



SkyCity Nine Eagles Golf Course

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## EM&A Quarterly Compliance Report

May 2009 to July 2009



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May 2009 to July 2009

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**Checker** Terence KONG

**Approver** Alexi BHANJA

**Report No** EB000226-R09-01

**Date** 14 August 2009

Three horizontal lines with handwritten signatures in blue ink. The first signature is for Yu Man TSANG, the second for Terence KONG, and the third for Alexi BHANJA.

This report has been prepared for SkyCity Nine Eagles Golf Course in accordance with the terms and conditions of appointment for *SkyCity Nine Eagles Golf Course* dated 16 March 2006. Hyder Consulting Limited (Company Number 126012) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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# 1 EXECUTIVE SUMMARY

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The purpose of this Project is to construct and operate a 9-hole Golf Course at the east side of the North Commercial District (NCD) on the Airport Island as an interim arrangement prior to the area's future development as a business park (see **Figure 1-1**). The interim golf facility, known as "SkyCity Nine Eagles Golf Course" is intended to serve airport passengers, overseas visitors and airport workers until August 2013.

The Project is managed by SkyCity Nine Eagles Golf Course, who have engaged Green Management Ltd. to establish and maintain the turfgrass of the Golf Course. Hyder Consulting have been employed as the Environmental Team (ET) for the Operation Period and have engaged ALS Technichem Pty Ltd as the HOKLAS accredited testing laboratory to carry out lake water analysis. Construction was completed on 31 December 2006, the first phase of the Operation Period was completed on 30 April 2007, and the second phase commenced on 1 May 2007.

According to the approved EM&A Manual, monthly compliance monitoring of lake water quality at four locations (W1 to W4) is required during the second phase of the Operation Period, with reporting on a quarterly basis. Parameters monitored comprise Suspended Solids (SS), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD<sub>5</sub>), nitrogen, phosphorous, temperature and salinity.

This is the ninth Quarterly Compliance report covering May 2009 to July 2009 and complies with the reporting requirements stated in the approved EM&A Manual.

There were exceedances of the Action Levels for SS and for BOD during scheduled monitoring in the reporting quarter. There were also exceedances in the Limit Level for SS during follow-on monitoring on once occasion. On each occasion of a series of exceedances, EPD and the Golf Course Supervisor were notified as required, as soon as the results were available, and follow-on monitoring was also arranged on weekly basis. Furthermore, the Golf Course Supervisor was advised that lake water was not of an acceptable quality for discharge and that the control valve must not be opened until there is no longer any exceedance of the Action Level.

The exceedances in were reviewed and, based on site observation, these have been attributed to rapid algal growth in the water. The algal growth is not due to excessive use of organic nutrients on the Golf Course washing off into the lake and resulting in high nutrient levels in the water – the nutrient levels in the water remain well below the Action Level – and so the TMP is not the cause. Instead, it is considered that the rapid algal growth is the result of a combination of high water temperatures, low rainfall and the limited circulation within the lakes, leading to stagnation – the water is visibly green due to algal content. To combat this, the Operator increased the use of the aerators in the lakes, in order to improve circulation, although this has not been completely successful. The Operator is therefore considering adding "Aqua Bio-Trol", a non-chemical, natural liquid microbial pond clarifier, to reduce algal growth.

During the reporting quarter, no complaints were received; and there were no notifications of summons. There were also no openings of the control valve, emergency or otherwise.



Figure 1-1 Location of SkyCity Golf Course on the Airport Island

## 2 LAKE WATER QUALITY EM&A

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### 2.1 Overview

The Golf Course has been designed to contain water within two artificial lakes, which are linked together by two underwater pipes. Because of the sloping topography of the site, all rainwater collected within the Golf Course will drain into the lakes through a sub-soil drainage system. The lakes provide a source of freshwater for irrigation, from which surplus water will flow back into the lakes.

The lakes are normally maintained at a capacity of 15,000m<sup>3</sup>. This is not "full" but is the level that provides the required visual appearance. During the winter (dry) months, however, the lake water may fall below this level. The maximum capacity of the lakes is 20,000m<sup>3</sup>.

If more than 20,000m<sup>3</sup> of water flows into the lakes, then the Golf Course may flood. To avoid this, the Golf Course Supervisor can authorise the opening of a control valve to allow the water to overflow from the lake and into off-site storm drains that discharge via Outfall No. 8. However, the valve can only be opened if the latest lake water monitoring results indicate that water is of an acceptable quality. In normal circumstances, the control valve remains closed and discharge off-site is not possible. All opening/closing of the control valve is logged on site.

If the latest lake water monitoring results indicate that water is not of an acceptable quality, then the valve cannot be opened, the lake water cannot overflow and the Golf Course may begin to flood. This is part of the mitigation design to prevent off-site discharge of water that does not meet the required standard.

