Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung

Monthly Environmental Monitoring & Audit (EM&A) Report for May 2007

(Report No. 382210/017)

Report Authorized For Issue By:	
	For and on Behalf of Black & Veatch Hong Kong Limited

Black & Veatch Hong Kong Limited
Room 1201-09, Millennium City 5,
418 Kwun Tong Road,
Kowloon, Hong Kong

The Hong Kong Jockey Club
One Sports Road
Happy Valley
Hong Kong

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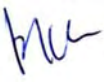
	Name	Signature	Date
Prepared	**Esther Tong**		June 2007
Checked	**Manuel Chua**		June 2007
Reviewed	**PK Lee**		June 2007

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Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung
(Independent Environmental Checker)

CHECK CERTIFICATE

1. We certify that professional skill and care have been used in the checking of the Environmental Team's (ET) No.17 Monthly EM&A Report for May 2007 for the construction of Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung.

2. We certify that the ET's EM&A programme for the reporting period has been satisfactorily executed and the No.17 Monthly EM&A report for May 2007 has been verified.

3. We would comment that our evaluation of the ET's EM&A is based on a random audit process which cannot be guaranteed to have all non-conformities identified.

Signed 

_____
Independent Environmental Checker

Name Gary Tam

of Hong Kong Productivity Council
3/F., HKPC Building,
78 Tat Chee Avenue,
Kowloon

Date 5th June 2007

Executive Summary

This is the seventeen Monthly Environmental Monitoring and Audit (EM&A) Report prepared by Black & Veatch, the designated Environmental Team (ET), for the Project "Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung". The construction works of golf course was commenced on 16th January 2006. This report presents the results of the EM&A works conducted in the month of May 2007 (25th April to 24th May 2007).

Summary of construction works undertaken during this report period

No dredging of the permanent intake and outfall pipelines for the desalination plant has been carried out. Hong Kong Jockey Club (HKJC) is still gathering supplementary information to EPD for the discharge licence application. Construction work of Irrigation Lake 1D and associated pipelines for the desalination plant were mostly completed (storage of the product water from the desalination plant for East Course irrigation will be carried out in future). As there is no discharge licence for the desalination plant, the plant will not be operated until approval was obtained from EPD.

Site formation work at the scaring areas within the East Course boundary was completed in the previous reporting month. Some hydroseeding areas were not fully covered with hydroseed and re-hydroseeding was required. The shrub planting was commenced in late April 2007 at the hydroseeded slopes and is in progress. According to the latest construction programme prepared by the Contractor, most of the northern portion of East Course will be planted with turf in the dry season of 2007 (February to March 2007). However, only golf holes 5 & 8 were completed (except green) before the wet season 2007. Turf planting at Holes 4 and 6 were in progress. The next planting golf holes are Holes 3 & 7. All of them were located at Northern section of East Course. For southern portion of the East Course, major construction works were site formation and construction of permanent drainage/irrigation systems. According to HKJC, Hole 11 will be the first golf holes for turf planting. Central portion will be the last portion to be planted with turf and mainly in the wet season of 2007. Applications of fertilizers at Holes 4, 5, 6 & 8 were recorded. Biological pesticide was applied to Holes 4, 5, 6 & 8 to suppress the growth of the army worms. Chemical application might be necessary when the biological pesticide application was considered ineffective.

Closed low flow drainage system includes lake formation, gravity drains, rising main, underground water tanks and pumping stations. The construction of gravity drains from Lake 1D to existing reservoir was completed and reinstatement work was in progress during the reporting month. The construction of the closed low flow drainage for the East Course is in progress (all underground tanks and related pumping stations were completed). Lake 1D and Lake near Hole 4 were completed and were under testing and commissioning. Lake near Hole 10 will be completed in the next reporting month.

Rainstorm events occurred on 19 and 20 May 2007 with rainfall was ranging from 70-100 mm. An *ad hoc* site audit was carried out and heavy silty runoff was observed at all streams, fresh water inland marsh and marine water. Additional water sampling due to the heavy rainstorm was carried out on 20 May 2007 which indicated that high limit level exceedances on suspended solids (ranged from 631 mg/L to 3,970 mg/L) and turbidity (ranged from 704 NTU to 3,870 NTU) at fresh water monitoring stations. Low concentrations of suspended solids and turbidity were recorded at fresh water control station at 45 mg/L and 41 NTU respectively. For marine monitoring stations, high concentrations of suspended solids were also recorded at outlet of fresh water inland marsh (23.2 mg/L) and temporary barging point (24.7 mg/L) while the suspended solids concentrations at control monitoring station (M_A) was 2.5 mg/L only.

Regarding the high exceedances of suspended solids and turbidity recorded, the temporary drainage installed on site was considered insufficient and ineffective. ET and the Engineer repeatedly reminded the Contractor to prevent silty/nutrient/pesticides runoff to the streams and marine water. The Contractor was reminded to critically review and revise the TDMP according to the actual site progress, install sufficient

temporary drains and provide sufficient desilting facilities in order to prevent/divert/collect the silty runoff and discharge to marine/streams according to the discharge licence and Water Quality Objectives (WQO) of Port Shelter.

Long-term nutrient exceedances are recorded at the downstream of fresh water inland marsh since February 2007. Due to the poor water quality recorded on 16 April 2007 from the direct discharge of the Contractor's (CHEC) temporary sewage treatment plant, an additional sampling was taken on 12 May 2007 due to the overflow incident of the sewage discharge from the temporary storage tank which was installed on 5 May 2007 in order to prevent contamination of the fresh water inland marsh as the interim mitigation measure until CHEC repair and resume the sewage treatment plant.

Similar to the previous discharge water record, high concentrations of ammonia nitrogen (286 mg/L), biochemical oxygen demand (134 mg/L) and *E. coli* (9,600,000 cfu/100mL) were recorded and all concentrations exceeded the EPD's discharge licence requirement. We recommended CHEC to dispose the contaminated water properly offsite by a licenced Contractor offsite. CHEC agreed to carry out weekly water samples for the coming month to check the compliance of the sewage treatment plant. If the water quality complies with the EPD's discharge licence requirement, the water quality monitoring frequency may decrease to monthly basis but subject to the stability of the sewage treatment plant performance. ET recommended all discharge water from the sewage treatment plant should be temporary stored and disposed offsite properly by a licenced Contractor until the sewage treatment plant was rectified.

No water was discharged from the sewage treatment plant since early May 2007. The ammonia nitrogen, nitrate nitrogen and total inorganic nitrogen was gently decreased during this reporting month. The water quality monitoring data during this reporting month confirmed that the cause of the nutrient exceedances at the downstream of fresh water inland marsh was due to the poor performance of the CHEC's temporary sewage treatment plant and not turf-related activities.

Regarding Stream B2 buffer zone intrusion which causes vegetation clearance in Nov 2006, buffer zone intrusion at Stream C near Hole 16 tee was recorded in May 2007. Incident report (intrusion due to construction of permanent drainage system) was prepared and submitted by the Contractor. Stream C buffer zone was reinstated by planting native shrub which is similar to Stream B2 during the reporting month. The Contractor was reminded to water frequently at the reinstated areas of Streams B and C.

Construction of permanent bridges at Streams A, B, C and fresh water inland marsh were completed before wet season (March 2007). Remaining work is mainly finishing work and in progress. Concrete batching plant has been in operation and is expected to be dismantled by the early July 2007.

Environmental Monitoring and Audit Progress

A summary of monitoring activities in this reporting period is shown as follows:

24-hour Total Suspended Particulates (TSP) monitoring at GCA B1	7 times
Water quality monitoring (marine + freshwater)	12 times
Terrestrial Ecology	1 time
Marine Ecology	0 time*
Landscaping & Visual	2 times

* For marine ecology, it will be carried out on quarterly basis and the next coral monitoring will be in June 2007.

Air Quality

7 sets of 24-hour TSP monitoring were carried out on 25th, 26th and 30th April, 7th, 12th, 18th and 23rd May 2007 at Bungalow A (GCA B1) at Kau Sai Chau during this reporting month. Additional air quality monitoring was carried out on 26th April 2007 which was due to action level exceedance record on 13th Apr 2007.

Water Quality

12 sets of water quality monitoring were carried out on 25th, 27th and 30th Apr, 2nd, 4th, 7th, 9th, 11th, 14th, 16th, 20th and 21st May 2007 at 9 marine and 7 freshwater monitoring locations. Rainstorm signal was hoisted on 19th and 20th May 2007 during the reporting month.

Terrestrial Ecology

Terrestrial ecology was conducted on 30th May 2007. The entire project site was under construction, and the demarcation of the stream buffer zone had been established for all identified streams. The permanent access bridges for Streams A, B and C had been constructed. The downstream section of Stream A channel was accidentally filled up by boulders before and remedial work will be implemented by the Contractor to clear the rubbles manually and restore the downstream. Some vegetation within the Stream B2 buffer zone had been previously damaged during the construction, and remedial replanting has been implemented. In general, Streams A, B, and C were protected by the buffer zone, while D was in natural conditions similar to the condition during the Baseline Survey.

Marine Ecology

Marine ecology was not required in May 2007. The next marine monitoring will be conducted in June 2007.

Landscaping & Visual

Landscape and visual monitoring and site audits were carried on 10th and 22nd May 2007. Site formation, shaping and planting works are being carried out at present. Shrub seedlings were planted on slopes of golf holes of 2, 4, 5, 10 and 11. The newly planted shrubs are fair in health. Small-scale erosion at the hydroseeded areas were occurred due to heavy rainfall on 22nd May 2007. The coverage of newly hydroseeded area is not in good condition. The Contractor shall take measures to improve the condition of damaged trees and provide adequate watering to newly hydroseeded area, planted shrubs and transplanted trees.

Damaged trees next to the administration building were still unprotected after being damaged by the adjacent construction activities. Wooden boards and garbage were put adjacent to the retained trees. Most of the labels of the retained trees were disappeared.

All transplanted trees were in fair condition except for T848. Mal-pruning of transplanted trees has not been rectified. Construction material was stockpiled within tree protection zones. A statement on the cause of death of tree T925 recorded in the last report is still outstanding.

The following works have been outstanding since July 2006: (i) Carry out surgery to damaged trees, (ii) Report the cause of death of tree T925, (iii) Re-fix the label of retained tree for easy identification, (iv) Maintain the tree protection zone required and remove all construction material / debris from the tree protection zone, (v) More frequent watering for transplanted trees, planted vegetation and hydroseeded grass and (vi) Rectify the mal-pruning practice of the transplanted trees.

Environmental Site Auditing

Four weekly joint environmental site audits were carried out on 2nd, 8th, 15th and 21st May 2007, with the Engineer and Contractor's representatives. A monthly joint environmental site audit was carried out on 21st May 2007 by the Contractor's Representative, ET's representative and Independent Environmental Checker (IEC).

Environmental Non-conformance

Air Quality

One action limit level exceedance of 24-hour TSP was recorded at GCA B1 on 18th May 2007 at 215.1 μg/m³. Additional samples were taken on 31st May 2007 (next reporting month). Exceedance was considered project-related.

Marine Water Quality

Nineteen exceedances were recorded at KLW, M_Marsh, TTC, M_BP, M_Coral and KS. Exceedances measured at TTC, KS, M_BP and M_Coral were mainly due to rainstorm events occurred on 19th and 20th May 2007. Exceedances at TTC were mainly ammonia nitrogen. Water quality exceedances recorded during and after the rainstorm events were considered project-related.

Freshwater Quality

Twenty-six exceedances of turbidity and twenty-five exceedances of suspended solids were recorded at Streams A, B, C and fresh water inland marsh.

