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

Quarterly Environmental Monitoring & Audit (EM&A) Report for July to September 2007

(Report No. 382210/Q_007)

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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 checking of the Environmental Team's (ET) **Quarterly Environmental Monitoring & Audit (EM&A) Report for July to September 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 **Quarterly Environmental Monitoring & Audit (EM&A) Report for July to September 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

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Date 16 October 2007

Executive Summary

This is the seventh quarterly 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 third quarter of 2007 from July to September 2007.

In the reporting quarter, the following activities took place for the Project:

Major works carried out at the construction site were as follows:
1. Site formation - **Completed**: Holes 3-16, 18
2. Drainage system installation – **Completed**: Holes 3-8, 10-16
3. Irrigation installation – **Completed**: 3-8, 11-16
4. Sub-soil drainage installation – **Completed**: 3-8, 11-16
5. Sand capping – **Completed**: 3-8, 11-16
6. Turf establishment: **Completed (green)**: Hole 5 (6 Mar 07), Hole 4 (19 Apr 07), Hole 6 (7 May 07), Hole 8 (12 Feb 07), Hole 7 (1 June 07), Hole 3 (18 Jun 07), Hole 11 (21 Aug 07), Hole 15 (21 Aug 07) & Hole 14 (31 Aug 07); **In progress**: Hole 18 (27 Jul 07), Hole 13 (21 Aug 07), Hole 16 (31 Aug 07) & Hole 12 (11 Sep 07).
7. Reinstatement work for gravity drain: **Completed**
8. Construction of Lake 1D, other pumping stations, underground water tanks and lakes: **Completed**
9. Slope restoration works: 95%

Construction of permanent bridges:
(i) Construction of permanent bridge at Stream A – decking /finishing work (**in progress**). Temporary bridge was demolished on 27 Mar 07.
(ii) Pipe culvert construction at Stream B2 – Completed
(iii) In-situ culvert bridge at Stream B1 – decking /finishing work (**in progress**). Temporary bridge was demolished on 30 Mar 07.
(iv) Construction of permanent bridge at Stream C – decking /finishing work (bridge wall finishing – **in progress**). Temporary bridge was demolished on 16 Mar 07.
(v) Construction of permanent bridge at the fresh water inland marsh – decking /finishing work (**in progress**). Temporary bridge was demolished on 6 Mar 07.

Other construction activities:
- Operation of concrete batching plant (located at Hole 2); **[*Dismantled at the end of August 07*]**
- Operation of sewage treatment work (site office)
- Operation of temporary barging point at EP location

No dredging of the permanent intake and outfall pipelines for the desalination plant has been carried out. Hong Kong Jockey Club (HKJC) submitted supplementary information to EPD in June 2007 regarding the discharge licence. Construction work of Irrigation Lake 1D and associated pipelines for the desalination plant were completed. As there is no discharge licence for the desalination plant, the plant will not be operated until successful application from EPD.

The 89 transplanted corals were checked in September for the fourth time after the transplantation survey. The site was the bedrock near Site D2, to the south of the existing ferry pier. 86 out of the 89 transplanted corals were recovered and their conditions were similar with the baseline conditions (during the transplantation process).

Marine ecology was conducted in September 2007 at Site B2, Site C and Control Site. In the survey, minor sedimentation on some of the tagged corals at Site B2 were observed, and one more colony (ie. B-

16) was found missing. New or further mortality on B-12, B-17, B-54 and B-55 were found in the survey, however, these mortality records were still below the Action Level for the coral monitoring. The Control site still remained similar conditions as during the Baseline Survey (no mortality, sedimentation or bleaching was found), except the missing of X-05 colony.

The floating pontoon was located and operated at the designated location according to Environmental Permit (EP). No further improper berthing at the temporary barging point was observed after a record of improper berthing was reported in last quarterly report (April to June 2007).

Archaeology watching brief was completed in February 2007. No archaeological material or deposits was identified. The final report was approved by AMO in June 2007.

