# Section 14

# 14 ENVIRONMENTAL MONITORING AND AUDIT SCHEDULES

## 14.1 INTRODUCTION

Environmental monitoring schedules and audit procedures are essential in order to:

- ensure that any environmental impacts resulting from the construction and operation of LAPH developments are minimised or kept to 'acceptable' levels at all times;
- establish procedures for checking that mitigation measures have been applied and are effective, and that the appropriate corrective action is undertaken if and when required; and
- provide a means of checking compliance with environmental objectives, recording anomalies and documenting corrective action.

This Section outlines monitoring and audit requirements for the construction and operation of the LAPH development in relation to air quality, noise, water quality and waste management, the details of which may be referred to in the appropriate Sections. Given that the construction phase will extend for a minimum of 17 yrs (to the end of phase IV) with operation of the berths occurring simultaneously, impacts resulting from construction and operation will be superimposed and largely be indistinguishable from each other. Monitoring and audit activities for both construction and operation should therefore be consistent and complimentary.

Monitoring schedules have been provided for the necessary environmental parameters (Table 14.1 to 14.4), however at this stage it is only possible to provide outline schedules as guidance. Detailed monitoring schedule and audit requirements should be incorporated into the construction contract(s) and lease conditions for the LAPH development in the form of environmental clauses (examples of which are presented Appendix A7). These clauses should be agreed in consultation with EPD before being finalised and will be prepared during the detailed design stages of the LAPH development. It is important to emphasise that monitoring and audit details such as monitoring locations are for reference only and will need to be agreed with EPD prior to construction commencing.

## 14.2 TECHNICAL/PERSONNEL REQUIREMENTS

### 14.2.1 Responsibilities

Ensuring that the environmental monitoring and audit requirements are met during the construction and operation of the LAPH development is the responsibility of the developer and port operator respectively. (It is possible that these maybe one and the same).

As the various port facilities will inevitably be operated by a number of organisations or co-ordinating committee, it is suggested that a central governing body be established to oversee and co-ordinate monitoring and audit requirements and activities with the authority to require mitigation measures to be implemented. This would help with consistency, reduce duplication and costs and be more likely to address cumulative impacts. This would ideally be achieved by a Port Authority.

### 14.2.2 Staff Organisation and Structure

The monitoring and audit work should be carried out by an environmental team of suitably qualified and experienced personnel. This should be contracted to an independent organisation. Such a team would need to include a supervisor (who reports directly to a nominated senior member of the developer/operator's management team), and contain sufficient support staff to carry out the tasks. The team will need liaise with the resident site engineer (RSE) during construction and the general site manager during operation.

While the environmental team will be required to possess appropriate technical knowledge and training to carry out the tasks, they should also have access to a specialist advisor for each main aspect (i.e noise, air quality, water quality, waste management). It would be advisable for details such as qualifications and experience of the environmental team to be sent to EPD for information/comment.

### 14.2.3 Equipment

The developer/operator should be responsible for providing appropriate monitoring and sampling equipment and facilities to enable the monitoring to be carried out. The equipment should be approved in advance by EPD.

### 14.2.4 Monitoring and Audit Manual

The developer/operator (or governing body) should be required to prepare an environmental monitoring and audit (EM & A) manual, the content of the manual will have to be agreed with EPD prior to the start of the construction works, but it should include the following:

- the construction programme and the required EM & A programmes to assess the environmental impacts due to the LAPH Development with time;
- the location, frequency and type of environmental monitoring and audit requirements to assess the environmental impacts of the construction;
- the form/content of event/action plans (including any emergency plans)for air, water and noise impacts;
- review of pollution sources and working practices/procedures required in the event of environmental pollution levels being exceeded;
- the content/presentation of monitoring data, their audit and the actions taken with respect to non-compliance with environmental pollution levels;
- appropriate report formats/frequency of submission/special event reports, etc.;
- complaints/consultation procedures ;
- equipment service records and calibration requirements; and
- the locations of sensitive receivers.

### 14.2.5 Reporting

A monthly monitoring and audit report should be prepared by the environmental team within 7 days of the end of each month and commencing 1 month after the commencement of construction. Copies of the report should be submitted to the senior management representative and simultaneously sent to EPD.

The report should be a relatively brief and concise account of the environmental monitoring during the previous month and should include a summary of:

- *Project Data* - A synopsis of the project organisation; project programme; management liaison structure;
- *Monitoring/Audit Requirements* - Summary of monitoring parameters; Trigger/Action/Target Levels; Action Plans; environmental protection requirements in contract documents; land lease and engineering conditions;
- *Monitoring Methodology* - Monitoring equipment used; locations; duration/frequency;
- *Monitoring Results* - Parameter; date; time; environmental conditions; location; etc.;
- *Audit Results* - Review of pollution sources, working procedures in the event of non-compliance with environmental monitoring levels; action taken in the event of non-compliance; follow-up procedures related to earlier non-compliance actions;
- *Complaints* - Liaison and consultation undertaken; subsequent action; database of telephone /written complaints, location of complaints; action plan and follow-up procedures etc.; and
- *Appendices* - Appropriate drawings/tables of monitoring locations, sensitive receiver locations, environmental monitoring and audit requirements etc..

The monthly monitoring and audit reports should be supported by submission of a six monthly and annual summary.

## 14.3 ENVIRONMENTAL MONITORING SCHEDULES

### 14.3.1 General

Environmental monitoring falls broadly into two categories: firstly baseline monitoring which should be undertaken to establish or update/confirm the existing conditions in the Study Area (this makes it possible to set limits for the construction and operational phases); and secondly compliance monitoring, which should be carried out during both the construction and operational phases of the LAPH development to achieve the following

'general' objectives:

- to assess the performance of construction/operation activities in environmental terms;
- to obtain early warning of potential problem areas, permit timely remedial action and identify any environmental impacts;
- to comply with appropriate standards and environmental objectives; and
- to provide reassurance to local communities.

