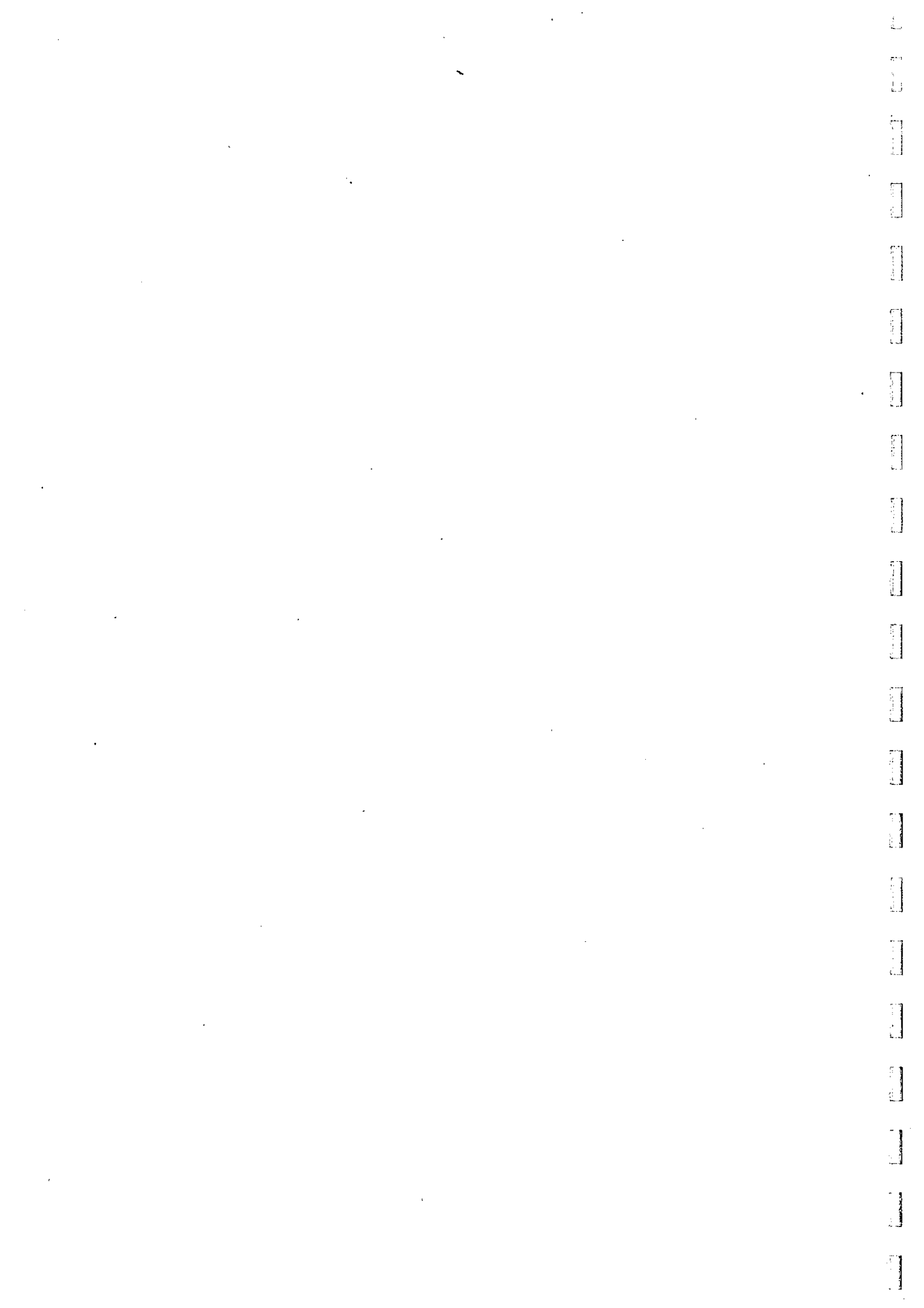
Sediment should be disposed of according to the level of contamination as defined in WBTC 2/94.

4.7.17 Site cleanliness shall be maintained at all times with rubbish bins provided and cleared at regular intervals.

4.7.18 If any office, works area canteen or toilet facilities are erected, foul water effluent should be directed to a foul sewer or to a sewage treatment facility either directly or indirectly by means of pumping or other means approved by the Engineer.

4.7.19 Wastewater generated from the washing down of mixer trucks and drum mixers and similar equipment should wherever practicable be recycled. The discharge of wastewater should be kept to a minimum.

4.7.20 Any waters entering the storm drains must have a pH within the range 6 - 8. Under normal circumstances, surplus wastewater may be discharged into foul sewers after treatment in silt removal and pH adjustment facilities (to within the pH range of 6 to 9). Disposal of wastewater into storm drains will require more elaborate treatment. Surface runoff should be segregated from the concrete batching plant and casting yard area as much as possible, and diverted to the stormwater drainage system. Surface runoff contaminated by materials in a concrete batching plant or casting yard should be adequately treated before disposal into stormwater drains.



5 WASTE MANAGEMENT

5.1 Overall Responsibilities of the Contractor

- 5.1.1 The overall principles of construction waste management are to reduce waste generation and to reuse and recycle construction waste.
- 5.1.2 The Contractor is responsible for implementation of the waste management schemes including reduction, reuse, recycle and disposal of the waste material produced from the site. The Contractor is also responsible for implementation of any mitigation measure to minimise waste or redress problems arising from the construction waste of the Project.
- 5.1.3 The Contractor shall pay attention to the *Waste Disposal Ordinance*, the *Dumping at Sea Ordinance*, the *Public Health and Municipal Services Ordinance* and the *Waste Disposal (Chemical Waste) (General Regulation)*, and carry out appropriate waste management work.
- 5.1.4 The Contractor shall refer to the relevant booklets issued by the EPD to obtain relevant licence/permit such as the effluent discharge licence, the chemical waste producer registration, etc.

5.2 Site Clearance

- 5.2.1 Vegetation, demolition waste, building materials (including concrete, corrugated iron and wood) and a small proportion of the available topsoil will arise during the site clearance works: approximately 270,000m² of land will need to be cleared. All construction waste should be sorted on site into inert and non-inert materials. Non-inert materials such as wood, and materials such as glass and plastics should be disposed of at landfill. Inert materials such as soil, sand, concrete, rubble, etc. should be kept separate and disposed of at public filling areas which are operated by CED.

- 5.2.2 Construction waste with only a small amount of inert material (not more than 20% by volume) will be allowed for disposal at landfill. In the case of reinforced concrete, steel rods should be separated from concrete rubble by mechanical means, and disposed of separately. Steel or other metals should be retrieved from the existing structures either before or after demolition. They should be recycled.
- 5.2.3 Attention shall be paid to *WBTC 6/92, Fill Management* which states that it is the responsibility of controllers of Government and quasi-Government projects, and of Government Departments processing plans for major private developments which generate fill material, to keep the Secretary of the FMC fully informed of anticipated volumes of excess fill. The identification of final disposal sites for spoil created by the construction work should be considered during the detailed design stage of the project.
- 5.2.4 'Inert materials' (public fill) refers to material such as soil, sand, rock, rubble, concrete, brick, cement mortar etc.
- 5.2.5 Any vehicle leaving the site carrying construction and demolition waste or public fill, should have their load covered. They should be routed, so far as is practically possible, to avoid sensitive receivers in the area.
- 5.2.6 The potential for contaminated land along the alignment is considered slight. This judgement is based on field assessments and desk surveys of the proposed channel alignment. During the detailed design stage, a core sampling programme will be undertaken to ascertain the nature of the substratum. In the unlikely event of contaminated land being encountered, it will be subject to the criteria specified in ProPECC Paper (PN 3/94) Contaminated Land Assessment and Remediation.

Topsoil

- 5.2.7 During site clearance works, large amounts of potentially desirable topsoil will be realised. Much of the Shap Pat Heung area (through which the Bypass Floodway passes) is fertile agricultural land. The topsoil is thus expected to be of good agricultural and landscaping value.
- 5.2.8 It is recommended that the topsoil underlying the proposed channel alignment be stripped off and put to use in agriculture, horticulture, nurseries and landscaping works. Such provisions should be written into contract documents, subject to AFD approval.

5.2.9 The topsoil should be stockpiled in a designated area within the works site, to be used as required. The stockpile should be less than 2 m in height, formed to a safe angle of repose, and hydroseeded or covered with tarpaulin to prevent erosion during the rainy season, and to minimise dust generation.

5.3 Excavated Material

5.3.1 The majority of material excavated during open cut works, and channel formation works is expected to consist of soil material, and also road and footpath making materials (such as concrete, cement, tar and other macadam based materials) which are inert.

5.3.2 Preliminary investigations suggest that the total volume of excavated material will be approximately 420,000 m³. This material should be stockpiled (less than 2 m in height and formed to a safe angle of repose) for use elsewhere in the Project area. Spoil initially designated as unsuitable for re-use in the Works by virtue of excess moisture should be stockpiled, drained and dried out, or mixed with overly dry materials and re-used in the Works as suitable fill.

5.3.3 Initial indications are that 102,000 m³ of the spoil excavated from the channel alignment south of the Route 3 project, will be required for landscaping and filling works on the Bypass Floodway. Therefore, a surplus of excavated material in the region of 318,000 m³ will need to be removed from the site. The detailed engineering study should seek to identify a suitable receiver site. The quantity of fill that will be generated is marginally less than that normally considered by the Fill Management Committee (FMC). However, the FMC will be consulted to identify potential receiver sites.

5.3.4 The preferred disposal option for such a sizeable quantity of fill material would be to concurrent projects in the area, such as Yuen Long South Development or the Lau Fau Shan Development. However, any surplus excavated material can be disposed of at a public filling area, so long as it complies with the public filling licence requirements.

5.3.5 During the detailed design a core sampling programme will be undertaken to ascertain the nature of the substratum. Should contaminated land be encountered the sediments will be tested, handled and disposed of in accordance with government requirements.

5.4 Concrete Waste

5.4.1 Concrete is the main construction material likely to be used in the installation of the 3.8 km long flood channel and all other associated works. Of the volume of concrete supplied, it is assumed that approximately 3-5% of the concrete used will be lost to waste. The estimated total volume of concrete to be used on the Bypass Floodway construction is 47,000m³. Dry concrete waste will be sorted out from the other wastes and recycled for reuse or sorted for disposal at a public filling area e.g. Pak Shek Kok.

5.5 General Works Waste

Wooden Materials

5.5.1 Different kinds of wooden materials are essential to the construction project, such as wooden boards for formwork, erection of site boundaries, as well as bamboo for any scaffolding. Wooden materials are important and valuable resources. Options for the reuse and recycling of discarded wooden waste are discussed below.

Formwork

5.5.2 Wood is generally used as formwork for concrete structures, although reusable steel shutters are an alternative. In order to estimate the waste volume of wooden boards and shutter ply, which may be required if steel shutters are not used, the following assumptions have been made:

- (i) wooden boards are assumed to be 0.02 m thick;
- (ii) it is assumed that the wooden boards can be reused five times, therefore the wastage rate of the wooden boards is assumed to be 20%.

5.5.3 All wooden materials used on site should be kept separate from other wastes. Wooden boards can be reused on site although the reusability and quantity of final waste depends on the shape and quality of the boards. Timber which cannot be reused should be sorted and stored separately from all inert waste before being disposed of to landfill. A number of private contractors will collect used formwork materials for local reuse or export to China.

5.5.4 Reusable steel shutters can be used as a preferred alternative.

Site fencing

5.5.5 Site fencing will be necessary to separate the construction works from the public and to reduce construction nuisance, such as noise, to nearby sensitive receivers. Two types of site fencing will be employed on the works area. These are:

- i) Full hoarding, and
- ii) Open Safety fencing

Full hoarding will be used for works at the Castle Peak Road crossing, the pumping station and around culvert sites. Elsewhere, open safety fencing will be used extensively in delineating the works and keeping the general public at bay, away from danger.

5.5.6 In the few areas where hoarding is relevant, the possibility of using metal fencing or building panels to provide site fencing should be considered. Concrete building panels with a lightweight core could be used. The material provides good sound and thermal insulation, as well as being both waterproof and fire resistant. These panels are easily recycled and reduce wastage of timber. However, wooden panels are more likely be used and the following data can be utilised in calculating waste.

5.5.7 It is assumed that the wooden hoarding used will be 0.02 m thick with a height of 2 m. The volume of waste generated from this source is often assumed to be 20% of the total volume.

5.5.8 This type of wooden board is valuable for reuse on other construction sites and should not therefore be disposed of to landfill. On completion of the construction phase, the boards should be sorted and grouped then distributed to other construction sites. The open safety fencing will have to be collected by the contractor, prior to disposal at a landfill site.

5.5.9 Under *Section 43 of the Air Pollution Control Ordinance (Cap. 311), Open Burning Regulation (1995)*, it is an offence under law to openly burn any waste emanating from, or located at, a construction site.

5.6 Chemical Waste

- 5.6.1 Where the construction processes produce chemical waste, the Contractor must register with EPD as a Chemical Waste Producer. Wastes classified as chemical wastes are listed in the *Waste Disposal (Chemical Waste) (General) Regulation*. These wastes are subject to stringent disposal routes. EPD requires information on the particulars of the waste generation processes including the types of waste produced, their location, quantities and generation rates. A nominated contact person must be provided.
- 5.6.2 The major chemical waste types arising from the construction sites are likely to be oils, lubricants, paints and solvents. Oil waste may be in the form of raw waste, or as sundries such as spent oil filters, or materials used to absorb oil leaks. Storage and disposal of these wastes are discussed below.
- 5.6.3 Hard standing surfaces draining via oil interceptors shall be provided in plant yards and works area compounds. Interceptors will be regularly emptied to prevent release of oils and grease into the surface water drainage system after accidental spillages. The interceptor should have a bypass to prevent flushing during periods of heavy rain. Oil and fuel bunkers should be bunded to prevent discharge due to accidental spillages or breaches of tanks. Waste collected from any grease traps should be collected and disposed of by a licensed contractor.
- 5.6.4 Any construction plant which is likely to leak oil, should have absorbent inert material eg. sand, placed beneath it. This material should be replaced on a regular basis and the contaminated material should be stored in a designated, secure place. Such relatively inert material is suitable for landfill disposal and can be disposed of via the normal waste stream.
- 5.6.5 Lubricants and waste oils are likely to be generated during the maintenance of vehicles and mechanical equipment. Used lubricants will be collected and stored in individual containers which are fully labelled. The containers should be stored in a designated secure place. If possible such waste should be sent to oil recycling companies; there are also companies which collect empty oil drums for reuse or refill.
- 5.6.6 Oil and lubricant wastes are classified as chemical wastes, and if not recycled, should be treated at the Chemical Waste Treatment Centre, Tsing Yi, or other sites licensed for the disposal of waste oil. A trip ticket system operates to control the movement of such chemical waste and tickets have to be produced upon the request of EPD.

- 5.6.7 Some paints and solvents are classified as chemical waste and, if used on site, will be subject to the stringent requirements of the *Waste Disposal (Chemical Waste) (General) Regulation*. Empty paint cans should be recycled or collected as waste. Any dry paint waste should be swept up and collected in containers for disposal.
- 5.6.8 No lubricants, oils, solvents or paint products should be allowed to discharge into water courses, either by direct discharge, or as contaminants carried in surface water runoff from the construction site. Measures should be taken to prevent such occurrences including immediate disposal and correct handling of any chemical spills.

5.7 Aqueous Waste

- 5.7.1 Requirements designed to protect against surface runoff include the use of sediment traps, settlement ponds, special drainage channels and bunding. Discharges from concrete batching must be settled and possibly treated to restore a balanced pH. Oil interceptors must have a bypass. Landtake under stockpiles or open working areas must be minimised wherever practicable such as the road upgrading works. Stockpiles are to be fenced and bunded and treated to reduce erosion and sediment release. The water must be collected and settled. Solids accumulated in the sand traps, settlement tanks, manholes, and streambeds must be cleared out regularly and disposed of correctly.
- 5.7.2 All discharged waters, including sewage and site runoff, should comply with the appropriate standards in the *TM on Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*, prior to discharge. Advice on the handling and disposal of construction site discharges, including site runoff and contaminated wastewaters, is provided in the *ProPECC Paper (PN1/94), Construction Site Drainage*.
- 5.7.3 Any floating refuse, emanating from the works, should be collected using refuse booms and disposed of appropriately.
- 5.7.4 All vehicles leaving the Site will pass through a wheelwash at the access/exit. If, at any time, further entry/exit points are created, they will be provided with similar facilities. The wheelwash requires regular cleaning to remove sediment, and may also produce a large volume of wastewater. To prevent excess sedimentation, and possible contamination of local streams and water courses, these wastewaters should be directed into settlement ponds as far as practicable. The wastewater can then be reused on Site. The maintenance of the wheelwash will be the responsibility of the Contractor undertaking the site formation works.