Refer to the site progress, turf planting (Green, tees and fairways) was completed at Holes 3-8, 11 and 14-15 in September 2007. Moreover, Holes 12, 13, 16 and 18 were planting (not yet completed) with turf. In the submitted programme proposed by the Contractor, Hole 1 will be planted with turf in the next reporting month (October 2007). Central portion (Holes 2, 9 and 17) was under site formation and will be the last portion to be planted with turf. Applications of fertilizers and pesticides at all holes with turfing were recorded. As reported in the previous quarterly report, biological pesticide (Bactospeine) was considered to be ineffective. Chemical applications (Chlorpyrifos, Chlorothalonil, Fipronil, Fosetyl Aluminium, Glyphosate, Manocozeb and Oxadiazon) were recorded.

Regarding the high exceedances of suspended solids and turbidity recorded from June to July 2007 continuously at all identified streams, 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 Temporary Drainage Management Plan (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. There were some improvements to silty runoff incident, but it was considered that it resulted from more holes being sand-capped and the fact that the frequency of rainstorms was lower than the last quarterly report (April to June 2007).

Terrestrial ecological monitoring was carried out in September 2007. The downstream section of the Stream A channel was accidentally filled up by boulders before and some remedial works had been implemented by the Contractor to clear the rubbles manually and a restoration plan will be prepared by the Contractor. Sedimentation had been previously observed in the Stream B, but was not found recently. Aquatic life including Atyid shrimps and freshwater snails were recorded in the Stream B again. Moreover, sedimentation was still observed in the Stream C, and the abundance of aquatic fauna, in particular caridian shrimps, was found very low. The Stream D was in natural conditions similar to the condition during the Baseline Survey, and the aquatic fauna abundance was found resuming.

Regarding the Stream B2 buffer zone intrusion which causes vegetation clearance in November 2006, buffer zone intrusion at the Stream C near Hole 16 tee was recorded in May 2007. The Stream C buffer zone was reinstated by planting native shrub which is similar to the Stream B2 in June 2007.

Long-term nutrient exceedances were recorded at the downstream of the Fresh Water Inland Marsh since February 2007. High level of ammonia nitrogen was recorded at 287 mg/L (exceeds the required standard of the discharge licence, 20 mg/L) at the effluent discharge outlet of the temporary sewage treatment plant near to the Contractor's site office on 16th April 2006. 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 repair can be made to the sewage treatment plant. However, 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.

For the temporary Sewage Treatment Plant (STP), sewage effluent was stored temporarily in a temporary storage tank since early May 2007. Jockey Club requested the Contractor to provide evidence to proof the performance of the STP and comply with the discharge licence before directly discharge to fresh water inland marsh. The temporarily stored sewage effluent was disposed off-site by licenced Contractor on bi-weekly basis. No information was submitted by the Contractor regarding the STP performance during reporting quarter.

No sewage influent to the temporary storage tank was recorded in June to early-July 2007 while the sewage treatment plant was still in operation. Algal blooms occurred at the upstream of the Fresh Water Inland Marsh on 26th June and 10th July 2007. The Contractor conducted a site inspection with the Engineer on 16th July 2007 and confirmed that the discharge pipe connecting the temporary sewage treatment plant to the temporary storage tank had been found damage and causing leakage which leading to continuous discharge of sewage water flowing into the Fresh Water Inland Marsh through drainage system. Moreover, after the new installed connecting pipeline from the temporary sewage treatment plant to the temporary storage tank since mid-July, the concentration of ammonia and nitrate nitrogen at the downstream of the Fresh Water Inland Marsh was found decreased gradually and to the level similar to those of other streams in September 2007.

Environmental Monitoring Works

A summary of the monitoring activities in this quarter is listed below:

24-hour Total Suspended Particulates (TSP) monitoring at GCA B1	16 times
Water quality monitoring (marine + freshwater)	16 times
Terrestrial Ecology	3 times
Marine Ecology	2 times
Landscaping & Visual	6 times

Air Quality

No exceedance of 24-hour TSP was recorded at GCA B1 in the reporting quarter.

Water Quality

For marine water quality, exceedances measured at M_Marsh were due to rainstorm events occurred on 28th June 2007 and discharge from the outlet of the Fresh Water Inland Marsh was considered project-related. Other recorded exceedances were considered not project-related.

For freshwater monitoring stations, exceedances were recorded, mainly suspended solids and turbidity, at all monitoring locations (Streams A, B & C) during the reporting quarter and all were considered project-related due to the silty runoff.