As part of the monitoring schedules three levels have been devised to monitor compliance with environmental objectives and to provide early warning of potential problem areas, thus stimulating the implementation of mitigation before the regulatory standards are reached (see Figures 14.1 and 14.2). The three levels are described below:

- the **Target Level** is the maximum permissible level which will achieve compliance with the appropriate regulatory standards, or other standards such as construction noise criteria outside restricted hours, and is therefore the upper boundary/limit which is acceptable in terms of environmental quality. Consequently, achievement of this level is undesirable and may lead to the cessation of activities. Compliance monitoring schedules are therefore devised such that remedial action is taken to prevent this level being attained. The term 'Target Level'(which is commonly used in compliance monitoring) is therefore a misnomer and should under no circumstances be considered as the desired level;
- the **Trigger Level** is a reference value to be used as an 'early warning' of a deterioration in environmental quality. Achievement of this level may stimulate increasing the frequency of monitoring and undertaking preliminary investigation (for example to identify any obvious causes) and possibly remedial action if appropriate; and
- the **Action level** indicates that deterioration is significant and that urgent corrective action is required.

As identified in the relevant sections of this Report, monitoring will be required to measure noise levels, particulate levels (for air quality), total suspended solids, dissolved oxygen (for water quality) and waste management practices. In addition, monitoring will involve checking on general working practices and compliance with the various control and mitigation measures also identified in this Report, results should be reported to the developer/operator and EPD, and reviewed on a regular basis.

The requirements for each of the environmental parameters are different, and therefore it is not possible to propose a single monitoring programme for all aspects. Requirements for individual parameters are summarized below, and where appropriate outline schedules are presented in Tables 14.1 to 14.5.

### 14.3.2 Construction

Environmental monitoring during construction will be the responsibility of the developer. For each construction site a check list should be prepared relating to each of the environmental issues as identified in the EIA. Together with environmental clauses in the contract documents, this check list will form the basis of a proforma for the environmental monitoring programme.

*Air Quality Monitoring*

A programme of particulate monitoring should be developed to ensure both the effectiveness of dust control measures and to highlight any associated deterioration of air quality during the construction phases. This will necessarily involve simultaneous wind direction and wind speed monitoring. Baseline monitoring will be undertaken at the appropriate SRs prior to commencing construction. Compliance monitoring will subsequently be undertaken during dust generating construction activities to check that appropriate air quality standards are maintained.

An outline air quality monitoring schedule is presented in Table 14.1. The Target Level comprises the accepted TSP limits for construction sites, of 500$\mu g/m^3$ (1 hr average) and 260$\mu g/m^3$ (24 hr average). Definitions of Trigger and Action levels are given by the exceedence of the sample in relation to the baseline for the Study Area plus 30%, thereby allowing for fluctuating ambient

levels. The Action Level is defined by the average of the Trigger and Target values. On breaching the warning levels, action should be taken as described in an outline action plan (Table 14.5).

It is recommended that the baseline should consist of data from 12 months monitoring in the Study Area prior to commencing construction activities. As the developer will not be known at this stage a possible mechanism for meeting the baseline monitoring requirements and costs would be for initial funding by Government, and subsequent reimbursement from the successful tendered after award of contract.

It is recommended that compliance monitoring is carried out at 3 locations at the construction site boundary, with samplers located down wind of active working areas. Potential monitoring locations are given in Figure 14.3, however, details of construction activities such as sequencing, site layout, size, boundary locations etc. are not available and therefore these locations are presented as examples only.

Location of samplers should be remote from influencing factors such as roads, local obstructions, etc. As a minimum, 24 hr samples should be taken at each monitoring location once every six days and hourly samples should be taken at least three times per week. The frequency and location of monitoring may alter in accordance with local meteorological conditions and the nature of construction activities.

In addition, it will also be necessary to monitor and check the effectiveness of mitigation measures, this will involve monitoring the efficiency, maintenance and use of:

- wheel washers;
- water sprays;
- dust covers;
- plant with filtration equipment; and
- barriers and enclosures.

Regular checks should be made to ensure:

- enforcement of speed limits;
- regular servicing of plant and site vehicles;
- that appropriate construction methods are being utilised and work sites are located away from SRs; and
- site cleanliness and the implementation of good site practice.

*Noise Monitoring*

Noise monitoring will be required to verify compliance with the guidelines for construction noise and with requirements of any construction noise permits (CNP) and criteria contained in the contract documents. In the absence of statutory controls relevant to unrestricted day-time hours (0700-2300 hrs Monday to Saturday inclusive), it is generally accepted that a limit of 75dB(A)$L_{eq(30\ min)}$ or 10dB(A) above ambient (whichever is lower) should be used as a guideline. Consequently, for daytime noise, the Target, Trigger and Action Levels have been devised such that the Action is 10dB(A) above background noise levels. Trigger and Target Levels should be 5dB(A) and 15dB(A) respectively above background.

Due to the inevitable and gradual transition of parts of the Study Area from a rural to an urban/industrial environment, these levels may need to be adjusted in accordance with EPD requirements. In such circumstances the Trigger and Action levels would be defined according to the occurrence and frequency of complaints (Table 14.2).

Construction noise during restricted hours i.e. night-time (2300-0700 hrs), public holidays and Sundays will be controlled under the provisions of a CNP. The Target is therefore the relevant ANL in the Noise Control Ordinance. Where a CNP is in force, monitoring results should be submitted to the developer and EPD immediately they are available. On breaching the permit, action should be taken as described in an outline action plan (Table 14.5).

Day-time compliance monitoring should be undertaken, three times per week and involve measurement of 30 minute time periods during typical activity. Periods of high ambient noise, such as during peak traffic flows should be avoided. Restricted hour monitoring should be undertaken at least twice during the restricted hours, (per 24 hr period, once in the evening and once in the night-time), for a 5 minute time period, in accordance with the Technical Memorandum on Noise From Construction Work, Other Than Percussive Piling. Measurements should be taken

(1m from the external facade) at the worst affected NSRs (Figure 14.3).