5.8 Sewage

5.8.1 Sewage is characterised by high BOD and suspended solids, and is enriched with nutrients and high bacteriological counts. Domestic sewage generated from the site toilets, washing facilities and any temporary canteen provided for construction workers will need to be collected separately and disposed of or appropriately treated to comply with Government requirements. Chemical toilets should be used if direct connection to public sewer is not possible. It is the responsibility of the contractor to ensure that sewage disposal complies with the standards set out in the *TM on Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*.

5.9 Municipal Waste

5.9.1 Solid and liquid wastes will be generated by the construction workers during the clearance/construction period. The total number of site staff is estimated to be between 60 to 110 persons. If the quantity of municipal waste generated is assumed to be 1.29 kg/employee/day¹, then the total generated waste requiring disposal is approximately 77 to 142 kg per day.

5.9.2 The Contractor will be required to set up a temporary refuse collection station. Municipal waste will be collected regularly in black refuse bags and delivered to, and disposed of at, an approved landfill as required by the Regional Services Department (RSD).

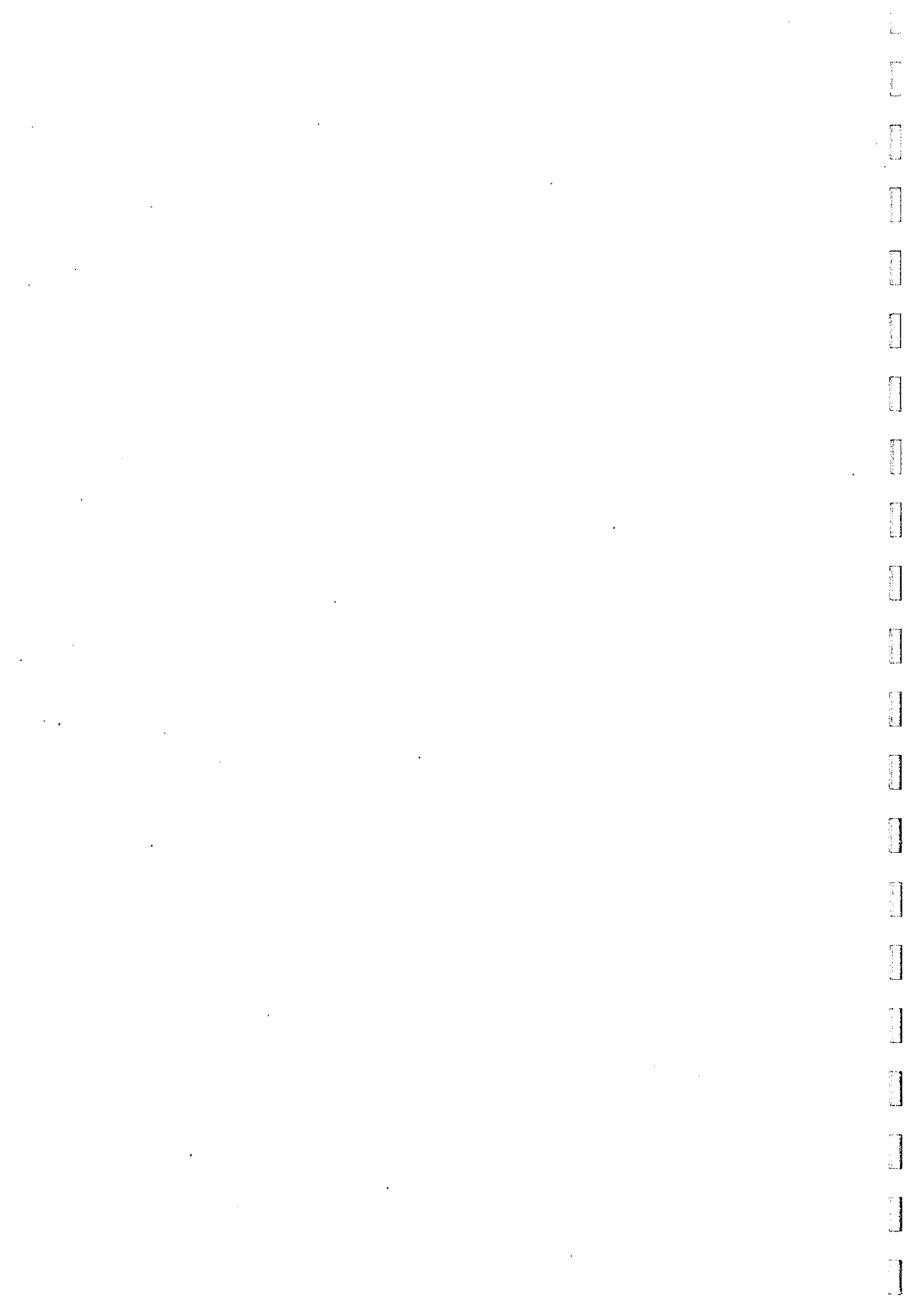
5.10 Operational Phase

5.10.1 During the operation of the Bypass Floodway, sediment will settle and accumulate in the channel. This will need to be removed and disposed of on a regular basis, to reduce the amount of sediment washed down the YLB Floodway into receiving water bodies i.e. Deep Bay.

5.10.2 The low flow interceptor channel will be dredged on a regular basis to prevent excess sediment accumulation and to maximise the flows and capacity of the channel. Such waste should be air dried (liquid content not exceeding 70% by weight) to reduce its volume, and to prevent spillage during haulage by truck to landfill for disposal. It is recommended that this work be carried out during the dry season and that the sediment is air dried on the flat base of the channel either side of the low flow channel.

¹ *Monitoring of Municipal Solid Waste 1991, 1992 (1993)* Environmental Protection Department.

- 5.10.3 Substantial improvement in water quality is expected with the full implementation of the *Livestock Waste Control Scheme*, the *Water Pollution Control Ordinance* and the *Waste Disposal Ordinance*. However, channel bed sediments will be tested during the dredging works to ensure that they are not contaminated. Sediment requiring marine disposal should be classified in accordance with the relevant technical circular in force.
- 5.10.4 Litter and general refuse such as polystyrene, polythene bags, plastic bottles and cans will inevitably enter the Bypass Floodway. To prevent this nuisance from entering the Kam Tin River, and ultimately Deep Bay, a refuse boom should be laid across the channel. The accumulated waste should be collected frequently and disposed of to landfill.



6 ECOLOGY

6.0.1 During the construction phase the direct ecological impacts are considered to be short term and acceptable therefore no EM&A requirements would be necessary.

6.0.2 In respect of the operation phase the EIA identified unacceptable adverse ecological impacts and proposed suitable compensation and mitigation measures. These are summarised below.

6.1 Baseline & Operational Ecological Surveys

6.1.1 An ecological baseline survey of the proposed YLBF alignment shall be undertaken within three months prior to the commencement of construction activities. The survey shall follow the criteria for evaluating a site /habitat as given in Table 2, Annex 8 of the Technical Memorandum on Environmental Impact Assessment Process. The results of the baseline survey shall be compared with the results of the ecological survey undertaken under this study to provide information on recent changes in habitat conditions. It is recognised that rapid development in the Yuen Long area has and will be a major factor in determining the current overall baseline ecological conditions of the area.

6.1.2 *Prior to Project Commencement*

6.1.2.1 A detailed, baseline floral survey of the abandoned and active agricultural land should be conducted by (or under the supervision of) an ecologist with at least three years local experience (vetted by AFD if necessary).

6.1.2.2 Faunal surveys should be carried out within the alignment habitats concentrating on 1) avifauna; 2) amphibians; and, 3) insects (especially dragonflies and butterflies).

6.1.2.3 Surveys shall be conducted in the early wet season (May-June) immediately prior to the commencement of Project works. Attention shall be drawn to dominant species (and their density), and the occurrence (if any) of rarities and/or protected species, and the activities of fauna (breeding/feeding/courting etc.).

6.1.3 *Operational Phase Monitoring*

6.1.3.1 During the first 2 years (commencing immediately after project completion), quarterly floral and faunal surveys shall be carried out by (or under the supervision of) an ecologist of at least three years local experience (vetted by AFD if necessary).

- 6.1.3.2 The floral survey shall monitor the dominance, height and density of naturally colonising wetland plant species, using 1 m quadrats at three points (to be decided in agreement with AFD during detailed design) along the alignment. One point should be at the downstream end to monitor the influence (if any) of saline intrusion on both floral and faunal presence.
- 6.1.3.3 Faunal surveys shall included bird and insect counts noting the activities of these fauna (breeding/feeding/courting etc.) with regard to the whole landscaping and channel area. This will determine the use of landscaped trees, the grasscrete sides, and the "marshcrete" areas by fauna. In order to assess the value of the "marshcrete" areas, floral and faunal presence should be specifically related to each of these habitats. Amphibian surveys should be carried out within the period of peak activity of this class (i.e. twice, during the wet season - May/June and July/August).
- 6.1.3.4 Attention shall be drawn to dominant species (and their density), and the occurrence (if any) of rarities and protected species, and the activities of fauna (breeding/feeding/courting etc.). Any other outside influencing factors (pollution, development etc.) should be highlighted.
- 6.1.3.5 For the next three years, the surveys shall be conducted on an annual, early wet season (May-June) cycle. Any other outside influencing factors (pollution, nearby development etc.) should be highlighted.
- 6.1.4 **Construction Phase Monitoring**
- 6.1.4.1 No ecological monitoring will be required during the construction phase.
- 6.1.5 **Criteria for success**
- 6.1.5.1 The criteria for the success of the mitigation proposals will be based on an ecological comparison with an existing concrete nullah in the Yuen Long Area (e.g. the Shan Pui Nullah). The baseline data prior to the Project commencement will be available for reference.
- 6.2 **Summary of Ecological Mitigation Measures**
- Alignment of northern channel section closer to Route 3 to minimise impact on fish ponds (Figure 6.1);

7 LANDSCAPING

7.1 Each of the following stages of the soft landscaping establishment and maintenance shall be subject to the inspection and approval of the landscape architect, before the next stage of the works proceed:

- i) after checking:- drainage prior to placing topsoils; setting out of planting areas; subgrade levels; and setting out of any additional planting;
- ii) at completion of soil preparation prior to planting;
- iii) after planting, staking and tying prior to placing mulch;
- iv) at completion of works; and,
- v) periodically, each three months during the standard one year maintenance phase.

7.2 A typical maintenance schedule for soft landscaping is provided in Table 7.1 below.

Table 7.1
General Schedule of Maintenance Works

OPERATIONS	SPRING			SUMMER			AUTUMN			WINTER			REMARKS
	M	A	M	J	J	A	S	O	N	D	J	F	
DISEASE CONTROL inspections	W	2W	2W	2W	2W	2W	2W	W	W	W	W	W	treatment immediately, after detection, weekly inspections thereafter
FERTILIZATION applications	O						R						
inspection					O								
GRASS CUTTING mowing operation	Bi-W	W	W	W	W	W	W	Bi-W	Bi-W	Bi-W	Bi-W	Bi-W	rule-of-thumb only, use grass sward length as accurate guide
IRRIGATION watering operation	D	D	D	D	D	D	D	D	D	D	D	D	early morning/late afternoon with exceptions, see note
MULCH topping up	O											of following run off caused by rain/wind storm	
PROTECTION inspection of fence, tree grills & guards	O	O	O	O	O	O	O	O	O	O	O	O	treatment immediately after detection
PRUNING plant pruning												As Appropriate	
REPLACEMENT inspection	O			O			O			O			a.s.a.p. after dead or near dead plants are found
Firming support up of plants & supports	O	O	O	O	O	O	O	O	O	O	O	O	Inspection also after heavy storm, firm-up operations immediately after detection
WEEDING weeding operation & litter collection	O	O	O	O	O	O	O	O	O	O	O	O	Additional litter inspection & collection after heavy use
Ties inspection of tree stakes & ties	O						O						Firm-up operation immediately after detection
THINNING inspections	O						O						Thinning operations in appropriate pruning or transplant season

KEY: S = once Daily
W = once weekly
2W = Twice weekly
Bi-W = Bi-weekly
O = Once
R = Repeat if necessary

8 SITE ENVIRONMENTAL AUDIT

8.1 Site Inspections

8.1.1 Inspection of construction sites and activities is a direct means to assess if the Project works are undertaken in such a manner that adverse impacts on the environment are minimised to acceptable levels. It is also an effective tool to trigger and enforce the environmental protection requirements on the construction site.

8.1.2 A formal site inspection shall be carried out at least once a month by the ET Leader. The ET Leader shall submit to the ER and Contractor a proposal on the site inspection and the deficiency and action reporting procedures within 21 days of the commencement of the Project works.

8.1.3 During the site inspections, the ET Leader shall review the on-site environmental situation including pollution control and mitigation measures within the Project areas. The ET Leader should also observe the off-site environmental situation to ascertain that any adverse impacts directly or indirectly arising from the Project works have been minimised to acceptable levels.

8.1.4 When conducting site inspections, the ET Leader shall make reference to:

- (a) the EIA recommendations on environmental protection and pollution control mitigation measures;
- (b) the contract specifications on environmental protection;
- (c) the relevant environmental and pollution control laws;
- (d) the works progress and programme to determine if the current activities match closely with proposed activities;
- (e) work methodologies submitted by the contractors to match with existing practices to assess adequacy of the associated pollution control; and
- (f) previous site inspection results.

8.1.5 The Contractor shall update the ET Leader with all relevant information of the construction contract for the ET Leader to carry out the site environmental audits.

- 8.1.6 The ET Leader shall submit results of each site inspection to the ER and Contractor within 24 hours upon completion of the inspection for reference and immediate action, including details of recommended actions to be taken where deficiencies are recorded. The Contractor shall follow the procedures and time-frame as stipulated in the proposal on the site inspection and the deficiency and action reporting procedures and report on any remedial measures subsequent to the site inspections.
- 8.1.7 Ad hoc site inspections shall be carried out if significant environmental problems are identified. The ad hoc site inspections may also be required as part of the investigation work of the handling of an environmental complaint or the Action Plan for the EM&A.

8.2 Compliance with Legal and Contractual Requirements

- 8.2.1 In addition to the law of environmental protection and pollution control, construction activities shall also comply with contractual requirements of environmental protection and pollution control.
- 8.2.2 All the works method statements submitted by the Contractor to the ER for approval shall be vetted by the ET Leader to ensure that sufficient measures for environmental protection and pollution control have been included.
- 8.2.3 The ET Leader shall also check the progress and programme of the works if relevant environmental laws have not been violated, and if any foreseeable potential violations of the laws can be prevented.
- 8.2.4 The ET Leader shall carry out document reviews regularly. The Contractor shall regularly provide copies of at least the following documents to the ET Leader:
- (a) the updated Works Progress Reports;
 - (b) the updated Works Programme;
 - (c) the application letters for different licence/permits under the environmental protection laws;
 - (d) all the valid licences/permits; and
 - (e) the site diary upon request.
- 8.2.5 If any noncompliance with the contractual and legislative requirements on environmental protection and pollution control is detected from the document review, the ET Leader shall advise the ER and the Contractor of the corrective actions for them to follow-up. The ET Leader shall also advise the Contractor and the ER accordingly if the document review concludes that the current status on licence/permit applications and any preparation works of environmental protection and pollution control may not cope with the progress and programme of the works,

or may result in potential violation of the requirements for environmental protection and pollution control in due course.

- 8.2.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remediate the situation. The ER shall ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

8.3 Environmental Complaints

- 8.3.1 All complaints need sensitive handling. Environmental complaints shall be directed to the ET Leader who shall be responsible for the implementation of complaints procedures. A flowchart of the handling of environmental complaints is given on Figure 8.1.

- 8.3.2 Each complaint shall be logged onto the Complaint Log to record details of the complaint:

- (a) data and time of receipt of complaint;
- (b) name, telephone or fax number, and address of complainant;
- (c) nature of the complaint;
- (d) site situations as observed by complainant;
- (e) communications made;
- (f) results of investigations and records of actions taken.