Continuous exceedances of ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, total inorganic nitrogen and chlorophyll a were recorded at the downstream of the Fresh Water Inland Marsh during the reporting quarter. The nutrient concentrations were started to decrease since the sewage effluent was diverted into a temporary storage tank in early May 2007 instead of discharging to the fresh water inland marsh. Poor effluent water quality results (high ammonia nitrogen and *E. coli*) taken in April and May 2007 were recorded from the Contractor's sewage treatment plant. All evidence had proven that the Contractor's sewage treatment plant is the major source for the Fresh Water Inland Marsh contamination reported in the last quarterly report (April to June 2007).

Ecology

Terrestrial

Heavy sedimentation to the Stream C leading to extreme low population aquatic fauna, in particular caridian shrimps, was found.

Marine

No non-compliance was recorded during the reporting quarter.

Transplanted coral

As agreed with AFCD, transplanted coral survey would require to be monitored for one year on quarterly basis. For the fourth quarterly (final) survey, 86 out of 89 transplanted corals were recovered and their conditions were similar with the baseline conditions in December 2006. No further transplanted coral survey will be required.

Environmental Audit

Site audit was carried out on a weekly basis to monitor environmental issues on the construction sites. The Contractor generally implemented the mitigation measures recommended in the EIA report to minimize the environmental impacts due to the construction works. Weekly site inspection and *ad hoc* site inspection were carried out to identify the potential source of dust, silty runoff and waste management. However, the monitoring results revealed that the temporary drainage system implemented and dust suppression measures were insufficient during reporting quarter. Waste management was satisfactory and in improvement progress during the reporting quarter.

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 fish 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.

Environmental Complaints and Prosecution

No environmental complaints/prosecution was received during the reporting quarter. The prosecution regarding the dust generation under the APCO (Construction Dust) Regulation (Schedule no. 14) in May 2007 was in progress.

Environmental Licensing and Permitting

License/Permits granted to the Project include the Environmental Permit (EP), construction noise permit (CNP) and chemical waste producer. The water discharge licence for the construction site was still valid during this reporting quarter.

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, and soil/sand/aggregates stockpiles;
- Turf establishment at the central portion of the East Course;
- 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;
- 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; 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/A, 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.

1.1.2 This is the seventh quarterly EM&A report which summarises the environmental monitoring and audit works for the Project in the third quarter of 2007 from July to September 2007.

2. Project Information

2.1 Background

2.1.1 The Project comprises the following major components:

- Construction of a 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 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 14th November 2005 under the EIAO. An Environmental Permit (EP-224/2005) was granted on 28th November 2005. A Variation of Environmental Permit (EP-224/2005/A) was issued on 17 August 2006.

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 16th January 2006 and was scheduled to be completed by end of June 2007. According to the Contractor's latest programme, construction works is schedule to be completed by December 2007.

2.5 Summary of EM&A Requirements

2.5.1 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.

Monitoring Parameters and Locations

2.5.2 24-hour TSP was the monitoring parameter for dust monitoring. One location for monitoring air quality was identified.

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

- Marine water quality (9 monitoring locations) - dissolved oxygen (DO), temperature, turbidity, suspended solids (SS), pH and salinity
- Freshwater water quality (7 monitoring locations) - dissolved oxygen (DO), temperature, turbidity, suspended solids (SS) , pH and salinity

2.5.4 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.

2.5.5 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.

2.5.6 Aquatic fauna and integrity of stream buffer zone at Streams A, B and C were identified to monitor the potential land formation impact on terrestrial ecology especially stream courses. For coral monitoring, there were one control and three impact monitoring locations were identified to monitor the marine construction activities.

2.5.7 Watching Brief (archaeology) monitoring locations are identified at the cut areas of Holes 2, 11, 12, 14, 15 & 16.

2.5.8 The monitoring locations for air, water, ecology and watching brief (archaeology) are depicted in **Annex B**.

Monitoring Methodology and Calibration Details

2.5.9 All monitoring works were conducted and monitoring equipment was regularly calibrated in accordance with the EM&A Manual. Calibration records were shown in the monthly EM&A reports for July to September 2007.