Seven exceedances of ammonia nitrogen, twelve exceedances of nitrate nitrogen, five exceedance of nitrite nitrogen, twelve exceedances of total inorganic nitrogen and ten exceedances of chlorophyll a were recorded at downstream of fresh water inland marsh. As the concentrations of ammonia nitrogen, nitrate nitrogen and total inorganic nitrogen were gradually decreased than previous reporting month when there was no direct discharge of wastewater from the sewage treatment plant to fresh water inland marsh since early May 2007. Main reason is due to the continuous discharge of poor wastewater quality from temporary sewage treatment plant at the contractor's site office. All exceedances were considered project-related.

As the upstream monitoring locations at Streams B & C (F_UB and F_UC) are located within the construction work area since September 2006, they represent and become impact monitoring stations instead of control stations.

All notifications of exceedances and the subsequent exceedance incident reports have been forwarded to the relevant parties.

For those considered project-related exceedances at all streams and freshwater and marine water, the Contractor was required to critically review the temporary drainage management plan and implement necessary improvement to prevent runoff from the construction site to the marine water and stream courses. The Contractor was also requested to rectify the situation as soon as possible. The water quality monitoring results revealed that the temporary drainage installed on site was insufficient and should be improved especially at those concern areas.

No environmental complaint was received in this reporting month. One pink form was issued by EPD regarding to the construction dust generated from construction site without provision of sufficient dust mitigation measures. This is the second pink form on air quality issued by EPD since the commencement of this project.

Implementation Status of Environmental Mitigation Measures

The Contractor was reminded the following issues and to take actions if necessary:

Air Quality

- Increase frequency of watering at main haul roads and rock breaking areas;
- Pave major haul roads with gravels/concrete to minimize the dust emission due to the heavy traffic;
- Cover all soil/sand/aggregates stockpiles with tarpaulin or other measures to reduce the dust emission; and
- Install hoarding at the main exit/entrance of the construction site;

Waste Management

- Properly dispose of the vegetation stockpiles, general refuse and construction waste off-site;
- Provide construction waste sorting area;
- Provide sufficient mobile toilets at remote site areas; and
- Properly maintain the temporary sewage treatment plant

Ecology

- Remove remaining rubbles at downstream of Stream A after temporary bridge dismantling;
- Maintain the reinstated conditions (planting shrub) at Stream B2 buffer zone since March 2007 and Stream C buffer zone since May 2007; and
- Rectify and remediate the silt deposit at Streams A, B and C after rainstorm events.

Water Quality

- Implement temporary drains according to Temporary Drainage Management Plan (TDMP) to avoid silty/nutrient/pesticide runoff;
- Provide sufficient preventing and/or mitigation measures at all open cut areas to avoid silty runoff;
- Minimize the water quality impact when undertaking cut-and-fill works and turfing. It is important to provide sufficient temporary drainage system at critical areas to confine, collect and provide proper treatment before discharging to marine water and stream courses to ensure that the water quality is complied with WQO requirements;
- Provide sufficient treatment facilities before water discharges from construction site;
- Maintain the integrity of silt curtains and remove settled silt within the silt curtain which have been installed outside the fresh water inland marsh, near Hole 2, near Hole 4, inactive culture zone and Stream A;
- Strengthen the preventive/interim measures for avoiding silty runoff from the exposed areas to the low lying areas. More frequent maintenance of the silt fence is necessary; and
- Provide sufficient temporary drainage system at all temporary bridges.

Landscape & Visual

- Protect the retain trees with sufficient watering mainly located at the administration building;
- Provide sufficient water to the retain trees, transplanted trees, hydroseeding areas;
- Provide tree protection zone for all retain tree at the administration building; and
- Provide incident report for the death of the retain trees.

Future Key Issues

General issues to be considered in the coming month include:

- Potential dust generation from activities on-site : permanent drainage/irrigation system construction, concrete batching plant operation and soil/sand/aggregates stockpiles;
- Turf establishment at northern East Course (Holes 3-8);
- Implement sufficient and improve the temporary drainage system (and make use of the permanent drainage system) on site to prevent silty/nutrients/pesticides runoff discharging to marine and stream courses before the coming wet season 2007;
- Apply the discharge licence for the desalination plant near to the existing KSC pier before operation;
- Dispose of construction wastes, vegetation and general refuse off-site; and
- Hydroseed the bare ground/temporary/permanent slopes according to the golf course design.

Key issues at particular areas:

- Review and revise the Temporary Drainage Master Plan (TDMP) for the silty runoff and turf establishment period prepared by the Contractor for Engineer and Jockey Club's approval;
- Carry out water quality monitoring for nutrients/pesticides due to turf establishment;
- Carry out coral monitoring for the transplanted corals on quarterly basis; and
- Carry out coral monitoring when desalination plant operates in dry season

1. Introduction

1.1 Background of the Project

1.1.1 Black & Veatch (hereinafter called the "ET") was appointed by Hong Kong Jockey Club (hereinafter called the "Project Proponent") to undertake Environmental Monitoring and Audit (EM&A) for "Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung" (hereinafter called the "Project"). Under the requirements of Section 4 of Environmental Permit EP-224/2005, EM&A programme as set out in the EM&A Manual is required to be implemented. In accordance with the EM&A Manual, environmental monitoring of air quality, water quality, terrestrial and marine ecology, landscape and visual, archaeology (watching brief) and land contamination are required for the Project. Application for Variation of an Environmental Permit by the Project Proponent on 2 August 2006 (Application No. VEP-222/2006) and the EP was superseded by EP-224/2005/A.

1.1.2 This report summarises the environmental monitoring and audit works for the Project in May 2007 (from 25th April to 24th May 2007).

1.2 Purpose of the Report

1.2.1 This is the seventeen EM&A report which summarizes the impact monitoring results and audit findings for the EM&A programme during the reporting period from **25th April** to **24th May 2007.**

1.3 Structure of the Report

1.3.1 The structure of the report is shown in Table 1.1.

Table 1.1 Structure of the Report

Section		Description
1	Introduction	Details the scope and structure of the report
2	Project Information	Summarizes background and scope of the project, site description, project organization and contact details, construction programme, the construction works undertaken and the status of environmental permits/licenses during the reporting period.
3	Environmental Monitoring Requirement	Summarizes the monitoring parameters, programmes, methodology, frequency, location, action and limit levels, event action plans, environmental mitigation measures as recommended in the EIA report and relevant environmental requirements.
4	Implementation Status on Environmental Mitigation Measures	Summarizes the implementation of environmental protection measures during the reporting period.
5	Monitoring Results	Summarizes the monitoring results obtained in the reporting period.
6	Environmental Site Auditing	Summarizes the audit findings of the weekly site inspections undertaken within the reporting period.
7	Environmental Non-conformance	Summarizes any monitoring exceedance, environmental complaints and environmental summons within the reporting period.
8	Future Key Issues	Summarizes the impact forecast and monitoring schedule for the next three month (25 Jun 2007 – 24 Aug 2007).
9	Recommendations and Conclusions	Lists out any recommendations and provides an overall conclusion of the results and findings of the EM&A programme for the reporting period.

2. Project Information

2.1 Background

2.1.1 The Project comprises the following major components:

- Construction of the third 18-hole public golf course on the east side of the island, south of the existing golfing area;
- A new irrigation lake to collect surface runoff from the new 18-hole golf course. Water stored at the new irrigation lake can also be diverted to existing reservoir for tertiary treatment and recycling;
- A new desalination plant adjacent to the existing pier to serve as an additional irrigation water supply for the new golf course during dry season; and
- Expansion of existing administration and maintenance buildings.

2.1.2 The potential environmental impacts of the Project have been studied in the Environmental Impact Assessment (EIA) report (EIAO Register No. AEIAR- 091/2005). The EIA was approved on 14 November 2005 under the EIAO. An Environmental Permit (EP-224/2005) was granted on 28 November 2005. Application for Variation of an Environmental Permit by the Project Proponent on 2 August 2006 (Application No. VEP-222/2006) and the EP was superseded by EP-224/2005/A.

2.2 Site Description

2.2.1 A layout plan of the Project is provided in **Figure 1.1**.

2.3 Project Organization

2.3.1 Project organization and lines of communication are shown in **Figure 1.2**.

2.4 Construction Programme

2.4.1 The tentative construction programme for the Project is presented in **Annex A**. The construction works were commenced on 16 January 2006 and are scheduled to be completed by end of July 2007.

2.5 Status of Environmental Submission

2.5.1 A summary of the reporting requirement for compliance with EP conditions of the Project is listed in Table 2.1.

Table 2.1 Summary of Compliance with EP Conditions

EP-224/2005	Environmental Permit Submission	Status	Remarks
2.3	Management organization of the main construction companies and/or any form of joint ventures associated with the construction of the Project.	Submitted	At least one week before the commencement of construction of the Project.
2.4	Contamination Assessment Plan (CAP) submission. If land contamination is confirmed by	Submitted	The Final Site Remediation Report (FSRR) was approved by EPD in this reporting month.

EP-224/2005	Environmental Permit Submission	Status	Remarks
	the site investigation, submission of a Remediation Assessment Plan (RAP) including a Contamination Assessment Report (CAR) is required.		
3.6	Detailed methodology for Coral Transplantation submission to the Director for approval.	Approved	Approved on 16th November 2006. Coral transplantation at Site D2 was completed in early December 2006. No dredging work for the desalination plant's intake and outfall pipelines was carried out. AFCD has no comment for the coral donor site survey, coral mapping survey and coral transplantation reports.
4.1	EM&A Manual (revised)	Submitted	At least two weeks before commencement of construction of the Project.
4.3	Baseline Monitoring Report	Submitted	At least two weeks before commencement of construction of the Project
4.5	Monthly EM&A Report	Submitted	within 10 working days after the end of the reporting month
5.1	Set up a dedicated web site and notify the Director in writing the Internet address.	Completed	Within 6 weeks after the commencement of construction of the Project (http://www.kscgolf.com/ema/index.asp)
3.4	Variation of Environmental Permit for the construction of the temporary crossings at Stream B during wet season.	Completed	Variation of Environmental Permit was approved on 18th August 2006. The revised registered EP was EP-224/2005/A.

2.6 Summary of EM&A Requirements

2.6.1 The EM&A programme requires environmental monitoring for air quality, water quality, terrestrial and marine ecology, landscape and visual, archaeology (watching brief) and land contamination. The EM&A requirements for each parameter are described in subsequent sections, including:

- All monitoring parameters;
- Action and Limit Levels for all environmental parameters;
- Event and Action Plans; and
- Environmental mitigation measures, as recommended in the project EIA final report.

