

Public Golf Course at Kau Sai Chau Island, Sai Kung

Operation Phase

Environmental Monitoring & Audit (EM&A) Report
for June 2008

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Report Authorized For
Issue By:



For and on Behalf of
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Executive Summary

This is the fourth Operation Phase Monthly Environmental Monitoring and Audit (EM&A) Report prepared by Black & Veatch for the Project “Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung”. This report presents the results of the EM&A works conducted in the month of June 2008 (25th May to 24th June 2008).

Water Quality

2 sets of water quality monitoring were carried out on 10th and 23rd June 2008 at 8 marine and 6 freshwater monitoring locations. No water sample is taken at M_RO2 (marine station), the monitoring will only be carried out when desalination plant is in operation. For F_Filter (fresh water station), no filter effluent was discharging during sampling and, thus no water sample was taken on 4th and 23rd June 2008. Heavy rainstorm events were hoisted on 29th May, 3rd and 6th June 2008 during this reporting month. Water samples were taken on 30th May, 4th and 7th June 2008.

Exceedances found at marine stations and freshwater stations are considered non-project related during the reporting month.

Marine Ecology

Temporary barging point removal was completed in June 2008. The coral monitoring for the East Course will commence in the next reporting month.

Landscaping & Visual

The Contractor is still finalizing the landscaping works, the landscape and visual site audit will be conducted once planting on the golf course are completed. According to the site audit observation, approximate 40% compensatory trees have died.

Soil Nutrient

No soil nutrient analysis was carried out during this reporting month.

1. Introduction

1.1 Background of the Project

1.1.1 Black & Veatch (hereinafter called the “ET”) was appointed by The Jockey Club Kau Sai Chau Public Golf Course Limited (hereinafter called the “Project Proponent”) to undertake Operation Phase of 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 on water quality, marine ecology, landscape and visual and land contamination during operation phase are required for the Project.

1.1.2 This report summarises the environmental monitoring and audit works for the Project in **June 2008**.

1.2 Purpose of the Report

1.2.1 This is the **fourth** EM&A report which summarizes the impact monitoring results and audit findings for the EM&A programme during the reporting period from **25th May to 24th June 2008**.

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 and site description
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	Monitoring Results	Summarizes the monitoring results obtained in the reporting period.
5	Environmental Non-conformance	Summarizes any monitoring exceedance, environmental complaints and environmental summons within the reporting period.
6	Conclusions	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 was submitted 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 Summary of EM&A Requirements

2.3.1 The EM&A programme requires environmental monitoring for water quality, marine ecology, landscape and visual and land contamination during operation phase. 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.

2.3.2 A summary of impact EM&A requirements is presented in Table 2.1.

Table 2.1 Summary of Impact EM&A Requirements during Operation Phase

Impacts	Parameters/descriptions	Locations	Frequencies
Water Quality	Dissolved Oxygen, Temperature, Turbidity, pH, Salinity, SS, NO ₃ -N, NO ₂ -N, NH ₃ -N, TP, Chl-a and selected pesticides.	9 marine and 6 freshwater locations	2-year of monitoring period for the operation phase. Monitoring should be carried out on bi-weekly basis for the first 12 months, after when the frequency will be reviewed by EPD. Additional monitoring parameters at Lake 1D are required (TKN, Ortho-P and Conductivity)
	Dissolved Oxygen, Temperature, Turbidity, pH, Salinity, SS, NO ₃ -N, NO ₂ -N, NH ₃ -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.
Marine Ecology	Natural corals	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.
Landscape and Visual	Audits to ensure effective implementation of mitigation measures	Golf course area and at visual sensitive receivers	Auditing inspections and reporting shall be undertaken once every two months for the first year of the operation phase.
Soil Nutrient	Nutrient Status of the Soil	Golf course	Twice annually

3. Environmental Monitoring Requirements

3.1 Water Quality

Monitoring Requirement

- 3.1.1 Water quality monitoring was conducted in accordance with the EM&A Manual. Tables 3.1 to 3.3 show the established Action/Limit Levels for the water environmental monitoring parameters.