Environmental Quality Performance Limits (Action and Limit Levels)

2.5.10 The environmental quality performance limits, i.e. Action and Limit Levels (AL Levels) were derived from the baseline monitoring results and make reference to EIA report and latest EPD monitoring data. If the measured environmental quality parameters exceed the AL Levels, the respective action plan would be implemented. The AL Levels for each environmental parameter are given in **Annex C**.

3. Monitoring Result & Site Audit

3.1 Air Quality

3.1.1 Graphical presentation of the trend of the monitoring results of 24-hour TSP is provided in **Annex D**.

3.2 Water Quality

3.2.1 Graphical presentations of the trends of the monitoring results of marine water and freshwater quality are provided in **Annex D**.

3.3 Ecology

3.3.1 Monitoring results of the terrestrial and marine ecology are provided in **Annex D**.

3.4 Landscape and Visual

3.4.1 Damaged trees next to the administration building were still unprotected after being damaged by the adjacent construction activities.

3.4.2 Mal-pruning of transplanted trees had not been rectified since July 2006. Construction material was still stockpiled within tree protection zones since July 2006.

3.4.3 A statement on the cause of death of tree T925 recorded in the last report was still outstanding.

3.4.4 All transplanted trees were in fair condition except Tree T848 transplanted in last reporting month.

3.4.5 Soil around the transplanted trees was dry and more frequent watering is required.

4. Environmental Audit

4.1 Implementation Status of Environmental Mitigation Measures

4.1.1 Major construction work of the third golf course were (i) turfing at Holes 3-8, 10-16 and 18 (ii) sand capping at Holes 10 and 18 (southern part) (iii) permanent drainage / irrigation system / sub-soil drainage installation at central part (Holes 1 and 10) of East Course, (iv) permanent closed low flow drainage system installation, (v) hydroseeding at the permanent slope/bare grounds and (vi) furnishing work at permanent bridges.

4.1.2 The Contractor was reminded to provide sufficient dust suppression measures for loading/unloading activities, rough shaping and haul road (truck traffic).

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 after heavy rains.

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. Construction waste stockpiles were temporary stored and accumulated at Hole 2 near the adjacent slope of concrete batching plant during this reporting month. The stockpile location was considered improper. The Contractor was reminded to relocate the construction waste or dispose more frequently off-site and to submit the trip tickets record for our record.

4.1.5 Disposal of temporary stored wastewater from the CHEC's temporary sewage treatment plant was carried out on 24th July, 5th & 26th August and 9th September 2007 by licenced Contractor. However, no water quality report was submitted by CHEC regarding the performance of the sewage treatment plant. Therefore, no discharge of sewage effluent from the sewage treatment plant to fresh water inland marsh is allowed. The Contractor was continuously reminded to submit the disposal record by the licenced Contractor for record.

4.1.6 Insufficient mobile toilets were available on site at remote areas, only few units were located at the southern portion of construction site and were in dirty condition. The Contractor was reminded to keep the mobile toilets in clean condition.

4.1.7 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 E**.

4.2 Status of Environmental Licensing and Permitting

4.2.1 Valid environmental licenses and permits for the project during the reporting quarter are summarised in **Annex F**.

4.3 Advice on Solid and Liquid Waste Management Status

4.3.1 According to the site observation, vegetation stockpiles, construction wastes stockpiles and general refuse were removed regularly offsite with disposal records prepared by the Contractor. The stockpiles location at Hole 2 for the construction waste was considered inappropriate because it was sitting on a steep slope adjacent to concrete batching plant.

4.3.2 Chemical waste storage area near to the concrete batching plant was available on site during the reporting quarter.

5. Non-compliance (Exceedances) of the Environmental Quality Performance Limits (Action and Limit Levels)

5.1 Air Quality

5.1.1 No exceedance of 24-hour TSP was recorded at GCA B1 in the reporting quarter.

5.2 Water Quality

5.2.1 Rainstorm events were occurred on 28th & 29th June and 6th & 22nd August during the reporting quarter. The marine water exceedances were summarized in **Table 5.2-1.**

