The Royal Hong Kong Jockey Club
英皇御准香港賽馬會

Hong Kong Government
Environmental Protection Department

THE KAU SAI CHAU PROJECT

KAU SAI CHAU
ENVIRONMENTAL MONITORING AND AUDIT MANUAL

MARCH 1994

AXIS Environmental

AXIS ENVIRONMENTAL CONSULTANTS LIMITED

KAU SAI CHAU PROJECT

ENVIRONMENTAL MONITORING AND AUDIT MANUAL

CONTENTS

1. BACKGROUND

1.1 Introduction
1.2 Existing Environment
1.3 Key Environmental Issues Identified in the Final EIA Report
1.4 Purpose of the Manual

2. PROJECT DESCRIPTION

2.1 Project Overview
2.2 Golf Course and Clubhouse Facilities
2.3 Water Supply System and Irrigation

3. PROJECT PROGRAMME

3.1 Construction Activities and Programme

4. PROJECT ORGANIZATION

5. ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS

5.1 Introduction
5.2 Monitoring and Audit Schedules
5.3 Water Quality Monitoring
5.4 Ecological Monitoring
5.5 Environmental Team - Principal Tasks
5.6 Archaeology and Grave Site Monitoring
5.7 Air Quality and Noise Monitoring

6. REQUIREMENTS ON ENVIRONMENTAL PROTECTION MEASURES

6.1 Schedule of Mitigation Measures
6.2 Contract Specifications

7. ENVIRONMENTAL COMPLAINTS PROCEDURES

8. REPORT PROCEDURES

List of Figures

3.1 Kau Sai Chau Development, Project Programme

4.1 Kau Sai Chau Environment Monitoring and Audit Project Management Team

5.1 Marine Water Quality Monitoring Locations

5.2 Kwat Tau Tam Mangrove Mitigation Detail

7.1 Environmental Complaints Procedure.

BACKGROUND

CHAPTER 1

SECTION 1 BACKGROUND

1.1 Introduction

The Hong Kong Government proposes to develop the northern part of Kau Sai Chau for a public golf course. The course would be developed and project managed by the Royal Hong Kong Jockey Club (RHKJC). The proposed development has been the subject of a two stage environmental impact assessment (EIA) to determine the environmental acceptability of the Project. The Final EIA Report for the project was submitted to Government in March 1994.

In addition to the EIA, AXIS Environmental Consultants Limited (AXIS) have produced a handbook on general golf course design, construction, and management procedures for Hong Kong. The handbook is independent of the proposed Kau Sai Chau golf course project, but many of the design, implementation, and assessment methods used at Kau Sai Chau have been incorporated into the handbook.

The contract documents for the project are under preparation. A draft of the environmental protection clauses to be included in the contract is given at Appendix 1.

1.2 Existing Environment

Site Context and Description

Kau Sai Chau is the fifth largest island in Hong Kong and the largest island off the eastern coast of the New Territories. Located in the centre of Port Shelter, the island forms a central feature with its mountain peaks rising to over 200m.

The indented coastline of the island reflects a series of deep gullies which dissect the landmass and some of which culminate in small waterfalls at the water's edge. These moist gullies are well vegetated with areas of diverse scrub/woodland. Elsewhere, however, Kau Sai Chau's vegetative cover is principally grass and low scrub. Natural regeneration has been limited by two agents. First, numerous grave sites on the northeast headland of the island have probably been the source of frequent wild fires which have precluded establishment of shrubs and trees.

Second, massive erosion caused by use of the island by various armed forces as an artillery range has created a "moonscape" over a large area of the island where vegetation has not established and soil erosion is severe. There are, however, extensive areas of mangrove and diverse high scrub/low canopy woodland along the water edge slopes.

Topographically the landform divides the island into two distinct areas. The northern half is comparatively low with a maximum elevation of 72m. It has an undulating series of ridges, and valleys forming two principal dendritic drainage systems flowing outward from the north and east coasts. The southern half rises steeply from the coast line to culminate in three peaks at an elevation of up to 216m. Large areas of outwash erosion remain on the mid level flanks of these hillslopes as a result of shell fire. These areas show little evidence of natural revegetation and stabilisation since shelling ceased in 1975.

As a consequence of the island's undeveloped character its appearance contributes significantly to the natural visual amenity value of Port Shelter. Together with the Sai Kung Country Park and a plethora of smaller islands, Kau Sai Chau forms a key component of the Port Shelter archipelago and contributes to its function as the primary coastal recreational resource for Hong Kong.

Immediately west of Kau Sai Chau lies Kiu Tsui Chau (Sharp Island) which is the site of Kiu Tsui Chau Country Park. Kau Sai Chau is zoned as a Conservation Area (CA). The CA zoning is meant to include prominent ridgelines, peaks and woodlands currently excluded from Country Parks. The purpose of the zoning is to preserve the natural landscape, environment and character of the designated area.

Current Land Use

Kau Sai Chau is the largest island in the Port Shelter area of eastern Hong Kong. It is undeveloped, and almost completely uninhabited. Apart from the settlement at Kau Sai on the southern tip of the island, the nearest permanent development is a Hong Kong Girl Guides camp (Louisa Lansdale Camp) on Yim Tin Tsai Island to the northeast of Kau Sai Chau. There are several privately owned plots which are abandoned farms. These are located in a major drainage catchment area on the east-central portion of the island. Overhead electric power lines cross the island from Yim Tin Tsai to Kau Sai.

In recent years the island has been used as an artillery range (1936 through 1975), a small-scale agricultural site (dates unknown, currently abandoned), a permanent settlement (Kau Sai), and a recreation site. The artillery practice range appears from visible erosion scars to have been located primarily on the west-central portion of the island, but extending across the island to the southeast shore as well. Because of the risk of unexploded ordnance on the island, there are currently signposts advising visitors of the danger and warning them to remain off the island.

A low breakwater has been constructed across the large Kwat Tau Tam inlet at the north end of the island which was apparently used to aid in trapping fish in the channel at high tides. However, the permanent settlement at Kau Sai is a fishing village near a mariculture site off the south shore of the

island. The population of Kau Sai is unknown. It appears that the village economy is based on commercial fishing and mariculture.

Recreation on and near the island is based on hiking, orienteering, and water sports. Kau Sai Chau is a popular mooring site for pleasure boats on weekends during most of the year.

Historic and Cultural Resources

There is evidence of Bronze Age settlement of the island which indicates that Kau Sai Chau has been subjected to a number of land uses beginning with what may have been the earliest human occupants some 3000 years ago. Archaeological evidence indicates that there were settlements on Kau Sai Chau near the mouths of the larger drainages and at the upper end of Kwat Tau Tam inlet. Archaeological surveys underway at the time of this writing may reveal information about the nature of the settlements.

Historic rock carvings can be seen on a prominent peninsula on the northwest side of the island. The rock carving site is identified on Hong Kong geographic maps. The rock carving is a declared monument (Antiquities and Monuments Office). There are also 3 sites on the island which have been reported by the Antiquities and Monuments Office to have yielded late Neolithic stone artifacts on past archaeological surveys. Due to their archaeological and historical significance a survey has been undertaken to identify and rescue all important artifacts.

Existing Monitoring Programmes

The EPD marine monitoring programme has nine monitoring positions within Port Shelter WCZ. The most relevant positions are north east and south east of Kau Sai Chau. The frequency of monitoring is approximately every two months.

1.3 Key Environmental Issues Identified in the Final EIA Report

The issues of major concern are:

a) water supply, irrigation , drainage, and infrastructure development;

b) the impact of the development on water quality of the freshwater habitats and marine environment, with particular reference to sewage disposal and the use of chemicals on the golf course;

c) the potential impact of the development on the ecology of Kau Sai Chau and the adjacent marine area. The single area where mangroves would be affected is in the proposed irrigation reservoir area at the north end of the island. This site harbours the largest area of mangroves on the island. The issue of loss of mangroves is addressed through the mitigation plan by transplanting trees to be lost, extension of suitable mangrove substrates on other off-site locations, and extension of mangrove habitat in the area downstream of the dam site. This will be achieved by placement of sediment removed during construction of the dam into the proposed mangrove replanting site.

d) general concerns to mitigate the loss of mangroves areas by re-establishing mangroves elsewhere on the island;

e) development design in order to integrate within the landscape context;

f) avoiding interference with archaeological sites;

g) the impact of construction works on the local environment;

h) the impact of transport on the development.

Potential Benefits

In addition to these potential environmental constraints the development provides a positive opportunity for environmental enhancement by:

a) repairing the gross damage done to the areas used for target practice by the military;

b) erosion control of wash out of surface damaged areas;

c) provision of the first public golf facility in Hong Kong;

d) provision of good access to a hitherto relatively inaccessible island;

e) using the Project as a model to demonstrate and set the standard for other similar developments in Hong Kong.

The integration of environmental issues with inputs from engineers and golf course designers has allowed a number of planning and design constraints to be overcome through innovative design and implementation measures.

1.4 Purpose of the Manual

The Environmental Monitoring and Audit (EM&A) Manual details the environmental monitoring and auditing of water quality and ecological

monitoring required to ensure compliance with environmental guidelines and standards set in the Kau Sai Chau Contract. The contract document should be referred to for details of the Contractor's and Engineer's responsibilities for environmental protection.

The EM&A Manual comprises the following:

(i) general guidance to resident site staff with respect to the environmental monitoring and audit requirements during the construction of the Kau Sai Chau golf course;

(ii) specific guidance with respect to the construction schedule and the necessary EM&A programme to assess the varying environmental impacts through time;

(iii) specific guidance on the locations of EM&A stations required to assess the environmental impacts of construction;

(iv) guidance on trigger, action and target levels for water quality;

(v) guidance on event contingency plans for water quality impacts during construction and working procedures required in the event of environmental action levels being exceeded; and;

(vi) specific guidance on presentation of environmental monitoring and audit data and appropriate reporting formats.

