SECTION 10

10 ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS

10.1 Introduction

10.1.1 This section presents a brief summary of the Environmental Monitoring and Audit (EM&A) requirements that have been included as part of the EM&A Manual for the Project. This Section describes the necessary EM&A requirements based on the findings of the assessment in the previous *Sections* of this report. As discussed in *Sections 3* to *9*, construction and operational impacts may lead to exceedance of environmental criteria and therefore EM&A at the affected sensitive receivers have been recommended. The EM&A Manual also covers general audit requirements in relation to, waste management, ecology, landscape visual impact and cultural heritage resources.

10.2 Objectives of Environmental Monitoring & Audit

10.2.1 The objectives of carrying out EM&A for the Project include the following:

- to provide a database against which any short or long term environmental impacts of the project can be determined;
- to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- to monitor the performance of the project and the effectiveness of mitigation measures;
- to verify the environmental impacts predicted in the EIA Study;
- to determine project compliance with regulatory requirements, standards and government policies;
- to take remedial action if unexpected problems or unacceptable impacts arise; and
- to provide data to enable an environmental audit.

10.2.2 The following *Sections* summarise the recommended EM&A requirements proposed.

10.3 Noise

10.3.1 Noise produced during the construction phase will have an impact upon nearby noise sensitive receivers (NSRs). The primary noise sources include dredgers, barges, bulldozers, excavators, dump trucks, loaders and rollers. The construction noise criteria of 75 dB(A) will be exceeded at some of the representative NSRs if construction noise is unmitigated.

10.3.2 It is anticipated that if the mitigation measures can be successfully applied, the noise levels experienced by the affected receivers will be reduced to within the noise criteria.

Noise Monitoring Locations

10.3.3 Noise monitoring requirements have been recommended in the EM&A Manual in order to ensure compliance with the criteria. It is recommended that noise monitoring be carried out as part of the EM&A programme during the construction and operational periods of the WCR at locations presented in *Table 10.3a* and *10.3b* and any additional locations considered necessary, in agreement with the Environmental Protection Department (EPD). The monitoring locations are shown in *Figures 10.3a,* and *10.3b* and *10.3c*.

Table 10.3a Noise Monitoring Stations - Construction Phase

Noise Monitoring Station	Noise Monitoring Location
CNM1 (N107)	Hoi Bun School
CNM2 (N115)	Sam Ka Tsuen Village House
CNM3 (N210)	Lei Yue Mun Housing Site Block 1
CNM4 (N301)	Church
CNM5 (N608)	Yau Tong Bay (Primary School)
CNM6 (N704)	Cha Kwo Ling Site
CNM7 (N903)	Junk Bay

Table 10.3b Noise Monitoring Stations - Operational Phase

Noise Monitoring Station	Location	Floor
ONM1 (NSR 202)	Lei Yue Mun Housing site Block 4	Medium floor
ONM2 (NSR 602)	Yau Tong Bay	Medium floor
ONM3 (NSR 609)	Yau Tong Bay School	Top floor
ONM4 (NSR 701)	Cha Kwo Ling Site	Medium floor

10.3.4 Note that in the case of a planned NSR (which has been identified as an operational noise monitoring location) not having been built or the actual layout differs from the adopted layout in this report before the operational monitoring period commences, a suitable equivalent monitoring location shall be selected. It will be necessary to gain approval of all equivalent monitoring locations from the EPD prior to the commencement of the operational noise monitoring programme. Further details concerning the selection of equivalent monitoring locations are provided in the EM&A Manual.

Baseline Monitoring

10.3.5 Baseline noise monitoring should be carried out prior to the commencement of the construction works. The baseline monitoring should be carried out daily for a period of at least two weeks.

10.3.6 No baseline operational monitoring is required.

Impact Monitoring

10.3.7 Construction noise monitoring should be carried out at all the designated monitoring stations (CNM1 - CNM7). The monitoring frequency shall depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when noise generating activities are underway:

- one set of measurements between 0700 - 1900 hours on normal weekdays;
- one set of measurements between 1900 - 2300 hours;
- one set of measurements between 2300 - 0700 hours of next day; and
- one set of measurements between 0700 - 1900 hours on holidays.

10.3.8 General construction work carrying out during restricted hours is controlled by CNP system under the NCO.

10.3.9 The monitoring is required to ensure compliance with the EIAO in providing feedback to the Contractors for the management of their operations. The specific requirements of the EM&A programme is presented separately in the EM&A Manual.

10.3.10 Operational noise monitoring should be carried out at all the designated operational noise monitoring stations (ONM1 - OMN4). The following is an initial guide regarding the operational noise requirements:

- All specified monitoring locations (at selected floor heights) within the first year of the road opening;
- The measurement period shall be three half hour periods during the peak traffic hour;
- A concurrent census of traffic flow and percentage heavy vehicle (as specified in CRTN) shall be conducted for the widened road and the existing road network in the vicinity of each measuring point; and
- The average vehicle speed estimated.