Table 5.2-1 Marine Water Exceedance Summary July to September 2007

Monitoring Station	Exceedance Level	Date	Parameters	Project-related
M_RO1	Action Level	8th Aug 07	SS	No
	Action Level	23rd Aug 07	SS	No
	Action Level	10th Sep 07	SS	No
KLW	Action Level	10th Sep 07	SS	No
M_Marsh	Action Level	28th Jun 07	Chl a	No
	Limit Level	28th Jun 07	Turbidity, SS	Yes
	Limit Level	28th Jun 07	NH_3-N	No
	Action Level	7th Jul 07	Chl a	No
	Limit Level	7th Jul 07	NH_3-N	No
	Limit Level	23rd Jul 07	NH_3-N	No
	Action Level	17th Sep 07	Turbidity	No
	Limit Level	17th Sep 07	Chl a	No
TTC	Limit Level	25th Jun 07	NH_3-N	No
	Action Level	28th Jun 07	Turbidity	No
	Limit Level	28th Jun 07	SS, NH_3-N, NO_3-N, TIN, Chl a	No
	Action Level	7th Jul 07	SS	No
	Limit Level	7th Jul 07	NH_3-N, Chl a	No
	Limit Level	16th Jul 07	NH_3-N, Chl a	No
	Limit Level	23rd Jul 07	NH_3-N, Chl a	No
	Limit Level	30th Jul 07	Chl a	No
	Action Level	8th Aug 07	SS	No
	Limit Level	13th Aug 07	Chl a	No
	Limit Level	20th Aug 07	Chl a	No
	Limit Level	23rd Aug 07	Chl a	No
	Action Level	27th Aug 07	Turbidity	No
	Limit Level	3rd Sep 07	NH_3-N	No
	Action Level	10th Sep 07	SS	No
	Limit Level	10th Sep 07	Chl a	No
	Limit Level	17th Sep 07	Chl a	No
M_Coral	Action Level	13th Aug 07	SS, Chl a	No
M_BP	Action Level	28th Jun 07	Turbidity, SS, Chl a	No
	Limit Level	28th Jun 07	NH_3-N	No

Monitoring Station	Exceedance Level	Date	Parameters	Project-related
	Action Level	7th Jul 07	SS	No
	Action Level	16th Jul 07	Chl a	No
	Limit Level	23rd Jul 07	NH_3-N	No
	Action Level	10th Sep 07	SS	No
KS	Action Level	28th Jun 07	SS	No
	Action Level	6th Aug 07	Chl a	No
	Action Level	8th Aug 07	SS	No
	Action Level	13th Aug 07	SS	No
	Limit Level	13th Aug 07	Chl a	No
	Limit Level	20th Aug 07	Chl a	No
	Limit Level	23rd Aug 07	Chl a	No
	Limit Level	3rd Sep 07	NH_3-N	No
	Action Level	10th Sep 07	SS	No

Freshwater

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

Table 5.2-2 Freshwater Exceedance Summary July to September 2007

Monitoring Station	Exceedance Level	Date	Parameters	Project -related
F_DA	Limit Level	25th Jun 07	Turbidity, SS	Yes
	Limit Level	28th Jun 07	Turbidity, SS	Yes
	Action Level	7th Jul 07	Turbidity, SS	Yes
	Limit Level	9th Jul 07	Turbidity, SS	Yes
	Action Level	16th Jul 07	SS	Yes
	Action Level	8th Aug 07	Turbidity, SS	Yes
	Limit Level	13th Aug 07	Turbidity, SS	Yes
	Action Level	23rd Aug 07	SS	Yes
	Limit Level	3rd Sep 07	NH3-N, TIN, Chl a	No
	Limit Level	17th Sep 07	NH3-N	No
F_UB	Limit Level	25th Jun 07	Turbidity, SS	Yes
	Limit Level	28th Jun 07	Turbidity, SS	Yes
	Limit Level	9th Jul 07	NO_3-N, TIN	Yes
	Limit Level	16th Jul 07	NH_3-N	Yes
	Action Level	23rd Jul 07	Chl a	Yes
	Limit Level	23rd Jul 07	Turbidity, SS	Yes
	Limit Level	30th Jul 07	NH_3-N, TIN	No
	Limit Level	6th Aug 07	Chl a	No
	Limit Level	8th Aug 07	SS	Yes
	Limit Level	13th Aug 07	Turbidity, SS	Yes
	Limit Level	13th Aug 07	NH_3-N, NO_3-N, TIN	No
	Action Level	20th Aug 07	SS	Yes
	Limit Level	20th Aug 07	Turbidity	Yes
	Limit Level	20th Aug 07	NO_3-N, TIN	No