This EM&A Manual should not be considered as a final document. The EM&A programme is subject to continual review in consultation with EPD. Alterations to the programme will be reported in the monthly EM&A reports.

PROJECT DESCRIPTION

CHAPTER 2

SECTION 2 PROJECT DESCRIPTION

2.1 Project Overview

An area approximating 158 ha in size located towards the northern end of Kau Sai Chau Island will provide the basis for the development. The central feature is a 36 hole public golf course (two 18 hole facilities), served by small but fully equipped club facilities. In addition there will be a practice range for driving, chipping, and putting.

The area designated for the golf course is the northern, low lying half of the island. Excluded from the development area are four steeply sloping and well vegetated headlands, the steep slopes near the shoreline, and the adjoining island of Yim Tin Tsai.

The course has been carefully designed to minimise disturbance of the landform and to retain the natural topography of the site to the extent possible. A key design criterion was to balance cut and fill volumes, in order to minimise earthworks and the need to import soil.

The majority of the two proposed 18 hole golf courses will be obscured from immediate sea level views by the steeply rising slopes at the shoreline. The central location of the proposed club house and practice area, at an elevation of 40m, will similarly be obscured from close external sea level views by its inland location.

A third major component of the proposed development comprises the damming of the Kwat Tau Tam inlet to provide the freshwater storage for both the golf course irrigation and potable supply. The dam design requires raising of the internal, stored freshwater level to 12mPD, in order to provide a freshwater storage of adequate capacity.

At full capacity it is estimated that some 640 golfers/day could be accommodated at the facility. Additional golfers could also be accommodated in golfing schools or on the driving range. The detailed estimates of golf players and visitors, caddies and staff indicate that the maximum daily population would be about 1440.

2.2 Golf Course and Clubhouse Facilities

The layout of the golf course was prepared by the Gary Player Design Company. The total area occupied by the golf course, practice range, and associated buildings will be of the order of 158 ha, with clubhouse facilities and driving range located centrally. Dimensions of the course are:

- North golf course - 6000m in length, par 72
- South golf course - 5400m in length, par 70
- practice range - 320m x 150m.

Powered golf carts will not be used on the courses, therefore there will be no requirement for hard-surfaced cart paths.

The golf courses will be constructed to a standard that will allow championship play, and it is anticipated that international tournaments will be held occasionally on the site. The longer course is intended to be more challenging, and suited for experienced golfers. The shorter course may be adaptable to tournament play by tee placement, but will be more suited to inexperienced golfers than the longer course.

Club House

The clubhouse comprises a single building which will house changing and locker rooms, a pro shop, a restaurant and administrative offices. It will be situated on a low rise near the centre of the golf course which overlooks the northern half of the island and much of Port Shelter. The design, layout, and construction materials of the clubhouse are selected to be minimally intrusive within the landscape and visual context of Kau Sai Chau.

Landscape plantings would be used around the club house to moderate the scale of the development and reduce the visual impact of the building. In keeping with the natural vegetation, which is primarily low scrub land of 0.5-1.5m and grassland , shrubs of 0.5-1.5m which occur on Kau Sai Chau would be used for landscaping.

Maintenance Facility

A maintenance workshop and grounds administration office will be constructed comprising garage facilities for vehicles material and equipment stores, and a water treatment plant. This building would be a simple structure designed to complement the general style of the club house.

The maintenance facility would include a bunded chemicals store, and a bunded chemicals preparation area.

Residential Accommodation (Staff)

Residential accommodation will be provided for a small number of resident staff, such as the golf course manager and superintendent as well as the maintenance superintendent and several maintenance staff. It is expected that about five family apartments of 2 and 3 bedrooms would be provided for permanent resident staff and their families. This accommodation would be included within the clubhouse building.

In addition single share dormitory accommodation would be provided for about 30 roster staff, including club house and grounds staff. A staff canteen would also be provided for these roster staff, and other day staff.

Access Road

A roadway of approximately 0.8km in length will be constructed from the jetty location to the clubhouse. Because there will be no internal traffic on the island except golf course maintenance equipment and shuttle buses, there will be no hard surfaced roads other than the access road. The route from the jetty to the clubhouse will be served by several vans which will be equipped to carry passengers and their golf equipment.

To minimise maintenance it is proposed that the roadway would be constructed of concrete.

Interconnecting Footpaths

The interconnecting footpaths between the fairways and around the development would be kept as natural as possible. Gravel paths of 1.0 metre width would be used in high traffic areas, or areas that begin to show deterioration. Where footbridges are required, these would be built of stone, timber or steel framework with suitable timber finish. Rubber matting would be used over timber or steel decking, to accommodate golfers with golf shoes.

2.3 Water Supply System and Irrigation

Potable Water and Irrigation Demand

Potable water is required to serve the clubhouse, residential accommodation and other facilities. It is estimated that about 4,600m^3/month (55,200 m^3/a) is required to meet predicted demand.

Potable water will also be supplied by a pipe from the Project potable supply to the Tai Tau Chau mariculture site on the east side of Kau Sai Chau. This will replace the existing untreated, surface flow supply to Tai Tan Chau, which will be interrupted due to abstraction of irrigation water from the indirect catchment.

The irrigation demand for the golf course is estimated to be of the order of 3.5mm per day (105mm/month) for fairways and general practice areas, and 7mm per day (210mm/month) for greens and tees. The total area to be irrigated is estimated to be 54 ha, which includes fairways, greens, and tees. The total irrigation water demand is estimated to be 305,000 m^3/a .

The total potable water and irrigation demand is thus estimated to be approximately 360,000 m^3/a of the total demand, of which some 15% is for potable water supply.

Water Supply System

In order to provide sufficient fresh water for irrigation and potable use, a freshwater reservoir (capacity 420,000 m^3 active storage and 150,000m^3 dead storage capacity) will be constructed at the northern end of the island by creating a dam across the Kwat Tau Tam inlet.

The refilling capability of this direct catchment area has been shown to be insufficient to replenish storage deficiency for the design period of the reservoir. Consequently the stream draining to the east of the direct reservoir catchment area will be developed as an indirect catchment (comprising 52 ha) to be diverted to the reservoir by use of an aqueduct.

The crest elevation of the dam would be 14mPD, and the maximum water level would be 12mPD. The dam will be about 140m long.

Potable water will be extracted from the reservoir and pumped to storage tanks near the clubhouse at the southern end of the golf course and gravity fed to the treatment plant. The treatment plant would be designed to meet Water Supply Department standards for potable water in Hong Kong. An activated carbon filtration unit would be used for final purification and removal of chemicals.

PROJECT PROGRAMME

CHAPTER 3

SECTION 3 PROJECT PROGRAMME

3.1 Construction Activities and Programme

The key engineering works can be divided into civil and building works. The main construction activities will span approximately two years. The longest duration construction project will be the golf courses, which will require 15 months. Clubhouse and other building construction will require 13 months. The overall project construction programme is shown in Figure 3.1. A more detailed construction programme will be available from the Contractor at a later date. Consequently, although this manual aims to provide maximum guidance to environmental monitoring and audit, the actual monitoring programme should be reviewed when details of the Contractors' construction sequence and methodology are available. The monitoring programme will need continuous review during the contract.

The construction programme is projected to begin in May 1994, and all facilities are planned to be completed prior to December 1995. Construction activities involving substantial earth moving (earthworks and drainage, access road, driving range, and golf courses) are scheduled to take place during the remaining autumn-winter dry seasons in 1993-1994 and in 1994-1995. This will reduce erosion and sedimentation potential during the construction period, but may increase potential for atmospheric contamination due to generation of dust.

Civil works will include the following construction projects:

- dam
- jetty
- earthworks and drainage
- access road
- clubhouse site formation
- practice driving range
- golf courses
- turf nursery (if required depending on turfgrass selection).

Building works will include construction of the clubhouse and associated maintenance buildings.

Construction of the dam and pier, drainage system, access road, golf courses, and clubhouse will begin on a staggered schedule beginning in month 8 of the construction period. All construction activities requiring substantial surface disturbance will be completed prior to the onset of the rainy season in year 2 of the Project. This will reduce risk of soil erosion

from the site, and allow fairway grass seeding or planting before the heavy rains of the typhoon season.

The construction activities will require the formation of a temporary beach head to be used for delivery of construction materials. A site has yet to be determined, however it is proposed to be close to the jetty site. The beach-head will require some minor dredging, by use of a grab, and some site formation. The beach head would be rehabilitated after completion of construction works.

More detailed information on key aspects of the construction activities is provided below.

Dam Construction

The dam will be built over a nine month construction period. The dam structure may be formed from either earth fill or rock fill won locally. In the case of rock fill embankment, an impermeable membrane would be required to be placed on either the upstream face or as a central core wall. The latter option is favoured as it could be founded on a concrete cut-off plug cast into the rock foundation. The dam wall foundation requires dredging of marine sediments to a base rock depth.

The depth of marine sediments at the dam site is about 11m. It is proposed that those sediments would be utilized to form a new area for mangrove replanting downstream of the dam site. The concrete case wall in the rockfill dam would be reinforced and be constructed in vertical panels with vertical joints incorporating water bars, with upstream and downstream transition zones to prevent damage during the placement of rockfill.

The dam would have an overflow culvert to handle water overflow during periods of heavy rain. Large rocks or gabions would be placed at the base of this culvert to break up the water flow and prevent erosion of the mangrove area at the base of the dam.

Jetty Construction

The jetty site selected on the west-central area of the island is near to the proposed clubhouse location. The jetty site offers relatively deep water and a sheltered location. Due to the water depth, dredging will not be required for the access and berth channel. The sheltered location will ensure safe operation of the ferry service and ease of berthing. The jetty will be built simultaneously with the dam.