10.3.11 Measured noise levels shall be compared with predicted noise levels by applying appropriate conversion corrections to allow for the traffic conditions at the time measurement.

10.3.12 The monitoring is required to ensure compliance with the EIAO and to ensure that the mitigation measures proposed provide sufficient protection. The specific requirements of the EM&A programme is presented separately in the EM&A Manual.

10.4 Air Quality

10.4.1 Construction work will lead to dust (total suspended particulates (TSP)) emissions, mainly from bulldozing, excavation, truck haulage and material

handling activities. It is predicted that the dust generated will exceed the hourly criteria of 500 μg m^3 at some ASRs.

10.4.2 Mitigation measures have been recommended in to limit the dust emission and dispersion. With proper dust control measures as part of good construction site practice, the TSP levels at the affected air sensitive receivers will comply with the dust criteria.

Air Quality Monitoring Locations

10.4.3 Dust monitoring requirements have been recommended in the EM&A Manual to ensure the efficacy of the control measures. It is recommended that dust monitoring be carried out as part of the EM&A programme during the construction period at the locations presented in *Table 10.4a* and any additional locations considered necessary, in agreement with EPD. The monitoring locations are shown in *Figure 10.4a.*

Table 10.4a Air Quality Monitoring Stations

Dust Monitoring Stations	Monitoring Location
AM1	Ma Shan Tsuen (West)
AM2	Ma Shan Tsuen (East)
AM3	Lei Yue Mun Village
AM4	Sam Ka Tsuen Recreational Ground

Baseline Monitoring

10.4.4 Baseline monitoring should be carried out at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24hr TSP samples. 1hr sampling shall also be done at least 3 times per day while the highest dust impact is expected.

Impact Monitoring

10.4.5 Construction impact monitoring should be carried out during the course of the Works. For regular impact monitoring, the sampling frequency of at least once in every six days, shall be strictly observed at all the monitoring stations for 24hr TSP monitoring. For 1hr TSP monitoring, the sampling frequency of at least three times in every six days should be undertaken when the highest dust impact occurs.

10.4.6 The monitoring is required to ensure compliance with the EIAO in providing feedback to the Contractors for the management of their operations. The EM&A programme is presented separately in the EM&A Manual.

10.5 Water Quality

10.5.1 The potential for suspended solids (SS) impacting water quality during the

construction of the TKO Section and Yau Tong Bay reclamations have been assessed and suitable mitigation measures recommended in *Section 5*.

Water Quality Monitoring Locations

10.5.2 Water quality monitoring requirements have been recommended in the EM&A Manual to ensure the efficiency of the control measures. It has been recommended that water quality monitoring be carried out as part of the EM&A programme during the construction period at locations summarised in *Table 10.5a* and *Table 10.5b* and shown in *Figure 10.5a* and *Figure 10.5b*.

Table 10.5a Water Quality Monitoring Stations TKO Section

Station Description	HK Metric Grid N	HK Metric Grid E	Code
TKO Section Reclamation	817205	844941	TKOWM1
TKO Section Reclamation	817013	843863	TKOWM2
TKO Section Reclamation	817813	843707	TKOWM3
TKO Section Reclamation	816573	843489	TKOWM4
TKO Section Reclamation	816351	843274	TKOWM5
Control Station for TKO Section Reclamation	817653	844499	TKOC1
Control Station for TKO Section Reclamation	816152	843086	TKOC2

Table 10.5b Water Quality Monitoring Stations Yau Tong Section

Station Description	HK Metric Grid N	HK Metric Grid E	Code
Cha Kwo Ling WSD Seawater Pumping Station	817679	842001	YTWM1
Yau Tong WSD Seawater Pumping Station	817020	842099	YTWM2
Yau Tong Bay Reclamation	817289	841876	YTWM3
Yau Tong Bay Reclamation	816693	842384	YTWM4
Control Station for Yau Tong Bay Reclamation	817348	841437	YTC1
Control Station for Yau Tong Bay Reclamation	816466	842446	YTC2

Baseline Monitoring

10.5.3 Baseline conditions for water quality shall be established and agreed with EPD prior to the commencement of works. The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact, control and reference monitoring stations. The baseline conditions shall normally be established by measuring the water quality parameters specified below:

- Dissolved oxygen (DO) (in mg L^{-1} and % saturation)

- Temperature (°C)
- pH value
- Turbidity (NTU)
- Water depth (m)
- Salinity (ppt)
- Suspended Solids (SS) (mg L^{-1})

10.5.4 The measurements should be taken at all designated monitoring stations including control stations, 3 days per week, at midflood and midebb tides, for four weeks prior to the commencement of marine works.