Monitoring Station	Exceedance Level	Date	Parameters	Project -related
	Action Level	23rd Aug 07	SS	Yes
	Limit Level	23rd Aug 07	Turbidity	Yes
	Limit Level	23rd Aug 07	NO_3-N, TIN	No
	Limit Level	27th Aug 07	Turbidity	Yes
	Action Level	3rd Sep 07	SS	Yes
	Action Level	3rd Sep 07	Chl a	No
	Limit Level	3rd Sep 07	Turbidity	Yes
	Limit Level	10th Sep 07	Chl a	No
	Action Level	17th Sep 07	Turbidity, SS	Yes
F_DB	Limit Level	25th Jun 07	Turbidity, SS	Yes
	Limit Level	28th Jun 07	Turbidity, SS	Yes
	Limit Level	7th Jul 07	Turbidity, SS	Yes
	Limit Level	9th Jul 07	Turbidity, SS, NO_3-N, TIN	Yes
	Action Level	16th Jul 07	NO_3-N	Yes
	Limit Level	16th Jul 07	Turbidity, SS, NH_3-N, TIN, Chl a	Yes
	Action Level	23rd Jul 07	NO_3-N, TIN	Yes
	Limit Level	23rd Jul 07	Turbidity, SS, Chl a	Yes
	Action Level	30th Jul 07	SS	Yes
	Limit Level	30th Jul 07	Turbidity	Yes
	Limit Level	30th Jul 07	NO_3-N, TIN, Chl a	No
	Action Level	6th Aug 07	SS	Yes
	Limit Level	6th Aug 07	Turbidity	Yes
	Limit Level	8th Aug 07	Turbidity, SS	Yes
	Limit Level	8th Aug 07	NO_3-N, TIN	No
	Limit Level	13th Aug 07	Turbidity, SS	Yes
	Limit Level	13th Aug 07	NO_3-N, TIN	No
	Action Level	20th Aug 07	SS	Yes
	Limit Level	20th Aug 07	Turbidity	Yes
	Limit Level	20th Aug 07	NH_3-N, NO_3-N, TIN	No
	Action Level	23rd Aug 07	SS	Yes
	Action Level	23rd Aug 07	Chl a	No
	Limit Level	23rd Aug 07	Turbidity	Yes
	Limit Level	23rd Aug 07	NO_3-N, TIN	No
	Action Level	27th Aug 07	SS	Yes
	Limit Level	27th Aug 07	Turbidity	Yes
	Limit Level	27th Aug 07	NO3-N, TIN, Chl a	No
	Action Level	3rd Sep 07	SS	Yes
	Limit Level	3rd Sep 07	Turbidity	Yes
	Limit Level	3rd Sep 07	NH3-N, NO3-N, TIN, Chl a	No
	Limit Level	10th Sep 07	Turbidity, SS	Yes
	Limit Level	10th Sep 07	Chl a	No
	Action Level	17th Sep 07	SS	Yes
	Action Level	17th Sep 07	NO3-N, TIN	No
	Limit Level	17th Sep 07	Turbidity	Yes
	Limit Level	17th Sep 07	Chl a	No