Driven tubular sheet steel or pre-stressed concrete piles will be used for the structural support. Longitudinal beams would be pre-cast, pre-tensioned concrete or steel bridge girders. Three beams are proposed for the leading head and two for the jetty. Spacing would be approximately 2.5m. The

deck will be formed by transverse pre-cast concrete planks with a slip resistant surfacing.

The concrete lower level landing and steps would be supported from the jetty piles on the inside and special outside support piles. The steps, landing and supporting beams will be cast in situ.

Earthworks and Drainage

Earthworks and drainage will be constructed between months 9 and 16 of the construction period. Drainage pipes will be installed between the indirect catchment and the reservoir (approximately 600mm concrete pipe), and beneath the areas of fill in the southwestern portions of the reservoir (one or two 1800mm concrete pipes).

Steel pipes will be installed for pumping water between the reservoir and the two 1000 m^3 water storage tanks near the clubhouse. All pipes will be installed using cut and cover methods except in the fill area in the southwest extent of the reservoir where pipes will be installed on fill.

Access Road

The access road from the pier to the clubhouse will measure approximately 800m in length, and will rise from the jetty elevation to about 50m elevation at the clubhouse. It will accommodate passenger shuttle buses and golf course maintenance equipment. There will be no other traffic on the access road, as there is no vehicular access to the island.

At the seaward end of the access road, a turning and temporary parking area for the shuttle bus is proposed to be formed partly by reclamation and partly by excavation into the steep shoreline. A turning area will be constructed at the clubhouse.

Golf course

The golf course will be constructed during months 10 to 24 of the Project. The total cut and fill requirements for the golf course construction are designed to balance and will be approximately 800,000m^3, due to reliance on existing topography for the finished landform of the golf course.

There is a requirement to bring in sand as cover for the formed fairways, to act as a good base for growing turf. The required depth of sand cover is about 15 cm. In total some 75,000 m^3 of sand is required, which would be brought in by barge.

Earthworks will be conducted during the dry season of 1994-1995. Planting, landscaping, construction of greens, tees, and bunkers will follow. It is anticipated that golf play will begin in late 1995.

It is expected that the fairways would be planted using hydroseeding. Greens and tees will be seeded. The requirement for soil amelioration is yet to be ascertained.

Buildings

Building construction will be the final phase of the construction project. All buildings will be constructed between months 11 and 23 of the programme.

Landscaping

The landscaping would be confined mainly to the area around the clubhouse, and would be sympathetic with the natural low cover on the island. Species would be chosen that occur naturally on the island.

It is proposed to extensively use "no-go" areas during construction, so that areas other than the fairways and interconnecting paths are left natural and as undisturbed as possible. With this approach any areas subject to minor disturbance should recover naturally.

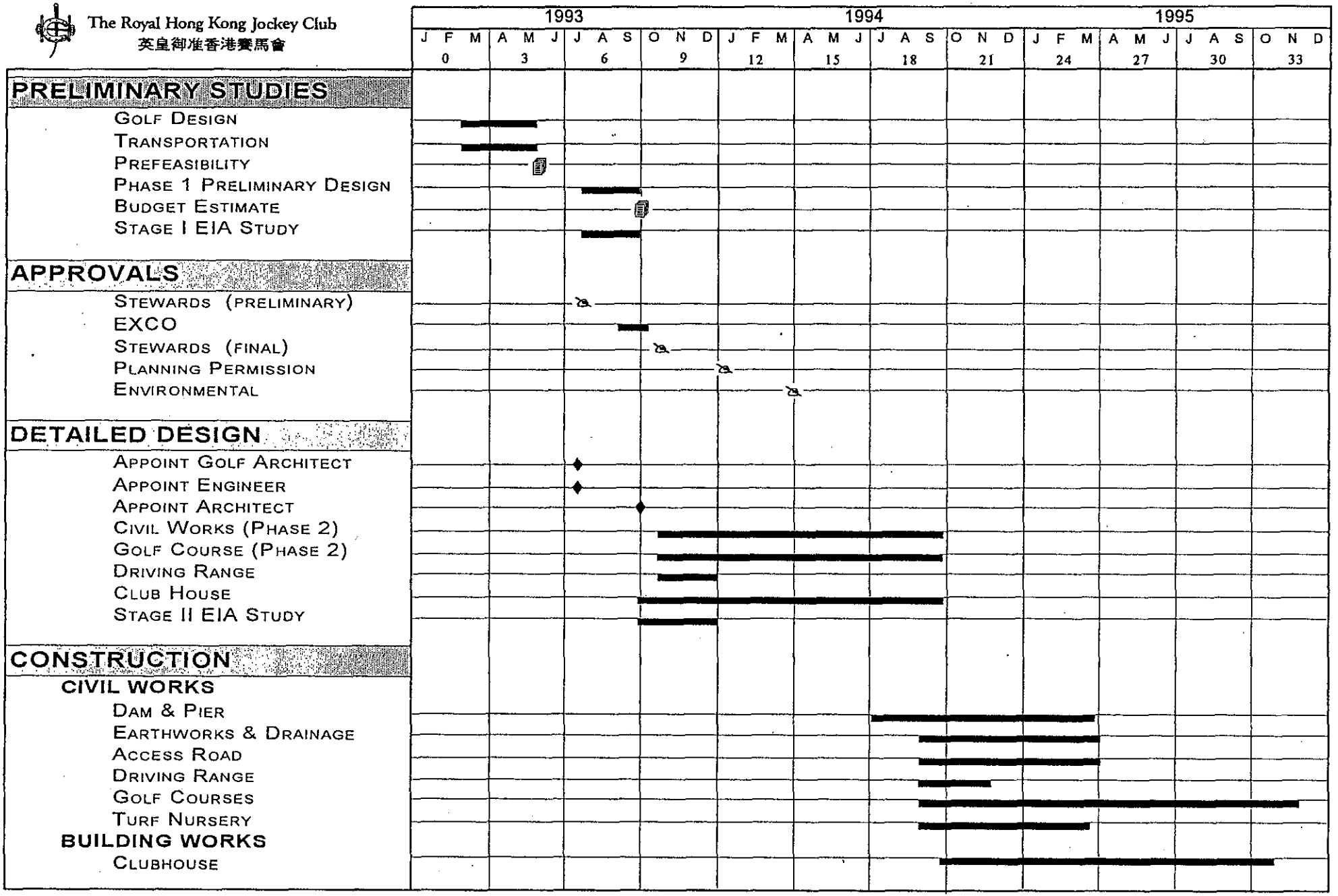


FIGURE 3.1 KAU SAI CHAU DEVELOPMENT, PROJECT PROGRAMME

Ref : c:\pm4\paul\ksc\kscprog.pm4

PROJECT ORGANIZATION

CHAPTER 4

SECTION 4 PROJECT ORGANIZATION

The Resident Engineer would be responsible for ensuring compliance with all environmental protection measures required of the Project during construction. This responsibility would be transferred to the Golf Course Manager for the operation of the Project.

During construction, the EM&A Team would be structured as indicated in Figure 4.1.

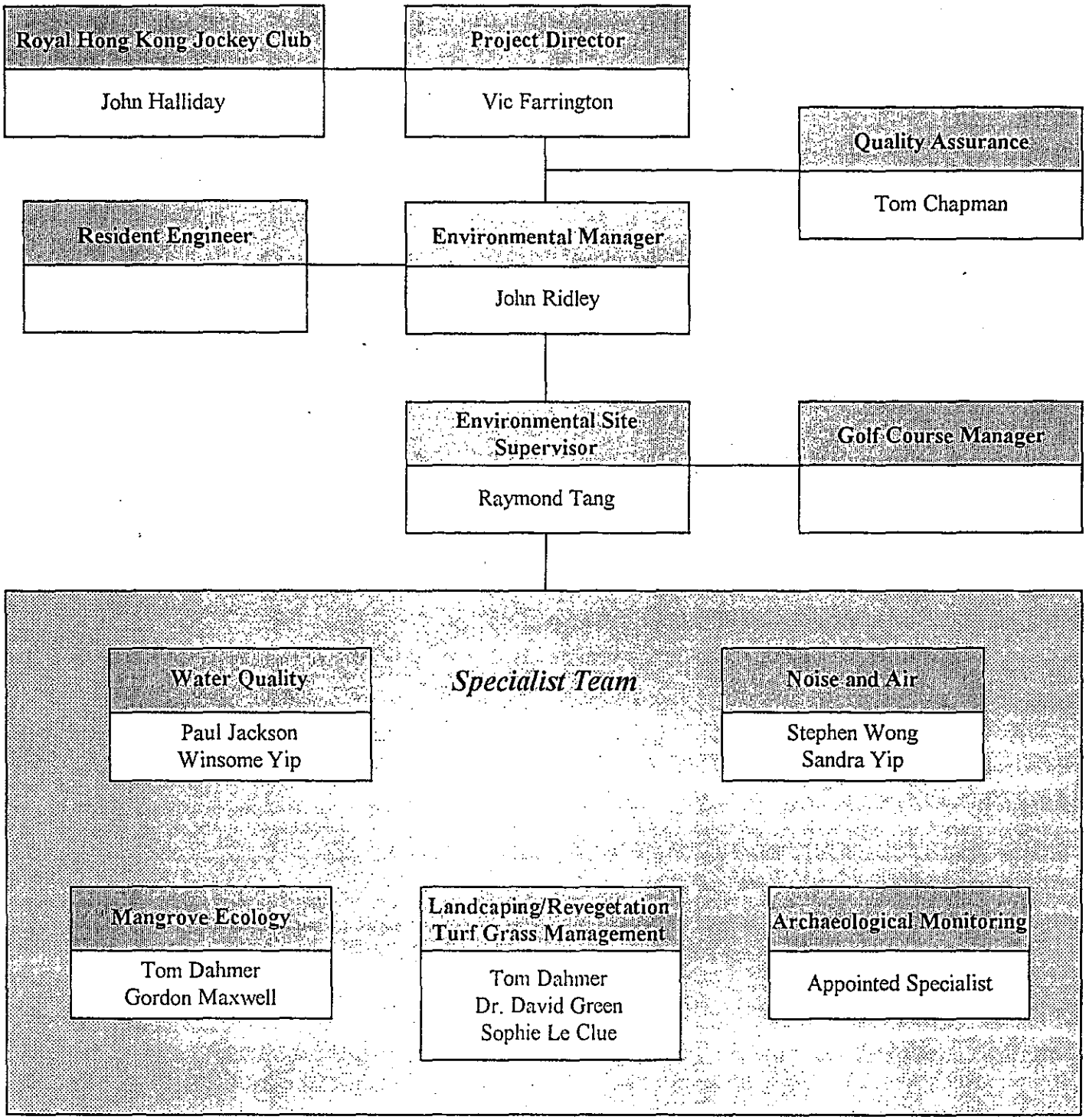
- the Environmental Manager has overall responsibility for environmental performance, to oversee the Monitoring activities and to Audit compliance with contract environmental conditions;

- environmental specialists in mangrove ecology, water pollution technology and environmental monitoring, and specialists in archaeology and landscape restoration. These specialists would undertake the monitoring activities for the project.