The bund that surrounds the site is at least 1.5m high and up to 90,000m<sup>3</sup> of floodwater can be retained within the Golf Course in addition to the 20,000m<sup>3</sup> lake capacity. In this situation, water samples from the flooded Golf Course will be taken more frequently. Only when water has returned to an acceptable quality will the control valve be opened to allow water to overflow from the lake and into off-site storm drains that discharge via Outfall No. 8, thereby allowing the flood to recede.

The system by which this water control is achieved is shown in **Figure 2-1**.

### 2.2 EM&A Programme

Monitoring of Dissolved Oxygen (DO) concentration in mg/l, Suspended Solids (SS) in mg/l, Biochemical Oxygen Demand (BOD<sub>5</sub>) in mg/l, Total Nitrogen in mg/l, Total Phosphorous in mg/l, Salinity in mg/l, and temperature in °C was carried out by the ET to ensure that any deterioration in lake water quality could be readily detected and timely action could be taken to rectify the situation if this was due to site operations. DO, temperature and salinity were measured *in-situ* whilst SS was determined in a HOKLAS-accredited laboratory.

## 2.2.1 Equipment and Methodology

Because of the relatively shallow water, *in-situ* measurements and water sampling were conducted at 0.5m from the surface (the mid-point of the 1m deep lake). Water samples for all monitoring parameters were collected, stored, preserved and analysed according to *APHA Standard Methods for the Examination of Water and Wastewater, 19<sup>th</sup> Edition, #17*.

In-situ monitoring was carried out using a DO concentration and DO saturation were carried out using a YSI Model 85 CE-C-M-Y multi-parameter meter and the range, resolution and accuracy of the equipment is provided in **Table 2-1**.

In-situ Parameters	Measuring Devices	Measurement Precision
Dissolved Oxygen	YSI Multi-purpose Meter	0.1 mg/l and 0.1%
Salinity	YSI Multi-purpose Meter	0.1 ppt
Temperature	YSI Multi-purpose Meter	0.1 °C

**Table 2-1 In-situ Monitoring Equipment Details**

A Kahlisco water sampler was used to obtain water samples for subsequent SS analysis in the laboratory. A sufficient volume of the sample is collected in clean, high density polythene bottles, packed in ice (cooled to 4 °C without being frozen), and delivered to the ALS laboratory immediately after monitoring. The analysis of the collected samples will start within the next working day after sample collection, following *APHA Standard Methods #2540D*.

## 2.2.2 Maintenance and Calibration

All in-situ monitoring instruments are calibrated and certified by ALS at monthly intervals throughout all stages of the lake water quality monitoring programme.

The YSI Multi-purpose Meter is calibrated once per monitoring day by the wet bulb method. Calibration at the ALS laboratory is carried out once every month in a water sample of known dissolved oxygen concentration. The sensor is immersed in the water and after thermal equilibration, the known mg/l value is keyed in and the calibration is carried out automatically. Calibration details are provided in **Appendix 3**.

## 2.2.3 Parameters Monitored

The following parameters are monitored and compared to A/L Levels:

- Dissolved Oxygen
- Suspended Solids
- BOD<sub>5</sub>
- Total Nitrogen
- Total Phosphorous

There are no A/L Levels for temperature or salinity – these parameters are recorded for information only.

## 2.2.4 Monitoring Locations

Monitoring locations together with grid references are shown in **Figure 2-2**. Monitoring Stations are designated as W1, W2, W3 and W4.

## 2.2.5 Monitoring Date, Time, Frequency and Duration

In accordance with the EM&A Manual, the monitoring frequency of lake water quality is shown as **Table 2-2**.

	Operation Phase	
	Below Action/Limit Level	Action/Limit Level Exceedance
Monitoring Frequency	Monthly	Weekly

**Table 2-2 Monitoring Frequency**

## 2.3 Action/Limit Levels

According to the approved EM&A manual, the A/L Levels for the compliance monitoring (for monitoring locations W1 to W4) are shown in **Table 2-3**.