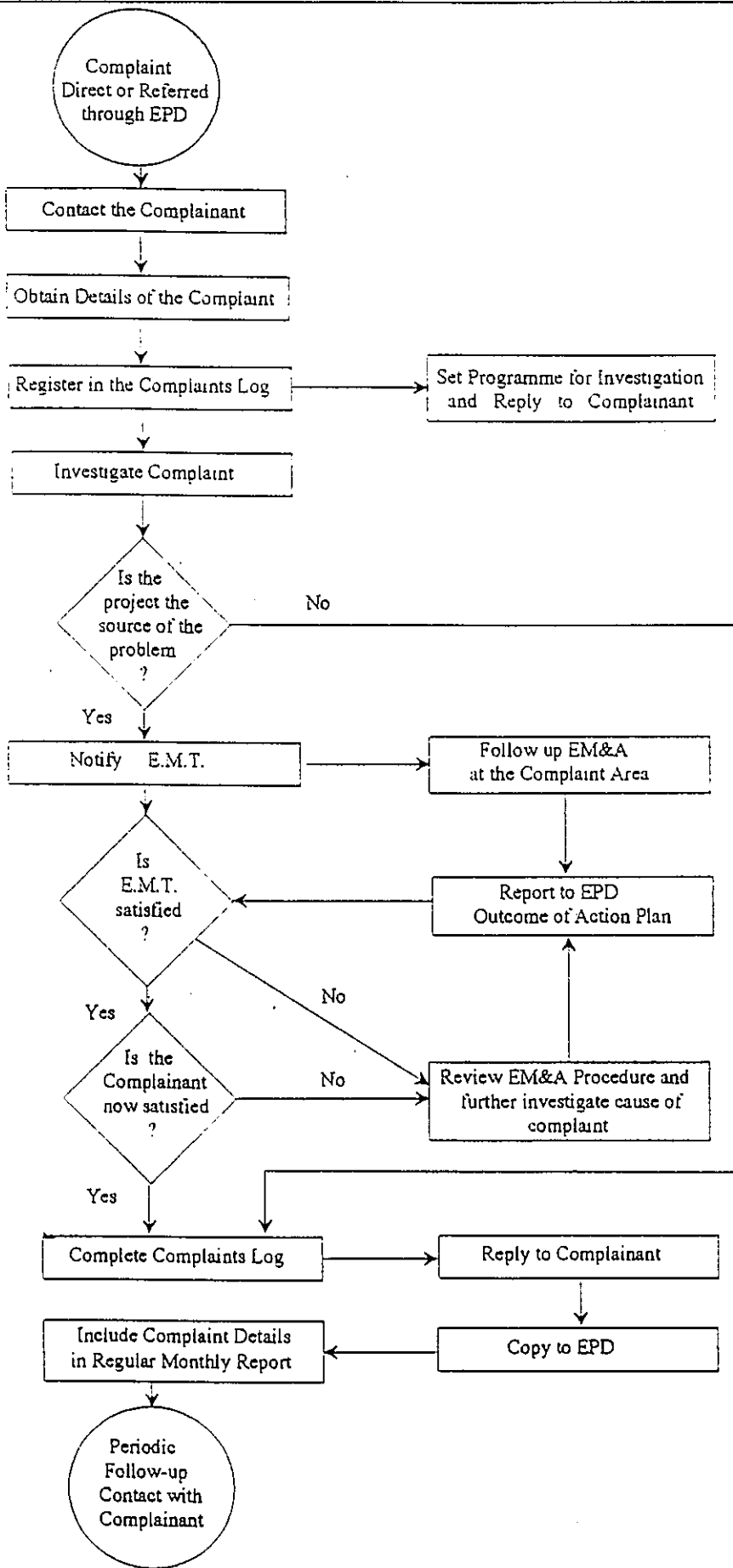
- 8.3.3 Each complainant shall be acknowledged receipt of the complaint as soon as possible in writing.

- 8.3.4 Each complaint shall be investigated to determine its validity and to assess whether the source of the problem is due to the Project works.

- 8.3.5 The ET Leader shall identify appropriate mitigation measures if they are verified to be valid and due to the Project works. The ET Leader shall also advise the Contractor accordingly on the required mitigation measures.

- 8.3.6 The ET Leader shall inform the complainant of any findings and subsequent actions, if any. The ET Leader may also need to contact the complainant after mitigation measures have been introduced to ensure their sufficiency.

- 8.3.7 The ET Leader shall recommend additional monitoring if appropriate.



Action Flow Chart for Handling
Complaints of EM & A Programme



TERRITORY
DEVELOPMENT
DEPARTMENT

Figure no. 8.1

YUEN LONG BYPASS FLOODWAY
FEASIBILITY STUDY
EM&A MANUAL

Prepared
AJT

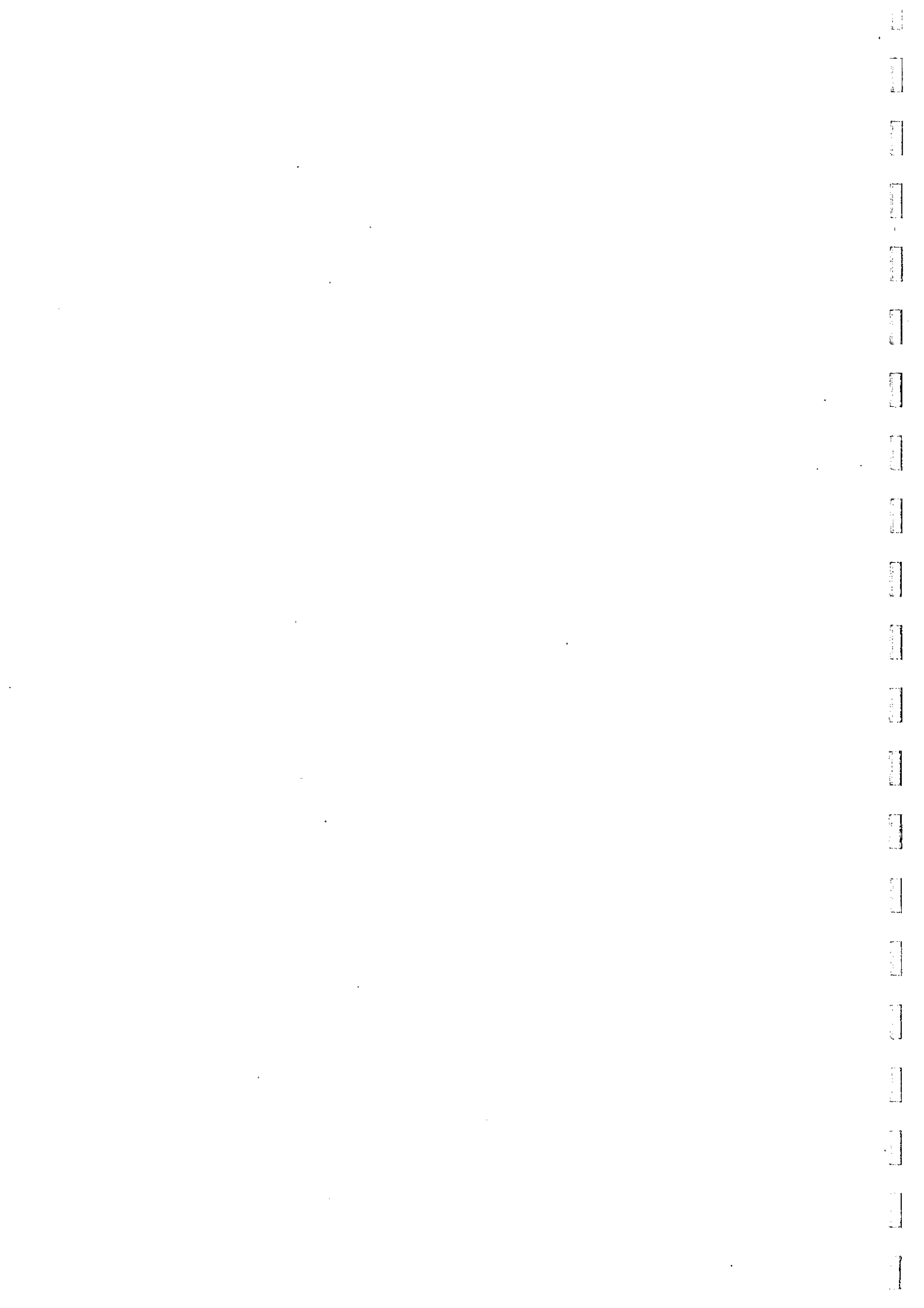
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BINNIE CONSULTANTS LIMITED 賓尼
賓尼工程顧問有限公司
CONSULTING ENGINEERS

Date
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- 8.3.8 The ET Leader shall review the Contractor's response on the recommended mitigation measures and the updated situation of the environmental complaint to ensure that recurrence of any error detected during complaint investigation is avoided.
- 8.3.9 If the complaint is transferred from the EPD, the ET Leader shall submit an interim report on the status of the complaint investigation and follow-up actions to the EPD within three working days upon receipt of the complaint.
- 8.3.10 The ET Leader shall record all the environmental complaints, the investigation, the subsequent actions and the results in the monthly EM&A reports.
- 8.3.11 During the complaint investigation, the Contractor and ER shall cooperate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation. The ER shall ensure that the measures have been carried out by the Contractor.



9 POST PROJECT AND OPERATIONAL PHASE

9.1 Post Project Audit

9.1.1 A post project audit report should be completed by the ET within one month after construction works are complete. This report should contain:

- (i) a checklist indicating that all permanent environmental mitigation requirements resulting during the course of the EIA Process are in place; and
- (ii) a post project analysis which compares the environmental impacts predicted in the EIA with the actual impacts.

9.2 Operational Phase Monitoring

9.2.1 Noise, air and water quality monitoring will not be required during the operation phase of the project. However, it is recommended that an annual ecological survey which pays particular attention to floral species (i.e. planted species and natural colonisers) and a biannual avifauna survey of the engineered wetland section be carried out by the current maintenance authority for a period of five years following commissioning of the floodway. These ecological surveys will be measured against the "criteria for success" identified during the baseline survey and appropriate maintenance requirements will be specified.

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10 REPORTING

10.1 Baseline Monitoring Report

10.1.1 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report to the Contractor, the ER and the EPD within 10 working days of completion of the baseline monitoring.

10.1.2 The baseline monitoring report shall include at least the following:

- (a) up to half a page executive summary;
- (b) brief project background information;
- (c) drawings showing locations of the baseline monitoring stations;
- (d) monitoring results (in both hard and diskette copies) together with the following information:
 - (i) monitoring methodology;
 - (ii) equipment used and calibration details;
 - (iii) parameters monitored;
 - (iv) monitoring locations;
 - (v) monitoring data, time, frequency and duration;
- (e) details on influencing factors, including:
 - (i) major activities, if any, being carried out on the site during the period;
 - (ii) weather conditions during the period;
 - (iii) other factors which might affect the results;
- (f) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;
- (g) revisions for inclusion in the EM&A Manual; and
- (h) comments and conclusions.

10.2 Monthly EM&A Reports

- 10.2.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports.
- 10.2.2 The EM shall prepare and submit to the Contractor, the ER and the EPD the monthly EM&A report within 10 working days of the end of each reporting month, with the first report due in the month after construction commences.
- 10.2.3 Before submission of the first EM&A report, the EM shall liaise with the Contractor, the ER and the EPD on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement.

First Monthly EM&A Report

- 10.2.4 The first monthly EM&A report shall include at least the following:
- (a) 1 to 2 page executive summary;
 - (b) basic project information including a synopsis of the project organisation, programme and management structure, and the work undertaken during the month;
 - (c) a brief summary of EM&A requirements including:
 - (i) all monitoring parameters;
 - (ii) environmental quality performance limits (Action and Limit levels);
 - (iii) Event-Action Plans;
 - (iv) environmental mitigation measures, as recommended in the project EIA study final report;
 - (v) environmental requirements in contract documents;
 - (d) advice on the implementation status of mitigation measures of environmental protection and pollution control as recommended in the EIA Report and in updated implementation schedule;
 - (e) drawings showing the project area, environmental sensitive receivers and the locations of the monitoring;

- (f) monitoring results (in both hard and diskette copies) together with the following information:
 - (i) monitoring methodology;
 - (ii) equipment used and calibration details;
 - (iii) parameters monitored;
 - (iv) monitoring locations;
 - (v) monitoring date, time, frequency, and duration;

- (g) graphical plots of trends of monitored parameters over the past four reporting periods for representative monitoring locations annotated against the following:
 - (i) major activities being carried out on site during the period;
 - (ii) weather conditions during the period; and
 - (iii) any other factors which might affect the monitoring results;

- (h) advice on the waste management status;

- (i) a summary of noncompliance with the environmental quality performance limits (Action and Limit levels);

- (j) a review of the reasons for and the implications of noncompliance including review of pollution sources and working procedures;

- (k) a description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance;

- (l) a summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints;

- (m) an account of the future key issues as reviewed from the works programme and works method statements.

Subsequent EM&A Reports

10.2.5 The subsequent monthly EM&A report shall include the following:

- (a) Title Page

-
- (b) Executive Summary (1-2 pages)
 - (i) Breaches of Action and Limit levels
 - (ii) Complaint Log
 - (iii) Reporting Changes
 - (iv) Future key issues
 - (c) Contents Page
 - (d) Environmental Status
 - (i) Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring
 - (ii) Summary of noncompliance with the environmental quality performance limits
 - (iii) Summary of complaints
 - (e) Environmental Issues and Actions
 - (i) Review of issues carried forward and any follow-up procedures related to earlier noncompliance (complaints and deficiencies)
 - (ii) Description of the actions taken in the event of noncompliance and deficiency reporting
 - (iii) Recommendations (should be specific and target the appropriate party for action)
 - (iv) Implementation status of the mitigation measures and the corresponding effectiveness of the measures
 - (f) Future Key Issues
 - (g) Appendix
 - (i) Action and Limit levels
 - (ii) Graphical plots of trends of monitored parameters at key locations over the past four reporting periods for representative monitoring locations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results
 - (iii) Monitoring schedule for the present and next reporting period
 - (iv) Cumulative complaints statistics
 - (v) Details of complaints, outstanding issues and deficiencies

10.3 Quarterly EM&A Summary Reports

10.3.1 The quarterly EM&A summary report shall be prepared by the EM. It should generally consist of about 3 pages of text and tables and 2 pages of figures. It should contain at least the following information:

- (a) up to half a page executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
- (c) a brief summary of EM&A requirements including:
 - (i) monitoring parameters;
 - (ii) environmental quality performance limits (Action and Limit levels); and
 - (iii) environmental mitigation measures as recommended in the EIA Report;
- (d) advice on the implementation status of mitigation measures of environmental protection and pollution control as recommended in the EIA Report and in the updated implementation schedule;
- (e) drawings showing the project area, any environmental sensitive receivers and the monitoring locations;
- (f) graphical plots of the trends of monitoring parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - (i) the major activities being carried out on site during the period;
 - (ii) weather conditions during the period; and
 - (iii) any other factors which might affect the monitoring results;
- (g) advice on the waste management status;
- (h) a summary of noncompliance with the environmental quality performance limits (Action Limit levels);
- (i) a brief review of the reasons for and the implications of noncompliance including review of pollution sources and working procedures;

- (j) a summary description of the actions taken in the event of noncompliance and any follow-up procedures related to earlier noncompliance;
- (k) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (l) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- (m) proponents' contacts and any hotline telephone number for the public to make enquiries.

10.4 Final EM&A Summary Report

10.4.1 The final EM&A summary report shall include, inter alia, the following:

- (a) an executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the entire construction period;
- (c) a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the project EIA study final report;
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation status proformas;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) graphical plots of the trends of monitored parameters over the construction period for representative monitoring stations annotated against;

- the major activities being carried out on Site during the period;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - the return of ambient environmental conditions in comparison with baseline data;
- (g) compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;
- (h) provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
- (i) advice on the solid and liquid waste management status;
- (j) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (k) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (l) successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (m) review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures), recommend any improvement in the EM&A programme; and
- (n) a conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

10.5 Data Keeping

10.5.1 The site document such as the monitoring field record, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, the document shall be properly updated and maintained by the ET Leader and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. All the document and data shall be kept for at least one year after completion of the construction contract.

10.6 Interim Notifications of Environmental Quality Limit Exceedances

10.6.1 When noncompliance with the environmental quality limits occurs, the ET Leader shall immediately notify the ER and the EPD, as appropriate. The notification shall be followed up with advice to EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Figure 10.1.