Impact Monitoring

10.5.5 During the course of the marine works for both the TKO reclamation, monitoring should be undertaken three days per week, at midflood and midebb tides, with sampling/measurement at the designated monitoring stations. During reclamation works at Yau Tong, monitoring should be undertaken on a daily basis and monitoring results shell be provided to WSD for review.

10.5.6 Samples shall be taken at 1 m below the surface, midwater depth and 1 m above the seabed at both midflood and midebb tide. If the water depth is less than 6 m, the middepth measurement may be omitted subject to the approval of the Engineer. If the depth is less than 3 m, only the mid depth measurement need to be taken subject to the approval of the Engineer.

10.5.7 Upon completion of all marine activities, a post project monitoring exercise on water quality shall be carried out for four weeks in the same manner as the impact monitoring.

10.5.8 The monitoring is required to ensure compliance with the EIAO in providing feedback to the Contractors for the management of their operations. The EM&A programme is presented separately in the EM&A Manual.

10.6 Waste Management

10.6.1 The Contractor is responsible for the control of waste within the construction site, the removal of any solid or liquid waste material produced at the site and the implementation of any mitigation measures to minimise waste or redress problems arising from site waste.

10.6.2 It is recommended that auditing of each waste stream shall be carried out periodically during site environmental audit inspections to determine if wastes are being managed in accordance with approved procedures and the site waste management plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal of wastes. An audit shall be undertaken at the commencement of the construction works, after submission and approval of the Contractor's waste management plan and then on a monthly basis thereafter.

10.6.3 The Contractor shall comply with the *Waste Disposal Ordinance*, the *Dumping at Sea Ordinance*, the *Public Health and Municipal Services Ordinance* and the *Water Pollution Control Ordinance* and carry out the appropriate waste management work. The relevant licence/permit, such as the effluent discharge licence, the chemical waste producer registration, etc. shall be obtained by the Contractor. The Contractor shall refer to the relevant booklets issued by EPD when applying for the licence/permit.

10.6.4 The Contractor is responsible for the implementation of all waste management mitigation measures recommenced in the EIA Study to minimise waste management impacts during construction. During the site environmental audit inspections, the Environmental Team leader will ensure that measures are fully implemented. Further details are provided in the EM&A Manual.

10.7 Ecology

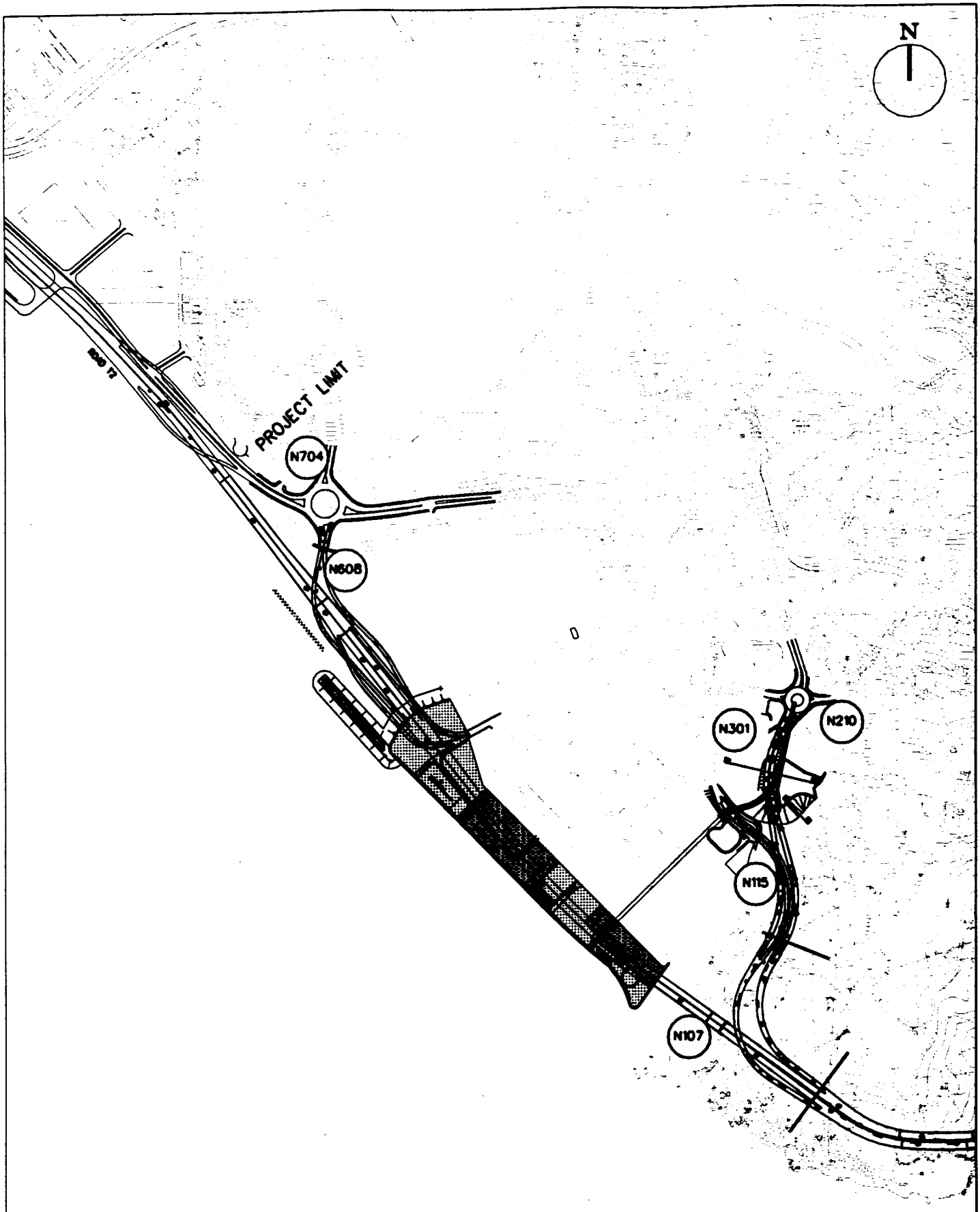
10.7.1 The Contractor is responsible for the implementation of ecological mitigation measures recommended in the EIA to minimise both direct and indirect ecological impacts from site activities which will be audited during the site environmental audit inspections. The Environmental Team Leader will be responsible for ensuring that mitigation measures are fully implemented by the Contractor throughout construction. Further details are provided in the EM&A Manual.