Parameter	Acceptable Standard (mg/ℓ)	
	Action Level	Limit Level
Suspended Solids	20	30
BOD <sub>5</sub>	13.5	20
Dissolved Oxygen	4	3
Total Nitrogen	20	30
Total Phosphorous	3.5	5

**Table 2-3 Action and Limit Levels for Lake Water Quality**

In case of exceedance of A/L Levels, the ET shall immediately implement the Event/Action Plan, shown in **Table 2-4**, in order to resolve the lake water quality problem:

Event	Action
Exceedance of Action Level	<ul style="list-style-type: none"> <li>▪ Notify the Golf Course Supervisor of the exceedance, providing full details (time, location, parameter, level, etc.).</li> <li>▪ Increase the frequency of monitoring of the particular parameter(s) to “Action/Limit Level Exceedance” as shown in <b>Table 2-2</b>.</li> <li>▪ If water quality continues to worsen, it may be prudent to review the Turfgrass Management Plan (TMP) in terms of application of nutrients and agree any revisions with the Golf Facility Supervisor.</li> <li>▪ Notify the Golf Facility Supervisor when water quality falls below “Action Level” and reduce monitoring frequency to “Below Action/Limit Level” as shown in <b>Table 2-2</b>.</li> </ul>



Event	Action
Exceedance of Limit Level	<ul style="list-style-type: none"> <li>▪ Notify EPD and Golf Course Supervisor of the exceedance, providing full details (time, location, parameter, level, etc.).</li> <li>▪ Suspend any ongoing application of organic nutrients.</li> <li>▪ Determine the likely cause of the exceedance(s). Review the TMP in terms of application of nutrients and agree any revisions with the Golf Facility Supervisor. Continue to irrigate the Golf Course using lake water.</li> <li>▪ Increase the frequency of monitoring of the particular parameter(s) to “Action/Limit Level Exceedance” as shown in <b>Table 2-2</b>. (if not already at this frequency) to demonstrate the effectiveness of remedial measures and to confirm that water quality has returned to acceptable levels.</li> <li>▪ Notify EPD and Golf Course Supervisor when water quality falls below “Action Level” (not “Limit Level”) and reduce monitoring frequency to “Below Action/Limit Level” as shown in <b>Table 2-2</b>.</li> </ul>

**Table 2-4 Event / Action Plan for Lake Water Quality Monitoring**

## 2.4 Summary of Monitoring Results

### 2.4.1 Review of Results and Implications

A summary of scheduled lake water monitoring results for the reporting quarter is provided in **Table 2-5**, below. Detailed results are provided in **Appendix 1** and graphical plots since commencement of the second phase of Operation are given in **Appendix 2**.

Monitoring Location		Salinity (mg/ℓ)	Temperature (°C)	SS (mg/ℓ)	BOD <sub>5</sub> (mg/ℓ)	DO Saturation (%age)	DO Concentration (mg/ℓ)	Total Nitrogen (mg/ℓ)	Total Phosphorous (mg/ℓ)
W1	Mean	0.1	26.1	13.7	7.7	73.1	7.4	2.4	0.2
	Minimum	0.1	21.8	9.0	4.0	63.3	6.8	1.1	0.1
	Maximum	0.1	29.8	18.0	12.0	79.6	8.0	3.1	0.3
W2	Mean	0.1	26.1	15.0	8.3	73.3	7.4	2.5	0.2
	Minimum	0.1	21.8	5.0	5.0	63.2	6.8	1.1	0.1
	Maximum	0.1	29.8	19.0	13.0	79.6	8.0	3.5	0.3
W3	Mean	0.1	26.1	20.3	8.7	74.6	7.2	2.6	0.1
	Minimum	0.1	21.6	15.0	5.0	65.8	6.6	1.3	0.1
	Maximum	0.2	30.1	<b>24.0</b>	<b>16.0</b>	79.2	7.6	3.6	0.1
W4	Mean	0.1	26.1	21.7	8.0	73.4	7.3	2.5	0.1
	Minimum	0.2	21.6	17.0	4.0	65.8	6.6	1.3	0.1
	Maximum	0.2	30.2	<b>25.0</b>	<b>14.0</b>	78.3	7.6	3.4	0.1

**Note:** **Bold** indicates Action Level exceedance; **Bold** indicates **Limit Level** exceedance

**Table 2-5 Summary of Compliance Monitoring Data During Reporting Quarter**

As shown above, there were exceedances of the Action Levels for SS and for BOD during scheduled monitoring in the reporting quarter. There were also exceedances in the Limit Level for SS during follow-on monitoring on once occasion, as shown in **Appendix 1**. In accordance with the Event / Action Plan, follow-on action was required, and this is described below.

## 2.4.2 Follow-on Action

On each occasion of a series of exceedances, EPD and the Golf Course Supervisor were notified as required, as soon as the results were available, and follow-on monitoring was also arranged on weekly basis. Furthermore, the Golf Course Supervisor was advised that lake water was not of an acceptable quality for discharge and that the control valve must not be opened until there is no longer any exceedance of the Action Level.

There were exceedances of the Action Level for SS at W3 (24mg/l) and W4 (25mg/l) on 15 May 2009. As soon as results were available, follow-on monitoring was carried out on 1 June 2009. This showed an increase in SS, with continued exceedances in Action Level for SS at W3 (28mg/l) and W4 (30mg/l). Further follow-on monitoring was therefore required.