Regular checks will also be required to establish the implementation and effectiveness of mitigation measures. This will require checking and monitoring on a regular basis of:

- the use, maintenance and efficiency of construction equipment;
- the appropriate location of noisy plant/equipment;
- the hours of operation;
- the use and effectiveness of noise enclosures and barriers; and
- the implementation of good site practice.

*Water Quality Monitoring*

The objective of water quality monitoring is to minimise adverse impacts on water quality which may result from LAPH construction activities. As identified in Section 6, monitoring is required to check the impacts resulting from dredging and will involve measurement of dissolved oxygen, suspended solids and turbidity.

In addition to EPD's water quality monitoring programme, ambient levels will be determined by baseline monitoring at two locations close to the areas to be dredged.

Compliance monitoring will be undertaken to establish compliance with the water quality objectives (WQOs). Target, Trigger and Action Levels have been defined according to the WQOs for Southern Waters such that for the parameters the Target is the appropriate WQO.

In order to account for the significant seasonal variations in water quality, Trigger and Action Levels have been defined according to background levels as monitored at a number of representative control stations. The Trigger Level is 20% above the running background for suspended solids and 20% below the running background for dissolved oxygen. The running background is derived from the mean of monitored data taken in the previous 2 weeks at the control stations. The Action Level is the average of the Trigger and Target values This definition of Trigger level for DO applies only when ambient DO is lower than the WQO. When ambient DO is higher than the WQO the trigger level is defined as:

$$\text{ambient DO} - {}^{2}/_{3}(\text{ambient DO} - \text{WQO}).$$

If suitable controls can be found then the ambient level can be taken as the value measured at the control stations, and the running mean would not be necessary.

As a minimum, 4-6 designated monitoring stations should be established 100m from the active dredging/reclamation areas, 2-3 control monitoring stations should be established at appropriate locations which will not be influenced by the project or any other development activities. Samples should be taken at both the control and designated monitoring stations at least 4 times per week at mid-flood and mid-ebb tides. Examples of potential monitoring stations (for Phase I) are presented in Figure 14.3.

In order to check the effectiveness of mitigation measures it will be necessary to ensure:

- drainage channels, settlement tanks and other construction phase water pollution control measures are being used and maintained;
- the effectiveness and maintenance of oil/grease interceptors;
- the use of equipment for removing floatables; and
- the use and adequacy of any waste reception facilities.

### 14.3.3 Operation

Environmental monitoring during the operation of the LAPH development is necessary to verify the findings of the EIA, and is the responsibility of the Port Operator(s) in accordance with the lease conditions. An outline monitoring schedule for air, noise, water quality and waste management is presented in Table 14.4. In addition to the operational monitoring requirements presented in this table and described below, it will be necessary for the port operator to continue monitoring working practices, plant efficiency and site cleanliness, to ensure that mitigation measures are in place and are effective.

*Air Quality Monitoring*

In order to assess the long term air quality impacts

resulting from the operation of LAPH, it is necessary to undertake air quality monitoring during the early years of operation. To effectively monitor these impacts it is necessary to supplement existing air quality data with additional air quality monitoring (to include wind speed and direction, $NO_2$, $SO_2$, TSP and RSP as a minimum). It is recommended that this data should be supplied from one or more permanent monitoring stations to be located within the Study Area (which may also be used as part of the baseline assessment). It is suggested that the establishment of such a monitoring station is jointly funded by Government, the developer and subsequent operators.

*Noise Monitoring*

Operational noise monitoring should be undertaken by the port operator to ensure compliance with the relevant NCO requirements. It is proposed that extensive noise monitoring be carried out by the environmental team during the early years of operation. Monitoring should also be carried out in response to complaints where appropriate.

*Water Quality*

It is envisaged that other than EPD's regular monitoring programme, minimal water quality monitoring will be required during the operation of the LAPH development. However, in the event of a major spillage or pollution incident, it is proposed that a pre-determined monitoring programme (devised by the port operator) be implemented with the necessary adjustments to suit the requirements of individual cases.

*Waste Management*

Monitoring of wastes is particularly important in the case of both oily MARPOL wastes, which maybe produced in large quantities (see Section 11) and wastes from the container handling and back-up areas (the largest producer of general wastes), notably difficult wastes. Records should be maintained by the port operator with respect to quantities of arisings, handling, storage and movements (both within and from LAPH) of these wastes.

### 14.3.4 Action Plans

Action Plans should be devised to facilitate the appropriate and immediate response by relevant personnel, in the event that the Target, Action and Trigger Levels are either attained or exceeded. The appropriate action is determined by the frequency of complaints and/or exceedence of the compliance monitoring levels, (target level).

The requirement for action plans should be contained in the contract and lease conditions and suitable plans should subsequently be submitted by the developer/operator to EPD. Examples of appropriate Action Plans for the LAPH development are outlined in Table 14.5 to 14.7.

## 14.4 ENVIRONMENTAL AUDITING

### 14.4.1 General

The purpose of environmental auditing is to review the effectiveness of the overall environmental protection programme (both construction and operation) in terms of monitoring, mitigation and corrective action. The audit process should not be divorced from general management activities, and should promote a pro-active approach to environmental protection.

### 14.4.2 Construction Phase Auditing

Construction phase auditing should be carried out in conjunction with the construction monitoring programme.

The audits should be conducted monthly during the four phases of the LAPH development (and any subsequent construction to the 'Ultimate' development). It is also considered prudent to conduct some audits to coincide with major construction activities.

Records of environmental monitoring should be maintained by the environmental team and developer, and the environmental audit should seek to check:

- records of environmental monitoring procedures;
- records of environmental monitoring results;
- records of exceedence of any regulatory requirements/target levels;
- details of control and mitigation action taken in response to unacceptable environmental impacts; and
- records of any complaints from residents/SRs in the Study Area and the

actions taken once the complaints have been received.

Assessment of monitoring records will ensure that any unanticipated impacts are being addressed and that any improvements required for future monitoring programmes are identified.