Incident Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

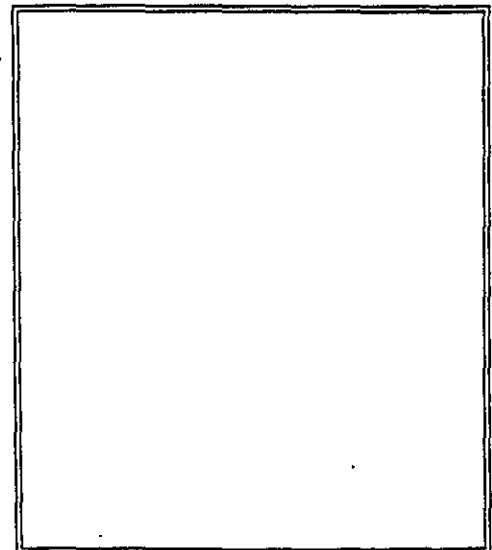
Location Plan



Prepared by : _____

Designation : _____

Signature : _____

Checked by : _____



Interim Notifications of Environmental Quality Limit Exceedances	 TERRITORY DEVELOPMENT DEPARTMENT	Figure no. 10.1	
	YUEN LONG BYPASS FLOODWAY FEASIBILITY STUDY EM&A MANUAL	Prepared AJT	Checked AS
	 BINNIE CONSULTANTS LIMITED 寶尼 寶尼工程顧問有限公司 CONSULTING ENGINEERS	Date 2/98	Scale NTS



11 SUMMARY OF MITIGATION MEASURES AND IMPLEMENTATION SCHEDULE

11.1 Table 11.1 presents an Implementation Schedule for all the mitigation measures recommended during the EIA process to date. As this EIA covers the preliminary design it will be subject to review and refinement during the detailed design stage. The schedule provides the currently available information on:

- the specific mitigation measures recommended including references to the EIA;
- the location and timing of implementation of the mitigation measures;
- the party responsible for implementing each mitigation measure; and
- the project stage at which the mitigation measure is to be implemented.

**Table 11.1
 IMPLEMENTATION SCHEDULE**

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
7.5.22	2.8.1	<p><u>Air Quality</u></p> <p><i>Construction mitigation measures</i></p> <p>Regular watering of haul roads to maintain surface wet. In order to meet this requirement, watering should be carried out at least twice a day and a water refilling system should be installed so that the water refilling time should be less than ten minutes.</p>	whole site/all times	CC		✓		APCO, APCR, LS2 to Gazette 14 Part III.14
	2.8.1	<p>Effective water sprays shall be used during delivery and handling of sand and aggregate and similar materials when dust is likely to be created and to dampen all stored materials during dry and windy weather.</p>	whole site/all times	CC		✓		APCR, LS2 Part IV.19
		<p>Any conveyor system used for transfer of dusty materials should be fitted with windboards on all sides, enclosures at conveyor transfer points and hopper discharge areas, three sided roofed enclosure with flexible curtain across the entry, conveyor belt cleaners and exhaust fans with suitable fabric cleaner.</p>	whole site/all times	CC		✓		APCR, LS2 Part IV.20

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
7.5.22	2.8.1	The Contractor shall confine haulage and delivery vehicles to designated roadways inside the Site. Any motorized vehicle causing dust nuisance shall be restricted to a maximum speed of 15 km per hour while within the Site.	whole site/all times	CC		✓		--
		Wheel washing facilities shall be installed and used by all vehicles leaving the Site. No earth, mud, debris, dust and the like shall be deposited on public roads. Water in the wheel cleaning facility shall be changed at frequent intervals and sediments shall be removed regularly. The Contractor shall submit details of proposals for the wheel washing facilities to the Engineer prior to construction of the facility. Such wheel washing facilities shall be usable prior to any earthworks excavation activity on the Site. The Contractor shall also provide a hard-surfaced road between any washing facility and the public road.	whole site/all times	CC		✓		APCR, LS2 Part III.B and Part IV.A
		All site vehicle exhausts should be directed upwards or away from the ground.	whole site/all times	CC		✓		

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
7.6.4	-	<i>Operational mitigation measures</i> Odorous sediments should be removed from the channel on a regular basis. The frequency of removal will vary with the time of year and should be carried out to minimize dispersion of odour to surrounding areas.	whole channel/according to maintenance schedule	DSD			✓	--
7.5.23	2.5	<i>Monitoring</i> The ET Leader shall carry out baseline monitoring at monitoring location C (Pok Oi Hospital) for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24 hour TSP samples. 1-hour sampling shall also be done at least 3 times per day while the highest dust impact is expected.	monitoring locations/specified times	ET				--
7.5.23	2.6	Routine sampling frequency should be carried out once in every six-days for 24-hr TSP monitoring and at least 3 times in every six days for 1-hr TSP monitoring (undertaken when the highest dust impact occurs) at each monitoring station that is currently affected by the works.	monitoring locations/specified times	ET		✓		--
		The impact monitoring results shall be compared with the air quality criteria set up for 24-hour TSP and 1-hour TSP.	monitoring locations/specified times	ET		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
7.5.23	2.6	In the case of non-compliance more frequent monitoring shall be conducted within 24 hrs after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or deterioration in air quality is rectified.	monitoring locations/specified times	ET		✓		--
8.1.36	3.7	<p><u>Noise</u></p> <p><i>Construction mitigation measures</i></p> <p>The contractor shall consider noise as an environmental constraint in the planning and execution of the works. With reference to Sections 8.1.36 to 8.1.43 of the EIA study report and Section 3.7 of the EM&A Manual, the Contractor shall prepare and submit to the Environmental Manager four (4) copies of a method statement fully indicating the noise mitigation to be adopted and its adequacy for each major item of works at least six (6) weeks before construction starts. This method statement must be certified by the Environmental Manager and submitted to EPD one month before construction starts.</p>	whole site/all times	CC	✓	✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
8.1.37	3.7.2	The Contractor shall comply with the <i>Noise Control Ordinance (Cap 400)</i> and with any regulations made under the Ordinance, including restrictions placed on noise from construction work and the requirements to seek Construction Noise Permits. Before commencing work which requires Construction Noise Permits, the Contractor should obtain such permits and display these appropriately.	whole site/all times	CC		✓		NCO (Cap 400)
8.1.38	3.7.4	In addition to the requirements imposed by the <i>Noise Control Ordinance</i> , to control noise generated from equipment and activities for the purpose of carrying out any construction work other than percussive piling during the time period from 0700 to 1900 hours on any day not being a general holiday (including Sundays), the following requirements shall also be complied with:	whole site/all times	CC		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
8.1.38	3.7.4	(a) The noise level measured at 1 m from the most affected external facade of the nearby noise sensitive receivers from the construction work alone during any 30 minute period shall not exceed an equivalent sound level (Leq) of 75 dB(A).	whole site/all times	CC		✓		--
		(b) The noise level measured at 1 m from the most affected external facade of any nearby schools from the construction work alone during any 30 minute period shall not exceed an equivalent sound level (Leq) of 70 dB(A) [65 dB(A) during school examination periods].	whole site/all times	CC		✓		--
		The Contractor shall liaise with the schools and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract. The Contractor should also liaise with Pok Oi Hospital regarding the timing and location of works.	whole site/all times	CC		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
8.1.38	3.7.4	Should the limits stated in the above sub-clauses (a) and (b) or, where applicable, (c) be exceeded, the construction shall stop and shall not recommence until appropriate measures acceptable to the Engineer that are necessary for compliance have been implemented. If two contractors working under this Project are both working close to the same NSR, both contractors may be required to reduce the noise level from their individual contract to 3 dB(A) less than the levels stipulated above so that the combined noise level does not exceed these limits.	whole site/all times	CC		✓		--
8.1.39	3.7.5	The Contractor shall devise, arrange methods of working and carry out the works in such a manner as to minimise noise impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these methods are implemented.	whole site/all times	CC		✓		--
8.1.40	3.7.6	Six weeks before the commencement of any work, the methods of working, equipment and sound-reducing measures intended to be used on the Site should be made available to the Environmental Manager and the Engineer for inspection and approval to ensure that they are suitable for the project.	whole site/all times	CC,ER		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
8.1.41	3.7.7	The Contractor shall ensure that all plant and equipment to be used on the Site likely to cause excessive noise effectively sound-reduced by means of silencers, mufflers, acoustic linings or shields, acoustic sheds or screens or other means to avoid disturbance to any nearby noise sensitive receivers (NSRs). All hand-held percussive breakers and air compressors will comply with the <i>Noise Control (Hand-held Percussive Breakers) Regulations</i> and <i>Noise Control (Air Compressors) Regulations</i> respectively under the <i>Noise Control Ordinance (Ordinance No. 75/88, NCO Amendment 1992 No. 6)</i> .	whole site/all times	CC		✓		NCR (HPB) NCR (AC) NCO
8.1.42	3.7.8	The Contractor shall ensure that all plant and equipment to be used on site are properly maintained and in good operating condition.	whole site/all times	CC		✓		--
8.1.43	3.7.9	It is recommended that construction noise should be mitigated using a suitable combination of the following measures:	whole site/all times	CC		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
8.1.43	3.7.9	Noisy equipment and activities should be sited by the Contractor as far from close-proximity sensitive receivers as is practical and orientated away from NSRs. Prolonged operation of noisy equipment close to dwellings should be avoided.	whole site/all times	CC		✓		--
		Noisy plant or processes should be replaced by quieter alternatives. Silenced diesel and gasoline generators and power units, as well as silenced and super-silenced air compressors, can be readily obtained.	whole site/all times	CC		✓		--
		Noisy activities should be scheduled to minimise exposure of nearby sensitive receivers to high levels of construction noise. For example, noisy activities can be scheduled for midday, or at times coinciding with periods of high background noise (such as during peak traffic hours).	whole site/all times	CC		✓		--
		Idle equipment should be turned off or throttled down. Noisy equipment should be properly maintained and used no more often than is necessary.	whole site/all times	CC		✓		--
		The power units of non-electric stationary plant and earth-moving plant should be quietened by vibration isolation and partial or full acoustic enclosures for individual noise-generating components.	whole site/all times	CC		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
8.1.43	3.7.9	Construction activities should be planned so that parallel operation of several sets of equipment close to a given sensitive receiver is avoided. The numbers of operating items of powered mechanical equipment should be minimised.	whole site/all times	CC		✓		--
		Construction plant should be properly maintained and operated. Construction equipment often has silencing measures built in or added on, e.g. bulldozer silencers, compressor panels, and mufflers. Silencing measures should be properly maintained and utilised.	whole site/all times	CC		✓		--
		Acoustic barriers should be used to protect nearby noise sensitive receivers if necessary. Barriers can be made of mounds of fill or any material having a surface density of 20 kg/m ² .	whole site/all times	CC		✓		--
8.1.46	3.4	<i>Monitoring</i> The baseline noise monitoring shall be carried out at the noise monitoring locations for a period of two weeks prior to the commencement of the construction works.	monitoring locations/ specified times	ET				--
8.1.46	3.5	Construction noise monitoring shall be carried out once per week between 0700-1900 on normal weekdays at all designated monitoring locations.	monitoring locations/specified times	ET		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
8.1.46	3.5	In case of noncompliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan shall be carried out. The additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.	monitoring locations/specified times	ET		✓		--
		<p><u>Water</u></p> <p><i>Construction mitigation measures</i></p> <p>With reference to Table 4.10 of the EIA study report and section 4.7 of the EM&A manual the Contractor shall submit to the Engineer and the Environmental Manager at least six (6) weeks prior to construction a total of five (5) copies of a method statement with accompanying drawings to illustrate the adequacy of the provision of water quality mitigation measures to be implemented as designated in items (a) to (l) below. These drawings and method statement must be agreed and certified by the Environmental Manager. A certified copy must be deposited with the Director of Environmental Protection one month before construction starts.</p>						

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
Table 4.10	4.7	(a) The Contractor shall ensure that works within the Yuen Long Bypass Floodway take place in the dry season as far as practicable or else additional temporary works such as cofferdam or temporary earth bund will be required to minimise runoff and pollution from the works entering the water column. Water collecting behind the cofferdam shall be either pumped onto the land-bank or collected, settled and pH adjusted to 8.5 or less before being allowed to enter the channels.	whole site/all times	CC		✓		ProPECC PN 1/94
		(b) Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on site shall be protected from erosion during rainstorms. Measures shall be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system. Hydroseeding should be used where practical.	whole site/all times	CC		✓		ProPECC PN 1/94

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
Table 4.10	4.7	(c) The transport of sediment to the environment shall be minimised by the installation of appropriate sediment traps within the drainage system. Sediment traps shall be designed with adequate capacity.	whole site/all times	CC		✓		ProPECC PN 1/94
		(d) Wastewater generated from the washing down of mixer trucks and drum mixers and similar equipment should be recycled. The discharge of wastewater should be kept to a minimum.	whole site/all times	CC		✓		--
		(e) Wastewater generated from construction activities should be discharged into an excavated sedimentation pit prior to discharge. The pit should be unlined to allow for infiltration of water into the ground and setting of concrete before disposal.	whole site/all times	CC		✓		--
		(f) In the case of an unlined pit for all types of wastewater being settled out, water infiltration into the ground requires a license from EPD under the WPCO regulations. Where a license cannot be obtained, or if water re-use is practiced, the pit may need to be lined, which requires more frequent removal of the contents.	whole site/all times	CC		✓		WPCO

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
Table 4.10	4.7	(g) Oil interceptors shall be provided in Site compounds and regularly emptied to prevent release of oils and grease into the surface water drainage system after accidental spillages. The interceptor shall have a bypass to prevent flushing during periods of heavy rain. Oil and fuel bunkers shall be banded to prevent discharge due to accidental spillages or breaching of tanks.	whole site/all times	CC		✓		ProPECC PN 1/94
		(h) Any waters entering the storm drains must have a pH less than 8.5. Under normal circumstances, surplus wastewater may be discharged into foul sewers after treatment in silt removal and pH adjustment facilities (to within the pH range of 6 to 9). Disposal of wastewater into storm drains will require more elaborate treatment. Surface run-off should be segregated from the concrete batching plant and casting yard area, if used, and diverted to the stormwater drainage system. Surface run-off contaminated by materials in a concrete batching plant or casting yard, if used, should be adequately treated before disposal into stormwater drains.	whole site/all times	CC		✓		ProPECC PN 1/94
		(i) Runoff should be prevented from entering adjacent ponds through construction of bunds between works areas and ponds.	whole site/all times	CC		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
Table 4.10	Section 4.7	(j) The Contractor shall take all reasonable measures to minimise adverse impacts resulting from construction activities associated with the removal of sediments. These measures shall include ensuring that all plant and equipment and working methods meet the following criteria. <ul style="list-style-type: none"> • utilising appropriate suspended solids containment screen while removing sediment. • minimise disturbance of the channel bed while dredging; • minimise leakage of dredged sediment during lifting through the use of closed grabs where practical; • prevent the overflowing of any hopper used to contain removed sediments. 	whole site/all times	CC		✓		-
		(k) The Contractor shall be responsible for disposing of all dredged sediments at an appropriate location depending on the volume and composition of the material.	whole site/all times	CC		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
Table 4.10	4.7	(l) If any office, works area canteen or toilet facilities are erected, foul water effluent should be directed to a foul sewer or to a sewage treatment facility either directly or indirectly by means of pumping or other means approved by the Engineer.	whole site/all times	CC		✓		ProPECC PN 1/94
		<p><i>Operational mitigation measures</i></p> <p>With reference to Table 4.11 and Figures 5.4 and 5.5 in the EIA Study Report, the Detailed Design Engineer (DDE) shall deposit scaled location and detail drawings with the Director of Environmental Protection at least one month before the commencement of construction showing the design of the channel banks, the areas of grasscrete and other ecological mitigation as specified in items (a), (b) and (c) below and in the section on ecological mitigation in this schedule. The drawings shall be submitted to the Environmental Manager for prior approval and certification.</p>						

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
Table 4.11	-	The Contractor should incorporate permeable areas along the channel banks such as grasscrete, and establish plant pollutant absorbing species in the channel as described in the Ecology section of this Implementation Schedule.	whole site Des&C stages	DDE/CC	✓	✓		--
		The water flow should be directed so that water comes into contact with grasscrete.	whole site Des&C stages	DDE/CC	✓	✓		--
		The remaining Government land between Route 3 and YLBF and remaining pond areas south of Route 3 should be incorporated into channel design to provide a greater surface area for infiltration (Figures 5.4 and 5.5 in EIA).	whole site Des&C stages	DDE/CC	✓	✓		--
Table 4.11		<i>Monitoring</i> Baseline monitoring of DO Turbidity, pH, NH ₄ -N and Temperature at the immediate mixing zone (W ₁) shall be undertaken by the ET, during mid ebb tide for a period of two consecutive weeks at a frequency of once per day. The samples shall be taken at mid depth.	monitoring locations/specified times	ET				--