The exceedances in Action Level were reviewed and, based on site observation, these have been attributed to rapid algal growth in the water. The algal growth is not due to excessive use of organic nutrients on the Golf Course washing off into the lake and resulting in high nutrient levels in the water – the nutrient levels in the water remain well below the Action Level – and so the TMP is not the cause. Instead, it is considered that the rapid algal growth is the result of a combination of high water temperatures, low rainfall and the limited circulation within the lakes, leading to stagnation – the water is visibly green due to algal content. To combat this, the Operator increased the use of the aerators in the lakes, in order to improve circulation.

Further follow-on monitoring was carried out on 9 June 2009. This showed another increase in SS, with exceedances of the Limit Level for SS at W3 (38mg/l) and W4 (37mg/l). Further follow-on monitoring was not arranged, however, since scheduled monitoring was due to be carried out a few days later, on 12 June 2009.

The results from scheduled monitoring on 12 June 2009 showed no exceedance of Action or Limit Level for SS – at W3 SS had fallen to 15mg/l and at W4 to 17mg/l. It is considered that the effects of the increased aeration implemented by the Operator helped to improve circulation and so reduce algae levels, which has helped to reduce SS to below the Action Level.

However, on 10 July 2009, the next scheduled monitoring, there were once again exceedances of the Action Levels for SS at W3 (22mg/l) and W4 (23mg/l) and also for BOD<sub>5</sub> at W3 (16mg/l) and W4 (14mg/l). Follow-on monitoring was carried out on 21 July 2009. The results from monitoring on 21 July 2009 showed no exceedance of Action or Limit Level for BOD<sub>5</sub> – W3 and W4 had both fallen to 5mg/l. However, there were continued exceedances in Action Level for SS at W3 (22mg/l) and W4 (23mg/l). Further follow-on monitoring will be carried out next month and the results will be reported in the next quarterly report.

Although the Operator has increased water aeration to reduce algal growth, this has not been completely successful. The Operator is therefore considering adding “Aqua Bio-Trol” to reduce the presence of algae. “Aqua Bio-Trol” is a non-chemical, natural liquid microbial pond clarifier – a proprietary blend of 58 strains of naturally occurring aerobic and facultative microbes, which act to bring lake water into proper ecological balance by pre-emptively consuming the organic matter on which the algae feeds. Further details of “Aqua Bio-Trol” are provided in **Appendix 4**.

## 2.5 Operational Practice

**Table 2-6** below, shows the operational practice during the reporting quarter, i.e., the activities relating to the management of water in the lakes:

Month	Month-end Lake Water Depth (m)	Can Control Valve Be Opened?	Has Control Valve Been Opened?	Quantity of Water Discharged (m <sup>3</sup> )
May 2009	0.8	No (from 15 May)	No	-
June 2009	0.9	Yes (from 12 June)	No	-
July 2009	1.3	No (from 12 July)	No	-

**Table 2-6 Operational Results**

From **Section 2.4**, the EM&A results for the reporting quarter have shown that A/L Levels were exceeded for periods in May, June and July 2009 and so for these periods, the control valve could not be opened. For those periods when the control valve could have been opened, it was not. Overall, no water was discharged from the lakes during the reporting quarter. As of end-July 2009, the valve cannot be opened until SS levels drop below the Action Level.

## 2.6 Complaints and Notifications of Summons

### 2.6.1 Complaints

No complaints were received during the reporting month and there are no outstanding follow-on issues to be addressed.