The Environmental Manager would report direct to the Resident Engineer.

The Environmental Supervisor would report directly to the Golf Course Manager, and be responsible for implementation of the environmental monitoring programme, and signing off operations required as part of the environmental protection programme, (see Section 5, Schedule of Mitigation Measures).

FIGURE 4.1 KAU SAI CHAU ENVIRONMENTAL MONITORING AND AUDIT PROJECT MANAGEMENT TEAM (CONSTRUCTION PHASE)



Ref : c:\pm4\proposal\kscmon.pm4

ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS

CHAPTER 5

SECTION 5 ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS

5.1 Introduction

The monitoring programme for both the construction and operation phases would be subject to periodic review in consultation with EPD. At these periodic review meetings, the monitoring results would be examined to consider:

- any changes to the monitoring methodology, or changes to the parameters being monitored;
- the need to increase, or the ability to relax the frequency of monitoring;
- the need to upgrade, or relax any mitigation measures.

5.2 Monitoring and Audit Schedules

Environmental monitoring falls broadly into two categories:

- baseline monitoring which has been or is being undertaken to establish the existing conditions in the Study Area; and
- compliance monitoring which should be carried out during both the construction and operational phases to achieve the following general objectives:
  1. to assess the performance of construction/operation activities in environmental terms;
  2. to obtain early warning of potential problem areas, permit timely remedial action and identify any environmental impacts;
  3. to comply with appropriate standards and environmental objectives;
  4. to provide reassurance to local communities.

Three quantitative levels would be set to monitor compliance with environmental objectives and to provide early warning of potential problem areas. This system of compliance monitoring will permit implementation of mitigation before the regulatory standards are reached. The three levels are described below:

1. **Trigger Level** is a reference value to be used as an early warning of 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;
2. **Action Level** indicates that deterioration is significant and that urgent corrective action is required;
3. **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. Compliance monitoring schedules are, therefore, devised such that remedial action is taken to prevent this level being attained. The Target Level should not therefore, be considered as the desired level.

In the case of ecological works these levels may need to be qualitative.

The monitoring programme is required to ensure compliance with the construction sequence and methods, and to monitor ecological effects, water quality, landscape restoration, general site working practices and site hygiene, and compliance with the various control and mitigation measures also identified in this report.

Environmental Auditing

The purpose of environmental auditing is to review 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 and Project management.

Construction Phase Auditing

Construction phase auditing should be carried out in conjunction with the construction monitoring programme. Audits should be conducted monthly during the construction period. Records of environmental monitoring should be maintained by the Environmental Manager and the Contractor, and the audit should seek to check:

- records of monitoring procedures;
- records of monitoring results;
- records of exceedence of any regulatory requirements;

- details of control and mitigation action taken in response to unacceptable impacts;
- effectiveness of overall environmental protection programme.

The audits will be conducted monthly and would cover the four key areas of engineering works including:

- dam and reservoir construction;
- internal access road and clubhouse site formation and utilities;
- golf course site formation;
- jetty construction.

5.3 Water Quality Monitoring

Baseline Monitoring

The proposed locations for baseline monitoring are shown in Figure 5.1 and the monitoring schedule is given in Table 5.1. This monitoring should be completed in the four weeks proceeding the commencement of construction.

Construction Phase Monitoring

The only construction activity which may have a significant impact on marine water quality is considered to be the dam construction. The parameters to be tested reflect the potential pollutants from this activity . Monitoring should be more frequent if there are indications that water quality is deteriorating, in accordance with the Water Quality Event Contingency Plan, Table 5.2.

Table 5.1 Marine Water Quality Monitoring Schedule

PARAMETER	OBJECTIVE	TRIGGER LEVEL	ACTION LEVEL	TARGET LEVEL	LOCATION	FREQUENCY/TIMING
Aesthetic Appearance SS, DO Salinity Ammoniacal Nitrogen Inorganic Nitrogen Nitrate Orthophosphate *E.Coli* Turbidity	Baseline assessment	N/A	N/A	N/A	5 Designated monitoring stations and control - 1m below surface - mid level - 1m above sea bed	Prior to commencing construction, 3 times/week for 4 weeks, at mid-ebb and mid flood.
Aesthetic Appearance Turbidity, SS, DO	Compliance monitoring	20% deterioration from running background levels	Average of Trigger and Target Levels	*WQO	Designated monitoring station positions 1 to 5 and control station 6 - 1m below surface - mid level - 1m above sea bed **	Weekly during the construction period, at mid-ebb and mid-flood.
SS, DO	Compliance monitoring	20% deterioration from running background levels	Average of Trigger and Target Levels	*WQO	Designated monitoring station positions 2 and control station 6 *** - 1m below surface - mid level - 1m above sea bed	3 times/week during marine dredging works and marine works associated with construction of the dam, and once weekly at other times at mid-ebb and mid flood.
Aesthetic Appearance SS, DO Salinity Ammoniacal Nitrogen Inorganic Nitrogen Nitrate Orthophosphate *E.Coli* Turbidity	Compliance monitoring	20% deterioration from running background levels	Average of Trigger and Target Levels	*WQO	5 designated monitoring stations and control - 1m below surface - mid level - 1m above sea bed **	Monthly during the operation of the golf course at the 5 designated marine monitoring stations and control station.

Note : N/A Not applicable

* In the event that the running background level is in excess of the WQO, the Target Level = a deterioration from the running background level of 30%

SS = Suspended Solids
DO = Dissolved Oxygen
WQO = Water Quality Objective

** The frequency of sampling would be reduced if no impacts are recorded, as agreed with the EPD.

*** Monitoring marine works is initially limited to position 2 and control site 6. If problems are detected this monitoring would be extended to include all the proposed monitoring positions. Turbidity is measured by turbidity meter.

Table 5.2 Water Quality Event Contingency Plan

EVENT	FREQUENCY	ACTION	
		Monitoring Personnel	*Contractor/operator*
Breach of Trigger Values	One sample	Inform contractor/operator	Check working methods/practices to identify any immediate causes; take appropriate remedial action if necessary
	Two consecutive samples	Inform EPD, AFD, contractor/operator; resample to confirm result	
Breach of Action Level	One sample	Inform EPD, AFD, contractor/operator; resample to confirm result	Check working methods/practices to identify any immediate causes; take approate remedial action if necessary
	Two consecutive samples	Inform EPD, contractor/operator; resample to confirm result	Undertake detailed chech of working methods and practices
		Increase frequency of monitoring	Carry out appropriate remedial action and inform EPD of remedial action
		Propose remedial action	Ensure corrective action has been undertaken and is effective
		Continue monitoring after completion of remedial action to confirm action is effective	Amend method statement, if appropriate
		Record event in monitoring report for submission to contractor/operator and EPD	
Breach of Target Level	One sample	Inform EPD, AFD, contractor/operator;	Undertake immediate check of activities and employ any appropriate mitigation
		Confirm result & increase monitoring frequency	
		Propose remedial action	Ensure immediate implementation of remedial action and in extreme cases cease activities
		Undertake monitoring at nearest water quality SR	Ensure corrective action has been undertaken and is effective and inform EPD of remedial action
		Continue monitoring after completion of remedial action to confirm action is effective	Amend method statment, if appropriate
		Complete Monitoring Report and submit to contractor/developer and EPD	

Event Contingency Plans

An Event Contingency Plan should be followed by the contractor to facilitate appropriate and immediate response by relevant personnel in the event that the Action Levels are attained or exceeded. Table 5.3 defines the trigger, action and target levels adopted for the water quality monitoring programme.

Table 5.3 Trigger, Action and Target Levels For Water Quality

Parameter	Trigger Level	Action Level	Target Level
Suspended Solids Turbidity	Station result >30%above the max. baseline level	Station result >30% above the maximum same day control station recording	Station result persistently >30% above the maximum same day control station recording
Dissolved Oxygen	Station result <4mg/l DO for 90% of samples and/or <2 mg/l DO for 90%of samples taken 2m above bottom	Station result <30% below the minimum same day control station.	Station result persistently <30% below the same day minimum level recorded at the control.

5.4 Ecological Monitoring

Before commencement of any works on site, baseline ecological surveys would be thoroughly checked against final development proposals to ensure minimum potential for damage to existing vegetation. This will be particulary important in Kwat Tau Tam inlet where mangroves to be preserved in the final scheme are located, or in areas near the works for the dam construction project.