2.6.2 A summary of impact EM&A requirements is presented in Table 2.2.

Table 2.2 Summary of Impact EM&A Requirements

Impacts	Parameters/descriptions	Locations	Frequencies	Duration
Air Quality	24-Hour TSP	1 Location	Once every 6 days	During Construction
	1-Hour TSP	1 Location	Three times in every 6 days	During Construction (As required when complaint received)
Water Quality	Dissolved Oxygen, Temperature, Turbidity, pH, Salinity and SS	9 marine and 7 freshwater locations	**First 3 months** 3 times a week, mid-ebb and mid-flood tides. If there is no exceedance occurs for the first 3 months, reduce to once per week.	During Construction
	Dissolved Oxygen, Temperature, Turbidity, pH, Salinity, SS, NO3-N, NO2-N, NH3-N, TP and selected pesticides.	9 marine and 7 freshwater locations	Once per week. If there is no exceedance occurs, monitoring frequency is subjected to change and shall be agreed with EPD.	During Construction: turf establishment period (permanent low flow drainage is not completed)
	Dissolved Oxygen, Temperature, Turbidity, pH, Salinity, SS, NO3-N, NO2-N, NH3-N, TP, Chl-a and selected pesticides.	9 marine and 6 freshwater locations	A 2-year of monitoring period for the operation phase is proposed. Monitoring should be carried out on bi-weekly basis for the first 12 months, after when the frequency will be reviewed by EPD.	During Operation
	Dissolved Oxygen, Temperature, Turbidity, pH, Salinity, SS, NO3-N, NO2-N, NH3-N, TP, Chl-a and selected pesticides	8 marine locations	Additional water quality monitoring shall be carried out after heavy rain storm or when there is an overflow event from the reservoir, irrigation buffer lake or detention ponds/tanks.	During Construction and Operation
Terrestrial Ecology	Monitoring aquatic fauna	Streams B, C & D	Once a month	During Construction
	Environmental Site Inspection mainly on intact of buffer zones	Streams A, B and C	Once a week	During Construction

Impacts	Parameters/descriptions	Locations	Frequencies	Duration
Marine Ecology	Transplanted corals	Site D2	Quarterly for one year after transplantation	During construction
	Natural corals	Site C, Site B2, Site D2, and the Control Site.	**<u>For Site D2 and the Control Site:</u>** Weekly at the first two weeks of dredging works for the desalination plant pipelines. If no exceedance was recorded, the monitoring schedule would be changed to biweekly till the pipeline construction works are finished. **<u>For Site C, B2 and the Control Site:</u>** Monthly for the first three months of the construction phase. If no exceedance was recorded, the monitoring schedule would be changed to quarterly during the rest of the construction phase.	During Construction
		Site C, Site D2 and the Control Site.	First three months would be monthly conducted during the first two years of the operation phase. If no exceedance was recorded, the monitoring schedule would be changed to semi-annually, i.e. once in dry season and once in wet season.	During Operation
	Seagrass bed	Site D3, and at Site D2 if seagrasses were found during the baseline monitoring.	Weekly during the first two weeks of dredging works, and then biweekly till the pipeline construction works are finished.	During Construction
		Site D3, and at Site D2 if seagrasses were found during the baseline monitoring.	During the first two years of the operation phase. The monitoring schedule during the first three months would be monthly. After that, the monitoring schedule would be changed to semi-annually, i.e. once in dry season and once in wet season.	During Operation
Landscape and Visual	Audits to ensure effective implementation of mitigation measures	Project area and at visual sensitive receivers	Auditing inspections and reporting shall be undertaken once every two weeks of the construction phase and once every two months of the operation phase.	During Construction and Operation
Archaeology (Watching Brief)	Monitor archaeological potential sites at major cut areas	Hole 2, Hole 11, Hole 12, Hole 14, Hole 15 and Hole 16.	The archaeologist should keep the AMO informed of the progress of watching brief. The archaeologist should submit progress reports every 3 months during the programme of the watching brief.	During Construction
Land Contamination	Total Sulphur and Total Lead	Locations 2, 3, 6, 7 & 8	One month before commencement of work at the identified 5 hotspots	During Construction
General Site Conditions	Environmental Site Inspection	Works areas and areas affected by works	Periodically (weekly basis)	During Construction

3. Environmental Monitoring Requirements

3.1 Air Quality

Monitoring Requirement

3.1.1 24-hour TSP monitoring was carried out at GCA B1 to monitor the construction dust impact level in this reporting period.

3.1.2 The established Action/Limit Levels (AL levels) for the 1-hour and 24-hour TSP monitoring works are summarized in Table 3.1 and Table 3.2.

Table 3.1 Action and Limit Levels for 1-hour TSP

Location	Description	Action Level	Limit Level
GCA B1	**Bungalow A** adjacent to Kau Sai Chau Public Golf Course Administration Building	277.2 μg m^{-3}	500 μg m^{-3}

Note: The action levels for GCA B1 are developed based on baseline monitoring result.

Table 3.2 Action and Limit Levels for 24-hour TSP

Location		Action Level	Limit Level
GCA B1	**Bungalow A** adjacent to Kau Sai Chau Public Golf Course Administration Building	187.4 μg m^{-3}	260 μg m^{-3}

Note: The action levels for GCA B1 are developed based on baseline monitoring result.

Monitoring Parameters, Frequency and Programme

3.1.3 The monitoring parameters and frequency are summarized in Table 3.3. The monitoring programme for the reporting period is shown in **Annex B**.

Table 3.3 TSP Monitoring Parameter and Frequency

Parameter	Frequency
24-hour TSP	Once every 6 days
1-hour TSP	3 times every 6 days (as required in case of complaints)

Monitoring Locations

3.1.4 In accordance with the EM&A Manual, one monitoring station (GCA B1) was selected and shown in **Figure 3.1**.

Monitoring Equipment

3.1.5 24-hour and 1-hour TSP (in case of complaints received) were performed using High Volume Samplers (HVS) and measured in-situ respectively. 24-hour TSP level of samples were collected using filters and High Volume Sampler and the collected samples were determined by a local HOKLAS accredited laboratory upon receipt of the samples and 1-hour TSP level will be performed in-situ.

3.1.6 High volume samplers (HVS - Model GS-2310 Accu-vol) complete with the appropriate sampling inlets were installed for 24-hour TSP sampling. The HVS is composed of a motor, a filter holder, a flow controller and a sampling inlet and its performance specification complies with USEPA Standard Title 40, Code of Federation Regulations Chapter 1 (Part 50 Appendix B). A portable dust meter was used for the 1-hour TSP monitoring. Table 3.4 summarises the equipment used.

Table 3.4 Air Quality Monitoring Equipment

Equipment	Model
HVS Sampler	GS 2310 Accu-vol system
Calibrator	GMW 25
1-hour TSP Dust Meter	Laser Dust Monitor – Model LD-1 (L)

Monitoring Methodology and Calibration Details

24-hour TSP Monitoring

(i) Field Monitoring, Operation & Analytical Procedures

3.1.7 Operating/analytical procedures for the operation of HVS are as follows. The sampler was placed on a horizontal platform with appropriate supporting structure such that:

- the filter was at least 1.3 meters above ground;
- no two samplers were placed less than 2 metres apart;
- the distance between the sampler and an obstacle, such as buildings, were at least twice the height that the obstacle protrudes above the sampler;
- a minimum of 2 metres separation from walls, parapets and penthouses were required for the rooftop samplers;
- a minimum of 2 metres separation from any supporting structure, measured horizontally was provided;
- airflow around the sampler was unrestricted;
- no furnaces or incineration flues were operating near the sampler;
- the sampler was more than 20 metres from the dripline; and
- any wire fence and gate to protect the sampler, did not cause any obstruction during monitoring.

3.1.8 Prior to the commencement of the dust sampling, the flow rate of the high volume sampler was properly set (between 1.1 m3/min. and 1.4 m3/min.) in accordance with the manufacturer's instruction to within the range recommended in USEPA Standard Title 40, CFR Part 50.

3.1.9 For TSP sampling, fibreglass filters (G810) were used [Note: these filters have a collection efficiency of > 99% for particles of 0.3 mm diameter].

3.1.10 The power supply was checked to ensure the sampler worked properly.

3.1.11 On sampling, the sampler was operated for 5 minutes to establish thermal equilibrium before placing any filter media at the designated air monitoring station.

3.1.12 The filter holding frame was then removed by loosening the four nuts and carefully a weighted and conditioned filter was centered with the stamped number upwards, on a supporting screen.

3.1.13 The filter was aligned on the screen so that the gasket formed an air-tight seal on the outer edges of the filter. Then the filter holding frame was tightened to the filter holder with swing bolts. The applied pressure should be sufficient to avoid air leakage at the edges.

3.1.14 The shelter lid was closed and secured with the aluminum strip.

3.1.15 The timer was then programmed. Information was recorded on the record sheeting, which included the starting time, the weather condition, and the filter number (the initial weight of the filter paper can be found out by using the filter number).

3.1.16 After sampling, the filter was transferred from the filter holder of the HVS to a sealable plastic bag and sent to the laboratory for weighing. The elapsed time was also recorded.

3.1.17 Before weighing, all filters were conditioned for 24 hours before weighing under temperature of 25°C ±3°C and the relative humidity (RH) < 50% ±5%, preferably 40%. The HOKLAS laboratory (ALS Technichem (HK) Pty Ltd) has comprehensive quality assurance and quality control programmes.

(ii) Maintenance

3.1.18 Proper maintenance would be provided for the HVS as described below:

3.1.19 The HVS motors and their accessories have been properly maintained. Appropriate maintenance such as routine motor brushes replacement (time interval for replacement is about 500 hours) and electrical wiring checking have been conducted to ensure that the equipment and necessary power supply were in good working condition.

3.1.20 Initial calibration of HVS was conducted upon installation of equipment. The subsequent calibration would be provided at 2-month intervals using GMW-25 Calibration Kit.

1-hour TSP Monitoring

(i) Measuring Procedures

3.1.21 The measuring procedures of the 1-hour dust meter have been in accordance with the Manufacturer's Instruction Manual as follows:

- Set POWER to "ON", push BATTERY button, make sure that the meter's indicator is in the range with a red line and allow the instrument to stand for about 3 minutes (Then, the air sampling inlet has been capped).
- Push the knob at MEASURE position.
- Push "O-ADJ" button. (Then meter's indication is 0).
- Push the knob at SENSI ADJ position and set the meter's indication to S value described on the Test Report using the trimmer for SENSI ADJ.
- Pull out the knob and return it to MEASURE position.
- Push "START" button.
- All measurement procedures in section 2.3 of the approved EM&A Manual are followed during the reporting period.

(ii) Maintenance

3.1.22 The 1-hour TSP meter would be checked at 3 month intervals and calibrated at 1-year intervals throughout all stages of the air quality baseline monitoring.

Event and Action Plans

3.1.23 The Event and Action Plan (EAP) for air quality monitoring is presented in **Annex C**.

3.2 Water Quality

Monitoring Requirement

3.2.1 Water quality monitoring was conducted in accordance with the EM&A Manual. Tables 3.5 & 3.6 show the established Action/Limit Levels for the water environmental monitoring parameters.

Table 3.5 Derived Summaries of Action and Limit Levels for Marine Water Quality

Parameters	Location	Action	Location	Limit
DO (Surface & Middle)	FCZ	6.0 mg/L	FCZ	5.3 mg/L
	All except FCZ	4.9 mg/L	All except FCZ	4.6 mg/L
DO (Bottom)	All	3.7 mg/L	All	3.4 mg/L
pH (depth-averaged)		N/A	All	6.5 - 8.5
SS (Depth-averaged)☆	FCZ	4.5 mg/L	FCZ	5.6 mg/L
	All except FCZ	6.1 mg/L	All except FCZ	10.6 mg/L
SS (Depth-averaged) Dredging for submarine pipelines⊕	M_RO1	6.1 mg/L	M_RO1	10.6 mg/L
Turbidity (Tby) (depth-averaged) ☆	FCZ	2.9 NTU☼	FCZ	3.9 NTU☼
	All except FCZ	3.3 NTU☼	All except FCZ	6.2 NTU☼
Ammonia Nitrogen (depth-averaged)	FCZ	0.02 mg/L	FCZ	0.03 mg/L
	All except FCZ	0.05 mg/L Δ	All except FCZ	0.05 mg/L Δ
Nitrate Nitrogen (depth-averaged)	FCZ	0.08 mg/L	FCZ	0.09 mg/L
	All except FCZ	0.09mg/L Δ	All except FCZ	0.09 mg/L Δ
Nitrite Nitrogen (depth-averaged)	FCZ	0.02 mg/L θ	FCZ	0.02 mg/L θ
	All except FCZ	0.02 mg/L	All except FCZ	0.04 mg/L
TIN (depth-averaged)	FCZ	0.12 mg/L	FCZ	0.14 mg/L
	All except FCZ	0.16 mg/L	All except FCZ	0.18 mg/L
Total Phosphorus (depth-averaged)	All	0.09 mg/L Δ	All	0.09 mg/L Δ

Remarks:
☆ : Action and limit levels are subjected to review especially for wet season throughout the construction phase of the project.
⊕ : Action and limit levels are subjected to review before the dredging works.
☼ : All are based on EM&A baseline monitoring data due to marked difference between EPD turbidity data and those from the baseline survey.
Δ : For nutrient monitoring (except NO_2-N) at non-FCZ stations, the trigger level has made reference to the existing golf course guideline values. The guideline value of NO_2-N is below the current detection limit of 0.01mg/L and thus not used.