### 2.6.2 Notifications of Summons

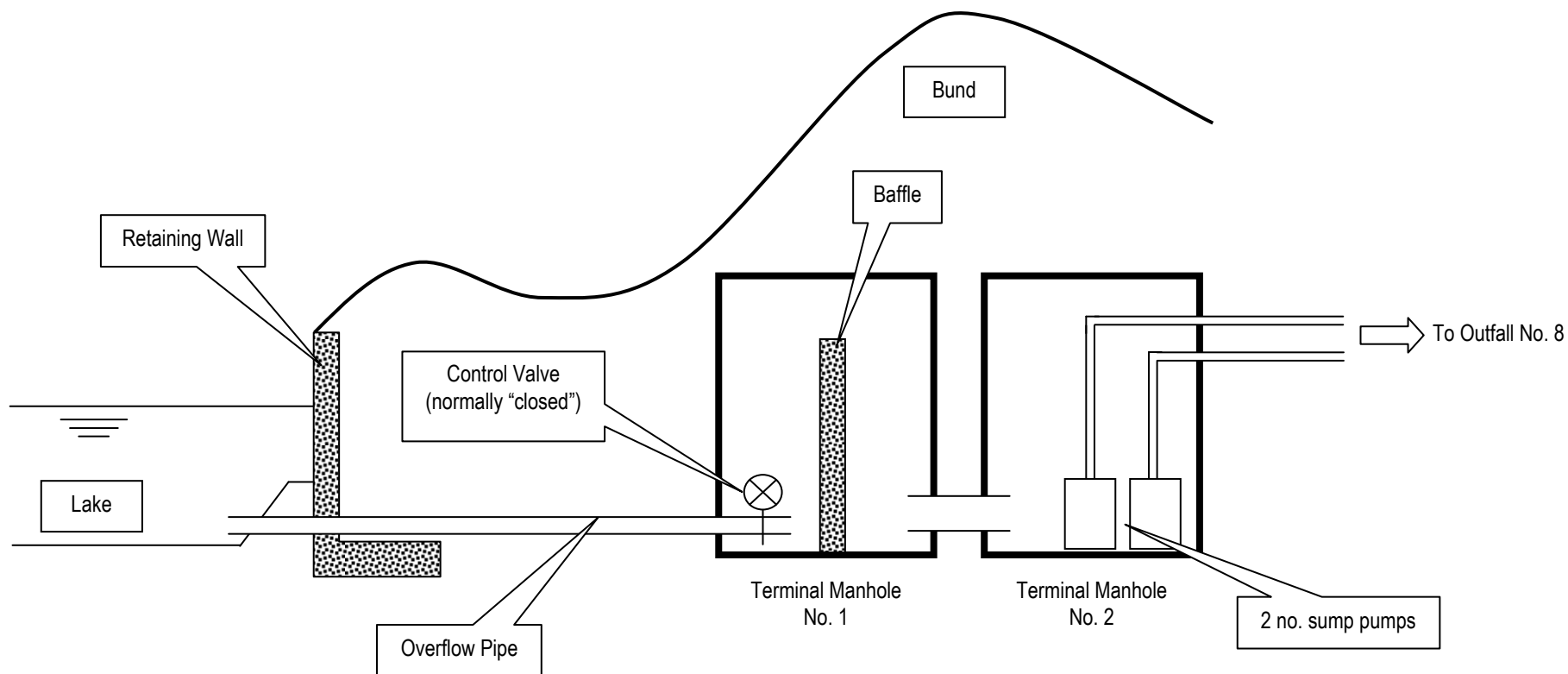
No notifications of summons were received during the reporting month and there are no outstanding follow-on issues to be addressed.

## 2.7 Future Monitoring Schedule

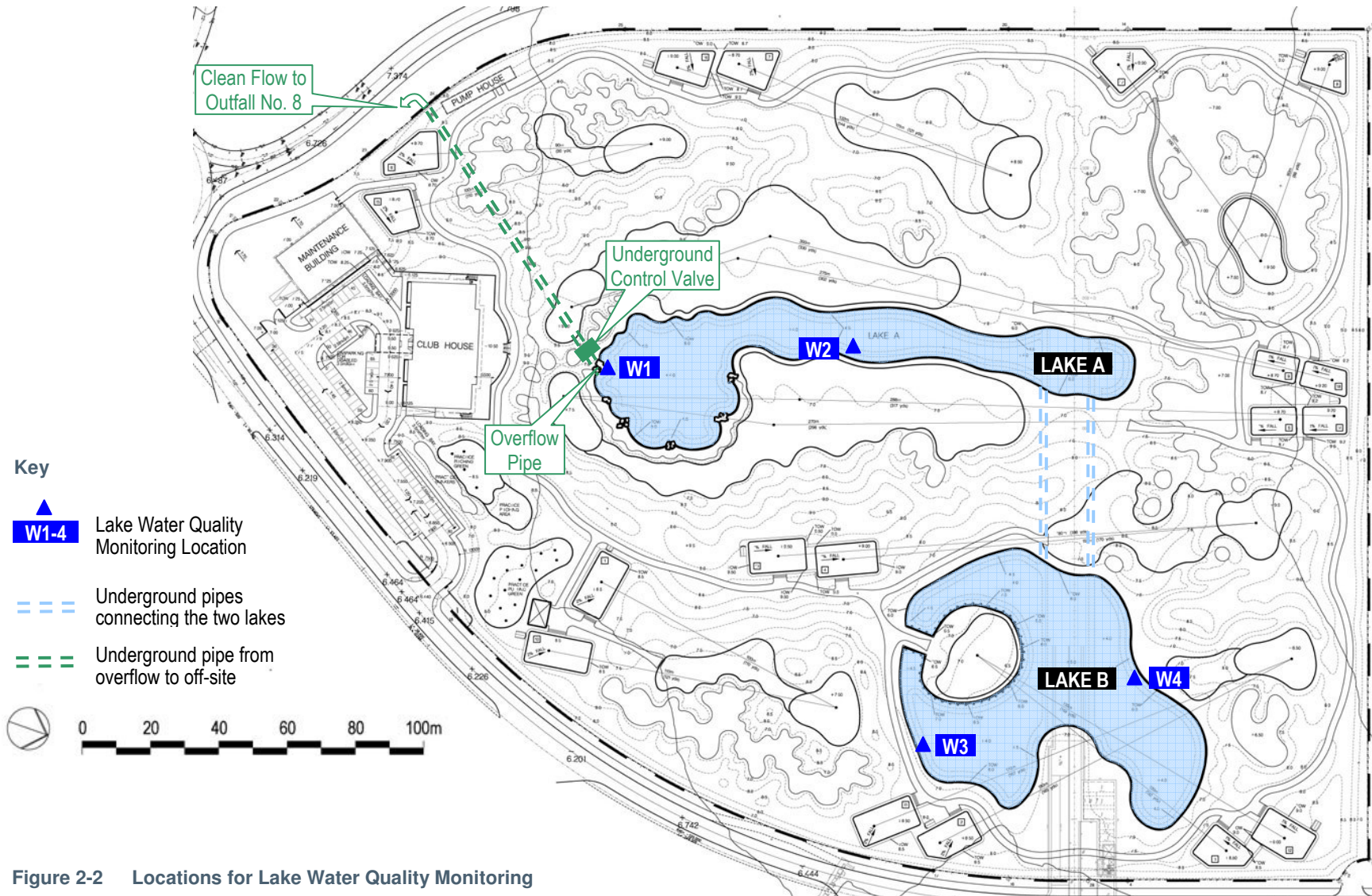
The lake water monitoring schedule for the next quarter (August to October 2009) is given in **Table 2-7**, below.