Monitoring Station	Exceedance Level	Date	Parameters	Project -related
F_UC	Limit Level	25th Jun 07	Turbidity, SS	Yes
	Limit Level	28th Jun 07	Turbidity, SS	Yes
	Action Level	9th Jul 07	SS	Yes
	Limit Level	6th Aug 07	NH_3-N	No
	Action Level	8th Aug 07	Turbidity, SS	Yes
	Limit Level	8th Aug 07	NO_3-N, TIN	No
	Limit Level	13th Aug 07	Turbidity, SS	Yes
	Limit Level	13th Aug 07	NH_3-N, NO_3-N, TIN	No
	Action Level	20th Aug 07	SS	Yes
	Limit Level	20th Aug 07	Turbidity	Yes
	Limit Level	20th Aug 07	NO_3-N, TIN	No
	Limit Level	23rd Aug 07	SS	Yes
	Limit Level	23rd Aug 07	NO_3-N, TIN	No
	Limit Level	3rd Sep 07	NH3-N, TIN	No
	Action Level	10th Sep 07	Chl a	No
	Limit Level	10th Sep 07	Turbidity, SS	Yes
	Action Level	17th Sep 07	SS	Yes
	Limit Level	17th Sep 07	Turbidity	Yes
	Limit Level	17th Sep 07	NO3-N, TIN, Chl a	No
F_DC	Limit Level	25th Jun 07	Turbidity, SS	Yes
	Limit Level	28th Jun 07	Turbidity, SS	Yes
	Action Level	7th Jul 07	SS	Yes
	Limit Level	7th Jul 07	Turbidity	Yes
	Limit Level	9th Jul 07	Turbidity, SS	Yes
	Action Level	8th Aug 07	Turbidity, SS	Yes
	Limit Level	8th Aug 07	NO_3-N, TIN	No
	Limit Level	13th Aug 07	Turbidity, SS	Yes
	Limit Level	13th Aug 07	NO_3-N, TIN	No
	Limit Level	20th Aug 07	Turbidity, SS	Yes
	Limit Level	20th Aug 07	NO_3-N, TIN	No
	Action Level	23rd Aug 07	SS	Yes
	Limit Level	23rd Aug 07	NO_3-N, TIN	No
	Action Level	27th Aug 07	Turbidity, SS	Yes
	Limit Level	27th Aug 07	NO3-N, TIN	No
	Action Level	3rd Sep 07	SS	Yes
	Limit Level	3rd Sep 07	Turbidity	Yes
	Limit Level	3rd Sep 07	NO3-N, TIN	No
	Action Level	10th Sep 07	Turbidity, SS	Yes
	Limit Level	10th Sep 07	NO3-N, TIN, Chl a	No
	Limit Level	17th Sep 07	NO3-N, TIN, Chl a	No
F_Inland M	Action Level	25th Jun 07	SS	Yes
	Limit Level	25th Jun 07	Turbidity, NO_3-N, TIN, Chl a	Yes
	Limit Level	28th Jun 07	Turbidity, SS, NH_3-N, NO_3-N, NO_2-N, TIN, TP, Chl a	Yes
	Action Level	7th Jul 07	SS	Yes
	Limit Level	7th Jul 07	Turbidity, NH_3-N, NO_3-N, TIN, Chl a	Yes

Monitoring Station	Exceedance Level	Date	Parameters	Project -related
	Action Level	9th Jul 07	Turbidity	Yes
	Limit Level	9th Jul 07	NH_3-N, NO_3-N, TIN, Chl a	Yes
	Action Level	16th Jul 07	SS	Yes
	Limit Level	16th Jul 07	Turbidity, NH_3-N, NO_3-N, TIN	Yes
	Limit Level	23rd Jul 07	Turbidity, NH_3-N, NO_3-N, TIN	Yes
	Limit Level	30th Jul 07	NO3-N, NO2-N, TIN	Yes
	Limit Level	6th Aug 07	NO3-N, TIN	Yes
	Action Level	8th Aug 07	SS	Yes
	Limit Level	8th Aug 07	Turbidity, NO3-N, TIN	Yes
	Limit Level	13th Aug 07	Turbidity, SS, Chl a	Yes
	Limit Level	23rd Aug 07	NO3-N, TIN	Yes
	Limit Level	27th Aug 07	NO3-N, TIN	No
	Limit Level	3rd Sep 07	NO3-N, TIN, Chl a	No
	Limit Level	10th Sep 07	NO3-N, TIN	No
	Limit Level	17th Sep 07	NH3-N, TIN	No

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 mainly due to remaining accumulation of nutrient discharge from the temporary sewage treatment plant and insufficient temporary drainage provided on site.

5.2.3 Exceedances of ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, total inorganic nitrogen and chlorophyll a were recorded at downstream of fresh water inland marsh. Further review of action and limit levels of ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, total inorganic nitrogen and chlorophyll is recommended. All exceedances were considered project-related but not due to the turf establishment.