10.8 Visual and Landscape

10.8.1 The Contractor is responsible for the implementation of all necessary mitigation measures as recommended in the EIA Study to minimise the landscape and visual impacts from construction activities. During the site environmental audit inspections, the Environmental Team Leader will be responsible for ensuring that landscape and visual mitigation measures are fully implemented by the Contractor. Further details are provided in the EM&A Manual.

10.9 Cultural Heritage

10.9.1 The Contractor is responsible for the implementation of all necessary mitigation measures as recommended in the EIA Study to minimise the potential for impacts to cultural heritage resources. During site environmental audit inspections, the Environmental Team Leader will be responsible for ensuring that mitigation measures are fully implemented by the Contractor to reduce the potential for any indirect impacts that may occur to the identified sites.



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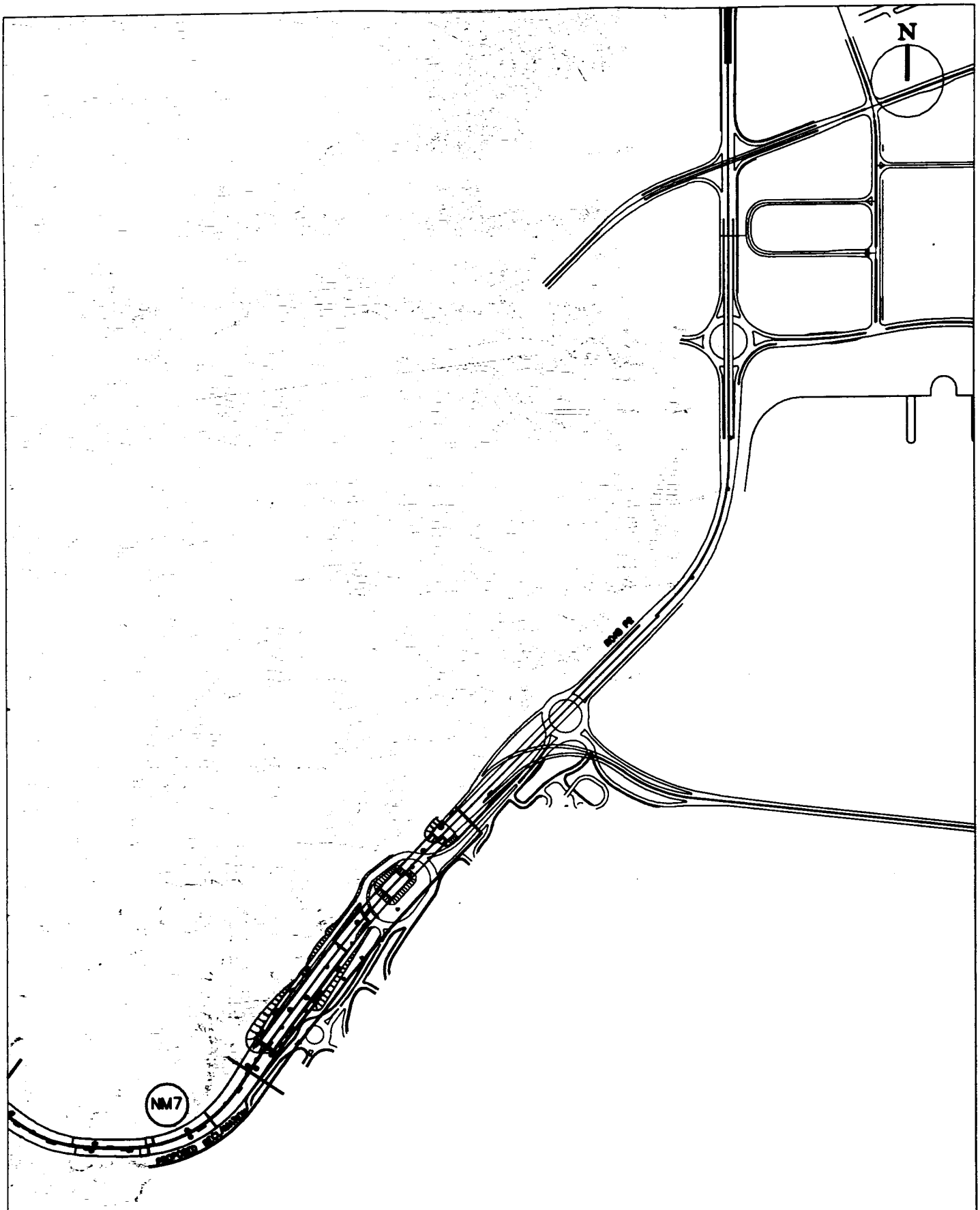
WCR, TKO YAU TONG RECLAMATION AREA
CONSTRUCTION NOISE MONITORING LOCATIONS