A monthly Monitoring and Audit Report (Section 14.2) should be compiled by the environmental monitoring team and submitted to the developer and EPD. These monthly reports should be supported by six monthly and annual summaries.

### 14.4.3 Operational/Post-Project Auditing

Due to the incremental nature of the LAPH development and the considerable time span to completion of the 'Ultimate' development, a post-project audit should be carried out after completion of each development phase. The audit will be designed to assess the environmental performance of those berths which have come into operation after completion of that phase.

The post-project audit should be undertaken after a sufficient time period from the berths becoming operational (e.g. 18 months), such that any findings are representative of the container port's activities. Post project auditing should verify the findings of the EIA and provide a mechanism for:

- reviewing the effectiveness of, and requirement for on-going monitoring programmes;
- reviewing environmental management practices in terms of achieving environmental objectives;
- reviewing the effectiveness of environmental mitigation; and
- recommending improvements in environmental controls and terminal operations in the event that environmental objectives are not achieved and environmental impacts are unacceptable.

A post- project audit report and executive summary should be submitted to EPD and the operator(s) within 5 weeks of completing the audit.

## TABLE 14.1

## AIR QUALITY MONITORING SCHEDULE (CONSTRUCTION)

| PARAMETER | OBJECTIVE | TRIGGER LEVEL | ACTION LEVEL | TARGET LEVEL | LOCATION | FREQUENCY/ TIMING |
|---|---|---|---|---|---|---|
| Particulates | * Baseline assessment | N/A | N/A | N/A | SRs | One year prior to commencing construction activities. ** 24 hr samples every 6 days. |
| Particulates | Compliance monitoring | 1 hr TSP, 24 hr TSP ≥ ** baseline + 30% | Average of Trigger and Target Levels | 500$\mu g/m^3$ 1 hr average 260$\mu g/m^3$ 24 hr average | 3 monitoring stations at Site Boundary in line with nearest SRs, locations to be reviewed monthly to take account of dust generating activities | One 24 hr sample every 6 days, hourly samples 3 times a week or more frequently depending on site and wind conditions |
| *** Wind speed | Assessment parameter/ compliance monitoring | N/A | N/A | N/A | Air Quality Monitoring Station and where necessary to account for wind direction with respect to SRs | Continuous |
| *** Wind direction | Assessment parameter/ compliance monitoring | N/A | N/A | N/A | Air Quality Monitoring Station and where necessary to account for wind direction with respect to SRs | Continuous |

Note :
- * In the event that a permanent monitoring station is established in the Study Area, this will form part of the baseline assessment. As a minimum the baseline should comprise data taken from 12 months monitoring in the Study Area.
- ** US EPA Ambient Air Quality Surveillance Regulations
- *** No values recommended, potential impacts are dependant on the nature of the construction activity. High wind speeds during dusty activities and/or wind direction towards an SR should act as a trigger
- SRs Sensitive Receivers
- N/A Not Applicable

## TABLE 14.2

## NOISE MONITORING SCHEDULE (CONSTRUCTION)

| PARAMETER | OBJECTIVE | * TRIGGER LEVEL | * ACTION LEVEL | TARGET LEVEL | LOCATION | FREQUENCY/ TIMING |
|---|---|---|---|---|---|---|
| $L_{10}$, $L_{50}$, $L_{90}$, $L_{Aeq\ (30\ min)}$ | Baseline Assessment | N/A | N/A | N/A | NSRs | 24 hr monitoring period for one week |
| $L_{10}$, $L_{50}$, $L_{90}$, $L_{Aeq\ (30\ min)}$ | Check Baseline | N/A | N/A | N/A | NSRs | Everyday for one week every 3 months or as near as possible for a typical period, when construction activities are not taking place or in close vicinity of the monitoring location. |
| $L_{Aeq\ (30\ min)}$ | Spot Check | Background + 5dB(A) | Background + 10dB(A) | Background + 15dB(A) | NSRs | Minimum of once per week for each NSR during construction activities |
| $L_{Aeq\ (30\ min)}$ | Compliance monitoring (non-restricted daytime hours) | Background + 5dB(A) | Background + 10dB(A) | Background + 15dB(A) | NSRs | Minimum of 3 times per week between 0700 and 1900 hrs, (2300) during general construction work; as appropriate during noisy activities |
| $L_{Aeq\ (5\ min)}$ | Compliance monitoring (restricted hours) | CNP-10dB(A) | CNP-5dB(A) | CNP (ANL) | NSRs | Minimum of at least twice per 24 hr period, probably once in night-time hours and at least once in restricted daytime hours |
| $L_{Aeq\ (30\ min)}$ | Response to complaints (non-restricted daytime hours) | Background + 5dB(A) | Background + 10dB(A) | Background + 15dB(A) | Complainant | As appropriate |
| $L_{Aeq\ (5\ min)}$ | Response to complaints (restricted hours) | CNP-10dB(A) | CNP-5dB(A) | CNP (ANL) | Complainant | As appropriate |

Note : NSRs - Noise Sensitive Receivers
N/A - Not Applicable
*
In light of creeping ambient levels resulting from the transition of a rural to an urban environment, it may be necessary to introduce Trigger and Action Levels which are defined according to the frequency of complaints. However there should be a definite time period for recording the complaints to indicate the level of nuisance. The Trigger Level = 1 complaint (either directly to the developer or via EPD), and the Action Level = more than 1 independent complaint (either directly to the developer or via EPD). An independent complaint is defined such that only one complaint is allowed from a single address.