5.2.1 Biological pesticide was applied to suppress the insect growth as the first priority. However, it was considered ineffective and caused turf damage. Chemical applications (Chlorpyrifos, Chlorothalonil, Fipronil, Fosetyl Aluminium, Glyphosate, Manocozeb and Oxadiazon) were recorded in the reporting quarter. In the reporting quarter, 23 days (5 days in July, 9 days in August and 9 days in September) water sampling was implemented, including chemicals (Chlorpyrifos, Chlorothalonil, Fipronil, Glyphosate, Oxadiazon) were covered. All water samples were required to send to overseas laboratory for analysis and testing. For July and August 2007, the residue chemicals in water at the monitoring stations are found undetectable. As for September 2007, the monitoring results are not available in the reporting month.

5.2.2 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.

5.2.3 The Contractor was reminded to improve and provide sufficient temporary drainage system and treatment facilities on site before water discharge to marine and stream water.

5.3 Ecology

5.3.1 The Contractor was reminded to remove the boulders within the stream buffer zone area at the downstream end of Stream A by hand. No equipment was allowed entering to the stream buffer zone area to rectify the situation. Consequent reinstatement of the stream buffer zone was also suggested to be carried out.

5.3.2 Stream C buffer zone incident (vegetation clearance at part of the buffer zone area) was occurred in May 2007 and reinstated in June 2007. The Contractor was reminded to maintain the reinstated buffer zone (Streams B & C) during the construction phase of this project.

5.3.3 Significant silty runoff and silt were deposited at the steam bed of Streams B & C after heavy rainstorms. We consider that the preventative measures provided on site is insufficient and many of the silt fence were collapsed at various low points along the buffer zone areas leading to silty runoff. We have also repeatedly reminded the Contractor to strengthen and implement sufficient preventive measures to avoid silty runoff to all streams and marine water during site audit. The incident report, proposed remediation work and mitigation measures prepared by the Contractor were still outstanding in this reporting quarter.

Marine Ecology

5.3.4 The fourth quarterly coral monitoring at Site B2, Site C and Control Site was carried out in September 2007. In the survey, minor sedimentation on some of the tagged corals at Site B2 were observed and one more tagged coral (B-16) was found missing. New or further mortality on B-12, B-17, B-54 and B-55 were found. But these mortality records were still below the Action Level for coral monitoring, i.e. “a 15% in crease in the percentage of partial mortality of corals occurs at more than 20% of the tagged coral conlonies at one or more monitoring sites”. The Control Site still remained similar conditions as during the Baseline Survey (no mortality, sedimentation or bleaching was found), except the missing of X-05 colony.

Transplanted Coral

5.3.5 The fourth quarterly coral monitoring at the transplanted corals was carried out in September 2007. 86 out of the 89 transplanted corals were recovered and their conditions were similar with the baseline conditions (during the transplantation process).

5.4 Summary of Environmental Complaint

5.4.1 No environmental complaint was received from the construction site during the reporting quarter.

5.5 Summary of Environmental Summons

5.5.1 No summon was received from the construction site during the reporting quarter.

6. Recommendations and Conclusions

6.1.1 This Quarterly Environmental Monitoring and Audit (EM&A) Report presents the EM&A works undertaken during the period from July to September 2007 in accordance with EM&A Manual and the requirement under EP-224/2005/A.

6.1.2 No exceedance were recorded for 24-hour TSP in the reporting quarter.

6.1.3 Except exceedances found at the Fresh Water Inland Marsh due to the leakage incident of the Contractor's temporary sewage facilities, water quality exceedances, chlorophyll a and nutrients, at marine and stream monitoring locations were mainly due to the natural variation of the water environment. However, suspended solids and turbidity exceedances at stream locations were recorded and considered project-related after rainstorms occurred during July to September 2007.

6.1.4 The Contractor was reminded to prevent any rock fill to Stream A happened in the previous reporting quarter. For Streams B & C (silt settled at the stream bed) during the wet season, the Contractor was reminded to protect the buffer zone and streams throughout the construction phase.

6.1.5 The fourth quarterly coral monitoring at the Site B2, Site C and the Control Site and fourth quarterly transplanted corals were carried out in September 2007. This was also the final monitoring for the transplanted corals.

6.1.6 The Contractor was reminded to properly dispose the vegetation stockpiles and construction waste. The Contractor was also reminded to rectify the mal-pruning practice of the transplanted trees and maintain all transplanted trees in good health condition in particular provision of tree buffer zone and sufficient watering.

6.1.7 No environmental complaint was received in the reporting quarter.

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