θ : The same action and limit level of 0.02 mg/L is determined from the EM&A baseline data as 78% of the NO_2-N data are <= 0.01 mg/L and all remaining 22% equal to 0.02 mg/L.
FCZ including fish culture zones of Kai Lung Wan, Tai Tau Chau and Kau Sai
All except FCZ including remaining impact monitoring station of M_RO1, M_Marsh, M_BP and M_Coral.
Control monitoring locations: M_A & M_B

Table 3.6 Derived Summaries of Action and Limit Levels for Freshwater Water Quality

Parameters	Location	Action	Location	Limit
DO (mid-depth)		6.3 mg/L	All	4 mg/L ξ
pH (mid-depth)		N/A	All	6.0 - 9.0
SS (mid-depth) ☆	All	3.8 mg/L or 120% of upstream control station's SS at the same tide of the same day	All	8 mg/L or 130% of upstream control station's SS at the same tide of the same day
Turbidity (Tby) (mid-depth) ☆	All	3.1 NTU or 120% of upstream control station's Tby at the same tide of the same day	All	4 NTU or 130% of upstream control station's Tby at the same tide of the same day
Ammonia Nitrogen (mid-depth)		N/A	All	0.01 mg/L
Nitrate Nitrogen (mid-depth)	All	0.10 mg/L	All	0.11 mg/L
Nitrite Nitrogen (mid-depth)		N/A	All	0.01 mg/L
TIN (mid-depth)	All	0.12 mg/L	All	0.13 mg/L
Total Phosphorus (mid-depth)		N/A	All	0.02 mg/L

Remarks:
☆ : Action and limit levels are subjected to review especially for wet season.
Freshwater monitoring locations: F_UA, F_DA, F_UB, F_DB, F_UC, F_DC and F_Inland Marsh
As most of the freshwater samples were reported of NH_3-N, NO_2-N levels below the detection limit of 0.01 mg/L, limit level is set at 0.01 mg/L. Similarly for TP, a limit level of 0.02 mg/L (the detection limit of TP) is imposed.
ξ : Water Quality Objectives of the Port Shelter

Monitoring Parameters, Frequency and Programme

3.2.2 For marine water quality, measurements shall be taken at both mid-flood and mid-ebb tides and at three water depths (1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted). Should the water depth be less than 3 m, only the mid-depth station will be monitored.

3.2.3 For the stream course, measurements shall be taken at mid-water depth.

3.2.4 The water quality parameters which need to be monitored are as follows:

- Marine water quality - dissolved oxygen (DO), temperature, turbidity, suspended solids (SS), pH and salinity
- Freshwater water quality - dissolved oxygen (DO), temperature, turbidity, suspended solids (SS) , pH and salinity

3.2.5 Additional marine and freshwater water quality monitoring parameters for the impact monitoring during construction include nitrate nitrogen (NO_3-N), nitrite nitrogen (NO_2-N), ammonia nitrogen (NH_3-N), total phosphate (TP) and selected pesticides.

3.2.6 The ET Leader shall propose the additional monitoring parameters for approval by IC(E), Engineer, EPD and AFCD, and shall submit such information for approval at least 2 weeks before the turf establishment period.

3.2.7 Additional water quality monitoring at Tai Tau Chau FCZ (TTC), Kai Lung Wan FCZ (KLW), Kau Sai FCZ (KS), downstream of the existing marsh (M_Marsh), marine water of Port Shelter (M_Coral), existing reservoir (F_Inland M) and Control stations (M_A and M_B) shall be carried out after heavy rain storm or when there is an overflow event from the reservoir, irrigation buffer lake or detention ponds/tanks. The heavy rain storm shall be defined when there is an amber/red/black rainstorm warning signal issued by the Hong Kong Observatory. The water sample shall be taken within 24 hours after the black/red/amber rainstorm warning signal is cancelled. Please refer to revised EM&A manual for the sampling condition requirement after a heavy rain storm event occurs. The monitoring parameters shall include dissolved oxygen, temperature, turbidity, suspended solids, pH and salinity. Additional parameters shall be the same as stated in paragraphs 3.2.5-3.2.6.

Monitoring Frequency

3.2.8 The monitoring parameters and frequency are summarized in Table 3.7. The monitoring programme for the reporting period is shown in **Annex B**.

Table 3.7 Water Quality Monitoring Parameter, Frequency and Locations

Parameters	Frequency	Location
Dissolved Oxygen (mg/L)	**3 days per week** Marine water : 2 times per day – 1 for mid-flood and 1 for mid-ebb Freshwater : once per day	**Marine Water** Fish culture zone stations: TTC, KLW, KS Control stations: M_A, M_B Impact stations: M_BP, M_RO1, M_Marsh, M_Coral **Freshwater Water** Stream A (F_UA, F_DA) Stream B (F_UB, F_DB) Stream C (F_UC, F_DC) Inland Marsh (F_lnland_M)
Temperature (ºC)		
Turbidity (NTU)		
pH		
Salinity (ppt)		
Suspended Solids (mg/L)		

Monitoring Locations

3.2.9 The water quality monitoring locations for marine and freshwater (**Figure 3.2**) are summarized in Table 3.8.

Table 3.8 Water Quality Monitoring Locations during Construction Phase

Identification Number	Location	Co-ordinates		Approx. Water Depth	No. of Depth
Marine Water (9 stations)		**latitude**	**longitude**		
TTC	Tai Tau Chau Fish Culture Zone	22° 22' 03.7"	114° 19' 19.6"	9.5 m	3
KLW	Kai Lung Wan Fish Culture Zone	22° 22' 10.6"	114° 18' 01.4"	13 m	3
KS	Kau Sai Fish Culture Zone	22° 20' 26.5"	114° 18' 59.9"	11 m	3
M_BP	Temporary barging point	22° 21' 50.6"	114° 19' 16.7"	9.6 m	3
M_RO1	Desalination plant south of the existing pier	22° 21' 51.8"	114° 18' 17.7"	5 m	2
M _ Marsh	Discharge point at the existing marsh	22° 22' 19.8"	114° 19' 05.4"	7.7 m	3
M _ Coral	Marine water of Port Shelter	22° 21' 21.3"	114° 19' 42.7"	10.2m	3
M _ A	Water Control Station of Port Shelter	22° 22' 51.3"	114° 18' 34.5"	7.5 m	3
M _ B	Water Control Station of Port Shelter	22° 20' 26.4"	114° 20' 11.8"	16.5 m	3
Fresh Water (7 stations)					
F_UA	Upstream and downstream of stream A	22° 21' 32.3"	114° 19' 06.5"	-	1
F_DA		22° 21' 33.5"	114° 19' 06.8"		1
F_UB	Upstream and downstream of stream B	22° 21' 23.9"	114° 19' 16.1"	-	1
F_DB		22° 21' 27.2"	114° 19' 16.0"		1
F_UC	Upstream and downstream of stream C	22° 21' 14.8"	114° 19' 26.4"	-	1
F_DC		22° 21' 03.5"	114° 19' 32.0"		1
F _ Inland M	Downstream of the existing marsh (Inland)	22° 22' 17.9"	114° 18' 59.1"	-	1

Monitoring Equipment

3.2.10 The equipment listed below shall be supplied by the ET and approved by the IC(E) and the Engineer for water quality monitoring.

Dissolved Oxygen and Temperature Measuring Equipment

3.2.11 The instrument shall be a portable and weatherproof DO measuring instrument complete with cable and sensor, and use a DC power source. The equipment shall be capable of measuring:

- dissolved oxygen levels in the range of 0 - 20 mg L^{-1} and 0 - 200% saturation; and
- a temperature of 0 - 45 degrees Celsius.

3.2.12 It shall have a membrane electrode with automatic temperature compensation complete with a cable. Sufficient stocks of spare electrodes and cables shall be available for replacement where

necessary. (For example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

3.2.13 Should salinity compensation not be built-in in the DO equipment, in-situ salinity shall be measured to calibrate the DO equipment prior to each DO measurement.

Turbidity Measurement Instrument

3.2.14 Turbidity shall be measured in situ by the nephelometric method. The instrument shall be portable and weatherproof turbidity measuring instrument using a DC power source complete with cable, sensor and comprehensive operation manuals. It shall have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example, Hach model 2100P or an approved similar instrument). The cable shall not be less than 25m in length. The meter shall be calibrated in order to establish the relationship between NTU units and the levels of suspended solids.

Suspended Solids

3.2.15 A water sample at least 2.5L in capacity with messenger and using a 10m line should be collected. Samples should be submitted to HOKLAS accredited laboratory as soon as possible for gravimetric analysis for suspended.

Sampler

3.2.16 A water sampler is required. It shall comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (for example, Kahlsico Water Sampler or an approved similar instrument).

Water Depth Detector

3.2.17 A portable, battery-operated echo sounder shall be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

Salinity

3.2.18 A portable salinometer capable of measuring salinity in the range of 0 - 40 parts per thousand (ppt) shall be provided for measuring salinity of the water at each monitoring location.

pH

3.2.19 The instrument shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It shall be readable to 0.1pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 shall be used for calibration of the instrument before and after use. Details of the method shall comply with APHA, 19th ed. 4500-HTB.

Flow Rate Meter

3.2.20 A portable, battery-operated flow meter should be used for the determination of water depth at each designated monitoring location and record in m^3/s. A hand held or meter fixed to the underside of the survey boat may be used.

Sample Containers and Storage

3.2.21 Water samples for laboratory analysis shall be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and delivered to the laboratory and analysed as soon as possible after collection. Sufficient volume of samples shall be collected to achieve the required detection limit.

Monitoring Position Equipment

3.2.22 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication or other equipment instrument of similar accuracy, shall be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

Monitoring Methodology and Calibration Details

3.2.23 Dissolved oxygen (DO), temperature, turbidity, pH and salinity were measured in situ at the designated water quality monitoring stations. General observation, weather conditions, with the sampling time, date and location were marked on the field record sheet.

3.2.24 Water samples were taken from each monitoring station for laboratory analysis. The sample identification number, sampling location, date, time, project name and analyses were required.

3.2.25 The samples were placed in a cooler with ice (to 4°C without being frozen) and kept away from sunlight. Samples were submitted to a Hong Kong Laboratory Accreditation Scheme (HOKLAS) or other international accredited laboratory for analysis within 24 hours of sampling.

Calibration of In-Situ Instruments

3.2.26 All in situ monitoring instruments were checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use and subsequently re-calibrated at three monthly intervals throughout all stages of the water quality monitoring programme. Responses of sensors and electrodes were checked with certified standard solutions before each use. Wet bulb calibration for a DO meter were carried out before measurement at each monitoring location.

Laboratory Analysis

3.2.27 All laboratory work were carried out by ALS Technichem Pty Ltd (HOKLAS accredited laboratory). Water samples were collected at the monitoring and control stations for carrying out the laboratory determinations. The determination work will start within 24 hours after collection of the water samples. The analysis shall follow the standard methods according to APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition, or an equivalent method approved by EPD.

Table 3.9 Analytical Methods to be applied to Water Quality Samples

Determinant	Standard Method	Reporting Limit
Suspended Solids	APHA 2540 D	2 mg/L
Nitrate Nitrogen	APHA 4500-NO_3^-	0.01 mg/L
Nitrite Nitrogen	APHA 4500-NO_2^-	0.01 mg/L
Ammonia Nitrogen	APHA 4500-NH_3(D)	0.01 mg/L
Total phosphorus	ASTM D515-88B	0.02 mg/L*
Chlorophyll a	APHA 10200 H2 &3	0.5 µg/L

Remarks: *After review baseline data, the detection limit report will be revised to 0.02 mg/L.