## TABLE 14.3

## WATER QUALITY MONITORING SCHEDULE (CONSTRUCTION)

| PARAMETER | OBJECTIVE | TRIGGER LEVEL | ACTION LEVEL | TARGET LEVEL | LOCATION | FREQUENCY/ TIMING |
|---|---|---|---|---|---|---|
| Dissolved oxygen | Baseline assessment | N/A | N/A | N/A | 2 monitoring stations close to area to be dredged | Prior to commencing construction for a period approximating 4 weeks |
| Suspended solids | Baseline assessment | N/A | N/A | N/A | 2 monitoring stations close to area to be dredged | Prior to commencing construction for a period approximating 4 weeks |
| Dissolved oxygen | Compliance monitoring | 20% below running background levels | Average of Trigger and Target Levels | * WQO | 4 - 6 Designated monitoring stations<br>2 - 3 Control Stations<br>- 1m below surface<br>- mid level<br>- 1m above sea bed | During the course of dredging and filling works - 3 times per week, 2 samples per monitoring station |
| Suspended solids | Compliance monitoring<br>. | 20% above running background levels | Average of Trigger and Target Levels | WQO | 4 - 6 Designated monitoring stations<br>2 - 3 Control Stations<br>- 1m below surface<br>- mid level<br>- 1m above sea bed | During the course of dredging and filling works - 3 times per week, 2 samples per monitoring station |
| Dissolved Oxygen | Post construction period compliance monitoring | 20% below running background levels | Average of Trigger and Target Levels | * WQO | 4 - 6 Designated monitoring stations<br>2 - 3 Control Stations<br>- 1m below surface<br>- mid level<br>- 1m above sea bed | After completion of dredging and filling activities for a period of 6-8 weeks continuously |
| Suspended solids | Post construction period compliance monitoring | 20% above running background levels | Average of Trigger and Target Levels | WQO | 4 - 6 Designated monitoring stations<br>2 - 3 Control Stations<br>- 1m below surface<br>- mid level<br>- 1m above sea bed | After completion of dredging and filling activities for a period of 6-8 weeks continuously |

Note : N/A Not applicable
WQO Water Quality Objective for Southern Waters = dissolved oxygen - 4mg/l (depth average) 2mg/l (bottom); suspended solids - waste discharge not to raise the natural ambient level by 30%, nor accumulation of suspended solids.
* In the event that the running background level is in excess of the WQO, the Target Level = a level 30% below the running background, or 2mg/l, whichever is greater
Turbidity should also be measured to give an instantaneous indication of the water quality and the frequency and related action should be agreed with EPD

## TABLE 14.4

## ENVIRONMENTAL MONITORING SCHEDULE (OPERATION)

| PARAMETER | OBJECTIVE | STANDARD | LOCATION | FREQUENCY/TIMING |
|---|---|---|---|---|
| * AIR QUALITY | | | | |
| $NO_2$<br>$SO_2$<br>TSP<br>RSP | Establish baseline data and trends due to the combined impact of Chek Lap Kok airport, the new transportation systems, development on North Lantau and LAPH. | AQOs | ** North Lantau<br>Penny's Bay<br>Discovery Bay<br>Peng Chau | Continuously for gaseous. Every 6 days for particulates Requirement for on-going monitoring to be assessed in the audit process |
| NOISE | | | | |
| $L_{Aeq}$ | Compliance with NCO standards | Appropriate ANLs | Worst affected NSRs | *** Over a 24 hr period approximately every month. Requirement for on-going monitoring to be assessed in the audit process |
| WATER QUALITY | | | | |
| dissolved oxygen<br>suspended solids<br>turbidity | Monitor the effects of maintenance dredging, compliance with WQOs or set by EPD | WQOs | Designated monitoring stations near to the area to be dredged | During maintenance dredging |
| WASTE MANAGEMENT | ** Record the quantities arising and confirm that handling, storage, transfer and disposal of difficult and clinical wastes are in accordance with GWMP and government requirements | 'Duty of Care' requirements with respect to quantities of waste arisings, handling , storage and disposal of wastes; and appropriate licensing requirements | LAPH site, off-site disposal | After initial set up, ongoing weekly checks |

Note :
- * $NO_2$, $SO_2$, TSP and RSP should represent the minimum parameters to be sampled.
- ** Monitoring location should be established in view of the likelihood that a permanent station will be developed in the Study Area.
- *** Frequency of monitoring should decrease if NCO standards are consistently met, or increasing in frequency if the NCO maxima is exceeded.
- GWMP Good Waste Management Practice.
- N/A Not appropriate

## TABLE 14.5

## AIR QUALITY ACTION PLAN - SUSPENDED PARTICULATES

| EVENT | FREQUENCY | ACTION | | |
|---|---|---|---|---|
| | | *Monitoring Team* | *RSE/Site Manager* | *Developer* |
| Breach of Trigger Value | One sample | Inform developer & RSE | | |
| | Two consecutive samples | Inform EPD, developer and RSE; resample to confirm result | Check working methods/practices to identify any immediate causes; take appropriate remedial action if necessary | |
| Breach of Action Level | One sample | Inform EPD, developer and RSE; resample to confirm result | Check working methods/practices to identify any immediate causes; take appropriate remedial action if necessary | |
| | Two consecutive samples | Inform EPD, developer and RSE; resample to confirm result | Undertake detailed check of working methods and practices | Review dust sources: plant, equipment and working procedures |
| | | Increase frequency of monitoring | | |
| | | Propose remedial action | Carry out appropriate remedial action as recommended by environmental monitoring team | Ensure implementation of remedial action |
| | | Continue monitoring after completion of remedial action to confirm action is effective | Ensure corrective action has been undertaken and is effective | Inform EPD of remedial action |
| | | Record events in monitoring report for submission to the developer and EPD | Amend method statement, if appropriate | |
| Breach of Target Level | One sample | Inform EPD, developer and RSE; | Undertake immediate check of activities and employ any appropriate mitigation. | Review plant and equipment and working procedures |
| | | Confirm result & increase monitoring frequency | In extreme cases cease activities | Ensure immediate implementation of remedial action |
| | | Propose remedial action | Ensure corrective action has been undertaken as proposed by (monitoring team) and is effective | |
| | | Undertake monitoring at nearest SR | Amend method statement, if appropriate | Inform EPD of remedial action |
| | | Continue monitoring after completion of remedial action to confirm action is effective | | |
| | | Complete Monitoring Report and submit to developer and EPD | | |