The mangrove mitigation plan proposed in the EIA falls into three defined activities as follows:

i) Transplanting mangroves outside Kwat Tau Tam

The first task required is to confirm the appropriate receptor sites, and to set out these sites for transplanting seedlings. The activity will require close supervision from the Environmental Site Supervisor backed by a specialist team.

ii) Mangrove seeding/transplanting on Kwat Tau Tam

A mangrove substrate is to be created immediately seaward of the reservoir dam location. Seedlings will have to be sourced and transplanted using the substrate created from sediment arising from the dam construction. The

mangrove impact mitigation plan calls for creation of a planting substrate. Because this type of project is relatively new to Hong Kong, it will require close supervision will be necessary to ensure the success of transplants. Therefore, it will be important that special attention is paid to selection of sediments for the substrate, construction methods, and the transplanting operation.

iii) Monitoring

Following the transplanting operation the progress/survival of the mangroves shall be monitored and remedial measures taken where appropriate.

Equally important is protection of existing mangroves located seaward of the dam site which may be impacted by dam construction operations. These areas must be carefully marked to avoid accidental encroachment by construction personnel or equipment. Also appropriate irrigation measures must be undertaken to ensure that the dewatering process to facilitate dam construction does not result in loss of those mangroves lying seaward of the dam site.

Procedures for coffer dam construction landward and seaward of the dam site would be carefully monitored to ensure minimal damage to mangroves and coastline vegetation. The Kwat Tau Tam mangrove mitigation detail is shown in Figure 5.2.

5.5 Environmental Team - Principal Tasks

During construction the primary tasks of the Environmental Team will be:

i) briefing and training of construction crews in the importance of confining construction and related activities to permitted areas ;

ii) marking special areas and features and also areas of vegetation to be avoided by personnel and equipment;

iii) liaising with survey and construction crews to modify layout as needed to avoid sensitive areas;

iv) monitoring and reporting performance of construction crews;

v) carrying out the mangrove mitigation plan;

v) immediately correcting situations which violate the intent of the ecology impact mitigation plans;

vi) working with the detail design and construction teams to ensure that water bodies are designed for maximal ecological utility;

vi) ensuring minimal adverse environmental effects of construction by monitoring earth moving operations and other site works.

Ecological monitoring will be directed at protection of all native vegetation. The Environmental Supervisor would be responsible for advising survey and construction crews of the protection status of these areas, and assisting/advising the Contractor with marking the site out and ensuring that no damage is done. Should construction activities appear likely to cause damage to identified vegetation or other habitat features, the Environmental Supervisor would formally advise the Site Engineer to cease or modify the works concerned.

An additional concern will be design and supervision of erosion control measures during the construction phase.

The measures to be adopted would include:

i) inspection of layout of erosion control matting as required;

ii) inspection of erosion control berms built to contain runoff from golf course construction sites.

iii) regular checks of temporary drainage works;

iv) inspection of dam construction procedures including sedimentation controls

iii) programming and supervision of mulching on exposed areas;

iv) programming of early hydroseeding and planting works.

The effectiveness of these works will need to be closely related to the water quality monitoring programme. Suspended solid concentrations seaward of the dam construction site will be quantified and reported as part of this programme.

5.6 Archaeology and Grave Site Monitoring

Due to the number and historic importance of the artifacts found to date on the site, it is probable that fairway and lake construction in the upper reaches of the Kwat Tau Tam inlet may unearth additional finds. Any items of historic interest will be identified, salvaged from the works area, catalogued and preserved.

The details of this plan will be revised through discussions with the Antiquities and Monuments Office (AMO) of the Recreation and Culture Branch. A general protocol with which to begin the monitoring would include the following:

1. Works in the area should be halted, and the equipment and personnel reassigned temporarily.

2. The AMO should be contacted by the Environmental Supervisor and notified of the nature of the find, and given an opportunity to respond.
3. The AMO should have the option of delegating a salvage operation to the Environmental Supervisor should staff commitments so dictate.
4. A salvage operation should be conducted, the artifacts should be properly identified, cataloged, and removed from the site.
5. The AMO should then authorize resumption of works on the site.

Grave sites in the Project area have been identified and mapped. However, during construction it is possible that additional sites could be found.

The AMO would be advised of any such finds. Should the grave site be possibly affected by the Project construction or operational activities, this would be discussed with AMO.

5.7 Air Quality and Noise Monitoring

Baseline monitoring would be undertaken for both air and noise as specified in the final EIA report. Two weeks of air quality monitoring would be carried out in accordance with US EPA Ambient Air Quality Surveillance requirements as set out in Title 40 of the Code of the Federal Regulations, Chapter 1 (Part 50).

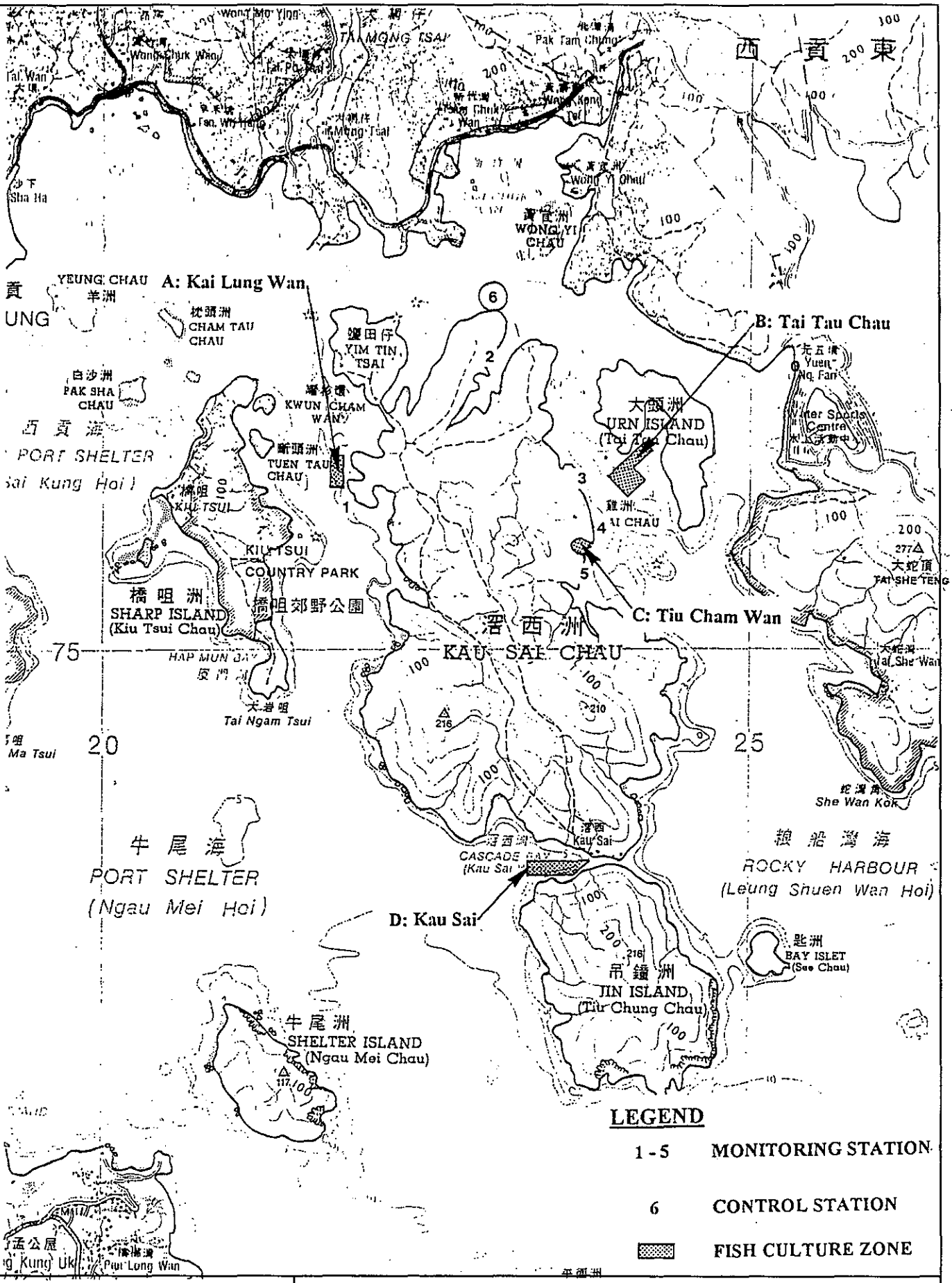
Noise monitoring will be required to establish the noise baseline and to verify compliance with guidelines for construction noise. The measurements would be compatible with the measurement procedures stipulated inthe Annex to EPD's "Technical Memorandum on Noise from Construction Work other than Perscussive Piling".

No compliance monitoring is required for noise or air, however the EM&A team will respond to complaints in accordance with the Event Contingency Plan, Table 5.4.