QA/QC Procedure

3.2.28 ALS Technichem Pty Ltd. has comprehensive quality assurance and quality control programmes. For QA/QC procedures of parameters, one duplicate sample was analysed for every batch of 20 samples as required by HOKLAS.

Event and Action Plans

3.2.29 The Event and Action Plan (EAP) for water quality monitoring is presented in **Annex C**.

3.3 Ecology

Introduction

3.3.1 The marine and terrestrial ecological monitoring surveys for the ecological EM&A were conducted in accordance with the EM&A manual.

3.3.2 As stipulated in the EM&A Manual, the ecological monitoring surveys for terrestrial ecology would be conducted monthly during the construction phase. Monitoring survey would consist of aquatic fauna survey. While the majority of the Project Area would be subject to site formation, natural streams would be partially or fully preserved and protected by buffer zones, and therefore would constitute the primary target of the terrestrial ecological monitoring. Special attention should thus be paid to ecologically sensitive streams to ensure minimum damage to existing vegetation and streams. The purpose of the monitoring survey was to check the conditions of the stream habitat and the associated aquatic fauna communities.

3.3.3 While the ecological monitoring surveys for marine ecology included coral monitoring at both the eastern and western coasts of Kau Sai Chau Island. The coral monitoring at the western coast would be conducted concurrently with the dredging works which has yet to conduct, and therefore had not been commenced. The coral monitoring at the eastern Kau Sau Chau would be monthly for the first three months of the construction phase, and if no exceedance was recorded, the monitoring schedule would be changed to quarterly during the rest of the construction phase. As a coral damage incident was recorded in March 2006, the monthly monitoring was extended for another three months from April 2006 to June 2006. If no exceedance was recorded during these three months, the monitoring schedule would be changed to quarterly after that till the end of the construction phase. Monitoring survey would consist of checking tagged corals at both impact sites and control site. The purpose of the monitoring survey was to check the conditions of the tagged corals and the impact sites. Although the commencement date for the dredging works has yet to be confirmed, the transplantation works were conducted in November 2006. The transplanted corals were also monitored quarterly for one year from December 2006. The second monitoring was conducted in March 2007. No monitoring is required in this month.

Ecological Mitigation Measures and Implementations

3.3.4 Ecological mitigation measures to be implemented during the construction phase include the following:

- Establishment of buffer zones for the natural stream courses during both construction phase.
- Provision of temporary bypass channels or pipes during construction phase for stream courses subject to pipe culverting.
- Protection of water quality of the natural stream courses and temporary bypass channels or pipes.

- Transplantation of coral colonies within the dredging area for the desalination plant prior to the dredging works.
- Avoidance of corals when the anchoring points are deployed, and to shift the floating temporary barging point to the location with least corals within the mapping area.
- Regular site audit of ecological mitigation measures and good site practice.

Monitoring Frequency and Schedule

Terrestrial Ecology

3.3.5 As reported in the EIA Report, there were four perennial natural streams (Streams A-D) within the Assessment Area for the EIA Study. Streams A, B & C were located within the Project Area, while Stream D was outside the Project Areas and acted as the main stream draining the western part of the Assessment Area. Buffer Zone would be established for the three streams within the Project Area along their partial length (Stream A) or full length (Streams B & C) (**Figure 3.3**). Moreover, Streams B, C & D would be monitored for aquatic fauna monthly during the construction phase. Monitoring on the implementation of the mitigation measures for stream protection, the effectiveness of stream buffer zones, and the aquatic fauna in streams would be conducted during the entire construction phase.

3.3.6 The objectives of the monitoring survey are to check the status of *Caridina trifasciata* and *Nanhaipotamon hongkongensis*. The surveys covered natural stream courses within the assessment area (Streams A to D), and aquatic fauna were studied by various sampling methods depending upon site conditions. Methods included direct observation, active searching, and sample collection using hand-nets. Hand nets were used to collect swimming organisms such as shrimps and fish. Where necessary boulders on the stream beds were overturned to locate aquatic organisms such as crabs. Aquatic species encountered was recorded, with special attention to rare or protected species.

Marine Ecology

3.3.7 As required in the EM&A Manual, prior to the commencement of all construction works, a baseline survey of natural corals were conducted in December 2005. At each of the Site C, Site B2, Site D2 and a Control Site near the AFCD's Coral Buoy at Sharp Island (**Figure 3.4**), 20 natural coral colonies in good conditions (i.e. generally intact and no sign of bleaching) and significant sizes (preferably over 20 cm in diameter) were selected and tagged. Each of the tagged coral colonies was identified to species level and their conditions, in terms of percentages of survival, sedimentation and bleaching, were recorded. Each coral was attached with a plastic label with assigned number and then photographed. The species and the size of each tagged corals were also recorded. The species of corals to have been tagged included the following 15 species: *Cyphastrea serailia, Favia speciosa, Favites abdita, Favites pentagona, Goniastrea aspera, Goniopora columna, Hydnophora exesa, Leptastrea pruinosa, Lithophyllon undulatum, Pavona decussata, Platygyra acuta, Platygyra carnosus, Plesiastrea versipora, Psammocora superficialis, and Turbinaria peltata.* All tagged corals were in good conditions during the baseline survey, without significant sign of bleaching or being covered by sediments, and therefore were all recommended as the monitored coral colonies (all 80 tagged corals, 20 from each site). The seagrass beds in Site D3 were also surveyed for their extent, coverage percentage and health conditions during the baseline survey. The results of the baseline survey were presented in the Baseline Report. The original 20 tagged corals at Site B2 were re-organised in April 2006, with B-11 to B-20 retained, but 40 new tagged corals (B-21 to B-60) were established. The number of tagged corals at Site B2 was therefore increased from 20 nos. to 50 nos. The baseline conditions of these newly tagged corals (40 nos.) were presented in the monitoring Report for April 2006.

3.3.8 As the dredging works for the desalination plant had not been commenced, the impact sites to be monitored in this monitoring programme were Site B2 and Site C (impact sites on the eastern Kau Sai Chau Island for the new golf course) only, while Site D2 and Site D3 (impact sites on the western Kau Sai Chau Island for desalination plant) were not required yet.

3.3.9 Transplantation for the natural corals at Site D2 was originally planned to be conducted one month before dredging works. Although the commencement date for the dredging works has yet to be confirmed, the transplantation works were conducted in November 2006. The transplanted corals were also monitored quarterly for one year from December 2006. The baseline conditions of the transplanted corals had been recorded during the transplantation and would be checked during the follow-up monitoring. The third quarterly coral monitoring will be scheduled in June 2007 (next reporting month).

3.3.10 The schedule for the impact sites on the eastern Kau Sai Chau Island during construction would be monthly in the first three months of the construction programme, and if no exceedance was recorded then quarterly till the end of the construction. As coral damage incident was reported in Month Three of the construction programme, AFCD requested the monthly monitoring should be extended to cover another three months (April, May and June 2006). No exceedence was recorded during the extended three-month period and the schedule was changed to quarterly until the end of the construction phase.

3.3.11 During the weekly site inspection, ET also monitored and audited the implementation of the recommended mitigation measures for terrestrial and marine ecology. Monitoring locations for ecology are shown in **Figures 3.3 – 3.5**. The monitoring programme for the reporting period is shown in **Annex B**.

Event and Action Plans

3.3.12 The Event and Action Plan (EAP) for ecology monitoring is presented in **Annex C**.

3.4 Landscape and Visual

3.4.1 The EIA concluded that the landscape and visual impacts associated with the construction of the third golf course are anticipated to be acceptable with mitigation. In order to ensure that the effective management and implementation of landscape mitigation measures developed and defined in the EIA, the ET conducted regular site inspections of the construction work sites.

3.4.2 Auditing inspections and reporting are undertaken once every two weeks of the construction phase. The effectiveness of the mitigation works has been audited in order to ensure impact reduction levels are achieved as described in the EIA report for this monitoring month. The monitoring programme for the reporting period is shown in **Annex B.**

3.5 Archaeology (Watching Brief)

Introduction

3.5.1 The archeological impact assessment conducted in the EIA concluded that some potential for archaeological material remains at the Wan Chai Archaeological Site and a watching brief is recommended during the construction phase.

3.5.2 A watching brief is a process whereby a qualified and licensed archaeologist monitors the excavation works during the construction phase in areas identified (and agreed with the Antiquities and Monuments Office (AMO)) to be of archaeological potential.

3.5.3 The archaeologist conducting the watching brief should obtain a licence prior to commencement of works as stipulated in Section 12 of the Antiquities and Monuments Ordinance (Cap. 53). The licence was granted on 22nd December 2005.

Monitoring Location

3.5.4 The monitoring locations include Hole 2, Hole 11, Hole 12, Hole 14, Hole 15 & Hole 16. The monitoring locations are present in **Figure 3.6**.

Monitoring Frequency

3.5.5 A total of 18 days of monitoring is considered as minimum, and additional arrangement for watching brief should be made in consultation with AMO in case significant archaeological findings are unearthed in the course of excavation work.

Progress Report

3.5.6 Archaeologist should submit progress reports every 3 months during the programme of the watching brief.

3.5.7 A summary table for categories of archaeological find and recommended action is presented in **Annex C**.

3.6 Land Contamination

Potential Areas Recommended for Further Investigation

3.6.1 Contamination Assessment Plan (CAP) shall be submitted to EPD for approval before site investigation. If land contamination is confirmed by the site investigation, submission of a Remediation Assessment Plan (RAP) including a Contamination Assessment Report (CAR) is required. Potential 5 land contamination hotspots are presented in **Figure 3.7**.

4. Implementation Status on Environmental Protection Requirements

4.1.1 Major construction work of the third golf course were (i) permanent drainage/irrigation system installation work at southern part (Holes 11-16) and cut-and-fill work central part (Holes 1, 2 and 17) of East Course, (ii) permanent closed low flow drainage system installation, (iii) irrigation system installation, (iv) sub-soil drains installation, (v) hydroseeding at the permanent slope/bare grounds, (vi) furnishing work at permanent bridges, (vii) lakes construction were completed and are undergoing testing and commissioning (except Lake near Hole 10) and (viii) turfing at Holes 4 and 6 during the reporting month.

4.1.2 No dust suppression mitigation measure was provided for all rock breaking areas. Dust suppression measures for loading/unloading activities, rough shaping and haul road (truck traffic) were insufficient. The water source for dust suppression was mainly pumped from downstream of Stream A only.

4.1.3 Implementation of temporary drains on site was not according to the general principles of TDMP. In addition, the water quality results at all identified streams and fresh water inland marsh revealed that improvement and strengthen of temporary drainage system installed on site is required.

4.1.4 Hydroseeding at scar areas within the East Course was completed before March 2007. However, some areas were required re-hydroseeding (due to soil erosion after rain and died out) and will be planted with native shrub. Vegetation stockpiles, general refuse and construction waste stockpiles were temporary stored at Hole 1 and part of it was disposed off-site during this reporting month. The Contractor was reminded to dispose all other remaining construction wastes gradually off-site and to submit the trip tickets record (construction/general waste, disposal record for chemical toilets and chemical waste) for our reference.

4.1.5 Disposal of temporary stored wastewater from the CHEC's temporary sewage treatment plant was carried out on 28 May 2007. The storage tank containing sewage water was transported by barge the Contractor's compound to Tsueng Kwan O for temporary storage before disposed by licenced Contractor.

4.1.6 Buffer zone incident was occurred at Stream C in early May 2007 since Stream B2 buffer zone vegetation clearance occurred in November 2006. Stream C buffer zone was reinstated similar to the Stream B2 buffer zone by planting of native shrubs. The Contractor was reminded to maintain the buffer zone with sufficient watering and fertilizers application if required.

4.1.7 Insufficient mobile toilets were available on site at remote areas, only few units were located at the southern portion of construction site.

4.1.8 No dredging work has been carried out near to the existing pier for the desalination plant pipelines. Summary of implementation status is provided in **Annex D**.