Table 3.1 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 NH₃-N, NO₂-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

**Table 3.2 Action and Limit Levels for Water Quality Monitoring
(applicable to irrigation lake 1D and existing reservoir)**

Parameter (mg/L unless stated)	Action and Limit Levels
pH	6.0 - 9.0 ⁽¹⁾
Turbidity (NTU)	-
Dissolved Oxygen	>4 ⁽¹⁾
Chlorophyll a (mg/m ³)	<5 ⁽¹⁾
Nitrate N	0.20 ⁽¹⁾
Nitrite N	0.20 ⁽¹⁾
Ammoniacal N	0.50 ⁽¹⁾
Total Kjeldahl N	1.2 ⁽²⁾
Total Phosphate	0.1 ⁽¹⁾
Ortho Phosphate	0.05 ⁽¹⁾
Conductivity (µS/cm)	<1000 ⁽¹⁾

Note: (1) These values are based on professional judgment and knowledge

(2) Based on 90th percentile of operational phase monitoring data (1996 to June 1998)

Table 3.3 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 NO₂-N) at non-FCZ stations, the trigger level has made reference to the existing golf course guideline values. The guideline value of NO₂-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 NO₂-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

Monitoring Parameters, Frequency and Programme

- 3.1.2 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.
- 3.1.3 For the stream course, measurements shall be taken at mid-water depth.
- 3.1.4 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, salinity and conductivity (Lake 1D only).
- 3.1.5 Additional marine and freshwater water quality monitoring parameters for the impact monitoring during construction include nitrate nitrogen (NO₃-N), nitrite nitrogen (NO₂-N), ammonia nitrogen (NH₃-N), total phosphate (TP) and selected pesticides. For Lake 1D, Total Kjeldahl Nitrogen (TKN) and Orthophosphate (Ortho P) are required.
- 3.1.6 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 3.1.5.

Monitoring Frequency

- 3.1.7 The monitoring parameters and frequency are summarized in Table 3.4. The monitoring programme for the reporting period is shown in **Annex A**.

Table 3.4 Water Quality Monitoring Parameter, Frequency and Locations

Parameters	Frequency	Location
Dissolved Oxygen (mg/L)	Bi-weekly for the first operation year, subjected to review for the second operation year	<u>Marine Water</u> Fish culture zone stations: TTC, KLW, KS Control stations: M_A, M_B Impact stations: M_BP, M_RO1, M_Marsh, M_Coral (M_RO2 - only when RO in operation)
Temperature (°C)		
Turbidity (NTU)		
pH		
Salinity (ppt)		
Suspended Solids (mg/L)		
Conductivity (uS/cm)*		
	<u>Marine water</u> : 2 times per day – 1 for mid-flood and 1 for mid-ebb <u>Freshwater</u> : once per day	<u>Freshwater Water</u> Stream A (F_DA) Stream B (F_DB) Stream C (F_DC) Inland Marsh (F_Inland_M) Outlet of ADS Filter (F_Filter) Lake 1D (F_lake 1D)

Remarks: *Lake 1D only

Monitoring Locations

- 3.1.8 The water quality monitoring locations for marine and freshwater (**Figure 3.1**) are summarized in Table 3.5.

Table 3.5 Water Quality Monitoring Locations during Operation Phase

Identification Number	Location	Approx. Water Depth	No. of Depth
<i>Marine Water (9 stations)</i>			
TTC	Tai Tau Chau Fish Culture Zone	9.5 m	3
KLW	Kai Lung Wan Fish Culture Zone	13 m	3
KS	Kau Sai Fish Culture Zone	11 m	3
M_BP	Temporary barging point	9.6 m	3
M_RO1	Desalination plant south of the existing pier	5 m	2
M_RO2	Desalination plant south of the existing pier	13 m	3
M_Marsh	Discharge point at the existing marsh	7.7 m	3
M_Coral	Marine water of Port Shelter	10.2m	3
M_A	Water Control Station of Port Shelter	7.5 m	3
M_B	Water Control Station of Port Shelter	16.5 m	3
<i>Fresh Water (7 stations)</i>			
F_DA	downstream of stream A	Mid-depth	1
F_DB	downstream of stream B	Mid-depth	1

Identification Number	Location	Approx. Water Depth	No. of Depth
F_DC	downstream of stream C	Mid-depth	1
F _ Inland M	Downstream of the existing marsh (Inland)	Mid-depth	1
F_lake 1D	Irrigation Lake 1D	Mid-depth	1
F_Filter	Filter effluent point at Holes 5 / 6	Mid-depth	1

Monitoring Equipment

Dissolved Oxygen and Temperature Measuring Equipment

3.1.9 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.