Table 5.4 Monitoring Event Contingency Plan

EVENT Exceedance of:	ACTION CONSULTANT	ENGINEER	CONTRACTOR
TRIGGER LIMIT	Identify source. Take measurement to substantiate complaint. Inform Engineer. Discuss with Engineer remedial actions required. If complaint is resolved, additional monitoring can cease.	Inform Contractor Discuss with the Consultant and the Contractor remedial actions required. Review monitoring data and Contractor's working methods. Liaise with the Consultant. Assess the effectiveness of remedial actions and keep Contractor informed.	Discuss with Engineer remedial actions required. Rectify any unacceptable practice to the Approval of the Engineer. Consider changes to working methods.
ACTION LIMIT	Identify source. Take measurement to substantiate complaint. Inform Engineer. Increase monitoring frequency to demonstrate efficacy of remedial measures. If complaint is not resolved, discuss with the Engineer further appropriate mitigation measures. If complaint is resolved, additional noise monitoring can be ceased.	Inform Contractor immediately Discuss with the Consultant and the Contractor remedial actions required. Review monitoring data and Contractor's working methods. Liaise with the Consultant. Assess the effectiveness of remedial actions and keep Contractor informed.	Submit proposal to the Engineer for remedial actions to reduce impact. Amend proposal if required by the Engineer. Implement immediately the agreed proposals.
TARGET LIMIT	Identify source. Take measurement to substantiate complaint. Inform Engineer. Increase monitoring frequency to demonstrate efficacy of remedial measures. If complaint is not resolved, discuss with the Engineer further appropriate mitigation measures. Assess effectiveness of remedial actions and keep Engineer informed of the results. If complaint is resolved, additional monitoring can cease.	Inform Contractor immediately Discuss with the Consultant and the Contractor remedial actions required. Review monitoring data and Contractor's working methods. Liaise with the Consultant. Assess the effectiveness of remedial actions and keep Contractor informed.	Take immediate action to avoid further exceedance. Submit a further proposal for remedial actions to Engineer immediately. Implement immediately the agreed proposals. Resubmit proposals if problem still not resolved.

Note: Trigger Level is defined as the receipt of one complaint to the Contractor, the Engineer or the EPD.
Action Level is defined as more than one complaint to the Contractor, the Engineer or the EPD in one week.
Target Level are the appropriate legislative standards for air and noise.

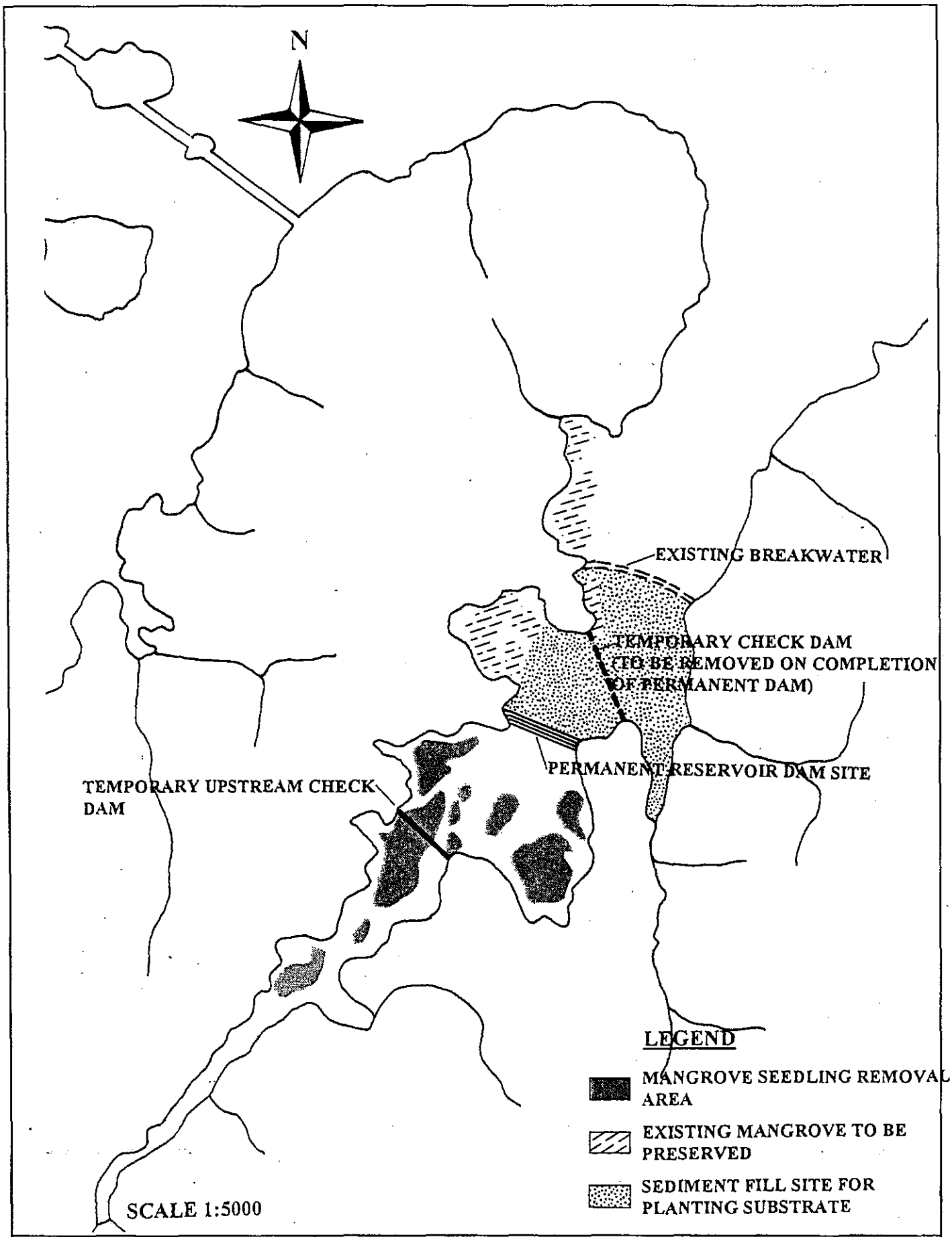


AXIS Environmental

Kau Sai Chau Project

Figure 5.1 Marine Water Quality Monitoring Locations

076000/ December 1993



AXIS Environmental

Kau Sai Chau Project

Figure 5.2 Kwat Tau Tam
Mangrove Mitigation Detail

076000/ December 1993

REQUIREMENTS ON ENVIRONMENTAL PROTECTION MEASURES

CHAPTER 6

SECTION 6.1 SCHEDULE OF MITIGATION MEASURES

Kau Sai Chau Golf Course Requirements on Environmental Protection Measures

Ref.	Environmental Protection Measure	Implementation Status
	Kau Sai Chau Mitigation Measures Water Quality Construction Phase	
EIA Sec 3.3.1	1. Activities involving substantial earth moving will be undertaken during the dry seasons 1993/94 and 1994/95.	
EIA Sec 3.3.1	2. The Contractor shall mark out the golf holes prior to any construction. This serves to identify vegetation to be retained.	
EIA Sec 9.4.1	3. Baseline Water Quality Monitoring will commence one month prior to the commencement of any construction works.	
EIA Sec 3.3.4	4. A silt curtain will be placed in the Kwat Tau Tam inlet north of the dam construction. This will control the release of sediments and allows for the use of sediment in mangrove transplanting.	
EIA Sec 9.4.2	5. Compliance monitoring will be undertaken throughout the construction period, at six monitoring locations. Monitoring in Kwat Tau Tam inlet will be intensified during marine works for the dam construction.	
EIA Sec 3.3.4	6. Temporary ditches would be provided to facilitate runoff discharge into the appropriate water courses, via a silt retention pond;	
EIA Sec 3.3.4	7. Sediment traps would be regularly cleaned and maintained by the contractor. Daily inspections of such facilities would be required of the contractor.	
EIA Sec 3.3.4	8. Exposed soil areas would be minimised to reduce the potential for increased siltation and contamination of runoff.	
EIA Sec 3.3.4	9. The Constractor shall ensure that no visible foam, oil, grease, scum, litter or other objectionable matter is present on the water;	
EIA Sec 3.3.4	10. Dredger's would be fitted with a closed seabed grab, with tight seals, and the dredged material loaded onto a split barge with a water tight seal. No barge overflowing would be permitted.	

Kau Sai Chau Golf Course Requirements on Environmental Protection Measures

Ref.	Environmental Protection Measure	Implementation Status
	Mitigation Plan for Impact to Kau Sai Chau Mangroves	
EIA Sec 5.6.2	1. Preserve mangroves outside the dam and reservoir locations through protection during construction;	
EIA Sec 5.6.2	2. establish replacement mangroves on Kau Sai Chau and immediately surrounding islands to compensate for the losses caused by the project;	
EIA Sec 5.6.2	3. enhance the spatial distribution of B. *gymnorrhiza* in the Kau Sai Chau area through transplanting.	
EIA Sec 5.6.2	4. transplantation of mangrove trees from the sites to be disturbed to existing mangrove habitats which are secure from disturbance;	
EIA Sec 5.6.2	5. creation of new substrate suitable for mangrove establishment immediately seaward of the proposed dam location;	
EIA Sec 5.6.2	6. transplantation of mangroves from disturbance sites to newly created substrates;	
EIA Sec 5.6.2	7. enhancement of existing mangrove propagule survival and distribution potential;	
EIA Sec 5.6.2	8. plantation of mangrove propagules collected from other Hong Kong sites into new substrates at Kau Sai Chau.	
EIA Sec 5.6.2	9. Monitoring existing and transplanted mangrove survival.	

Kau Sai Chau Golf Course Requirements on Environmental Protection Measures

Ref.	Environmental Protection Measure	Implementation Status
EIA Sec 5.6.4	**Impact Mitigation Measures of Marine Habitats** 1. fauna translocation would involve the following groups, and must be conducted prior to disturbance of the inlet: Mud-dwelling invertebrate infauna and epifauna, especially the gastropod and bivalve molluscs; Epizoic gastropods on the adult mangroves, such as *Littorina melanostoma.*	
EIA Sec 5.6.6	**Impact Mitigation Measures for Terrestrial Habitats** 1. To minimize the extent of habitat loss during construction habitats between or surrounding the golf playing areas would be clearly demarcated prior to construction. Equipment and personnel would be excluded from these areas during the construction process, and the areas would remain in their native condition.	
EIA Sec 7.5	**Archaeology** 1. A 3-stage study has been commissioned. Stage 1 is a study of the northern extent of the disturbed area Stage 2 is an assessment of the potential impacts of the project on discovered resouces, resulting where appropriate in design changes to the project plan. Stage 3 rescue and salvage operation to remove artifacts from the sites to be disturbed. 2. Education and training of the golf course construction workers.	
EIA Sec 2.11	**Safety** 1. Clearance of unexploded ordnance prior to commencement of construction on-site.	