5. Monitoring Results

5.1 Air Quality

5.1.1 Dust monitoring was conducted as scheduled in the reporting month. Monitoring of air quality was conducted on 7 occasions in April to May 2007. All monitoring data are provided in **Annex E**. Monitoring of 24-hour TSP was conducted at GCA B1 on 25th, 26th and 30th Apr, 7th, 12th, 18th, 23rd May 2007. The QA/QC results for laboratory testing in the reporting month were acceptable. The QA/QC results are summarised in **Annex F**.

5.1.2 Additional air quality monitoring was carried out on 26th April 2007 due to the exceedance occurred on 13th April 2007. One action level exceedance of 24-hour TSP was recorded at GCA B1 on 18th May 2007 at 215.1 μg/m³ during the reporting month. Additional sample will be taken on 31st May 2007 (next reporting month). Exceedance were considered project-related.

5.2 Water Quality

5.2.1 Marine and freshwater water quality monitoring were conducted at the 9 and 7 designated monitoring stations respectively. All monitoring data are provided in **Annex E**.

5.2.2 Monitoring of marine and freshwater locations was conducted on 12 occasions in April to May 2007 (25th, 27th and 30th April, 2nd, 4th, 7th, 9th, 11th, 14th, 16th, 20th and 21st May 2007). The QA/QC results for laboratory testing in the reporting month were acceptable. The QA/QC results are summarised in **Annex F**. Rainstorm signal was hoisted on 19th and 20th May 2007 and the total rainfall was 47.2 and 81.6 mm respectively.

5.2.3 Turf establishment progress is shown as follows:

- Hole 8 – February 2007 (except green) <in progress>;
- Hole 5 – March 2007 (except green) <in progress>;
- Hole 4 – April 2007 (except green) <in progress>; and
- Hole 6 – May 2007 (in progress) <in progress>
  (planting of turf will start in late June 2007 at Holes 3-8)

5.2.4 Additional water quality parameters include NH_3-N, NO_3-N, NO_2-N, TIN, TP and Chlorophyll a. Monitoring locations for the additional parameters include F_Inland M, M_Marsh, M_BP, TTC and M_A.

Marine water

- KLW: one action level exceedance of suspended solids (SS);
- M_Marsh: (i) three action level exceedances of turbidity (TUR), SS and total inorganic nitrogen (TIN) and (ii) six limit level exceedances of TUR, SS, nitrate nitrogen (NO_3-N) and TIN.
- TTC: (i) one action level exceedance of ammonia nitrogen (NH_3-N) and (ii) six limit level exceedances of NH_3-N and SS.
- M_BP: (i) one action level exceedance of SS and (ii) six limit level exceedances of NH_3-N and SS.
- M_BP: (i) one action level exceedance of SS and (ii) three limit level exceedances of NH_3-N, TUR and SS.
- M_Coral: two action level exceedances of SS and TUR.
- KS: (i) one action level exceedance of SS and (ii) one limit level exceedance of TUR.

5.2.5 The marine water exceedances were summarised in **Table 5.2-1.**

Table 5.2-1 Marine water Exceedance Summary April to May 2007

Monitoring Station	Exceedance Level	Date	Parameters	Project-related
KLW	Action Level	14th May 07	SS	No
M_Marsh	Action Level	14th May 07	Turbidity	No
	Limit Level	20th May 07	SS, Turbidity, NO_3-N, TIN	Yes
	Action Level	21st May 07	SS, TIN	Yes
	Limit Level	21st May 07	Turbidity, NO_3-N	Yes
TTC	Action Level	25th Apr 07	NH_3-N	No
	Limit Level	11th May 07	NH_3-N	No
	Limit Level	16th May 07	NH_3-N	No
	Limit Level	20th May 07	SS	Yes
	Limit Level	20th May 07	NH_3-N	No
	Limit Level	21st May 07	SS	Yes
	Limit Level	21st May 07	NH_3-N	No
M_BP	Limit Level	20th May 07	SS, Turbidity	Yes
	Action Level	21st May 07	SS	Yes
	Limit Level	21st May 07	NH_3-N	No
M_Coral	Action Level	30th Apr 07	Turbidity	No
	Action Level	20th May 07	SS	Yes
KS	Limit Level	20th May 07	SS	No
	Action Level	21st May 07	SS	No

Remarks: Exceedances were mainly due to natural variation / rainstorm events of the marine water.

5.2.6 During non-rainy days, the range of the suspended solids, turbidity and ammonia nitrogen measured at the Control Station (M_A) was in the same order of magnitude at various marine monitoring stations including TTC, M_Coral and KS and KLW. There is no significant difference of the measured concentrations between control station and impact stations and the exceedances were considered not project-related.

5.2.7 Non-compliances of SS, TUR, NO_3-N and TIN were recorded at M_Marsh, TTC, M_BP and M_Coral during and after rainstorm events occurred on 19th and 20th May 2007. All exceedances were consider project-related.

Freshwater

- Stream A: (i) five limit level exceedances of turbidity and (ii) one action level and four limit exceedances of suspended solids.
- Stream B: (i) eight limit level exceedances of turbidity and (ii) two action limit and six limit level exceedances of suspended solids.
- Stream C: (i) eight limit level exceedances of turbidity and (ii) one action and six limit level exceedances of suspended solid.
- F_Inland Marsh: five limit level exceedances of turbidity; two action and three limit level exceedances of suspended solids; seven limit level exceedances of ammonia nitrogen, twelve limit level exceedances of nitrate nitrogen; five limit level exceedances of nitrite nitrogen; twelve exceedances of limit level of total inorganic nitrogen and 10 limit level exceedances of chlorophyll a.

5.2.8 The freshwater water exceedances were summarised in **Table 5.2-2.**

Table 5.2-2 Freshwater Exceedance Summary April to May 2007

Monitoring Station	Exceedance Level	Date	Parameters	Project-related
F_DA	Limit Level	25th Apr 07	SS, Turbidity	Yes
	Limit Level	30th Apr 07	SS, Turbidity	Yes
	Action Level	14th May 07	SS	Yes
	Limit Level	14th May 07	Turbidity	Yes
	Limit Level	20th May 07	SS, Turbidity	Yes
	Limit Level	21st May 07	SS, Turbidity	Yes
F_UB	Limit Level	25th Apr 07	SS, Turbidity	Yes
	Action Level	30th Apr 07	SS	Yes
	Limit Level	30th Apr 07	Turbidity	Yes
	Limit Level	20th May 07	SS, Turbidity	Yes
	Limit Level	21st May 07	SS, Turbidity	Yes
F_DB	Limit Level	25th Apr 07	SS, Turbidity	Yes
	Limit Level	30th Apr 07	Turbidity	Yes
	Action Level	7th May 07	SS	Yes
	Limit Level	20th May 07	SS, Turbidity	Yes
	Limit Level	21st May 07	SS, Turbidity	Yes
F_UC	Limit Level	25th Apr 07	SS, Turbidity	Yes
	Limit Level	30th Apr 07	Turbidity	Yes
	Limit Level	20th May 07	SS, Turbidity	Yes
	Limit Level	21st May 07	SS, Turbidity	Yes
F_DC	Limit Level	25th Apr 07	SS, Turbidity	Yes
	Limit Level	30th Apr 07	Turbidity	Yes
	Action Level	7th May 07	SS	Yes
	Limit Level	20th May 07	SS, Turbidity	Yes
	Limit Level	21st May 07	SS, Turbidity	Yes
F_Inland M	Limit Level	25th Apr 07	SS, Turbidity, NH_3-N, NO_3-N, NO_2-N, TIN, Chl a	Yes
	Limit Level	27th Apr 07	NH_3-N, NO_3-N, NO_2-N, TIN, Chl a	Yes
	Action Level	30th Apr 07	SS	Yes
	Limit Level	30th Apr 07	Turbidity, NH_3-N, NO_3-N, NO_2-N, TIN	Yes
	Limit Level	2nd May 07	NH_3-N, NO_3-N, NO_2-N, TIN, Chl a	Yes
	Limit Level	4th May 07	NH_3-N, NO_3-N, NO_2-N, TIN	Yes
	Action Level	7th May 07	SS	Yes
	Limit Level	7th May 07	NO_3-N, TIN, Chl a	Yes
	Limit Level	9th May 07	NO_3-N, TIN, Chl a	Yes
	Limit Level	11th May 07	NO_3-N, TIN, Chl a	Yes
	Limit Level	14th May 07	Turbidity, NO_3-N, TIN, Chl a	Yes
	Limit Level	16th May 07	NO_3-N, TIN, Chl a	Yes
	Limit Level	20th May 07	SS, Turbidity, NH_3-N, NO_3-N, TIN, Chl a	Yes
	Limit Level	21st May 07	SS, Turbidity, NH_3-N, NO_3-N, TIN, Chl a	Yes

Remarks: Exceedances recorded at Streams A, B & C were mainly due to insufficient temporary drainage provided on site, in particular during and after rain. Exceedances recorded at F_Inland Marsh were due to remaining accumulation of nutrient discharge from the temporary sewage treatment plant and insufficient temporary drainage provided on site.

5.2.9 Exceedances of ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, total inorganic nitrogen and chlorophyll a were recorded at downstream of fresh water inland marsh. High concentrations of ammonia nitrogen (286 mg/L), biochemical oxygen demand (134 mg/L) and *E. coli* (9,600,000 cfu/100mL) were recorded on 11th May 2007 from the discharge of the sewage treatment plant maintained by CHEC. It confirmed that nutrient exceedances at the downstream of fresh water inland marsh were due to continuous discharge of poor wastewater quality to the fresh water inland marsh (non-compliance to the EPD discharge licence requirement). All exceedances were considered project-related but not due to the turf establishment.

5.2.10 For the upstream monitoring location (F_UB), it is located downstream to the construction area near Hole 10 and the monitoring location cannot be relocated further upstream (temporary bridges located at Streams B1 and B2) as no water was observed and available for sampling. For Stream C, exceedances were recorded at both upstream and downstream monitoring locations. For the upstream monitoring location (F_UC), it is located downstream to the construction area near Hole 16 and the monitoring location cannot be relocated further upstream as no water was observed and available for sampling. Therefore, the F_UC is considered the most upstream location of Stream C. Same as Stream B, it is considered that F_UC is also the impact monitoring location and F_UA was used as the representative control monitoring station.

5.3 Ecology

5.3.1 Terrestrial and marine ecology monitoring photos are provided in **Annex E**.

5.3.2 The Monitoring Survey for the reporting month was conducted on 30th May 2007. The project site has been fully cleared and under construction works.

5.3.3 Although the surveyed streams have not been previously affected by developments or pollution sources, they are relatively small. Water depth was less than 0.3m in most of the stream reaches even during wet season.

5.3.4 Stream A is located within the Project Area. Its main stream section (downstream to the confluence of two tributaries) would be protected by stream buffer zone (**Figure 3.3**). Stream A was heavily silted with sediments from eroded hillsides all year round, particularly at the main stream section. The stream had low flow.

5.3.5 The permanent bridge across Stream A was finished and the temporary access bridge had been removed. In the present monitoring survey, the main stream course of Stream A (the section downstream to the confluence of tributaries A1 and A2) was found still to be filled up by rubbles which was first report in June 2006 (see **Photo Plate 5.3-1**). The rubbles were reported to be washed down from the upper Tributary A2 which had been under pipe culvert construction. Although the riparian vegetation was not affected by the rubbles, this section of stream channel was temporarily lost. Tributary A2 was converted to underground pipeline as proposed in the EIA report. Stream A was of the lowest ecological value among the four natural streams as it was heavily silted with sediments from eroded hillsides all year round. No stream fish and only very limited aquatic fauna were recorded in Stream A before. The impact from this temporary loss of stream channel would not be severe. But remedial works should be implemented to clear the rubbles and restore the channel, and improve the water quality, as the conditions of this stream is expected to improve after the construction of the golf course extension (in which the eroded hill slopes would be replaced by turf).