DATE: JAN 99

FIGURE No. 10.3a

SCALE: 1 : 11000



KEY
NM7 (N903) - Junk Bay

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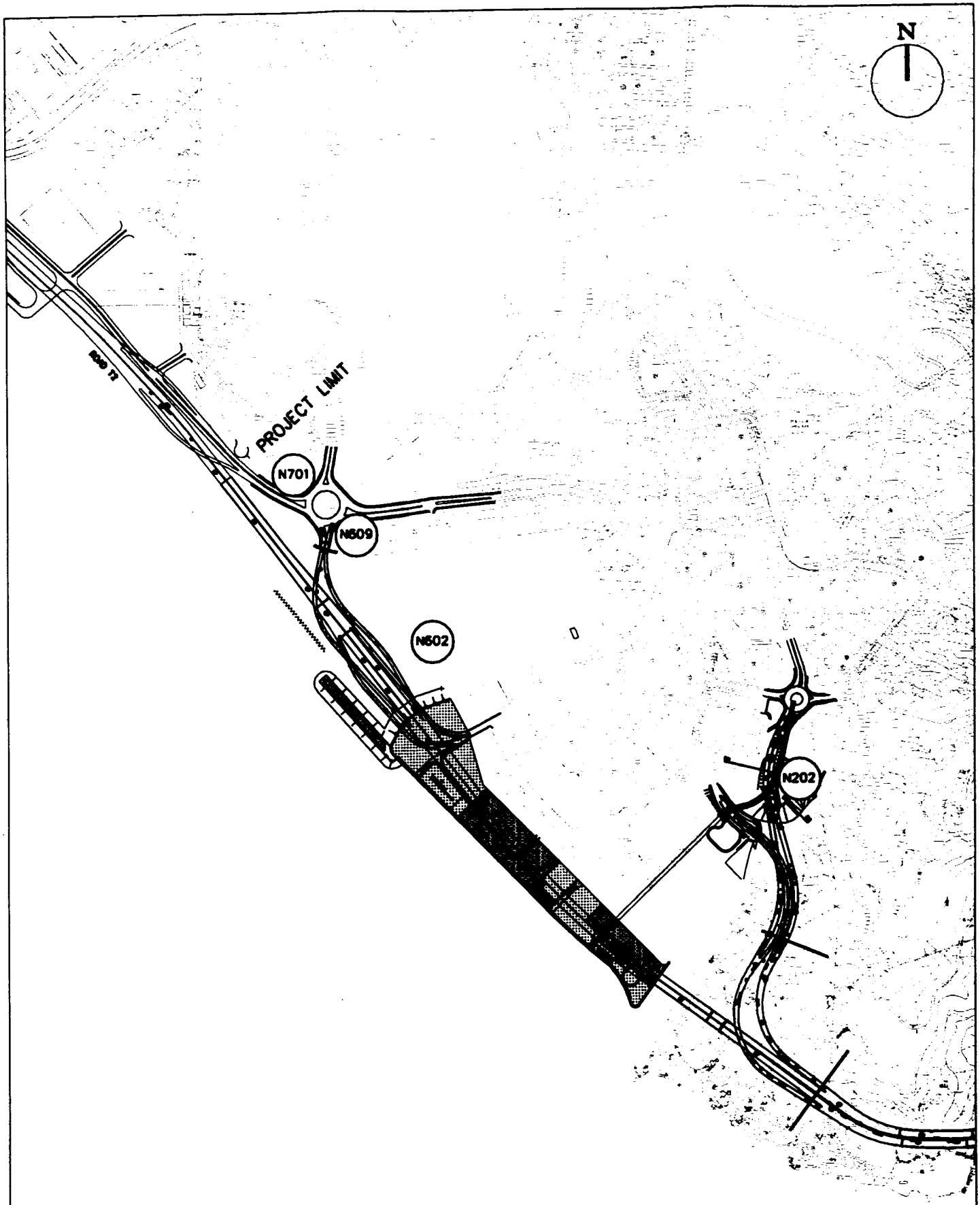
WCR, TKO – CONSTRUCTION NOISE MONITORING LOCATIONS