SECTION 6.2 CONTRACT SPECIFICATIONS

Kau Sai Chau Golf Course Requirements on Environmental Protection Measures Contract Specfication

Clause	Environmental Protection Measure	Implementation Status
	General	
1.1	The Contractor shall take all reasonable precautions to avoid any nuisance arising from his operations. This should be accomplished where at all possible by suppression of the nuisance at source rather than abatement of the nuisance once generated.	
1.2	The Contractor shall be responsible for ensuring no earth, rock or debris is deposited on public or private rights of way as a result of his operations, including any deposits arising from the movement of plant or vehicles.	
1.3	The Contractor shall at all times ensure that all existing stream courses and drains within and adjacent to the Site are kept safe and free from any debris and any excavated materials arising from the Works. The Contractor shall ensure that chemicals and concrete agitator washings are not deposited in watercourses.	
1.4	All water and other liquid waste products arising on the Site shall be collected, removed from Site via a suitable and properly designed temporary drainage system and disposed of at a location and in a manner that will cause neither pollution nor nuisance. In addition, the effluents shall comply with the standards stated in the "Technical Memorandum on Standards for Effluent discharged into Drainage and Sewerage Systems, Inland and Coastal Waters" for the Port Shelter Water Control Zone.	
1.5	The Contractor shall supply to the Engineer each month three copies of a monitoring and audit report in both printed and magnetic media form, to an agreed format, giving the dates, times of each series of measurements and equipment in use. The actual measurements of each recording, together with comments on any discarded measurements, shall also be submitted.	
1.6	No burning of debris, construction wastes or vegetation shall be allowed on the Site.	
1.7	An adequate fire break shall be maintained between the Works Areas and areas outside the Works Areas.	

Kau Sai Chau Golf Course Requirements on Environmental Protection Measures Contract Specfication

Clause	Environmental Protection Measure	Implementation Status
1.8	The Contractor shall ensure that all plant and equipment is effectively maintained, serviced and repaired at appropriate regular intervals.	
1.9	The Contractor shall brief and train the construction crew in the importance of confining activities to permitted areas.	
	Air Quality: Particulates	
1.10	The Contractor shall devise and arrange methods of working to minimise dust emissions, and shall provide experienced personnel with suitable training to ensure that these methods are implemented.	
	The Contractor shall implement dust suppression measures which shall include, but not be limited to, the following:-	
	(a) Stockpiles of sand and aggregate greater than $20m^3$ for use in concrete manufacture shall be enclosed on three sides, with walls extending above the pile and 2 metres beyond the front of the pile.	
	(b) 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.	
	(c) Areas within the Site where there is a regular movement of vehicles shall be watered to suppress dust during dry and windy weather.	
	(d) Conveyor belts shall be fitted with windboards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize dust emission. All conveyors carrying materials which have the potential to create dust shall be totally enclosed and fitted with belt cleaners.	
1.11	The Contractor shall follow an Event Contingency Plan (see table 5.4 of the EM&A Manual) in order that air quality and noise standards are not exceeded during the course of the construction.	

Clause	Environmental Protection Measure	Implementation Status
	Water Quality	
1.12	The Contractor's attention is drawn to the Buildings Ordinance, the Water Pollution Control Ordinance, and the Technical Memorandum "Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters" issued by EPD.	
1.13	Baseline conditions for the various water quality parameters shall be established at the commencement of the Works. An independent Consultant appointed by the developer shall establish the baseline conditions by measuring the following water quality parameters at all designated monitoring stations:- (a) turbidity (b) dissolved oxygen concentration (DO in mg/L) (c) dissolved oxygen saturation (DOS in %) (d) Ammonical Nitrogen (e) Inorganic Nitrogen (f) Nitrate (g) Orthophosphate (h) *E.coli*	
1.14	Measurements are to be taken on 3 sampling days per week, at mid-flood and mid-ebb, for 4 consective weeks. All measurements shall be taken at 3 water depths, namely, 1m below water surface, mid-water depth, and 1m above sea bed, except that in water depth less than 6m the mid-depth measurement may be omitted.	
1.15	The Contractor shall provide the following equipments for the exclusive use of the Engineer throughout the execution of the works. (i) 3 instruments for dissolved oxygen and temperature monitoring (ii) 3 turbidity meters (iii) 3 instruments for suspended solids monitoring (iv) 1 portable battery operated Echo Sounder (v) Calibration of all instruments	

Clause	Environmental Protection Measure	Implementation Status
1.16	The Environmental Monitoring and Audit Consultant shall supply a suitable work boat and a qualified boat operator together with all equipment as described above.	
1.17	Monitoring shall be undertaken on 3 days each week. Monitoring and Control Station shall be undertaken by a series of measurements at mid-ebb or mid-flood tide conditions such that the interval between the series of measurements shall not be less than 36 hours.	
1.18	Monitoring shall be undertaken at six designated monitoring position as directed by the Engineer.	
1.19	The Contractor shall follow an Event Contingency Plan in order that water quality standards are not breached during the course of the works. Trigger, Action and Target limits shall be the basis for the plan, the definition of which is indicated in Attachment 6.1.	
1.20	Should the Station Result indicate a deterioration in water quality as evidenced by suspended solids or dissolved oxygen levels or by increase in turbidity, the Action Plan should be followed, (Attachment 6.2).	
	Drainage from Dust Suppression Facilities	
1.21	Water used for dust suppression purposes shall be laid to specially constructed settlement tanks to permit sedimentation of particulate matter. Water used for dust suppression purposes shall not be discharged direct to sea.	
	Works area compounds	
1.22	Compounds in Works Areas shall be designed to take account of contaminated surface water. This will involve provision of drainage channels and settlement lagoons 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 to be agreed with the Supervising Officer.	

Clause	Environmental Protection Measure	Implementation Status
	Spillage of oils and grease	
1.23	Oil interceptors shall be provided in works area compounds and regularly emptied to prevent release of oils and grease into the surface water drainage systems after accidental spillages. The interceptor shall have a by-pass to prevent flushing during periods of heavy rain. Oil and fuel bunders shall be bunded to prevent discharges due to accidental spillages of breaching of tanks.	
	Stockpile of materials	
1.24	Any stockpile of spoil or fill materials shall be treated to reduce erosion of the stockpile and sediment release. A separate settlement system for large stockpile shall be provided as necessary to collect contaminated surface water prior to release to the works area drainage system.	
	Periodic inspection	
1.25	The Contractor shall undertake periodic inspections to ensure that good working practice is being observed and that settlement tanks (and lagoons if appropriate) are managed and maintained to ensure optimum performance.	
	Dredging and filling	
1.26	Barges used for transporting spoils shall be loaded in a manner such that dredged material does not spill onto decks and exposed fittings.	
1.27	When dredging/filling occurs for dam construction in the Kwat Tau Tam inlet the following applies: (a) a floating silt curtain should be utilised to contain suspended solids; (b) dredging shall be curtailed when barges move in and out of the silt curtain enclosure; and (c) a slow hoist speed agreed with the Supervising Officer shall be used.	

Kau Sai Chau Golf Course Requirements on Environmental Protection Measures Contract Specfication

Clause	Environmental Protection Measure	Implementation Status
1.28	Overflow or discharge of excess water from dredgers or barges when dredging marine material is not permitted except where trailing suction hopper dredgers for dredging of uncontaminated marine materials are in use, excess water from the hopper may be discharged through an adjustable stand pipe at keel level.	
	Silt curtains	
1.29	In the event that silt curtains are required during dredging the following apply:-	
	(a) The Contractor shall be responsible for designing, agreeing with the Supervising Officer, and installing silt curtains to achieve the water quality requirements.	
	(b) Silt curtains shall be formed from tough, abrasion-resistant, permeable membranes, suitable for the purpose, supported on floating booms in such a way as to ensure that the ingress of turbid waters to the enclosed waters shall be restricted.	
	(c) The boom of the curtain shall be formed and installed in such a way that tidal rise and fall are accommodated, and that the ingress of turbid waters is limited. The removal and reinstallation of such curtains during typhoon conditions shall be as agreed with the Director of Marine.	
	Noise Control	
1.30	The Contractor shall consider noise as an environmental constraint in his planning and execution of the Works.	
	Solid Wastes Control	
1.31	Removal of Waste Material	
	(a) All construction waste material deemed unsuitable for Reclamation and all other waste material shall be disposal of at a public landfill or in some other Approved manner.	

Clause	Environmental Protection Measure	Implementation Status
	(b) Cleared vegetation shall be chopped or shredded and stockpiled on the Site for latter use or removed off site to the Contractor's tip or disposed of in some other Approved manner.	
	Hazardous Materials	
1.32	The Contractor shall ensure that all collection & disposal of hazardous materials are carried out by competent and experienced personnel or subcontractors who are licensed to provide such services.	
	Environmental monitoring and audit personnel	
1.33	The Environmental Team [employed by the Contractor] shall be responsible for the review and audit of the Contractor's designs for all environmental protection and pollution prevention proposals for all Permanent and Temporary Works.	
	Ecology	
1.34	Cognizance shall be taken of the vegetation and mangrove areas on-site to be retained. Such areas shall be clearly marked out by the Contractor under the supervision of the environmental monitoring and audit team.	
1.35	During construction of the dam the Contractor shall liaise with the environmental monitoring and audit team to ensure protection of mangroves and coastal vegetation immediately seaward of the dam site. The Contractor shall ensure that mangroves located between the check dam and the main dam (see Figure 5.2 of the EM&A manual), are preserved. Most inportantly these mangroves shall not be allowed to dry out.	
	Archaeology	
1.36	The Contractor shall brief and train the construction crew on the importance of and appropriate actions to be taken in the event of unearthing historical artifacts.	