## TABLE 14.6

## NOISE ACTION PLAN

| EVENT | ACTION | | |
|---|---|---|---|
| | *Monitoring Team* | *RSE/Site Manager* | *Developer* |
| Breach of:<br><br>daytime (unrestricted hours)<br>Trigger value | Inform developer, RSE<br>Investigate complaint*** | | |
| Breach of:<br><br>restricted hours **Trigger value;**<br><br>daytime (unrestricted hours)<br>Action Value;<br>1 complaint | Inform developer, EPD, RSE; resample at NSR to confirm monitoring result ($L_{Aeq\ (5\ min)}$ within restricted hours, $L_{Aeq\ (30\ min)}$ outside restricted hours)<br><br>- Submit report to EPD within two weeks of receipt of complaint should the measured noise level exceed the Target, proposals to reduce noise should be recommended in the report | Check working methods, practices, to identify causes, take appropriate remedial action if necessary | Ensure appropriate remedial action is taken action as proposed by the monitoring team<br><br>Inform EPD of remedial action taken |
| Breach of:<br>restricted hours **Action value;**<br>* **2 complaints** | Inform developer, EPD, RSE; resample to confirm monitoring result ($L_{Aeq\ (5\ min)}$ within restricted hours, $L_{Aeq\ (30\ min)}$ outside restricted hours)<br><br>Increase frequency of monitoring at affected NSRs to at least two measurements per time period or daily as appropriate<br><br>Propose remedial action<br><br>Continue monitoring after completion of remedial action to confirm was effective, - until no further complaint is received within two weeks of the last complaint<br><br>- Submit report to EPD within two weeks of receipt of complaint should the measured noise level exceed the target, proposal to reduce noise should be recommended in report.<br><br>Confirm corrective action has been undertaken and is effective in monitoring and audit report | Undertake detailed check of working methods and practices. Investigate complaint and increase impact monitoring -<br><br>Undertake appropriate remedial action and provide evidence of having done so<br><br>Ensure corrective action has been undertaken and is effective<br><br>Amend method statement if appropriate | Review noise sources (plant and equipment) and working procedures<br><br>Ensure implementation of remedial action as proposed by the monitoring team<br><br>Inform EPD of remedial Action |

Note: * In the event of creeping ambient levels, Trigger Level = 1 complaint, Action Level = 2 complaints

** Action associated with response to complaints

*** The action plan for the target level should be adopted and implemented whenever the noise levels measured during any complaint investigation exceed the appropriate target level.

**TABLE 14.6 (continued)**

**NOISE ACTION PLAN**

| EVENT | ACTION | | |
|---|---|---|---|
| | *Monitoring Team* | *RSE/Site Manager* | *Developer* |
| Breach of:<br><br>daytime (unrestricted hours)/ restricted hours **Target Value,** (prevailing background +10dB(A) outside restricted hours and ANLs within restricted hours. | Inform developer RSE, EPD<br><br>Confirm monitoring result and repeat measurement for a further 15 minutes (3x5 min) and 30 minutes respectively for exceedence of Target level within and outside restricted hours following the implementation of noise reduction measures<br><br>Increase frequency of monitoring<br><br>Undertake immediate check of construction activities and employ appropriate mitigation.<br><br>Propose remedial action<br><br>Confirm corrective action has been undertaken and is effective in monitoring and audit report | Review noise sources and working procedures and methods<br><br>In extreme cases cease activities<br><br>Ensure implementation of immediate remedial action as proposed by monitoring team<br><br>Inform EPD of remedial Action | Review noise sources (plant and equipment) and working procedures<br><br>Ensure implementation of remedial action<br><br>Inform EPD of remedial action |

Note: * In the event of creeping ambient levels, Trigger Level = 1 complaint, Action Level = 2 complaints
** Action associated with response to complaints

## TABLE 14.7

## WATER QUALITY ACTION PLAN - SUSPENDED SOLIDS AND DISSOLVED OXYGEN

| EVENT | FREQUENCY | ACTION | | |
|---|---|---|---|---|
| | | *Monitoring Team* | *RSE/Site Manager* | *Developer* |
| Breach of Trigger Value | One sample | Inform developer & RSE | | |
| | Two consecutive samples | Inform EPD, developer and RSE; resample to confirm result | Check working methods/practices to identify any immediate causes; take appropriate remedial action if necessary | |
| Breach of Action Level | One sample | Inform EPD, developer and RSE; resample to confirm result | Check working methods/practices to identify any immediate causes; take appropriate remedial action if necessary | |
| | Two consecutive samples | Inform EPD, developer and RSE; resample to confirm result | Undertake detailed check of working methods and practices | Review plant, equipment and working procedures |
| | | Increase frequency of monitoring | | |
| | | Propose remedial action | Carry out appropriate remedial action as recommended by environmental monitoring team | Ensure implementation of remedial action |
| | | Continue monitoring after completion of remedial action to confirm action is effective | Ensure corrective action has been undertaken and is effective | Inform EPD of remedial action |
| | | Record event in monitoring report for submission to developer and EPD | Amend method statement, if appropriate | |
| Breach of Target Level | One sample | Inform EPD, developer and RSE; | Under take immediate check of activities and employ any appropriate mitigation. | Review plant, equipment and working procedures |
| | | Confirm result & increase monitoring frequency | In extreme cases cease activities | Ensure immediate implementation of remedial action |
| | | Propose remedial action | Ensure corrective action has been undertaken as proposed by (monitoring team) and is effective | |
| | | Undertake monitoring at nearest water quality SR | Amend method statement, if appropriate | Inform EPD of remedial action |
| | | Continue monitoring after completion of remedial action to confirm action is effective | | |
| | | Complete Monitoring Report and submit to developer and EPD | | |