DATE: JUN 98

FIGURE No. 10.3b

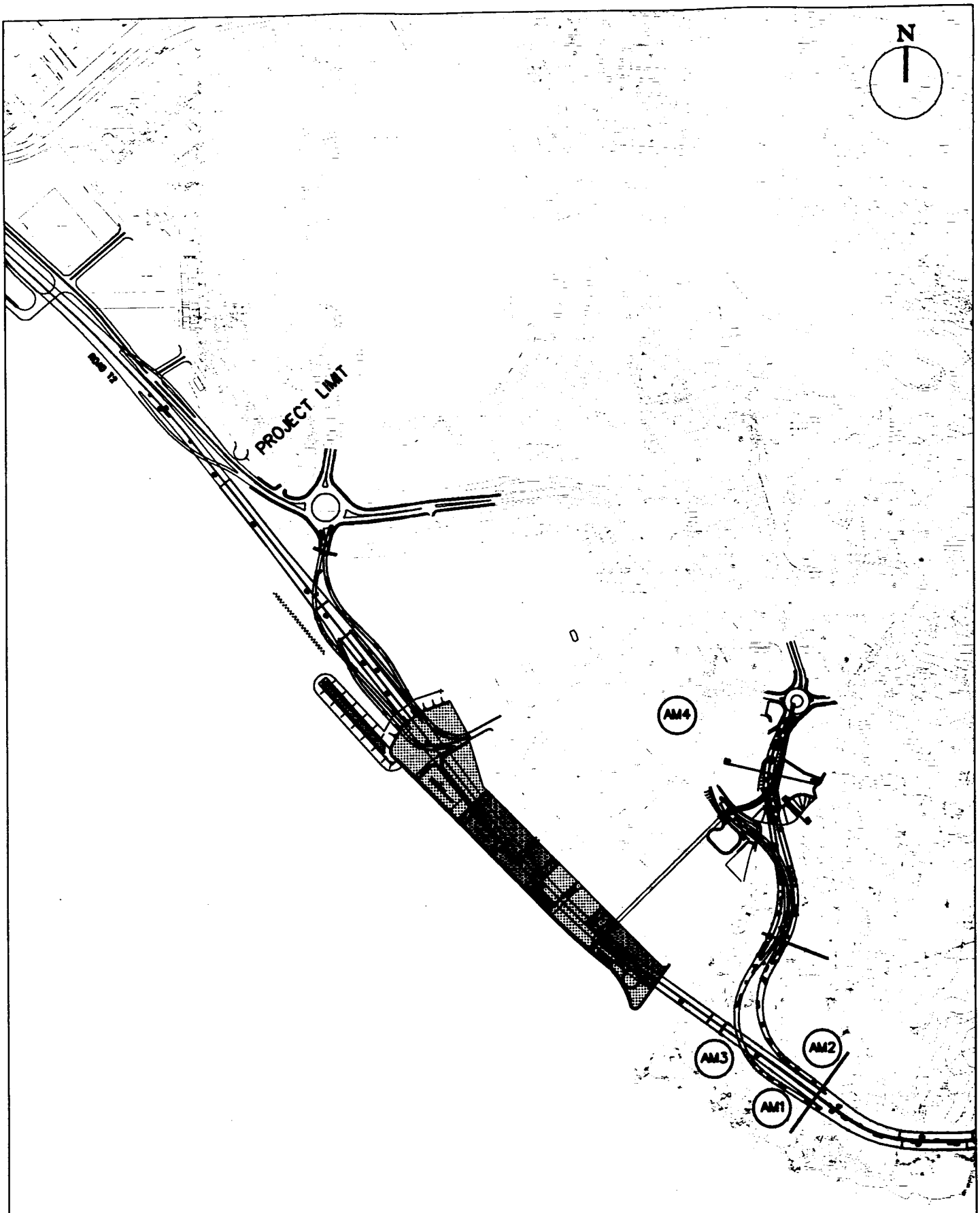
SCALE: 1 : 11000



WCR, TKO YAU TONG RECLAMATION AREA
OPERATIONAL NOISE MONITORING LOCATIONS

MAUNSELL CONSULTANTS ASIA LTD

DATE: JAN 99	FIGURE No. 10.3c
SCALE: 1 : 11000	



KEY
AM1 - Ma Shan Tsuen West
AM2 - Ma Shan Tsuen East
AM3 - Lei Yue Mun Village
AM4 - Sam Ka Tsuen Recreational Ground