3.1.10 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).

3.1.11 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

3.1.12 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

3.1.13 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

3.1.14 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

- 3.1.15 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

- 3.1.16 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

- 3.1.17 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

- 3.1.18 A portable, battery-operated flow meter should be used for the determination of water depth at each designated monitoring location and record in m³/s. A hand held or meter fixed to the underside of the survey boat may be used.

Sample Containers and Storage

- 3.1.19 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

- 3.1.20 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

- 3.1.21 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.
- 3.1.22 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.
- 3.1.23 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

- 3.1.24 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

- 3.1.25 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

- 3.1.26 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

- 3.1.27 The Event and Action Plan (EAP) for water quality monitoring is presented in **Annex B**.

3.2 Marine Ecology

Introduction

- 3.2.1 The marine ecological monitoring surveys are conducted in accordance with the EM&A manual.
- 3.2.2 As stipulated in the EM&A Manual, the ecological monitoring surveys for marine ecology included coral monitoring at both the eastern and western coasts of Kau Sai Chau Island (Site C and Control Site). It is not required to monitor Site D2 due to no commencement of dredging work for the desalination plant during the construction phase. The purpose of the monitoring survey was to check the conditions of the tagged corals and the impact sites.

Monitoring Frequency and Schedule

- 3.2.3 At each of the Site C and a Control Site near the AFCD's Coral Buoy at Sharp Island (**Figure 3.2**), 20 natural coral colonies are already selected and tagged during construction phase. If the tagged coral is found die or not suitable for sequent operation phase monitoring during the first month survey, new coral will be selected, tagged and replaced for the damage one. The species of corals had 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*.
- 3.2.4 The coral monitoring will be conducted monthly for the first three months of the operation phase, and if no exceedance was recorded, the monitoring schedule will be changed to semi-annually (i.e. one dry season and one in wet season) during the rest of the operation phase. Monitoring survey will consist of checking tagged corals at both impact sites and control site. Percentages of survival, sedimentation and bleaching for each tagged corals will be recorded. The monitoring programme for the reporting period is shown in **Annex A**.

Event and Action Plans

- 3.2.5 The Event and Action Plan (EAP) for ecology monitoring is presented in **Annex B**.

3.3 Landscape and Visual

- 3.3.1 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, regular site inspections on trees health will be conducted. Auditing inspections and reporting are undertaken once every two months during the first year of the operation phase. The monitoring programme for the reporting period is shown in **Annex A**.

3.4 Soil Nutrient

- 3.4.1 Routine soil testing for nutrients at East Course will be conducted semi-annually to ensure that nutrient applications to the golf course are having the desired effect. Adjustments, if necessary, are made to the applications program approved by Golf Course Superintendent to amend any soil imbalances or deficiencies in nutrients. The details of the fertilizers and pesticides application will also be recorded.

4. Monitoring Results

4.1.1 Monitoring data are provided in **Annex C**.

4.1 Water Quality

4.1.2 Marine and freshwater water quality monitoring were conducted at the 9 and 6 designated monitoring stations respectively.

4.1.3 Application of the discharge licence of the desalination plant is in progress. The monitoring M_RO2 is not necessary until the desalination plant fully is operational.

4.1.4 Monitoring of marine and freshwater locations was conducted on 2 occasions in May and June 2008 (4th and 23rd June 2008). The QA/QC results for laboratory testing in the reporting month are acceptable and summarised in **Annex D**. Rainstorm signal was hoisted on 29th May, 3rd and 6th June 2008 during this reporting month.