EIA Ref	EM&A Log Ref	Environment Protection Measures			Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
							Des	C	O	
Table 4.11	4.5	Impact monitoring should be carried out as follows:			monitoring locations/specified times	ET		✓		--
		Location	Parameters	Frequency						
		All Site Discharges including ultimate discharge into Kam Tin River	Turbidity, PO, pH, Temperature	Once per week (during mid ebb at ultimate discharge)						
			oil and grease, SS	Once per month (during mid ebb at ultimate discharge)						
Mixing Zone of YLBF and Kam Tin River ¹	pH, Temperature, NH4-N, DO Turbidity	Once per week during mid ebb								
¹ Mixing zone is taken to be 10 m downstream from the floodway discharge part										
Table 4.11	4.6	Data obtained from impact monitoring should meet the compliance criteria for each parameter. Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria are exceeded, the actions in accordance with the Action Plan should be carried out.			monitoring locations/specified times	ET		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
		<p><u>Waste</u></p> <p><i>Construction mitigation measures</i></p> <p>With reference to Sections 6.1 and 6.2 of the EIA Study Report, the Contractor shall deposit to the Director of Environmental Protection, a detailed methodology statement demonstrating the adequacy of the provisions made, at least one month prior to the commencement of construction. This statement must have prior approval and certification by the Environmental Manager. The statement should be accompanied with location and detail drawings of provisions for hard-standing areas, settlement ponds, fuel storage facilities, chemical waste storage facilities, and all other temporary waste storage facilities including stock-piled materials. The Method Statement must include the Spill Action Plan.</p>						

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
6.1,6.2	Chapter 5	The Contractor is responsible for waste control within the construction site, removal of the waste material produced from the site and implementation of any mitigation measure to minimise waste or redress problems arising from the waste from the site. The waste material may include any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the site onto any adjoining land, storm sewer, sanitary sewer, or any waste matter or refuse to be deposited anywhere within the site or onto any adjoining land.	whole site/all times	CC		✓		WDO Cap 354
		Waste should be handled in accordance with the Construction Waste Management Strategy recommendations for handling of waste. The hierarchy of management method is: avoidance, minimisation, recycling/re-use, treatment, disposal.	whole site/all times	CC		✓		--



EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
6.1,6.2	Chapter 5	When handling the waste material, the following measures shall be undertaken by the Contractor:	whole site/all times	CC		✓		WDO, PHMSO, WPCO, WD(CW) (GR ProPECC PN3/94 CWCS RCWP CPPLSCW WBTC 5/98
		(i) The Contractor shall be aware of, and comply with, the <i>Waste Disposal Ordinance</i> , the <i>Public Health and Municipal Services Ordinances</i> , the <i>Water Pollution Control Ordinance</i> and the <i>Waste Disposal (Chemical Waste) (General Regulation)</i> .	whole site/all times	CC		✓		
		(ii) The excavation of soft, contaminated mud and its removal must, as far as is practicable, be carried out during the dry season.	whole site/all times	CC		✓		
		(iii) The Contractor's attention is drawn to <i>A Guide to the Chemical Waste Control Scheme</i> ; <i>A Guide to the Registration of Chemical Waste Producers</i> ; and the <i>Code of Practice on the Packing, Labelling and Storage of Chemical Wastes</i> .	whole site/all times	CC		✓		
		(iv) The Contractor shall segregate all inert construction waste material suitable for reclamation or land formation and shall dispose of such material at public dumping areas or at a location agreed in advance by the FMC and EPD.	whole site/all times	CC		✓		

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
6.1,6.2	Chapter 5	(v) All non-inert construction waste material deemed unsuitable for reclamation or land formation and all other waste material shall be dumped at public landfill.	whole site/all times	CC		✓		WBTC 5/98
		(vi) The Contractor shall comply with and complete the procedures in WBTC No. 2/93 and/or EPD's ProPECC PN 3/94 regarding marine or land-based disposal of dredged mud, prior to the commencement of Works.	whole site/all times	CC		✓		WBTC 2/93 ProPECC PN3/94
		(vii) The new <i>Air Pollution Control (Open Burning) Regulation</i> came into effect on 26th February 1995. This regulation prohibits open burning for the disposal of construction waste or the clearance of a site in preparation for construction work. Certain other types of open burning are allowed under permits issued by the EPD.	whole site/all times	CC		✓		APC(OB)R
		(viii) Fossil fuel and used lubricants for trucks and machinery are classified as chemical wastes. The Contractor shall register with EPD as a chemical waste producer and observe all the requirements under the storage, labelling, transportation and disposal of chemical waste.	whole site/all times	CC		✓		WDO(CW) (GR)

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
6.1,6.2	Chapter 5	(ix) The Contractor shall prevent fuel and lubricating oil leakage from plant and storage sites from contaminating the construction site. All compounds in works areas shall be located on areas of hardstanding with provision of drainage channels and settlement lagoons where necessary to allow interception and controlled release of settled water; and provision of bunding for all potentially hazardous materials on Site including fuels. The Contractor shall prepare a spill action plan and keep suitable clean-up materials on site.	whole site/all times	CC		✓		WDO(CW) (GR)

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
6.1,6.2	Chapter 5	(x) Care must be taken to prevent spillages: (a) the storage area for fuels and lubricants shall be isolated from working areas and kept secure; (b) use of fuels and lubricants shall be carried out with care; (c) any spillage problem due to any truck and machinery shall not be ignored; (d) emulsifier and absorbent shall be available on Site, so that immediate action can be taken when there is minor spillage; (e) all containers shall be stored so as to prevent any spillage of the contents and disposed of carefully; and (f) concepts of 'Site cleanliness' shall be introduced to workers, to gather and store construction waste in an appropriate manner.	whole site/all times	CC		✓		WDO(CW) (GR)
		(xi) Temporary waste facilities shall be set up by the Contractor. Municipal waste shall be collected in black refuse bags and delivered to, and disposed of at, an approved landfill.	whole site/all times	CC		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
6.1,6.2	Chapter 5	A core sampling programme should be undertaken to ascertain the nature of the substratum. In the unlikely event of contaminated land being encountered, it will be subject to the criteria specified in ProPECC Pager (PN3/94) Contaminated Land Assessment and Remediation. <i>Operation mitigation measures</i>	whole site/Des	DDE	✓			ProPECC PN 3/94
6.3	5.10	Channel desilting should be carried out during the dry season whenever possible Dredged sediments should be set aside and air dried prior to being loaded onto trucks for disposal at landfill A refuse boom should be laid across YLBF confluence with Kam Tin Floodway and the sediment should be regularly collected and disposed of at a landfill	whole site/routinely according to DSD maintenance schedule	DSD			✓	ProPECC PN 3/94
		<i>Monitoring</i> No monitoring is proposed to identify the nature of waste arising. It is the responsibility of the Contractor to measure the contaminant level of dredged mud and classify it before disposal. The success of measures to minimise impact on the aquatic environment may be reflected by water quality monitored as described in Section 4.					✓	--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
	6.1.3	<p><u>Ecology</u></p> <p><i>Construction mitigation measures</i></p> <p>An Ecologist should be included in detailed design team.</p> <p>With reference to Section 5.5 of the EIA Study Report and Section 6.2 of the EM&A Manual, the Detailed Design Engineer will deposit with the Director of Environmental Protection scaled location and detail drawings at least one month before construction commences. These drawings shall show all ecological mitigation measures for the Project. The drawings shall demonstrate conformance with the measures in the EIA study report and shall be certified by the Environmental Manager.</p>	Des	DDE	✓			--
5.5.6	6.2	The alignment of northern channel section should be routed as close as possible to Route 3 to minimise impact on fish ponds (Figure 5.2 in EIA).	specified locations/Des&C stages	DDE/CC	✓	✓		--
5.5.12 - 5.5.14	6.2	Grasscrete should be incorporated in the channel design on sides and base of channel between ch 1+340 and 3+545.	specified locations/Des&C stages	DDE/CC	✓	✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
5.5.15 - 5.5.19	6.2	Government and private land south of Route 3 should provide an off-line marshcrete area between ch 2+780 and 2+940 (Figures 5.4 and 5.5 in EIA). "Recirculated" water should be back-pumped from pumping station to supply wetland area in association with local runoff. Pollution and saline tolerant species should be planted and established along the channel.	specified locations/Des&C stages	DDE/CC	✓	✓		--
5.5.14 - 5.5.19	6.2	The land between the YLBF and Route 3 (between ch 3+050 and 3+545) should be utilised to create an offline wetland area on a submerged grasscrete substrate. Recirculated water back-pumped from the pumping station will supply wetland area. Saline tolerant and pollution tolerant wetland species should be planted and established along the channel.	specified locations/Des&C stages	DDE/CC	✓	✓		--
5.5.20	6.2	Suitable tree species should be planted along the channel banks which are attractive to fauna. Species should be selected from species list given in Table 5.15 of EIA;	specified locations/Des&C stages	DDE/CC	✓	✓		--
5.5.25 - 5.5.26	6.2	<i>Operation mitigation measures</i> Maintenance of wetland areas should be carried out during the operational phase in the form of grass cutting and sediment removal.	Whole site/O	temporarily by TDD until a permanent maintenance department identified ¹			✓	--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
	6.1	<p><i>Monitoring</i></p> <p>An ecological baseline survey of the proposed YLBF alignment shall be undertaken within three months prior to the commencement of construction activities. The results compared with the results of the ecological survey undertaken under this study to provide information on recent changes in habitat conditions. Both floral and faund surveys should be carried out. Ecological surveys shall be undertaken under the supervision of an ecologist with at least 3 years of local experience.</p>	monitoring locations/specified times	ET				-- --
		<p>No ecological monitoring will be required during the construction phase.</p> <p>During the first 2 years (commencing immediately after project completion), quarterly floral and faunal surveys shall be carried out by (or under the supervision of) an ecologist of at least three years local experience (vetted by AFD if necessary).</p>	monitoring locations/specified times	ET			✓	-- --

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
	6.1	<p>Attention shall be drawn to dominant species (and their density), and the occurrence (if any) of rarities and protected species, and the activities of fauna (breeding/feeding/courting etc.). Any other outside influencing factors (pollution, development etc.) should be highlighted.</p> <p>For the next three years, the surveys shall be conducted on an annual, early wet season (May-June) cycle. Any other outside influencing factors (pollution, nearby development etc.) should be highlighted.</p> <p>The criteria for the success of the mitigation proposals will be based on an ecological comparison with an existing concrete nullah in the Yuen Long Area (e.g. the Shan Pui Nullah). The baseline data prior to the Project commencement will be available for reference.</p>	<p>monitoring locations/specified times</p> <p>monitoring locations/specified times</p> <p>monitoring locations/specified times</p>	<p>ET</p> <p>ET</p> <p>ET</p>			<p>✓</p> <p>✓</p> <p>✓</p>	<p>--</p> <p>--</p> <p>--</p>
		<p><u>Landscape & Visual Impacts</u></p> <p>With reference to Section 9.6 of the EIA Study Report and Chapter 7 of the EM&A Manual, the Detailed Design Engineer shall deposit with the Director of Environmental Protection, scaled location and landscape report drawings and a landscape report demonstrating conformance with the requirements of the EIA study. The drawings and landscape report shall have prior approval and certification by the Environmental Manager.</p>						

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
9.6.2	Chapter 7	Soft landscaping measures should be used, employing native plant species to restore green landcover and enhance the vegetated, rural environment. This includes tree/shrub planting and hydroseeding in the peripheral site area, the proposed embankment slopes, footpath sides and access roads.	Whole site/C	CC		✓		--
9.6.7	Chapter 7	Saline tolerant and pollution tolerant wetland species should be planted in engineered wetland areas.	Fishpond area/C	CC		✓		--
9.6.7	Chapter 7	After completion of construction works, the drained fishponds to the north of the site, should be restored.	Fishpond area/C	CC		✓		--
9.6.8	Chapter 7	The recreational opportunities presented by the reprovisioning of public open space affected by the YLBF, should be considered.	specified locations/Des&C stages	DDE/CC	✓	✓		--
9.6.9	Chapter 7	The exterior of the pumping station, handrailings and parapets shall be painted in a colour so as to minimise visual impact. Trees and shrubs may be planted around the pumping station to soften the visual impact of the structure.	Pumping Station, handrailings & parapets/C	CC		✓		--
9.6.10	Chapter 7	The inclusion of small areas of stone finishing, to soften the visual impact of the channel, should be examined.	specified locations/Des	DDE	✓			--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
9.6.11	Chapter 7	In the interests of conservation and preservation, the large <i>Ficus Microcarpa</i> and six protected species should be retained as described in the Tree Survey Report (Report No. 0136/TSR/Issue 1). Eleven protected tree species should be transplanted.	specified locations/Des	DDE	✓			--
9.6.13	Chapter 7	Top soil should be retained and used in any landscape mitigation measures. Detailed landscape design should be carried out by a landscape architect.	Whole site/C	CC		✓		-- --
	7.1	<i>Monitoring</i> During the soft landscape establishment and maintenance, each of the following stages shall be subject to the inspection and approval of the landscape architect before commencement of the next stage of works.	specified locations/C	ET		✓		--

EIA Ref	EM&A Log Ref	Environment Protection Measures	Location/ Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
					Des	C	O	
9.6.13	7.1	1. After checking of setting out of planting areas and subgrade levels, and setting out of any additional planting and drainage prior to placing topsoils.	specified locations/C	ET		✓		--
		2. At completion of soil preparation prior to planting.	specified locations/C	ET		✓		--
		3. After planting, staking and tying prior to placing mulch.	specified locations/C	ET		✓		--
		4. At completion of works	specified locations/C	ET		✓		--
		5. At completion of each three month period of the maintenance works.	specified locations/O	ET			✓	--
		Maintenance works landscaping monitoring should be carried out in accordance with the General Schedule of Maintenance Works.	specified locations/O	ET			✓	--

Note This Implementation Schedule is based on information provided in the EIA and EM&A for the preliminary design and will be subject to review during subsequent stages of the project.

* Des=Design; C=Construction; O=Operation;
Territory Developments Department (TDD) is the ultimate agent responsible for the implementation of the mitigation measures during design and construction stages. The Detailed Design Engineer (DEE), Construction Contractor (CC), Engineer's Representative (ER) and Environmental Team (ET) will be employed by TDD in due course.
DSD is responsible for maintenance of the concrete channel during operation stage.