Kau Sai Chau Golf Course Requirements on Environmental Protection Measures Contract Specfication

Clause	Environmental Protection Measure	Implementation Status
1.37	In the event that potential archaelogical finds are unearthed the Contractor shall follow the Action Plan below: 1. Works in the area should be halted, and the equipment and personnel reassigned temporarily. 2. The AMO should be contacted by the Environmental Supervisor and notified of the nature of the find, and given an opportunity to respond. 3. The AMO should have the option of delegating a salvage operation to the Environmental Supervisor should staff commitments so dictate. 4. A salvage operation should be conducted, the artifacts should be properly identified, cataloged, and removed from the site. 5. The AMO should then authorize resumption of works on the site. 6. The AMO and Sai Kung District Office shall be notified in event of disturbance of any grave site.	

ATTACHMENT 6.1

Kau Sai Chau Golf Course
Requirements on Environmental Protection Measures
Contact Specfication

	Trigger, Action and Target Levels for Water Quality		
Parameter	**Trigger Level**	**Action Level**	**Target Level**
Suspended Solids Turbidity	Station result >30% above the maximum baseline level.	Station result >30% above the maximum same day control station recording.	Station result persistently > 30% above the maximum same day control station recording.
Dissolved Oxygen	Station result <4 mg/litre dissolved oxygen for 90% of samples and/or <2 mg/litre dissolved oxygen for 90% of samples taken 2m above bottom.	Station result <30% below the minimum same day control statoin.	Station result persistently <30% below the same day minimum level recorded at control stations.

ATTACHMENT 6.2

Water Quality Event Contingency Plan

EVENT	FREQUENCY	ACTION	
		Monitoring Personnel	*Contractor/operator*
Breach of Trigger Values	One sample	Inform contractor/operator	Check working methods/practices to identify any immediate causes; take appropriate remedial action if necessary
	Two consecutive samples	Inform EPD, AFD, contractor/operator; resample to confirm result	
Breach of Action Level	One sample	Inform EPD, AFD, contractor/operator; resample to confirm result	Check working methods/practices to identify any immediate causes; take approate remedial action if necessary
	Two consecutive samples	Inform EPD, contractor/operator; resample to confirm result	Undertake detailed chech of working methods and practices
		Increase frequency of monitoring	Carry out appropriate remedial action and inform EPD of remedial action
		Propose remedial action	Ensure corrective action has been undertaken and is effective
		Continue monitoring after completion of remedial action to confirm action is effective	Amend method statement, if appropriate
		Record event in monitoring report for submission to contractor/operator and EPD	
Breach of Target Level	One sample	Inform EPD, AFD, contractor/operator;	Undertake immediate check of activities and employ any appropriate mitigation
		Confirm result & increase monitoring frequency	Ensure immediate implementation of remedial action and in extreme cases cease activities
		Propose remedial action	Ensure corrective action has been undertaken and is effective and inform EPD of remedial action
		Undertake monitoring at nearest water quality SR	Amend method statment, if appropriate
		Continue monitoring after completion of remedial action to confirm action is effective	
		Complete Monitoring Report and submit to contractor/developer and EPD	

ENVIRONMENTAL COMPLAINTS PROCEDURES

CHAPTER 7

SECTION 7 ENVIRONMENTAL COMPLAINTS PROCEDURES

Figure 7.1 is a flow diagram demonstrating the procedure by which complaints are resolved. This duty falls to the Environmental Site Supervisor who will substantiate the complaint and implement the appropriate actions required.

There are essentially four main lines of communication for the general public to register complaints.

i) To the District Lands Office, Sai Kung, telephone number 7917014;

ii) To the EPD telephone hotline, direct line 8383111;

iii) To the Project Manager/Engineer; and

iv) To the Resident Site Engineer and/or the Contractor.

Further details of contact names and addresses would be available prior to construction works commencing on-site. This information may also be posted at the site entrance and at the District Lands Office.

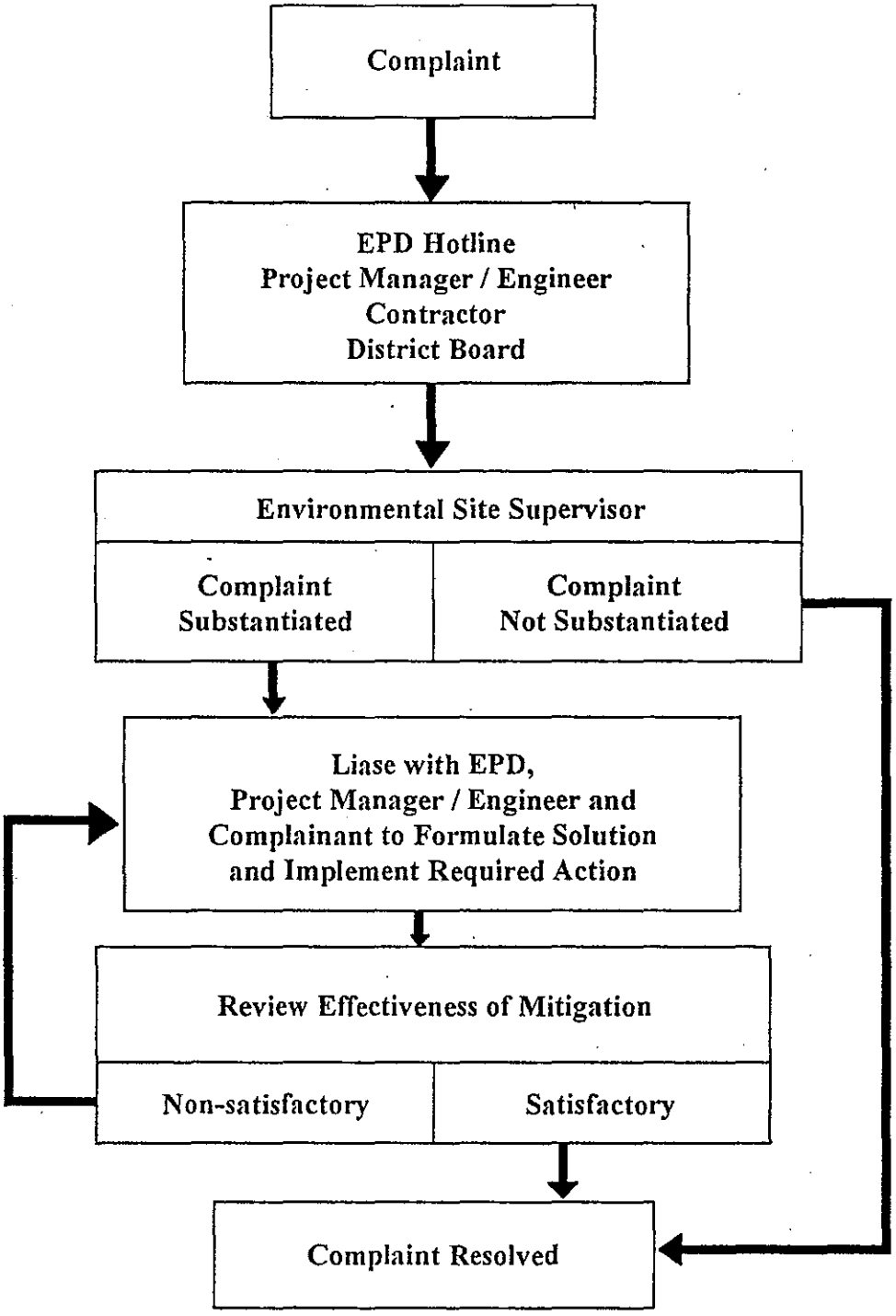


Figure 7.1 Environmental Complaints Procedure

REPORT PROCEDURES

CHAPTER 8

SECTION 8 REPORT PROCEDURES

Reporting and Review

A periodic monitoring and audit report would be prepared and submitted simultaneously to the senior management representative and to EPD. The frequency of reporting should be agreed with EPD but is recommended to be monthly during the construction period.

The report would be a concise account of the environmental monitoring and restoration programme during the previous period and would include:

- Summary - A concise summary of major incidents and performance during the period and recommendations for the coming period;
- Project Data - A synopsis of the project organisation; project programme; management liaison structure;
- Monitoring/Audit Requirements - Summary of parameters to be monitored;
- Trigger/Action/Target Levels, Action Plans, environmental protection requirements in contract documents, and engineering conditions, and performance criteria for ecological works and landscape restoration;
- Monitoring Methodology - Monitoring equipment used, locations, duration/frequency;
- Monitoring Results - Parameter, data, 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 for 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.;
- Appendices - Appropriate drawings/tables of monitoring locations, sensitive receiver locations, environmental monitoring and audit requirements, etc.

All monitoring should be recorded on daily record sheets recording:-

(a) sampling points;
(b) sampling time;
(c) monitored levels;
(d) equipment used;
(e) weather conditions; and

(f) activities being carried out on site.

The originals of all daily record sheets should be retained on site and copies should be included in the monthly reports.

The following reports should be prepared to an agreed format:

(a) a report on the baseline water quality monitoring should be prepared within 14 days of the completion of the monitoring.

(b) monthly EM&A reports of impact monitoring.

The monthly report should include a comprehensive analysis of the data and, for impact monitoring, the details of any trigger, action, or target levels exceeded, remedial measures and any further recommendations for action. This report should also give dates and times of each series of measurements together with comments on any discarded or repeated measurements. All monitored data should be compared with the baseline levels and trigger, action and target levels.

Five copies of the monthly EM&A report should be submitted no later than the 10th day of the monthy reporting period.

A floppy disk containing all the monitored data should be submitted to EPD with the monthly report. The format of the data should be agreed with EPD prior to the first report.