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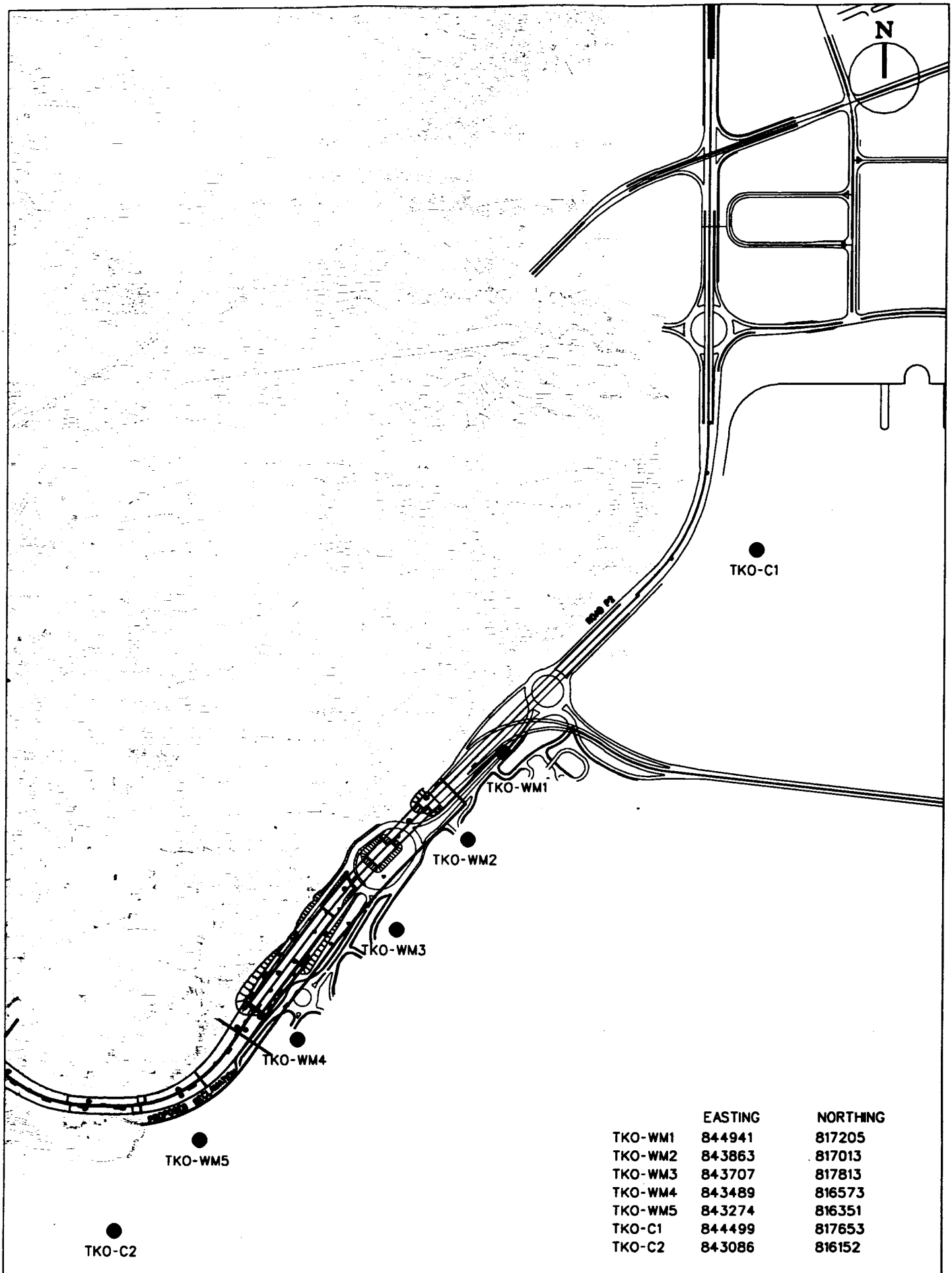
WCR, TKO YAU TONG RECLAMATION AREA – LOCATION OF DUST MONITORING STATIONS