1 TDD has agreed to provide interim maintenance responsibility until a permanent maintenance authority has been designated for such sites under the Wetlands Compensation Study

- APCO Air Pollution Control Ordinance
APCR,LS2 Air Pollution Control Regulation, Legal Supplement 2
NCO Noise Control Ordinance
NCR(HPB) Noise Control Regulation (Hand-held Percussive Breakers)
NCR(AC) Noise Control Regulation (Air Compressors)
ProPECC Professional Persons Practice Note 1 (1994)
PN1/94
WDO Waste Disposal Ordinance
PHMSO Public Health and Municipal Services Ordinances
WPCO Water Pollution Control Ordinance

WD(CW)(GR) Waste Disposal (Chemical Works)(General Regulations)

ProPECC Professional Persons Practice Note 3(1994)
PN3/94

CWCS A guide to the Chemical Waste Control Scheme

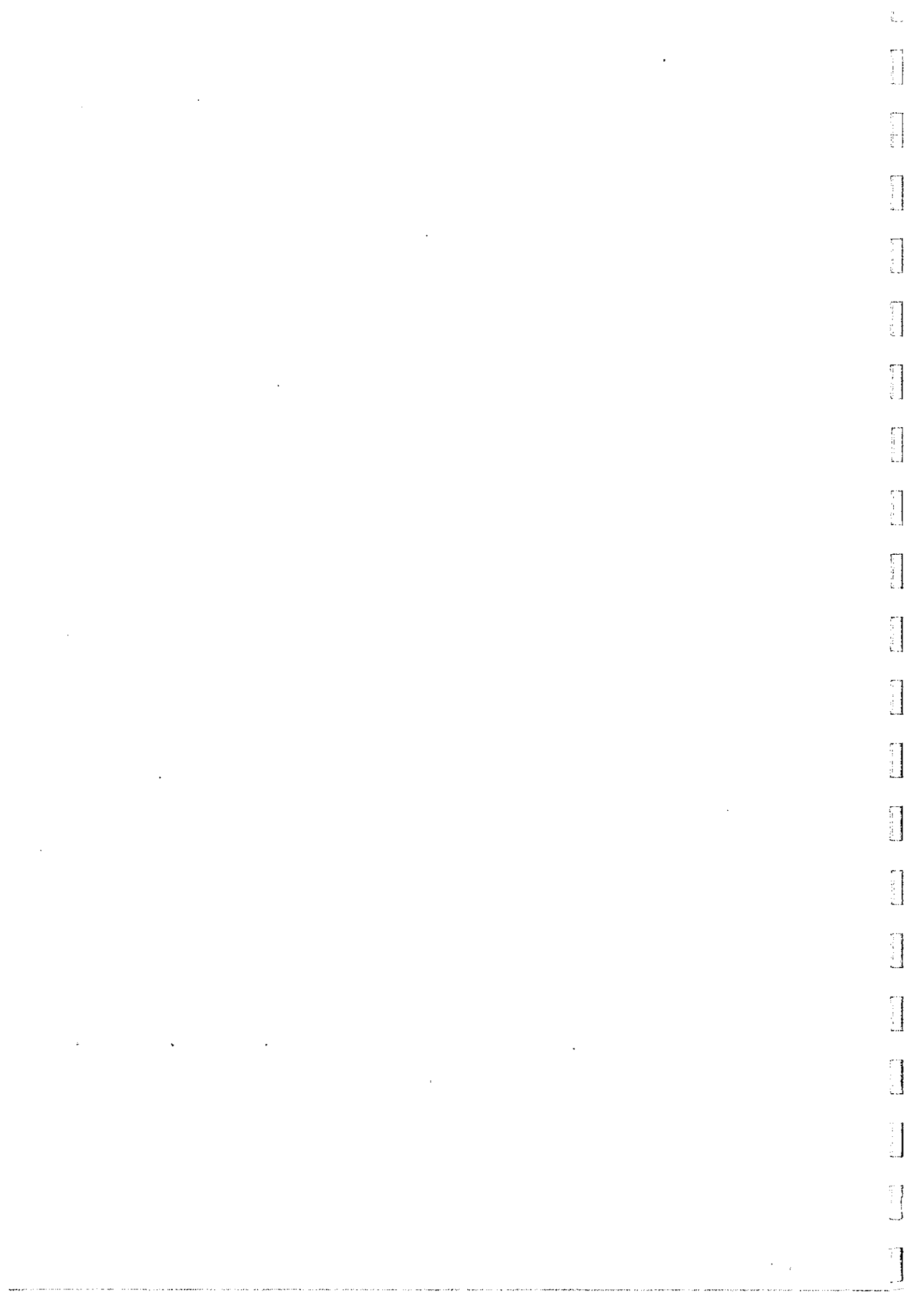
RCWP A guide to the Registration of Chemical Waste Producers

CPPLSCW Code of Practice on the Packing, Labelling and Storage of Chemical Wastes

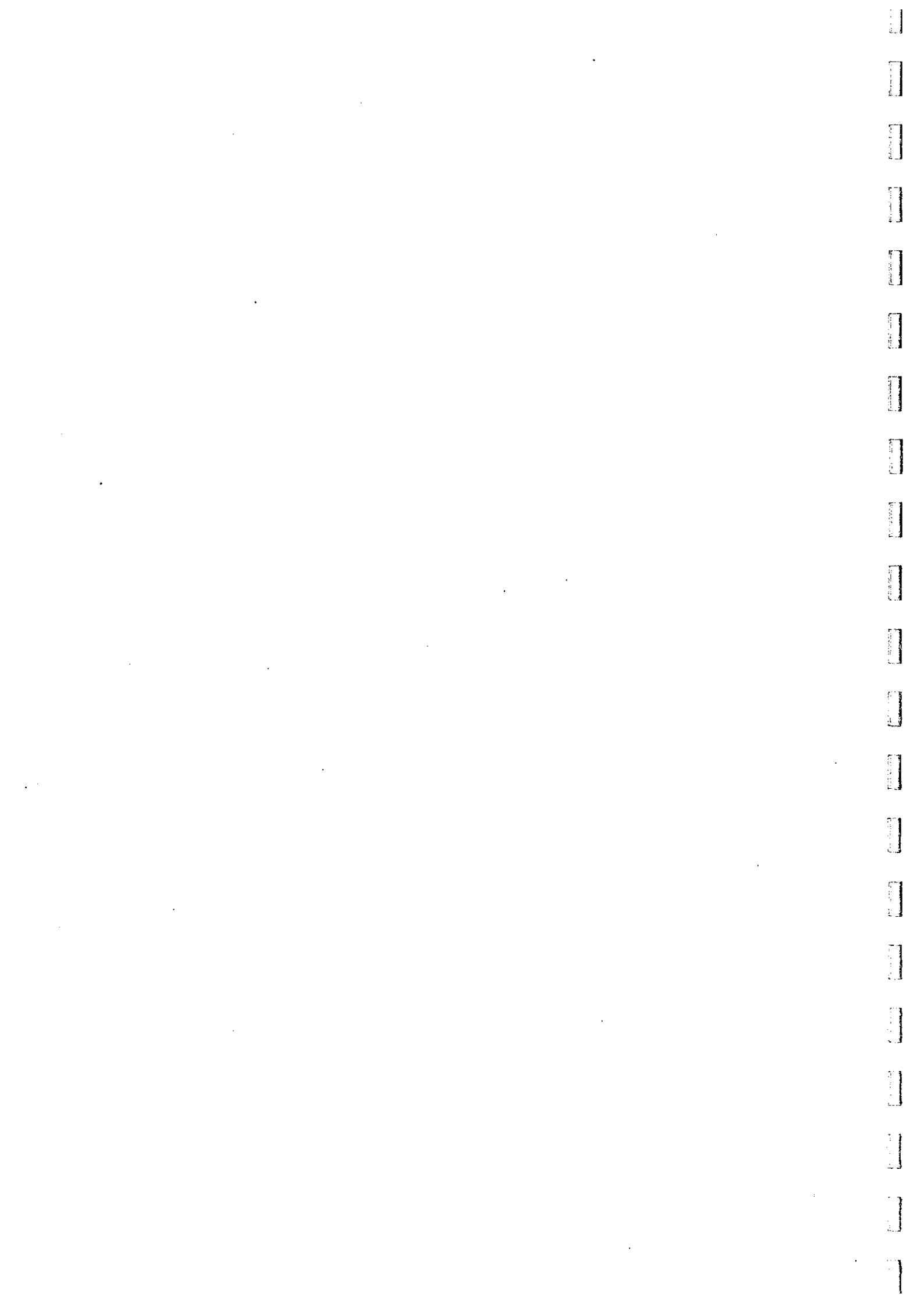
WBTC 5/98 Works Branch Technical Circular No. 5 (1998)

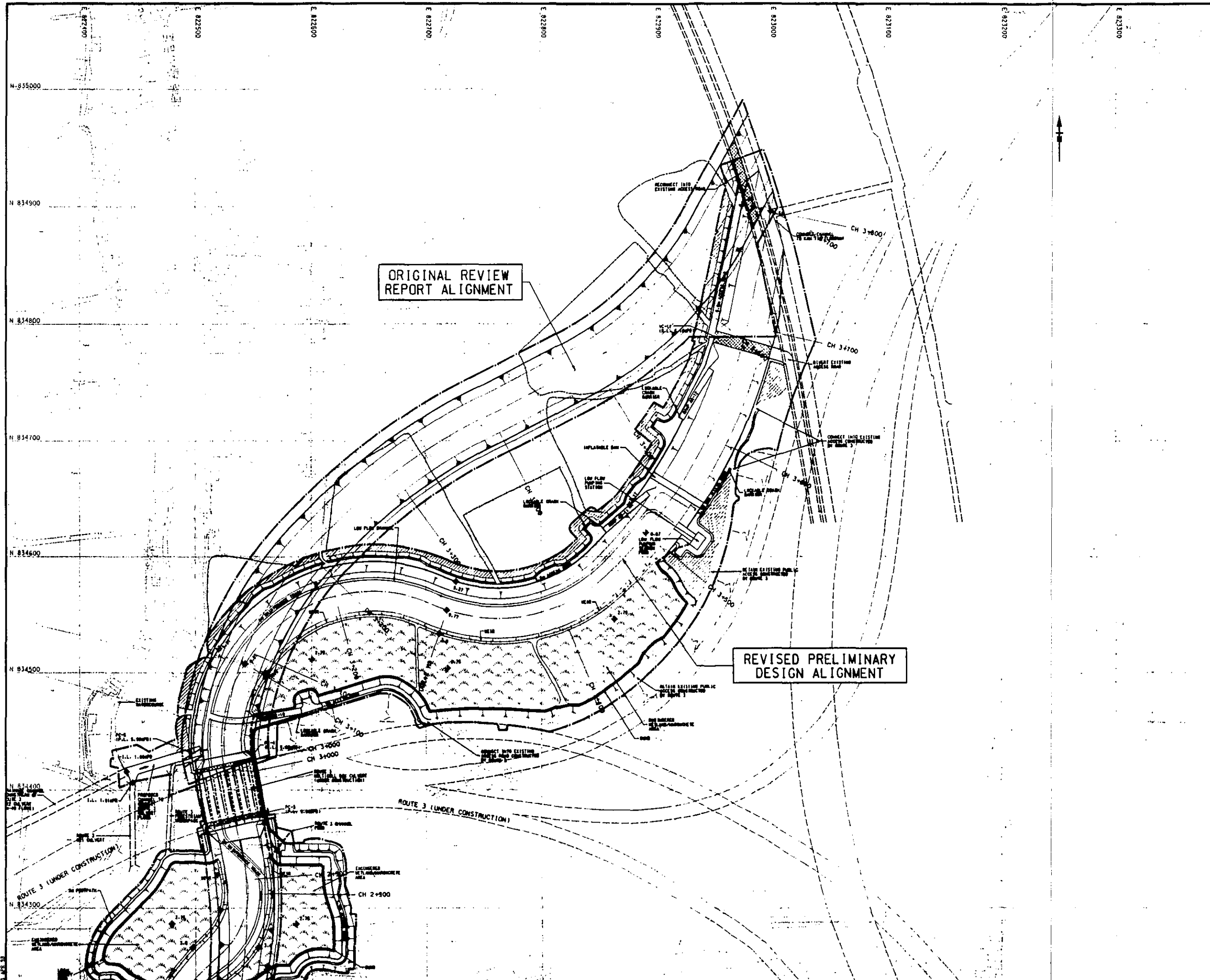
APC(OB)R Air Pollution Control (Open Burning) Regulation

APPENDIX 1
PRELIMINARY LAYOUT PLAN



- Use of grasscrete on sides and base of channel between ch 1+340 and 3+545. (See Appendix 1);
- Use of land between the YLBF and Route 3 (between ch 3+050 and 3+545) to create an offline wetland area on a submerged grasscrete substrate (marshcrete Figure 6.2). Recirculated water back-pumped from the pumping station will supply wetland area. Planting of saline tolerant and pollution tolerant wetland species;
- Use of Government land south of Route 3 (between ch 2+780 and 2+940) to provide an offline wetland area on a marshcrete (Figure 6.2). Recirculated water back-pumped from the pumping station to supply wetland area in association with local runoff. Planting of pollution tolerant and saline tolerant wetland species.
- Tree planting atop the channel banks should be attractive to fauna. Species should be selected from the species list given in Table 5.15 of the EIA.

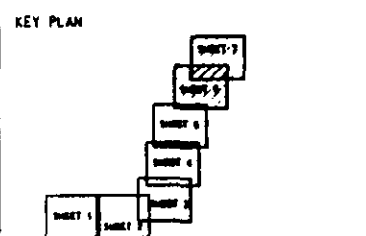




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- NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
 2. ALL LEVELS ARE IN METERS ABOVE PRINCIPAL DATUM (MPD).
 3. GRID LINES ARE HONG KONG METRIC GRID 1980.

- LEGEND:
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - [Hatched Box] BOX CULVERT
 - [T-shaped Box] PROPOSED SLOPE
 - [White Box] EXISTING SLOPE
 - [White Box] AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - [Wavy Box] ENGINEERED WETLAND/MARSHCRETE AREA
 - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - ⬇ PROPOSED LEVEL
 - ⊕ EXISTING LEVEL (OBTAINED FROM SITE VISIT)
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION



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project
YUEN LONG BYPASS FLOODWAY
FEASIBILITY STUDY
EM & A MANUAL

Figure title
ENVIRONMENTAL
MITIGATION MEASURES
REVISED CHANNEL ALIGNMENT

Figure no. 6.1 Scale 1:1500

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 3. GRID LINES ARE HONG KONG METRIC GRID 1980.
 4. DRAWING MODIFIED FROM ORIGINAL PRELIMINARY LAYOUT FIGURE 4.7.

- LEGEND:
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - WETLAND AREA
 - BOX CULVERT
 - PROPOSED SLOPE
 - EXISTING SLOPE
 - AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - PROPOSED LEVEL
 - EXISTING LEVEL (OBTAINED FROM SITE VISIT)
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION
 - PIPE
 - U-CHANNEL
 - 0.5m HIGH WALL

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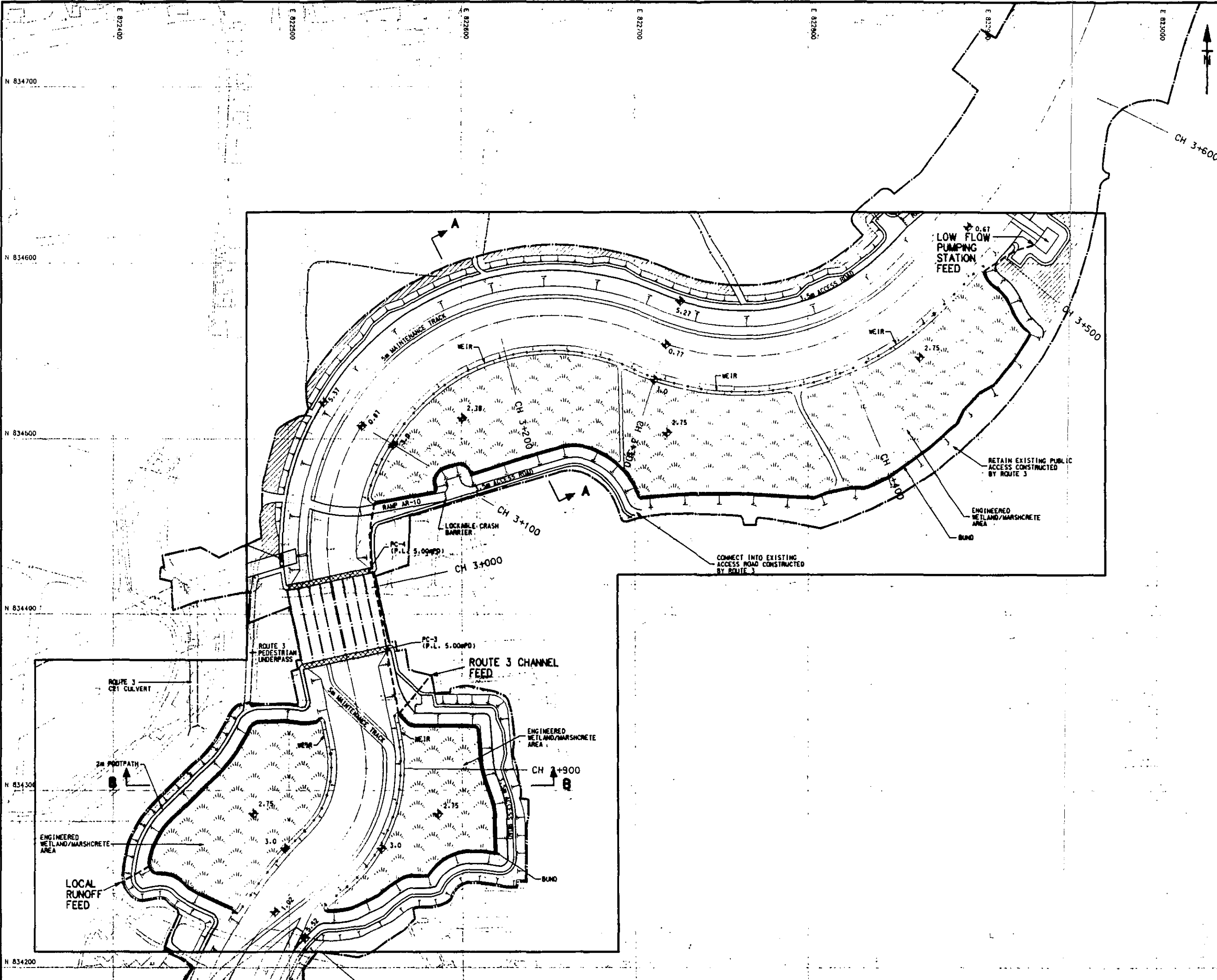
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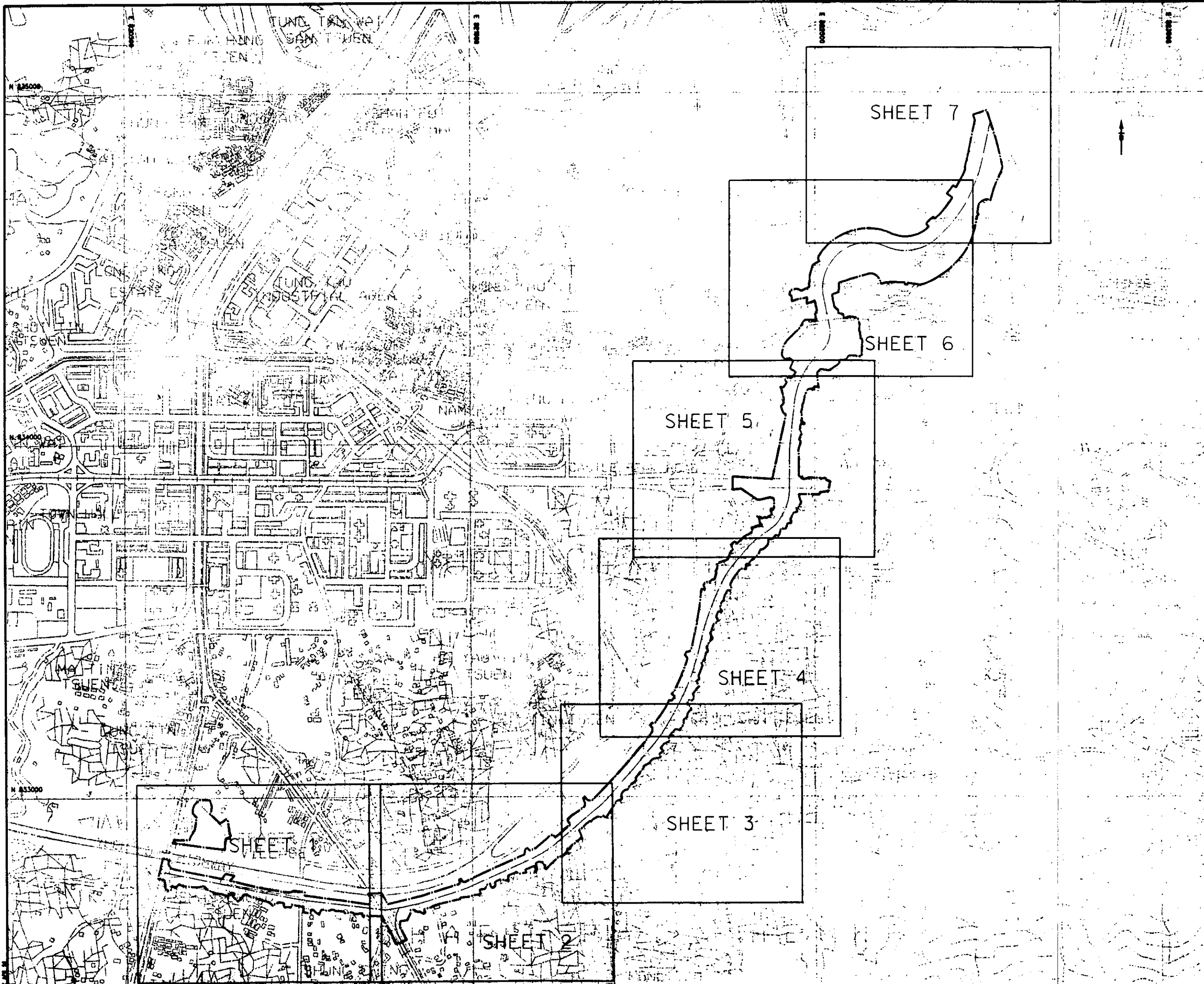
Figure title
ENVIRONMENTAL
MITIGATION MEASURES
OFF-LINE WETLAND AREA PLAN