Sampling Date	Sampling Locations
14 August 2009	W1 to W4
11 September 2009	W1 to W4
9 October 2009	W1 to W4

**Table 2-7 Future Monitoring Schedule**



**Figure 2-1 Schematic of Lake Water Control System**



**Figure 2-2 Locations for Lake Water Quality Monitoring**

### 3 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS

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Compliance monitoring of lake water quality is required on a monthly basis, with an increase in frequency to weekly if there are exceedances of Action or Limit Levels. Parameters tested for comprise SS, DO, BOD<sub>5</sub>, nitrogen, phosphorous, temperature and salinity. Monthly compliance monitoring was carried out on 15 May, 12 June and 10 July 2009 at four locations within the two lakes.

Reporting during the second phase of the Operation Period is required on a quarterly basis. This is the ninth Quarterly Compliance report covering May to July 2009 and complies with the reporting requirements stated in the approved EM&A Manual.

There were exceedances of the Action Levels for SS and for BOD during scheduled monitoring in the reporting quarter. There were also exceedances in the Limit Level for SS during follow-on monitoring on once occasion. On each occasion of a series of exceedances, EPD and the Golf Course Supervisor were notified as required, as soon as the results were available, and follow-on monitoring was also arranged on weekly basis. Furthermore, the Golf Course Supervisor was advised that lake water was not of an acceptable quality for discharge and that the control valve must not be opened until there is no longer any exceedance of the Action Level.

There were exceedances of the Action Level for SS at W3 and W4 on 15 May 2009 and so follow-on monitoring was carried out on 1 June 2009. This showed an increase in SS and so further follow-on monitoring was carried out on 9 June 2009. This showed another increase in SS, with exceedances of the Limit Level for SS at W3 and W4. Scheduled monitoring on 12 June 2009, however, showed no exceedance of Action or Limit Level for SS. On 10 July 2009, the next scheduled monitoring, there were once again exceedances of the Action Levels for SS at W3 and W4 and also for BOD<sub>5</sub> at W3 and W4. Follow-on monitoring was carried out on 21 July 2009 and showed no exceedance of Action or Limit Level for BOD<sub>5</sub> but there were continued exceedances in Action Level for SS at W3 and W4. Further follow-on monitoring will be carried out next month and the results will be reported in the next quarter.

The exceedances in SS levels were reviewed and, based on site observation, these have been attributed to rapid algal growth in the water. The algal growth is not due to excessive use of organic nutrients on the Golf Course washing off into the lake and resulting in high nutrient levels in the water – the nutrient levels in the water remain well below the Action Level – and so the TMP is not the cause. Instead, it is considered that the rapid algal growth is the result of a combination of high water temperatures, low rainfall and the limited circulation within the lakes, leading to stagnation – the water is visibly green due to algal content. To combat this, the Operator increased the use of the aerators in the lakes, in order to improve circulation, although this has not been completely successful. The Operator is therefore considering adding “Aqua Bio-Trol”, a non-chemical, natural liquid microbial pond clarifier, to reduce algal growth.