4.1.5 Under normal situation, there is no water discharge from the Holes 5 / 6 through the drainage system during sampling. Therefore, no water sample for F_Filter was collected during the reporting month. However, water samples were discharged from Holes 5 / 6 and collected after the rainstorm events on 20th May, 7th, 10th and 14th June 2008. Summary of fertilizer and pesticides applications are summarized in **Annex E**.

4.1.6 Chemical applications were applied during the reporting month. They are approved pesticides listed in the turfgrass management plan in the final EIA report. Water samples were required to send to overseas laboratory for analysis and testing.

Marine water

4.1.7 The marine water exceedances are summarised in **Table 4.1-1**.

4.1.8 SS exceedance was recorded at KLW at 4.7 mg/L on 7th June 2008 while SS concentration recorded at M_A is similar to KLW at 6mg/L.

4.1.9 Turbidity and SS exceedances were recorded at M_Marsh at 4.2 NTU and 6.5 mg/L on 7th June 2008. Turbidity exceedance was recorded at M_Marsh at 3.5 NTU on 10th June 2008. As M_Marsh is far from golf course, the variation could be due to the wet weather during the month of June 2008.

4.1.10 All marine water exceedances are considered non-project related.

Table 4.1-1 Marine Water Exceedance Summary (May to June 2008)

Monitoring Location	Exceedance Level	Date	Parameters	Project-related
KLW	Action Level	7 June 2008	SS	No
M_Marsh	Action Level	7 June 2008	Turbidity, SS	No
	Action Level	10 June 2008	Turbidity	No

Fresh water

4.1.11 The fresh water exceedances are summarised in **Table 4.1-2**.

Table 4.1-2 Marine water Exceedance Summary (May to June 2008)

Monitoring Location	Exceedance Level	Date	Parameters	Project-related
F_DA	Action Level	30 May 2008	Turbidity, SS	No
	Limit Level	30 May 2008	NO ₃ -N, TIN	No
	Limit Level	4 June 2008	NO ₃ -N, TIN	No
	Action Level	7 June 2008	Turbidity, SS	No
	Action Level	10 June 2008	SS	No
	Limit Level	10 June 2008	Turbidity	No
	Action Level	14 June 2008	SS	No
	Limit Level	14 June 2008	Turbidity	No
F_DB	Action Level	30 May 2008	SS	No
	Limit Level	30 May 2008	NO ₃ -N, TIN	No
	Limit Level	4 June 2008	NO ₃ -N, TIN	No
	Action Level	7 June 2008	SS	No
	Limit Level	7 June 2008	Turbidity	No
	Action Level	10 June 2008	SS	No
	Limit Level	10 June 2008	Turbidity	No
	Action Level	14 June 2008	Turbidity, SS	No
F_DC	Limit Level	30 May 2008	Turbidity, SS, NO ₃ -N, TIN	No
	Limit Level	4 June 2008	NO ₃ -N, TIN	No
	Action Level	7 June 2008	SS	No
	Limit Level	7 June 2008	Turbidity	No
	Action Level	10 June 2008	SS	No
	Limit Level	10 June 2008	Turbidity	No
F_Inland M	Limit Level	30 May 2008	Turbidity, SS, NO ₃ -N, TIN, Ortho P, Chl a	No
	Action Level	4 June 2008	SS	No
	Limit Level	4 June 2008	Turbidity, NO ₃ -N, TIN, Ortho P	No
	Limit Level	7 June 2008	Turbidity, SS, NO ₃ -N, NO ₂ -N, TIN, Ortho P, Chl a	No
	Limit Level	10 June 2008	Turbidity, SS, NH ₃ -N, NO ₃ -N, TIN	No
	Limit Level	14 June 2008	NO ₃ -N, TIN, Ortho P	No
	Limit Level	23 June 2008	NO ₃ -N, TIN	No
F_Filter	Limit Level	30 May 2008	Turbidity, SS, NO ₃ -N, TIN, Ortho P	No
	Action Level	7 June 2008	SS	No
	Limit Level	7 June 2008	Turbidity, NO ₃ -N, TIN, Ortho P, Chl a	No
	Limit Level	10 June 2008	NO ₃ -N, TIN, Ortho P	No
	Limit Level	14 June 2008	NO ₃ -N, TIN, Ortho P	No
Lake 1D	Limit Level	30 May 2008	Ortho P, Chl a	No
	Limit Level	4 June 2008	NO ₃ -N, Ortho P	No
	Limit Level	7 June 2008	Turbidity, SS, Ortho P	No
	Limit Level	10 June 2008	Turbidity, SS, Ortho P	No
	Limit Level	14 June 2008	Turbidity, SS, Ortho P	No
	Limit Level	23 June 2008	Ortho P	No