Figure no
6.2
Scale
1:1000

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LEGEND:

----- PRELIMINARY SITE LIMIT
 ———— PROPOSED CHANNEL ALIGNMENT

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initial	01/96	GY	AJT	YLL	CBC
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Figure title
 PROPOSED CHANNEL KEY LAYOUT
 PLAN

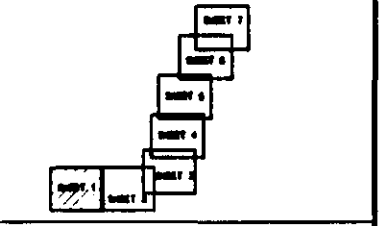
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 - ALL LEVELS ARE IN METERS ABOVE PRINCIPAL DATUM (HPD).
 - GRID LINES ARE HONG KONG METRIC GRID 1960.
- LEGEND:**
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - [Hatched Box] BOX CULVERT
 - [T-T Box] PROPOSED SLOPE
 - [White Box] EXISTING SLOPE
 - [Diagonal Hatched Box] AREA TO BE FILLED TO ADJACENT ORBLIND LEVEL
 - [Wavy Hatched Box] ENGINEERED METLAND/MARSHCRETE AREA
 - - - - - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - ↗ PROPOSED LEVEL
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - - - - - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION



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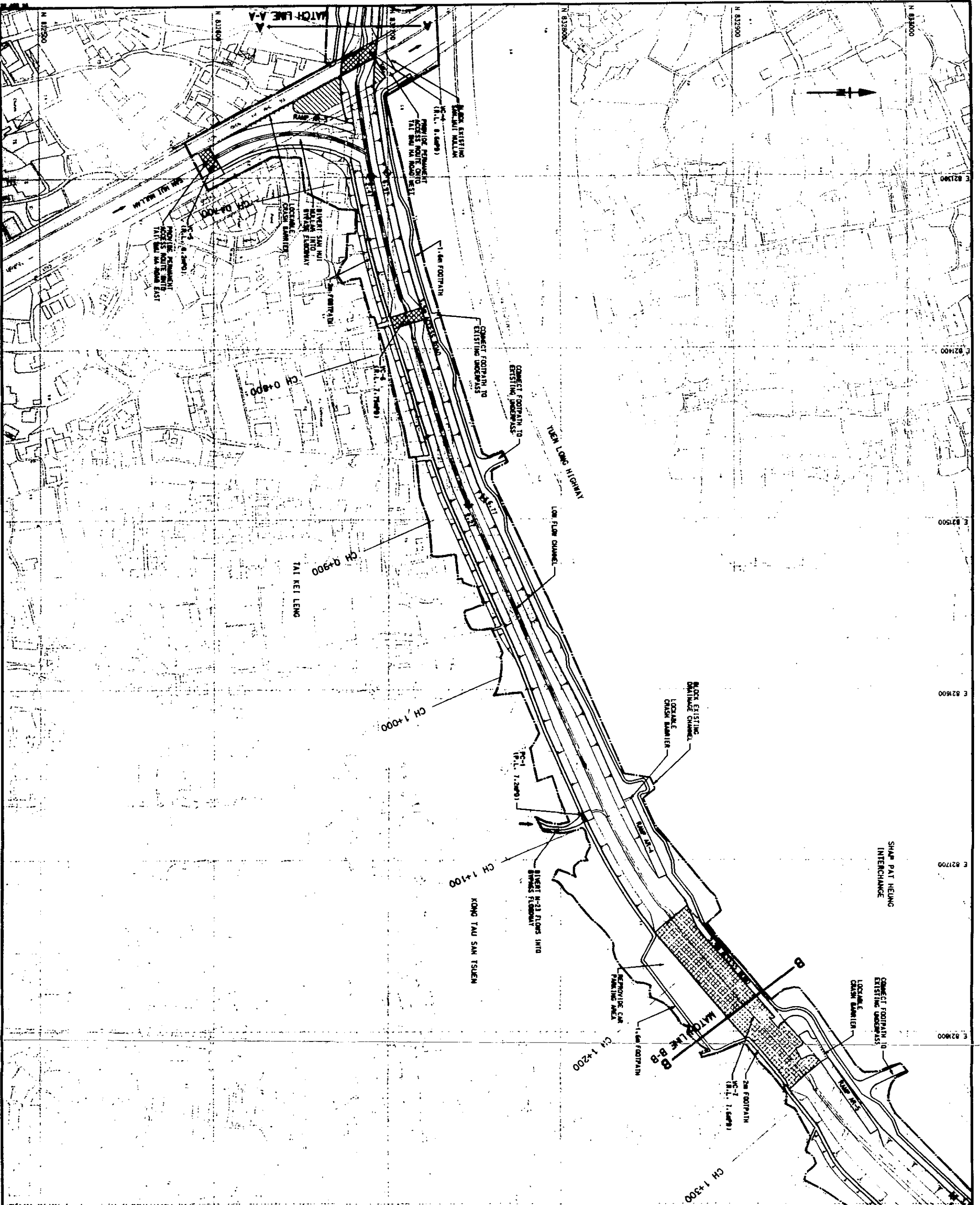
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Figure title
PRELIMINARY LAYOUT
(SHEET 1 OF 7)

Figure no. **4.2** Scale **1:1000**

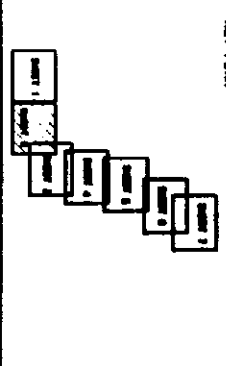
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 3. GRID LINES ARE FROM 1984 METRIC GRID 1984.

- LEGEND:
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - ONE WAY
 - PROPOSED SLOPE
 - EXISTING SLOPE
 - AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - ENGINEERED RETAINMENT/CONCRETE AREA
 - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - PROPOSED LEVEL
 - VEHICULAR CROSSING
 - PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - OTHER PRODUCTS UNDER PRESENT/PENDING CONSTRUCTION



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PRELIMINARY LAYOUT (SHEET 2 OF 7)

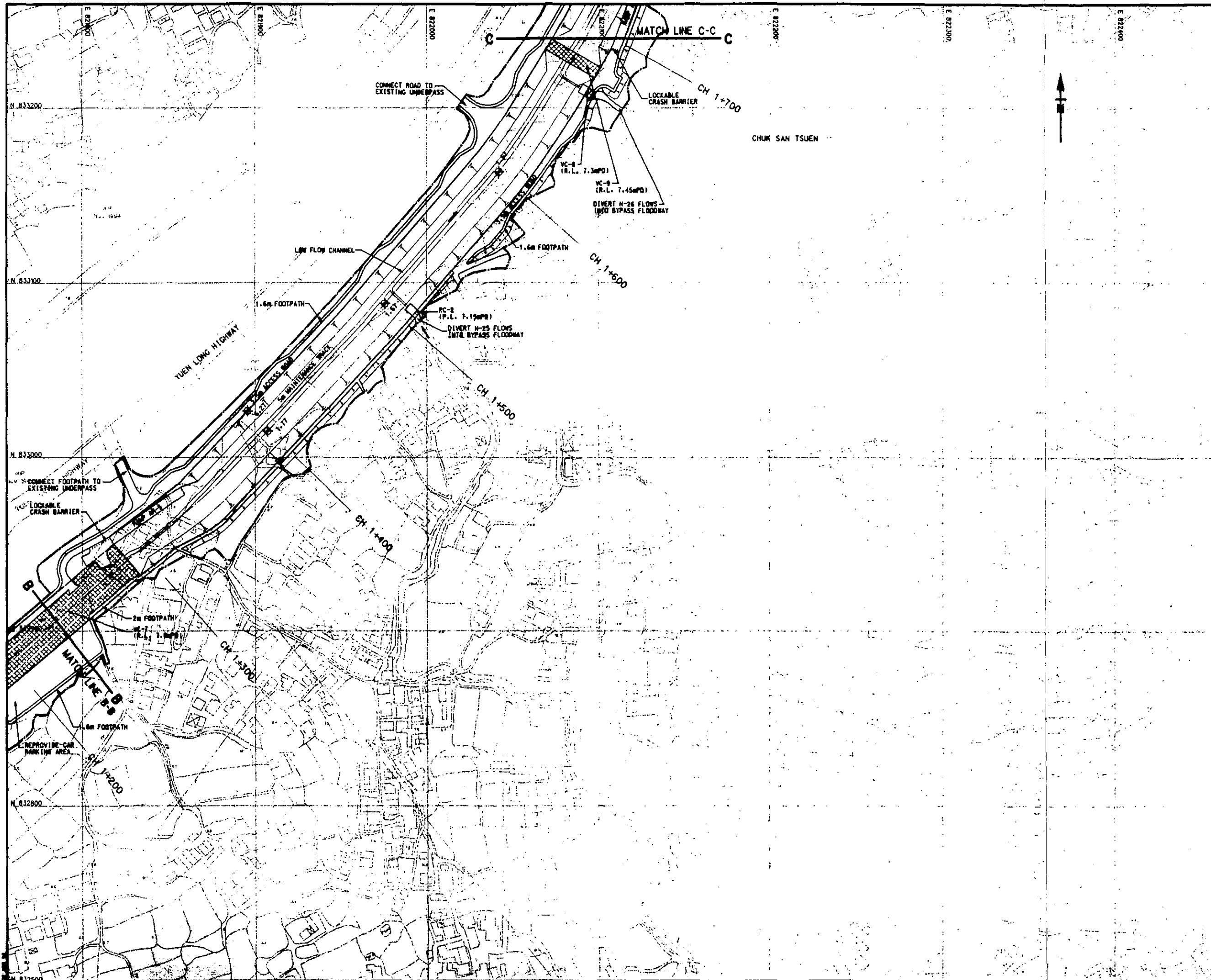
Figure No. 4.3

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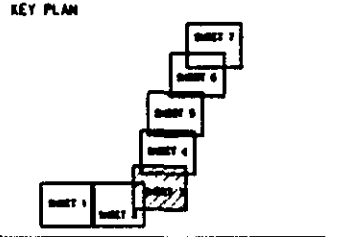
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 2. ALL LEVELS ARE IN METERS ABOVE PRINCIPAL DATUM (MPO).
 3. GRID LINES ARE HONG KONG METRIC GRID 1980.

- LEGEND:
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - [Hatched Box] BOX CULVERT
 - [Trapezoid] PROPOSED SLOPE
 - [Dotted Box] EXISTING SLOPE
 - [Diagonal Lines] AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - [Wavy Lines] ENGINEERED WETLAND/MARSHCRETE AREA
 - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - PROPOSED LEVEL
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION



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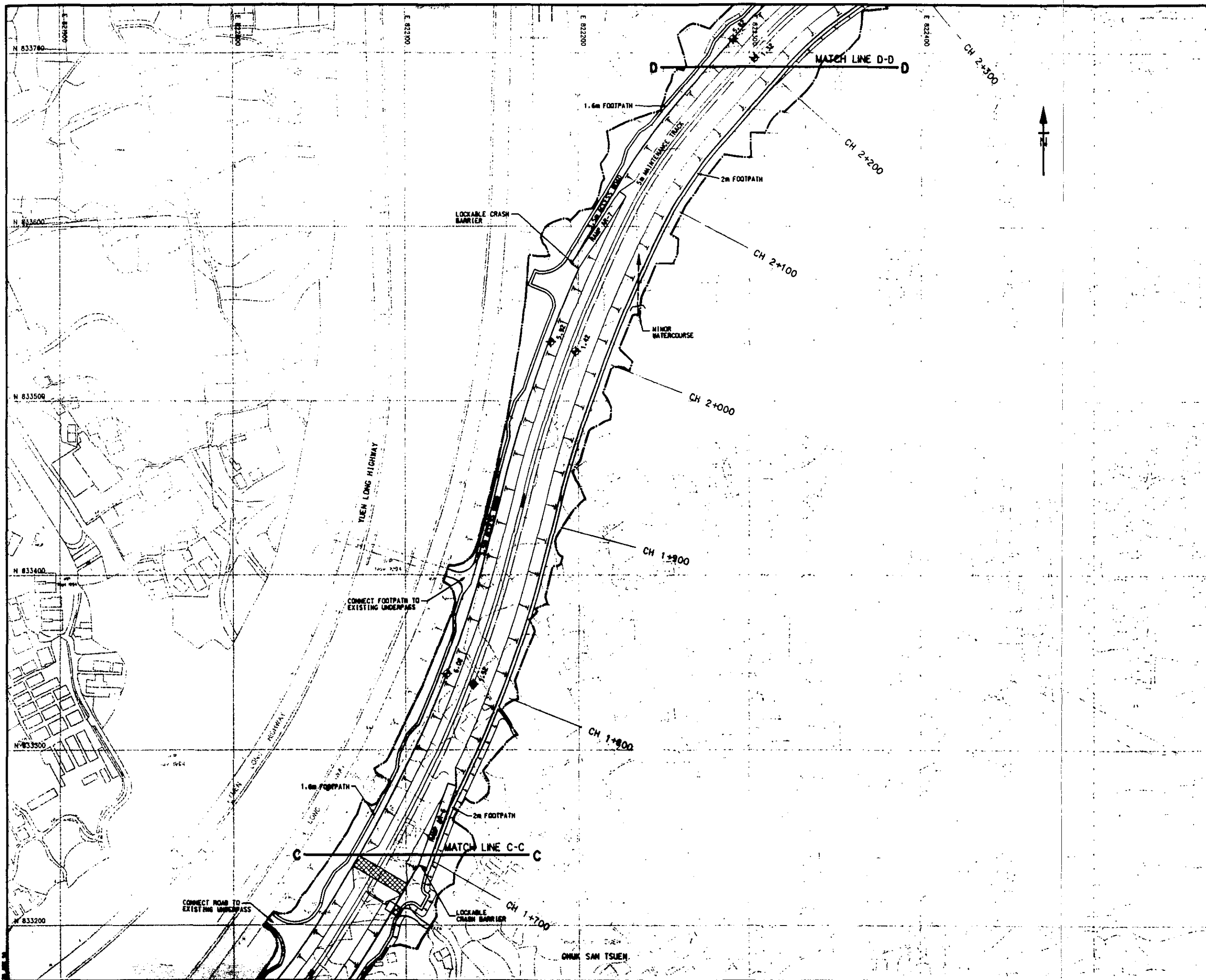
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PRELIMINARY LAYOUT
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Figure no. 4.4 Scale 1:1000