DATE: MAR 99
SCALE: 1 : 11000
FIGURE No. 10.4a



	EASTING	NORTHING
TKO-WM1	844941	817205
TKO-WM2	843863	817013
TKO-WM3	843707	817813
TKO-WM4	843489	816573
TKO-WM5	843274	816351
TKO-C1	844499	817653
TKO-C2	843086	816152

TKO SECTION RECLAMATION – WATER QUALITY MONITORING STATIONS

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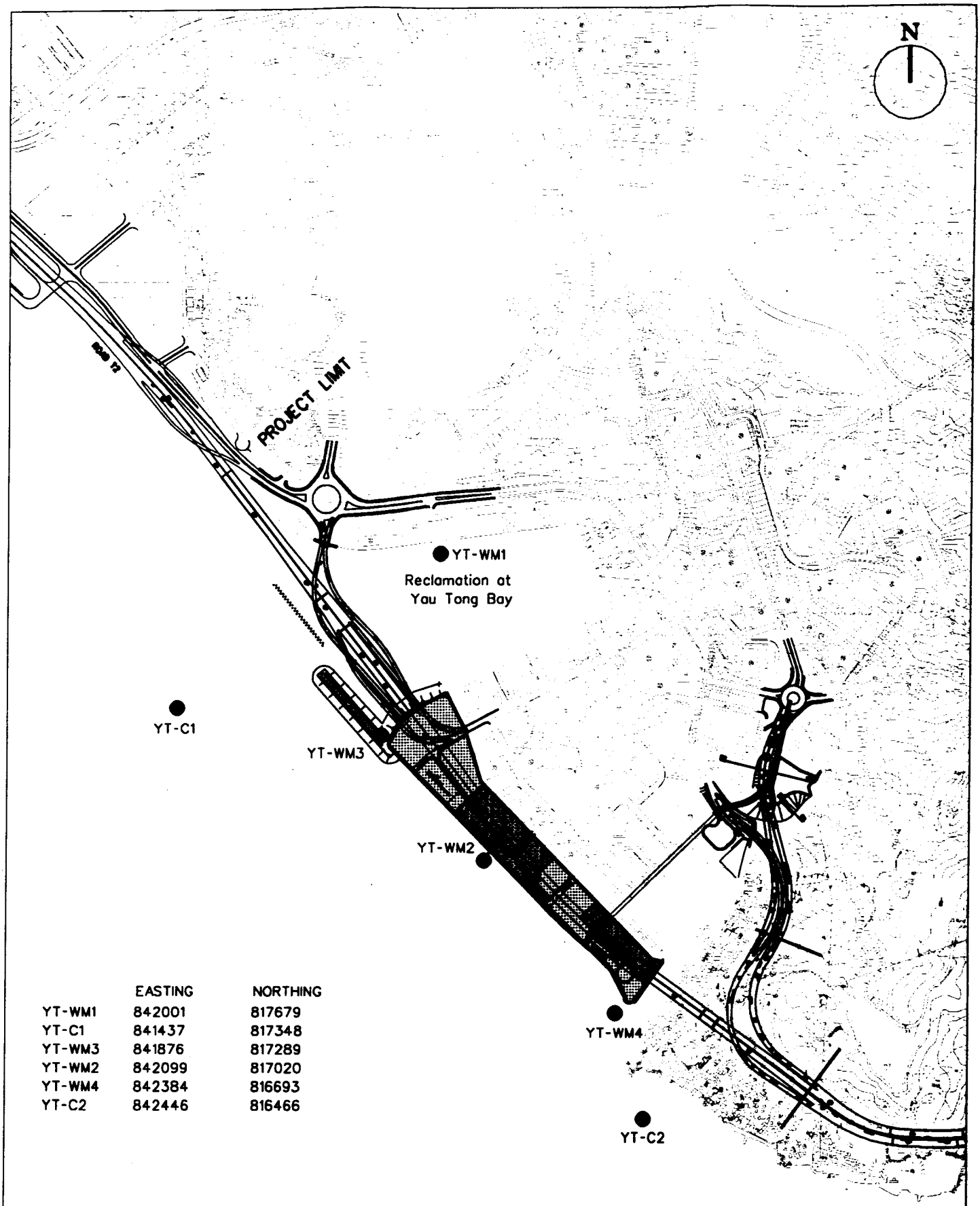
DATE: FEB 99

SCALE: 1 : 11000

FIGURE No. 10.5a



	EASTING	NORTHING
YT-WM1	842001	817679
YT-C1	841437	817348
YT-WM3	841876	817289
YT-WM2	842099	817020
YT-WM4	842384	816693
YT-C2	842446	816466

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YAU TONG COASTAL RECLAMATION – WATER QUALITY MONITORING STATIONS

DATE: FEB 99

SCALE: 1 : 11000

FIGURE No. 10.5b