- 4.1.12 June 2008 is the third month of wet season and the wettest month. Water quality of the streams before any commencement works were measured in April 2006 in order to indicate natural variation between dry and wet seasons. By taking into account the seasonal variation (wet season) together with the baseline monitoring data (dry season), the 95%-ile and 99%-ile for NO₃-N are 0.22 and 0.55 mg/L respectively while the 95%-ile and 99%-ile for TIN are 0.25 and 0.67 mg/L respectively.
- 4.1.13 Limit levels nitrate nitrogen (NO₃-N) and total inorganic nitrogen (TIN) exceedances were recorded at downstream A, B & C. NO₃-N concentrations ranging from 0.13 mg/L to 0.27 mg/L while TIN concentrations ranging from 0.15 mg/L to 0.29 mg/L were recorded. Both NO₃-N and TIN concentrations are well within the wet season natural variation range. Therefore, it is considered that all exceedances are non-project related.
- 4.1.14 Turbidity (5.7 to 93.2 NTU), SS (7 to 103 mg/L), NH₃-N (0.14 mg/L), NO₃-N (0.13 to 0.50 mg/L), NO₂-N (0.02 mg/L), TIN (0.18 and 0.52 mg/L), Ortho P (0.03 to 0.08 mg/L) and Chlorophyll a (0.7 to 09 µg/L) exceedances were recorded at downstream of Fresh Water Inland Marsh and F_Filter. One of the possible reasons for the exceedances is due to huge amount of rainwater collected by the existing golf course catchment during the occurrence of the rainstorm events and washing down to the fresh water inland marsh which vigorously disturb the fresh water inland marsh. In addition, some of the golf course areas are being damaged and wash-off to downstream of fresh water inland marsh. It is considered non-project related.
- 4.1.15 The lake 1D is designed for temporary storage to collect the runoff from East Course through the closed low flow drainage system. The water will be recycled and reused as one of the irrigation water sources for the East Course. Turbidity, SS, NO₃-N, ortho P and chlorophyll a exceedances were recorded. As there is no overflow / discharge from the Lake 1D to marine or fresh water bodies, no further action has to be taken.
- 4.1.16 As there was no chemical application (heavy rainstorm events) during the reporting month, no monitoring result is presented in this report.

4.2 Marine Ecology

- 4.2.1 The removal of the temporary barging point was completed in June 2008. The operation phase monitoring will commence in the next reporting month.

4.3 Landscape & Visual

- 4.3.1 The landscape work is not yet completed by the Contractor. The operation phase monitoring will commence when the Final Landscape Plan is available from the Contractor.

4.4 Soil Nutrient

- 4.4.1 No soil nutrient was taken and reported during this reporting month.

5. Conclusions

- 5.1.1 The Environmental Monitoring and Audit (EM&A) Report presents the operational EM&A works undertaken during the period from 25th May to 24th June 2008 in accordance with EM&A Manual and the requirement under EP-224-2005/A.
- 5.1.2 Exceedances on marine stations are recorded and considered non-project related. The exceedances are mainly due to the natural variation.
- 5.1.3 Exceedances on fresh water stations are recorded and considered non-project related. The exceedances are mainly due to wet season variation, in particular, rainstorm events.
- 5.1.4 Application of discharge licence of the desalination plant is in progress. Marine water monitoring location at M_RO2 is not required.
- 5.1.5 Removal of rock-filled pier at the temporary barging point was completed. Coral monitoring will commence in the next reporting month.
- 5.1.6 The landscape work is still not yet completed by the Contractor. The operation phase monitoring will commence when the Final Landscape Plan is available from the Contractor.
- 5.1.7 No environmental complaint / summon was received during the reporting month.