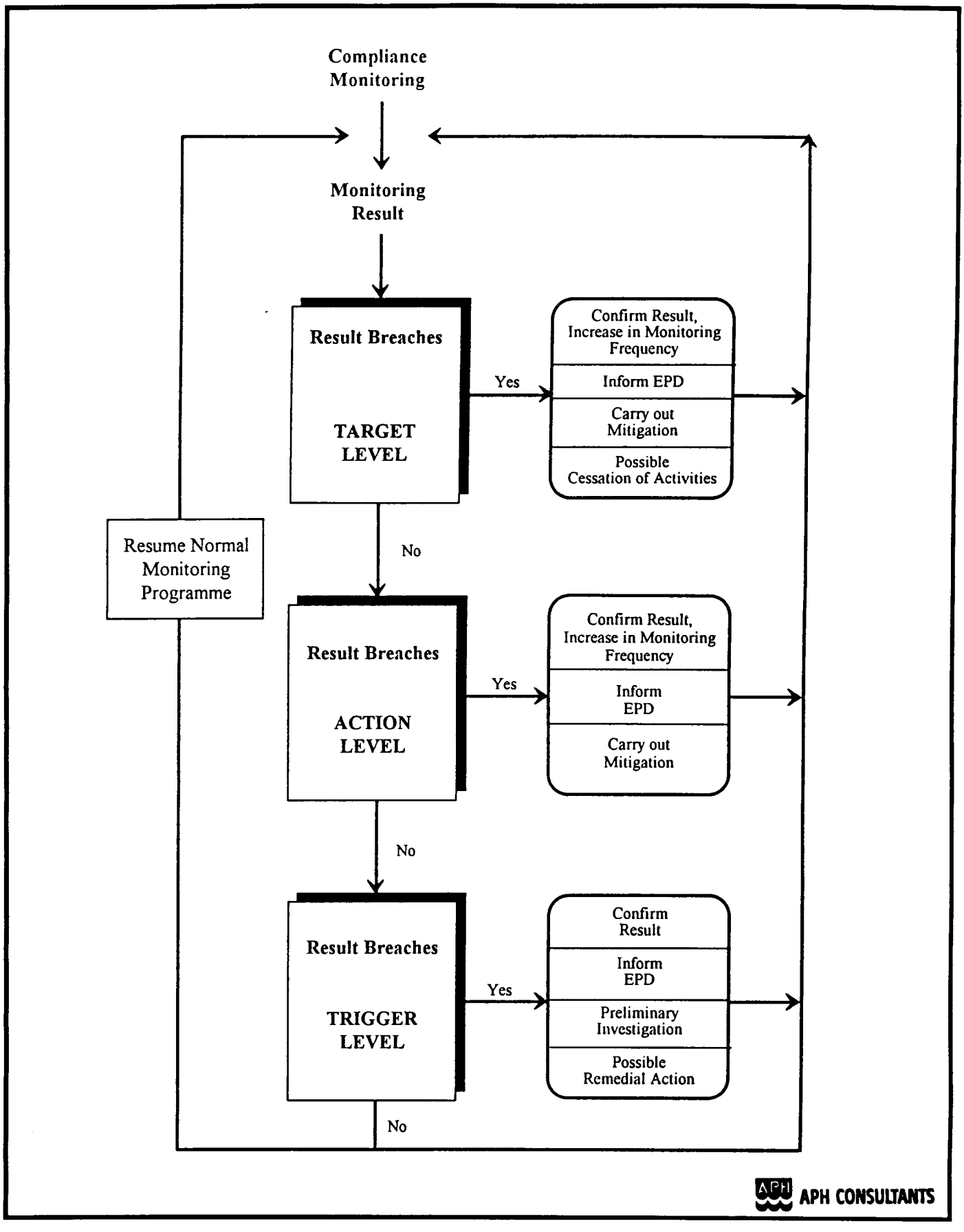
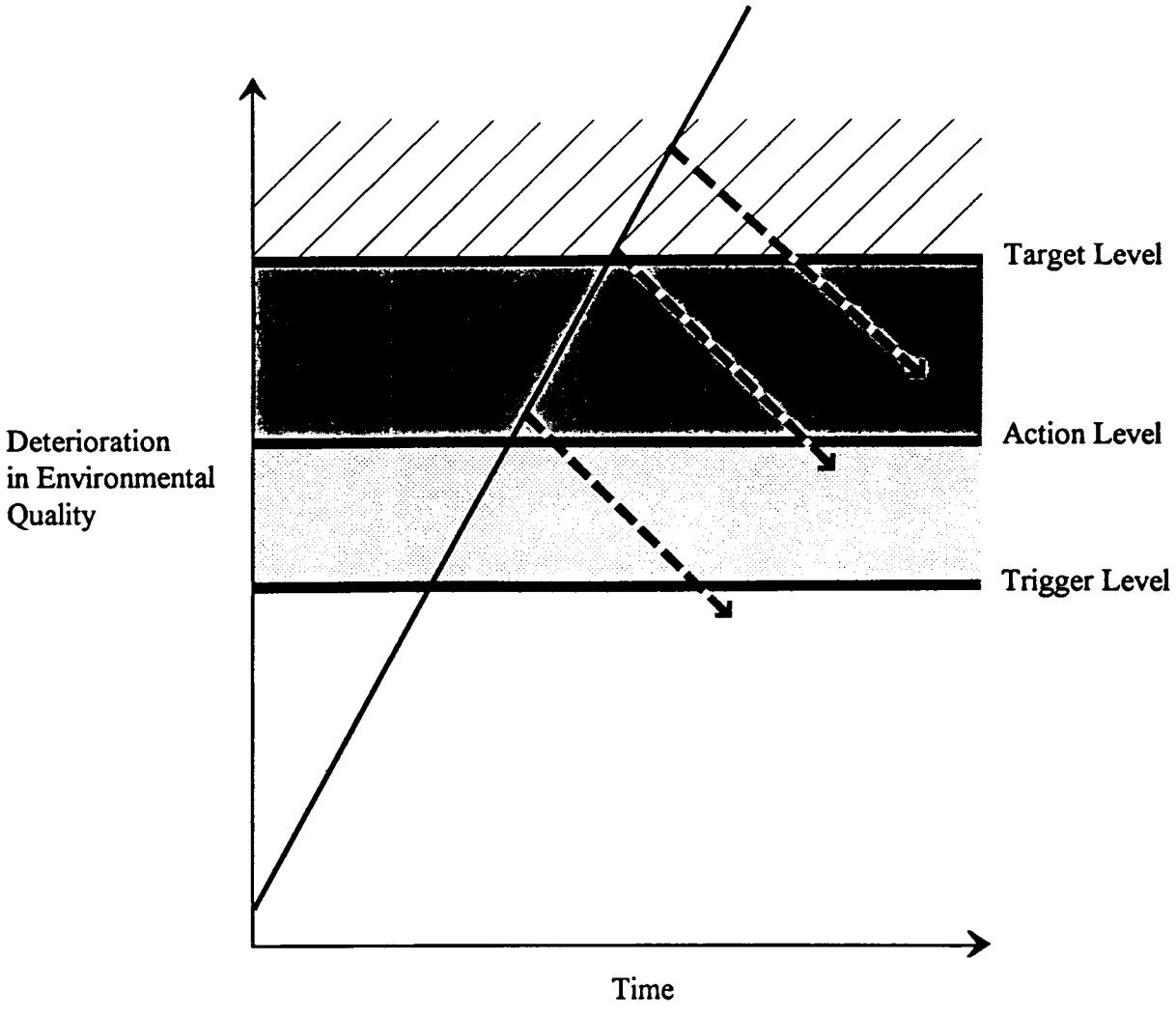