During the reporting quarter, no complaints were received; and there were no notifications of summons. There were also no openings of the control valve, emergency or otherwise.

## Appendix 1

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# Lake Water Quality Monitoring Data

Date	Time	Station	Salinity (mg/ℓ)	Temperature (°C)	SS (mg/ℓ)	BOD <sub>5</sub> (mg/ℓ)	DO Saturation (%age)	DO Conc. (mg/ℓ)	Total Nitrogen (mg/ℓ)	T. Phosphorous (mg/ℓ)
15-May-09	6:45	W1	0.1	26.8	14.0	4.0	63.3	6.8	1.1	0.1
	6:50	W2	0.1	26.8	13.0	5.0	63.2	6.8	1.1	0.1
	7:05	W3	0.2	26.5	<b>24.0</b>	5.0	65.8	6.6	1.3	0.1
	7:10	W4	0.2	26.5	<b>25.0</b>	4.0	65.8	6.6	1.3	0.1
<i>01-Jun-09*</i>	<i>7:15</i>	<i>W3</i>			<b>28.0</b>					
	<i>7:25</i>	<i>W4</i>			<b>30.0</b>					
<i>09-Jun-09*</i>	<i>7:45</i>	<i>W3</i>			<b>38.0</b>					
	<i>7:50</i>	<i>W4</i>			<b>37.0</b>					
12-Jun-09	7:05	W1	0.1	21.8	9.0	7.0	76.4	7.4	3.1	0.3
	7:10	W2	0.1	21.8	13.0	7.0	77.2	7.4	2.9	0.3
	7:15	W3	0.1	21.6	15.0	5.0	78.8	7.6	2.9	0.1
	7:20	W4	0.1	21.6	17.0	6.0	78.3	7.6	2.7	0.1
10-Jul-09	7:00	W1	0.1	29.8	18.0	12.0	79.6	8.0	3.0	0.1
	7:05	W2	0.1	29.8	19.0	13.0	79.6	8.0	3.5	0.1
	7:10	W3	0.1	30.1	<b>22.0</b>	<b>16.0</b>	79.2	7.5	3.6	0.1
	7:15	W4	0.1	30.2	<b>23.0</b>	<b>14.0</b>	76.2	7.6	3.4	0.1
<i>21-Jul-09*</i>		<i>W3</i>			<b>22.0</b>	<i>5.0</i>				
		<i>W4</i>			<b>23.0</b>	<i>5.0</i>				
<b>Mean</b>			<b>0.1</b>	<b>25.7</b>	<b>17.2</b>	<b>8.2</b>	<b>73.4</b>	<b>7.3</b>	<b>2.4</b>	<b>0.1</b>
<b>Minimum</b>			<b>0.1</b>	<b>21.6</b>	<b>9.0</b>	<b>4.0</b>	<b>63.2</b>	<b>6.6</b>	<b>1.1</b>	<b>0.1</b>
<b>Maximum</b>			<b>0.2</b>	<b>30.1</b>	<b>25.0</b>	<b>16.0</b>	<b>79.6</b>	<b>8.0</b>	<b>3.6</b>	<b>0.3</b>

**Notes:** **Bold** indicates Action Level exceedance; **Bold** indicates **Limit Level** exceedance

\* Additional follow-on monitoring (shown in *italic*) carried out only at those locations and only for those parameters which had previously shown exceedance in A/L Levels (these follow-on results are excluded from the mean, minimum and maximum calculations)