5.3.6 Stream B is located within the Project Area. It had clear flow (with little sediment in the stream beds) of moderate volume during the wet season. This stream also has two main tributaries, B1

and B2. The full length of Stream B (two tributaries and the main stream) would all be protected by buffer zone (**Figure 3.3**). Stream B also contains a long estuarine section of muddy sandy substrate.

5.3.7 An area of the buffer zone of Tributary B2 was previously accidentally cleared. As the function of the buffer zone for the stream protection might be affected, replanting with native shrub species was implemented as remedial action (see **Figure 5.3.1**).

5.3.8 In the present survey, it was found that the flow in Stream B were similar with the previous months, being restored from the minor turbidity reported in dry season. Sedimentation however was found on the stream bed, probably due to the recent heavy rainfall, as the buffer zone and the vegetation inside were found intact. Even though, aquatic fauna including *Caridina trifasciata* were still sighted in the stream.

5.3.9 Stream C is located within the Project Area. This stream also has two main tributaries. It has had low but clear flow. In contrast to Stream B, Stream C drains to a sandy beach at Kau Chung Wan, and therefore lacks a clear estuarine zone. The full length of Stream C (two tributaries and the main stream) was protected by buffer zone (**Figure 3.3**). The permanent bridge across Stream C had been in place, with the piers outside the buffer zone demarcation. The temporary bridge had been removed.

5.3.10 An area of the buffer zone of downstream of Stream C was cleared due to the permanent drainage system construction. As the function of the buffer zone for the stream protection might be affected, replanting with native shrub species was implemented as remedial action.

5.3.11 Sedimentation in Stream C was reported previously in November 2006 because silt fences were found collapsed after the heavy rainfalls. In the present survey, it was found that much of the fine sediment was present on the majority of the main stream course of Stream C. Although the flow was clear during the survey, additional sandy sedimentation after the rainstorms occurred at 19th and 20th May 2007 was observed throughout the Stream C. Relatively fewer aquatic fauna including *Caridina trifasciata* were found hiding among the aquatic plants.

5.3.12 Stream D is located outside the Project Area but within the Assessment Area and is the main stream draining the west side of the Assessment Area. It had clear water and moderate flow levels. Stream D is the only stream with deeper water depth among the four streams (water depth over 0.3 m in some of the stream reaches). As Stream D is outside the construction area, buffer zone would not be needed for this stream. In the present survey, the flow was found clear in Stream D, and Atyid shrimp *Caridina trifasciata* was still recorded.

5.3.13 Photos of Streams A to C were shown in **Photo Plate 5.3-1 (Annex E)**. The habitats and vegetation generally remained intact within a large potion of the project site (beyond the works fronts), and within the majority of the stream buffer zone (except and area for Tributary B2 which was accidentally cleared before) and outside the project area. No earthwork, human disturbance or fire disturbance was observed beyond the project site boundary other than the historical erosion of hillsides.

5.3.14 Aquatic fauna communities were checked during the monitoring survey. Atyid shrimp *Caridina trifasciata* were found in Stream B, Stream C & Stream D during the present monitoring survey (**Annex E - Photo Plate 5.3-1**). Although the low water levels and flow volume, Atyid shrimp *Caridina trifasciata* was still recorded in the streams, especially among the emergent plants, in the present survey. The sedimentation incident in November 2006 made a large portion of the stream bed in Stream C covered by sediment and this limit the habitat size for the shrimps. Measures should be taken to prevent any similar incidents in the future but considered insufficient after the rainstorm events occurred in April and May 2007.

5.3.15 Another species of Atyid shrimp, *Caridina cantonensis*, which is common and widespread in Hong Kong was found in Stream B, C and D. Other aquatic fauna and flora encountered during the monitoring included Freshwater snail *Brotia hainanensis*, which is usually found in streams with good water quality, found at B2 tributary of Stream B.

5.3.16 The demarcation of the stream buffer zone had been fully established at Stream A main stream, the two tributaries of Stream B and Stream C at the time of the monitoring survey. Except at the temporary access bridges crossing Stream A, Stream B and Stream C, and the vegetation is being cleared within Streams B and C buffer zone, riparian vegetation within the buffer zone was not disturbed by construction works.

Marine Ecology

5.3.17 The monitoring on corals was not required in the reporting month (May 2007). The next marine ecological monitoring is scheduled in June 2007 (next reporting month).

5.4 Archaeology (Watching Brief)

5.4.1 Excavation was carried out at Holes 11, 12, 14 & 16 during this monitoring month and watching brief monitoring was resumed since September 2006. According to the latest construction programme, part of the Hole 2 will be completed in February 2007. Approximate 40% of the Hole 2 area was being excavated and the watching brief at Hole 2 will have to further extend. The first (January to March 2006) and second (April to September 2006) quarterly progress reports had been sent to AMO for comments on 31st March 2006 and 15th October 2006 respectively. The third (October to December 2006) and fourth (January to March 2007) quarterly progress report had also been submitted to AMO in January and March 2007 respectively.

5.4.2 The Archaeological Watching Brief (AWB) will consist of 18 days of on-site monitoring of the construction work. An initial site visit was made on 20th January 2006 to inspect preliminary vegetation clearance at Hole 2. The second site visit was undertaken on 3rd February 2006. The first day of the monitoring was agreed on 14th February 2006 after the confirmation with the Contractor that the bulk excavation was being carried out at Hole 2. The site visit at Holes 11, 12, 14, 15 & 16 were started from September 2006 once vegetation clearance commence and in progress.

5.4.3 Monitoring results were shown as follows:

Hole 2

5.4.4 Clearance of surface soil was monitored in Areas 1 and 2 (mainly the concrete batching plant and underground water tank location) which is around 60% of the actual bulk earthwork. All monitoring areas were investigated after vegetation clearance and no archaeological material was identified in the first quarterly report. A thirty minute video of the works was recorded. No works have been undertaken outside the Areas 1 and 2 up the reporting period (January to March 2006).

5.4.5 Excavation at Hole 2 was completed during this reporting month. The fourth quarterly report is under preparation. No archaeological material was identified. The archaeological watching brief at Hole 2 was completed in February 2007.

Holes 11, 12, 14, 15 & 16

5.4.6 For the excavation at watching brief concern areas (Holes 11, 12, 14, 15 & 16), the excavation programme was commended in early September 2006 after the completion of temporary bridges construction at Streams B1 and B2. Vegetation clearance was started in early September 2006 and completed in the reporting month at Holes 11, 12, 14, 15 & 16. Bulk earthwork at concerned watching brief area was concentrated Holes 11, 12, 14 and 16. No archaeological material was identified in the second quarterly report (April to September 2006) and third quarterly report (October to December 2006). The archaeological watching brief at Holes 11, 12, 14, 15 and 16 was completed in January 2007.

Final Archaeology Watching Brief Report

5.4.7 A draft final report was submitted to AMO for comments during the previous reporting month and comment from AMO was received in early June 2007. Final report is under preparation for submission.

5.5 Land Contamination

5.5.1 The Contamination Assessment Plan (CAP) was approved by EPD 17th February 2006. Site investigation was carried out on 14th and 15th February 2006. Site audit was carried out with IEC on 14th February 2006 with the Contractor's representatives. The CAP was approved on 17th February 2006. The Contamination Assessment Report (CAR) and Remediation Action Plan (RAP) were approved on 18th August 2006.

5.5.2 Remedial work for the contaminated soil located at the Hotspot L3 (Hole 18) is required to be implemented properly according to the RAP. A confirmation pilot trial on the ratio of cement and contaminated soil was carried out during the reporting month. According to the Contractor's submitted methodology, the contaminated soil will be transferred from Hole 18 to Hole 17 for remediation. It is because that Hole 17 is the major fill area and the remediation soil to cement mixture can be used as general fill material. The full scale remediation work was carried in the reporting month on 4th October 2006. A Final Site Remediation Report (FSRR) was submitted to EPD on December 2006 and approved by EPD on January 2007. No further remediation work is required.

6. Environmental Site Auditing

6.1.1 The weekly site inspections were conducted by the ET with Contractor's representative and/or Jockey Club's representative on 2nd, 8th 15th, 21st May 2007, and the monthly joined site inspection with IEC and the Contractor's representative undertaken on 21st May 2007. The following observations and recommendations were made.

Dust Mitigation Measures

6.1.2 Major site formation was carried at southern part of East Course during the reporting month. No dust suppression measure was provided during rock breaking activities. Dust generation from the haul road, during earth moving operation and excavation were observed at sunny and windy weather, insufficient dust mitigation measures was provided on site.

6.1.3 Temporary soil stockpiles, sand/aggregates were mainly located at Hole 1 and more vulnerable to silty runoff and dust generation due to their fine particular size in nature and not suitable for compaction and watering.

6.1.4 The Contractor was reminded to minimize the dust generated by the site vehicles moving along the haul road by paving the heavy traffic haul road, watering etc. The Contractor was repeatedly reminded to provide sufficient dust suppression measure at all other excavation / earth moving areas.

6.1.5 As permanent cart path, turfing and hydroseeding areas (permanent areas and eroded slope) will gradually completed, therefore, dust generation will gradually decrease from the construction site is expected.

6.1.6 Concrete batching plant was operating during this reporting month. No major dust generation was observed from the concrete batching plant during operation. As the construction of the administration buildings and maintenance buildings and cart paths will complete soon, the concrete batching plant is expected to be dismantled by the end of July 2007.

6.1.7 The Contractor was reminded to install the hoarding near to the main exit/entrance near S7 according to the Air Pollution Control Ordinance and its subsidiary regulations. It was outstanding for at least few months.

Water Quality

Temporary Drainage Master Plan

6.1.8 Regarding to the TDMP, some of the proposed temporary and permanent drainage were not observed on site or installed temporary drains layout were different from the proposed layout plans. The TDMP layout plans, therefore, did not totally match with the existing site progress of the temporary/permanent drainage system. In addition, some of the catch basins cannot function because they were not located at the relative low points within the golf hole to collect the surface runoff. The Contractor was urged to revise the TDMP layout plans and present the actual (temporary and permanent drainage system) installation/construction completion date of each golf hole. Interim reports regarding the TDMP progress should be submitted and revised from time to time. If the permanent drainage system is not available at some particular areas, temporary drainage system should be sufficiently installed to prevent runoff entering to nearby water quality sensitive receivers directly.

6.1.9 Direct silty discharge from construction site to Streams A, B and C through silt fences were observed during and after rain. The Contractor should review the effectiveness of the silt fence, strengthen at vulnerable areas, provide sufficient desilting facilities, rectify the collapsed silt fences and is recommended to propose other effective means to confine the silty runoff and properly treated before discharge.

6.1.10 Sand capping and turfing can significantly reduce the potential silty runoff during rain according to the site observation.

6.1.11 Silt fence installation is the major temporary drainage system component in addition to the use of permanent drainage system on site during the wet season. According to the site observation, the silt fence was either not observed, poorly maintenance or in slow progress. The Contractor was repeatedly reminded to improve the effectiveness of the mitigation measures and provide sufficient temporary drainage system on site.

6.1.12 Permanent drainage system should be installed properly before turfing at each of the golf hole. As the installation of the closed low flow drainage system is in progress (runoff cannot pumping back to the existing reservoir directly), runoff could be concentrated and directly discharge through underground water tanks and/or lakes overflow or catch basins to the sea / streams. The Contractor was reminded to provide sufficient desilting / treatment facilities on site in order to comply the WPCO.

6.1.13 No dredging work for the permanent intake and outfall pipelines was carried out during the reporting month.

6.1.14 Construction of permanent bridges was completed before the wet season 2007. Remaining furnishing work was in progress during the reporting month.

6.1.15 The Contractor was reminded to maintain the silt curtain and desilt the settled solids within the silt curtain in a routine basis and ensure the effectiveness of its intended use.