FIGURE 14.1

## GENERAL GUIDE TO COMPLIANCE MONITORING




KEY:

Remedial action/cessation of activities causes return to acceptable levels

Remedial action causes return to Pre-Action/Trigger

Remedial action cause return to pre-Action/Trigger level

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FIGURE 14.2

## SCHEMATIC REPRESENTATION OF COMPLIANCE MONITORING LEVELS

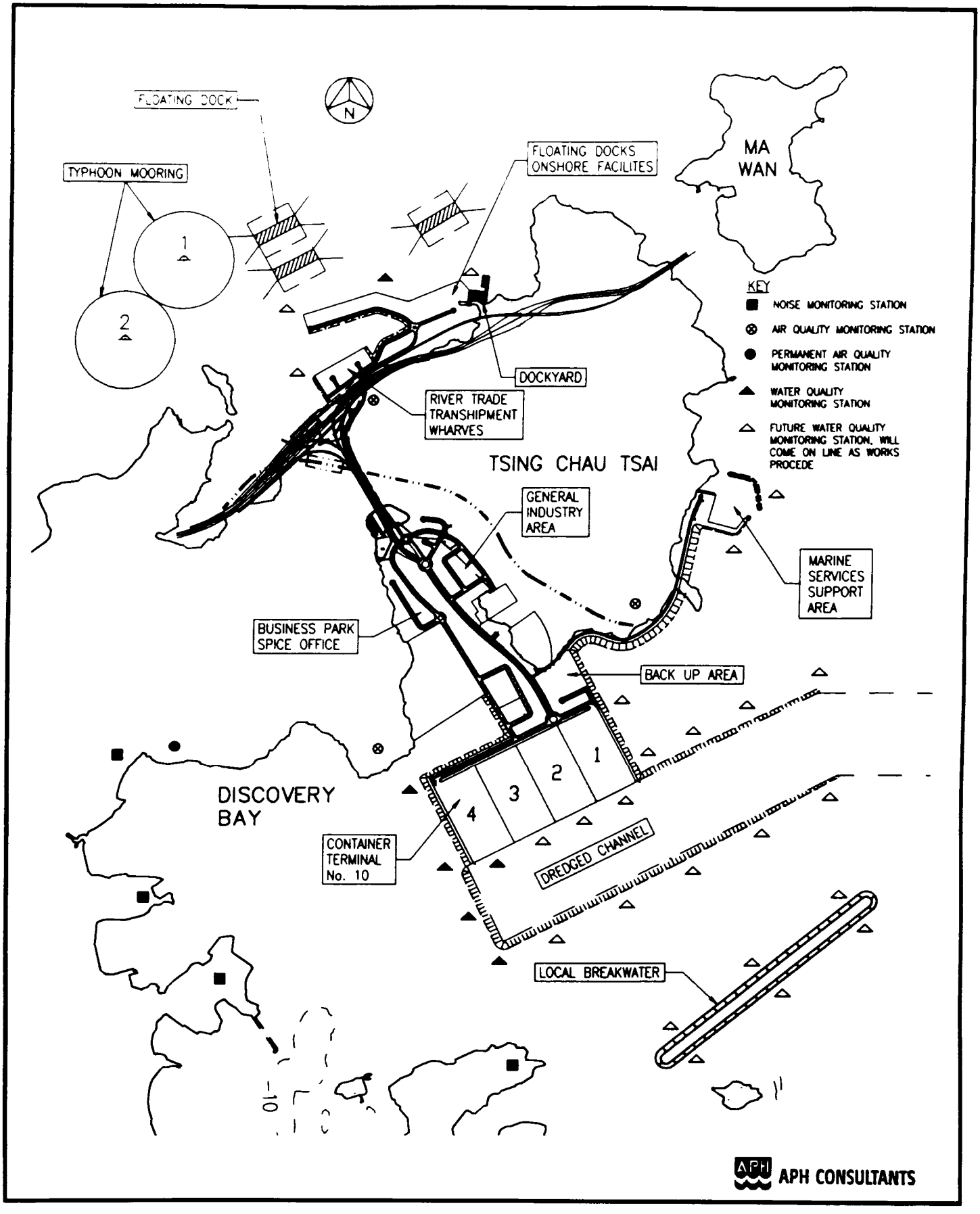


FIGURE 14.3

# POTENTIAL LOCATION OF MONITORING STATIONS FOR PHASE I