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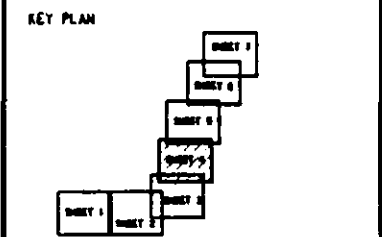
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- LEGEND:**
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - ▨ BOX CULVERT
 - ▧ PROPOSED SLOPE
 - ▩ EXISTING SLOPE
 - ▨ AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - ↗ PROPOSED LEVEL
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION



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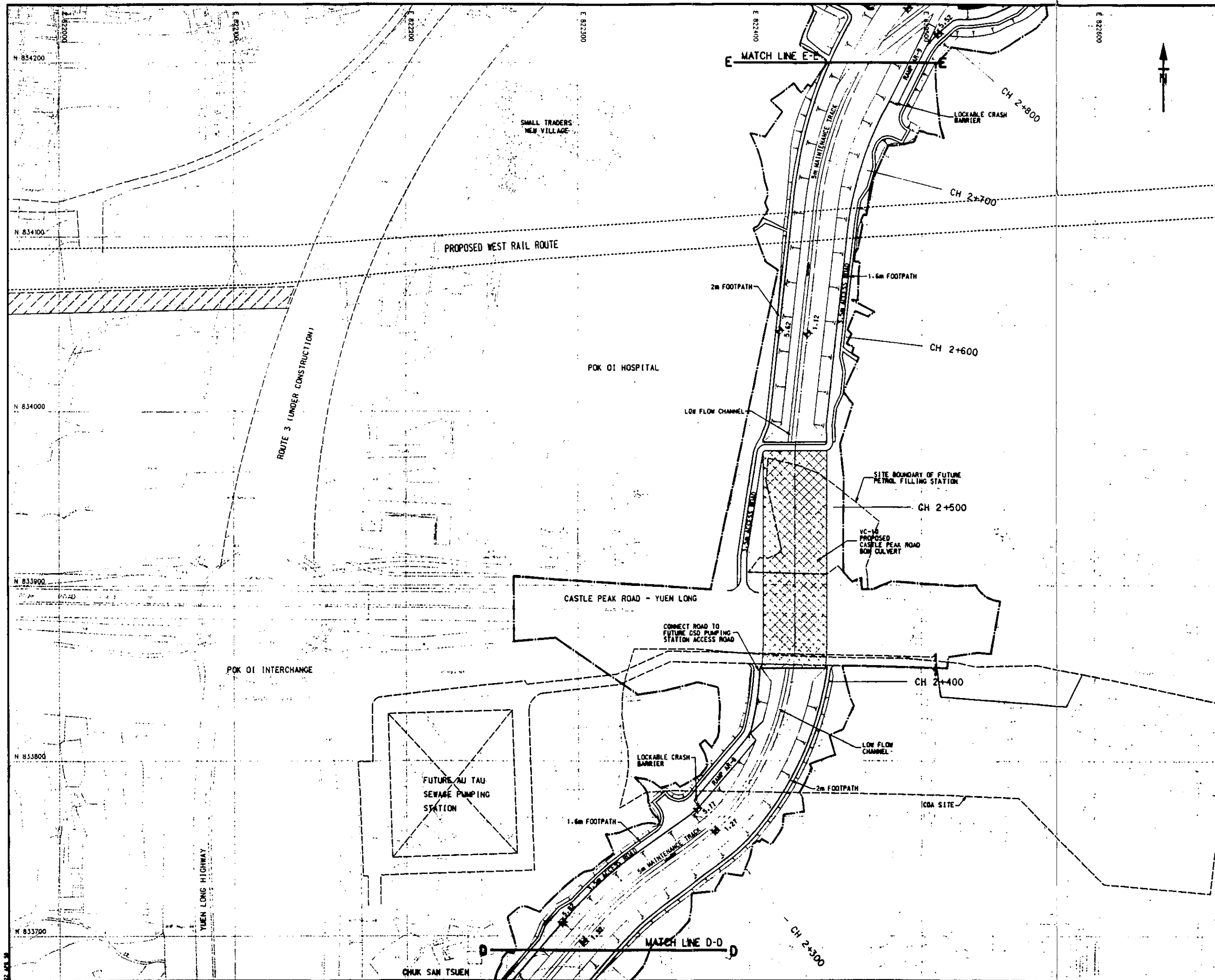
Figure title
**PRELIMINARY LAYOUT
(SHEET 4 OF 7)**

Figure no. **4.5** Scale **1:1000**

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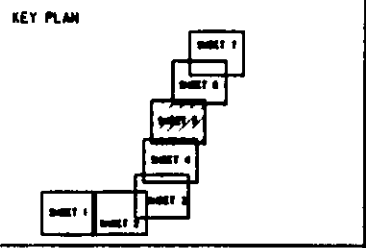
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- LEGEND:
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - [Hatched Box] BOX CULVERT
 - [T-Y] PROPOSED SLOPE
 - [White Box] EXISTING SLOPE
 - [Dotted Box] AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - - - - - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - ↕ PROPOSED LEVEL
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - - - - - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION



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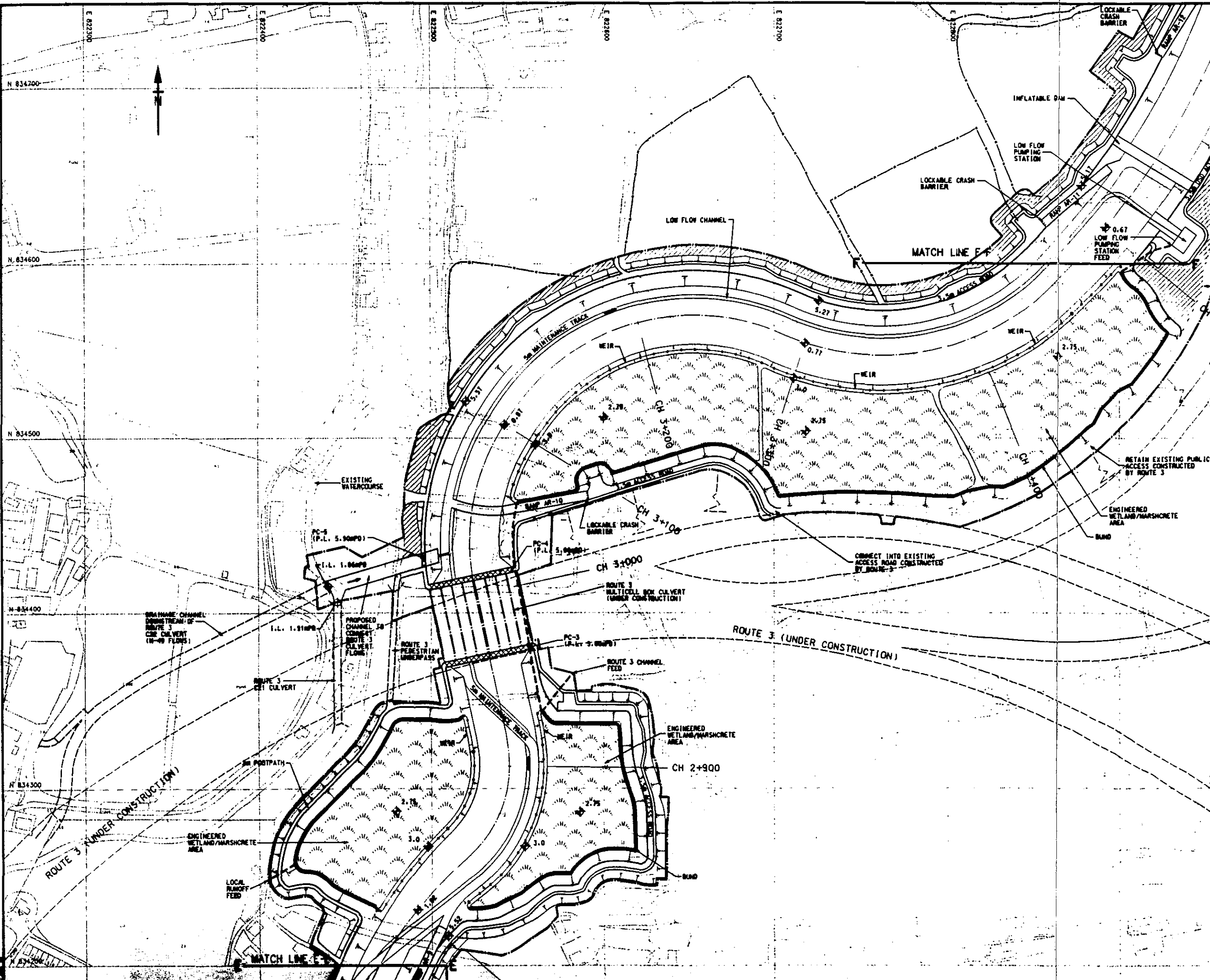
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PRELIMINARY LAYOUT
(SHEET 5 OF 7)

Figure no. **4.6** Scale **1:1000**

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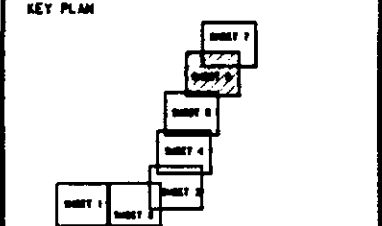
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- LEGEND:
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - [Hatched Box] BOX CULVERT
 - [T-shaped Box] PROPOSED SLOPE
 - [Dotted Box] EXISTING SLOPE
 - [Diagonal Hatched Box] AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - [Wavy Box] ENGINEERED WETLAND/MARSHCRETE AREA
 - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - PROPOSED LEVEL
 - EXISTING LEVEL (OBTAINED FROM SITE VISIT)
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION
 - PIPE
 - U-CHANNEL
 - 0.5m HIGH WALL



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PRELIMINARY LAYOUT (SHEET 6 OF 7)

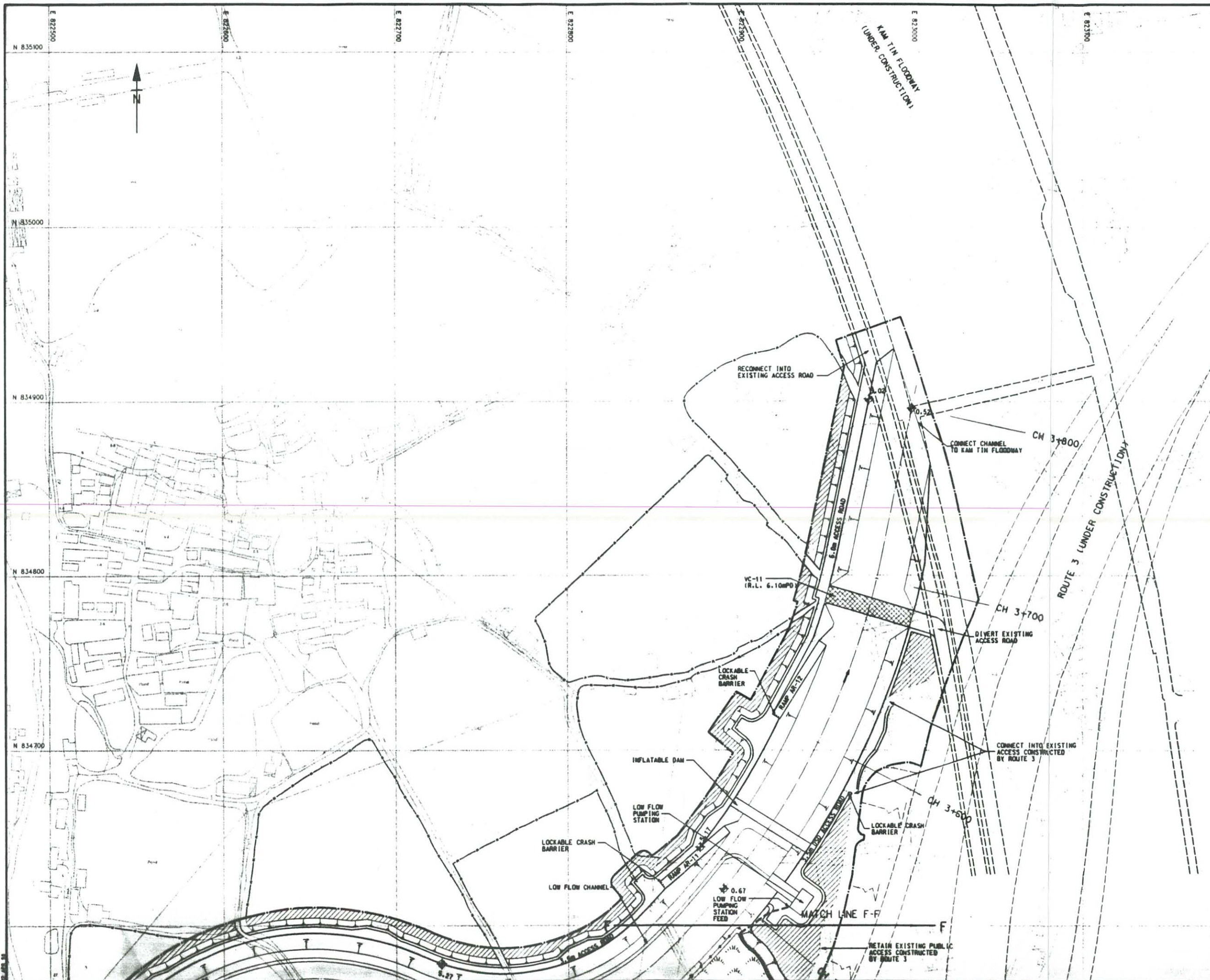
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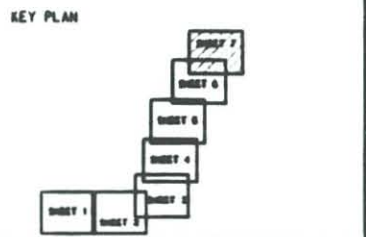
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- LEGEND:
- PROPOSED SITE LIMIT
 - DIRECTION OF FLOW
 - [Hatched Box] BOX CULVERT
 - [Dashed Line] PROPOSED SLOPE
 - [Solid Line] EXISTING SLOPE
 - [Diagonal Hatched] AREA TO BE FILLED TO ADJACENT GROUND LEVEL
 - [Wavy Hatched] ENGINEERED WETLAND/MARSHCRETE AREA
 - LIMIT OF RIGHT OF TEMPORARY OCCUPATION
 - ★ PROPOSED LEVEL
 - VC VEHICULAR CROSSING
 - PC PEDESTRIAN CROSSING
 - R.L. TOP OF ROAD LEVEL
 - P.L. TOP OF FOOTPATH LEVEL
 - OTHER PROJECTS UNDER PRESENT/FUTURE CONSTRUCTION
 - * * 0.5m HIGH WALL



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PRELIMINARY LAYOUT
(SHEET 7 OF 7)

Figure no. **4.8** Scale **1:1000**

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