6.1.16 As confirmed by the Contractor, all ADS filter system at Holes 5 and 6 had been properly installed.

Turfing

6.1.17 Fertilizer applications were recorded at Holes 4, 5, 6 & 8 on regular basis according to the turf establishment requirement and approved turf grass management plan. Biological pesticides (Bactospeine) were applied in May 2007 at Holes 4, 5, 6 & 8 to suppress the army worms but ineffective. Application of insecticides will be required during the next reporting month. Water quality monitoring on pesticides will be initiated at Northern Part of East Course.

Ecology

6.1.18 Buffer zone at Streams B1, B2 and C had been fully established. For Stream A, buffer zone was finally established during the reporting month. The whole buffer zone aims to protect the streams and avoid any works/equipment intrusion into the buffer zone.

6.1.19 The main stream course of Stream A was found to be filled up by rubbles to the level of the weir at its downstream end since mid-June 2006. Remedial works were implemented to clear the rubbles and restore the channel manually in early November 2006. However, the rocks were filled up the downstream A again after the rainstorm on 21st November 2006. Most of the rubbles from Hole 17 covering the downstream of Stream A were removed in the December

2006. The temporary bridge at Stream A had been dismantled before wet season. There were still some remaining rocks sitting on the stream bed of the downstream of Stream A.

6.1.20 No illegal berthing was observed during the site audit. Floating pontoon was berthed at EP location at the temporary barging point. Increase of loading of the sand/aggregates/drainage pipes/irrigation pipes delivery was observed during the reporting month.

Stream B2 Buffer Zone

6.1.21 The reinstated shrub planting area at Stream B2 buffer zone was improving when it compares to previous month. The Contractor was reminded to keep the buffer zone areas in good condition.

Stream C Buffer Zone

6.1.22 Stream C buffer zone (Hole 16 tee) was cleared due to the construction permanent drainage system. The vegetated clear area was around 36 m². Native shrub was planting at Stream C with the same density as the reinstated area of Stream B2. The Contractor's remedial proposal in order to avoid same kind of incident occurred in future again, they are (i) to avoid carrying out construction work closed to the sensitive area such as buffer zone of stream in the holiday and (ii) to ensure adequate supervision personnel to monitor the construction work close to sensitive area if any work has to be carried out in the holidays at these areas.

Silt Deposit at Streams

6.1.23 Significant silty runoff and silt deposited were recorded not only on 22nd November 2006 but also on 24th April 2007 after rainstorms at all streams. The Contractor was reminded to enhance the temporary drainage system to prevent the same incident happened in wet season 2007.

Waste / Chemical Management

6.1.24 According to the site observation, vegetation stockpiles, construction wastes stockpiles and general refuse were accumulated at Hole 1 and partially disposed off-site during the reporting month. The Contractor was provided trip-ticket records and construction waste disposal records during the reporting month.

6.1.25 Insufficient mobile/chemical toilets were provided at the construction site. The Contractor was repeatedly reminded to provide sufficient toilets in particular at works site distant from the Contractor's office.

6.1.26 Disposal of temporary stored wastewater from the CHEC's temporary sewage treatment plant was carried out on 28 May 2007 at Tsueng Kwan O. CHEC was reminded to dispose properly by licenced Contractor offsite during interim stage and submitted relevant disposal record for our reference. Once the discharge water quality complies with the EPD's discharge licence requirements by frequent monitoring carried out by CHEC, Jockey Club might consider resume the direct discharge to the fresh water inland marsh from the sewage treatment plant in future. In the meantime, temporary disposal of wastewater offsite would be the best option to avoid contamination of fresh water inland marsh. Random audit on discharge water quality will be carried out by ET to ensure the water quality complies with the EPD's discharge licence requirement.

6.1.27 Due to the high exceedances of ammonia nitrogen and reactive phosphorus from the effluent discharge of the temporary sewage treatment plant located near to the contractor's site office, the Contractor has to further investigate and stop the plant immediately (instructed by RE) until the performance of the plant improve and satisfy with the EPD's discharge licence requirement.

Landscape and Visual

6.1.28 Landscape and visual monitoring and site audits were carried on 10th and 22nd May 2007. Site formation, shaping and planting works are being carried out at present. Shrub seedlings were planted on slopes of golf holes of 2, 4, 5, 10 and 11. The newly planted shrubs are fair in health. Small-scale erosion at the hydroseeded areas were occurred due to heavy rainfall on 22nd May 2007. The coverage of newly hydroseeded area is not in good condition. The Contractor shall take measures to improve the condition of damaged trees and provide adequate watering to newly hydroseeded area, planted shrubs and transplanted trees.

6.1.29 Damaged trees next to the administration building were still unprotected after being damaged by the adjacent construction activities. Wooden boards and garbage were put adjacent to the retained trees. Most of the labels of the retained trees were disappeared.

6.1.30 Retained trees, such as but not limited to T957 and T956, next to administration building were severely damaged by construction. Damaged trees next to the administration building were still unprotected after being damaged by the adjacent construction activities. The Contractor was reminded to prevent further damage to those trees and carry out tree surgery works immediately.

6.1.31 All transplanted trees were in fair condition except for T848. Mal-pruning of transplanted trees has not been rectified. Construction material was stockpiled within tree protection zones. A statement on the cause of death of tree T925 recorded in the last report is still outstanding since February 2007.

Status of Environmental Licensing and Permitting

6.1.32 Permits / licences submission and approval status are summarised in Table 6.1.

Table 6.1 Summary of Environmental Licensing and Permit Status

Permit/licence/notification form title	Submission date	Status	Registration No./ Remarks
Application for a construction noise permit for the use of powered mechanical equipment for the purpose of carrying out construction work other than percussive pilling and/or the carrying out of prescribed construction work.	21st Jan 2006	Approved on 16th February 2006	GW-RE0012-06 (valid until 3rd July 2006)
Application for a construction noise permit for the use of powered mechanical equipment for the purpose of carrying out construction work other than percussive pilling and/or the carrying out of prescribed construction work.	6th Apr 2006	Approved on 9th Jun 06 (supersede the GW-RE0012-06)	GW-RE0157-06 (valid until 28th Nov 2006)
Application for a construction noise permit for the use of powered mechanical equipment for the purpose of carrying out construction work other than percussive pilling and/or the carrying out of prescribed construction work.	Nov 2006	Approved on 22nd Nov 06 (supersede the GW-RE0157-06)	GW-RE0384-06 (valid until 26th May 2007).

Permit/licence/notification form title	Submission date	Status	Registration No./ Remarks
Application for a construction noise permit for the use of powered mechanical equipment for the purpose of carrying out construction work other than percussive pilling and/or the carrying out of prescribed construction work.	4th May 2007	Approved on 18th May 07 (supersede the GW-RE0384-06)	GW-RE0141-07 (valid until 25th Nov 2007).
Notification of the air pollution control (construction dust) regulation	21st Jan 2006	Acknowledge receipt from EPD on 27th February 2006	Ref. no.: 001006902
Registration as a chemical waste producer	10th Jan 2006	Register on 7th February 2006	WPN-5213-813-C1186-04
Application for a permit to dump material at sea under the Dumping at Sea Ordinance	10th Jan 2006	Deferred by CHEC on 17th March 2006 (CHEC/KSC3.9.1/0459)	No dredging work will be carried out between May to December 2006.
Application of exemption account for the construction waste charging scheme	12th Jan 2006	Approved on 16th January 2006	A/C no. 5005322 (valid until 2nd August 2007)
Application for a licence for production pursuant to Section 14 of Air pollution Control Ordinance	2nd Mar 2006	The total silo capacity for the cement works was 45 tonnes which is lower than 50 tonnes. It is not a specified process, application is not required.	EPD letter refer. no.: EP640/EA/SK/015
Application for a licence under Water Pollution Ordinance – Construction Site	18th Mar 2006	Approved on 12th Sept 2006 (CHEC/KSC3/9.1/0414)	EPD letter refer. No: EP640/W4/J1003

7. Environmental Non-Conformance

7.1 Summary of Environmental Non-Compliance

Air Quality

7.1.1 One action level exceedance of 24-hour TSP was recorded at GCA B1 during the reporting month. Exceedance was considered project-related.

Marine Water Quality

7.1.2 Nineteen exceedances were recorded at KLW, M_Marsh, TTC, M_BP, M_Coral and KS. Exceedances measured at TTC, KS, M_BP and M_Coral were mainly due to rainstorm events occurred on 19th and 20th May 2007. Exceedances at TTC were mainly ammonia nitrogen which considered not project-related. Water quality exceedances recorded during and after the rainstorm events were considered project-related.

Freshwater Quality

7.1.3 Twenty-six exceedances of turbidity and twenty-five exceedances of suspended solids were recorded at Streams A, B, C and fresh water inland marsh. Seven exceedances of ammonia nitrogen, twelve exceedances of nitrate nitrogen, five exceedance of nitrite nitrogen, twelve exceedances of total inorganic nitrogen and ten exceedances of chlorophyll a were recorded at downstream of fresh water inland marsh. All exceedances were considered project-related.

Terrestrial Ecology

7.1.4 Non-compliance, Stream C buffer zone vegetation clearance, was recorded during the monthly site audit.

Marine Ecology

7.1.5 Quarterly coral monitoring survey at Site B2, Site C and Control site was not required in this reporting month. Coral transplantation was carried out in the December 2006 at Site D2, quarterly monitoring for the transplanted coral was not required in this reporting month. No dredging work was carried out at Site D2 for the desalination plant's intake and outfall construction.

7.2 Summary of Environmental Complaint

7.2.1 No environmental complaint was received in this reporting month.

7.3 Summary of Environmental Summons

7.3.1 One pink form was issued by EPD during the reporting month on dust generation from the construction site.

8. Future Key Issues

8.1 Key Issues for coming month

8.1.1 Major works to be taken for the coming monitoring period are summarized as follows.

- Operation of temporary barging point
- Operation of sewage treatment plant
- Operation of concrete batching plant
- Drainage and irrigation systems installation at Golf Holes
- Sand capping and turf establishment at Golf Holes
- Implementation of temporary drainage master plan
- Operation of desalination plant if required

8.2 Monitoring Schedule for the coming month

8.2.1 The tentative schedule of air, water, ecology and landscape & visual monitoring for the next three months is presented in **Annex F**. The environmental monitoring will be conducted at the same monitoring locations in this reporting month. The monitoring programme has been reviewed and was considered as adequate to cater the nature of works to be undertaken.

8.3 Construction programme for the next three month

8.3.1 The construction programme for the next three months is presented in **Annex G.**

9. Recommendations and Conclusions

9.1.1 The Environmental Monitoring and Audit (EM&A) Report presents the EM&A works undertaken during the period from 25th April to 24th May 2007 in accordance with EM&A Manual and the requirement under EP-224-2005/A.

9.1.2 The Contractor was repeatedly reminded to improve and provide sufficient temporary drainage system on site to prevent silty runoff to marine and stream courses. The Contractor was reminded to provide sufficient dust suppression mitigation measures especially during rock breaking activity, earth movement (loading and unloading), at haul road (vehicle movement) and large soils stockpiles. In addition, the Contractor was reminded to provide sufficient temporary drainage at the turfing areas.

9.1.3 Same as the last reporting month, no rectification work was done by the Contractor. Regarding the retained trees, the Contractor shall take the following measures:

- Carry out surgery to damaged trees;
- Report the cause of death of tree T925;
- Re-fix the label of retained tree for easy identification;
- Maintain the tree protection zone required and remove all construction material / debris from the tree protection zone;
- More frequent watering for transplanted trees, planted vegetation and hydroseeded grass; and
- Rectify the mal-pruning practice of the transplanted trees.

9.1.4 No environmental complaint was received during the reporting month. One pink form was received was issued by EPD on dust generation from construction site.

9.1.5 The ET will keep track of the EM&A programme with respect to compliance of environmental requirements and the proper implementation of all necessary mitigation measures.