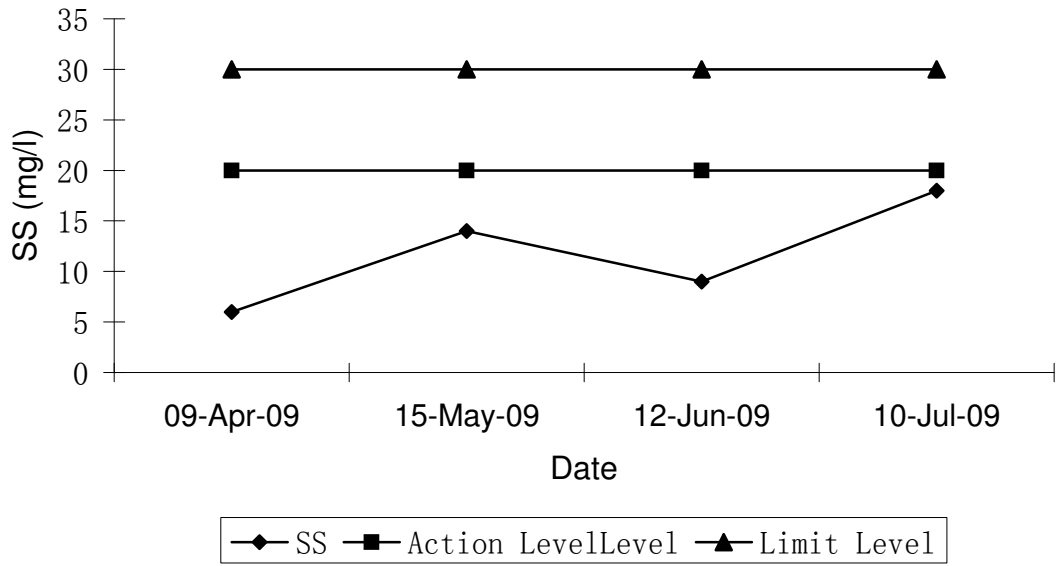


## Appendix 2

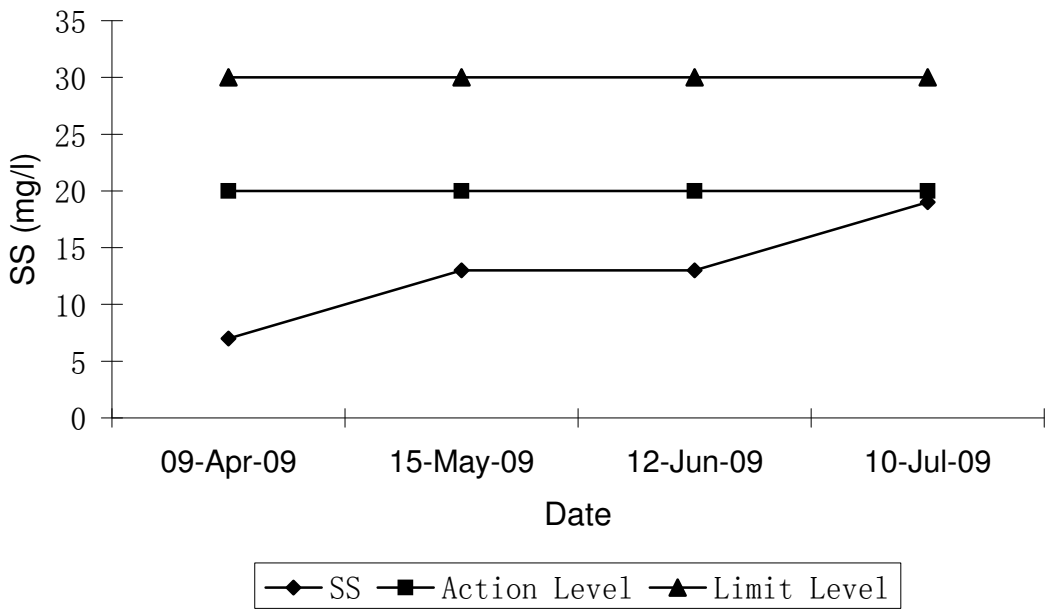
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# Graphical Plots of Monitoring Results

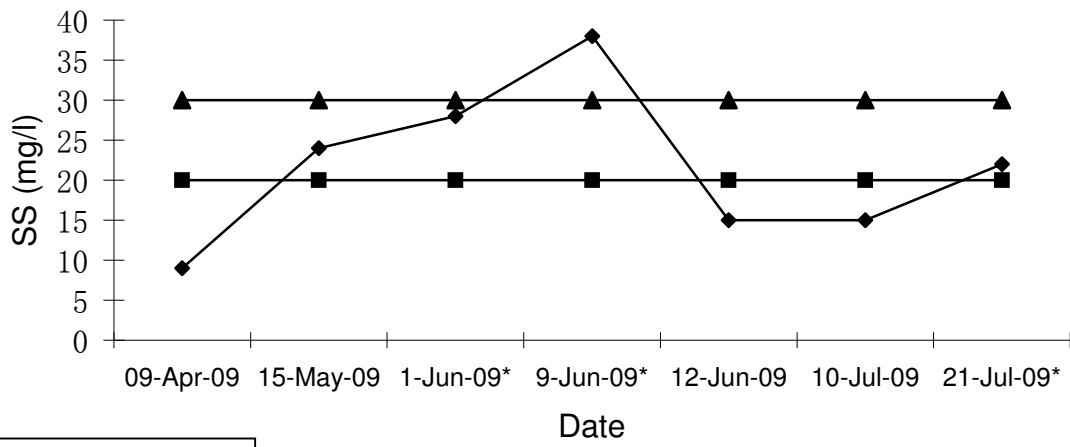
SkyCity Golf Lake Water Quality Monitoring SS at W1



SkyCity Golf Lake Water Quality Monitoring SS at W2



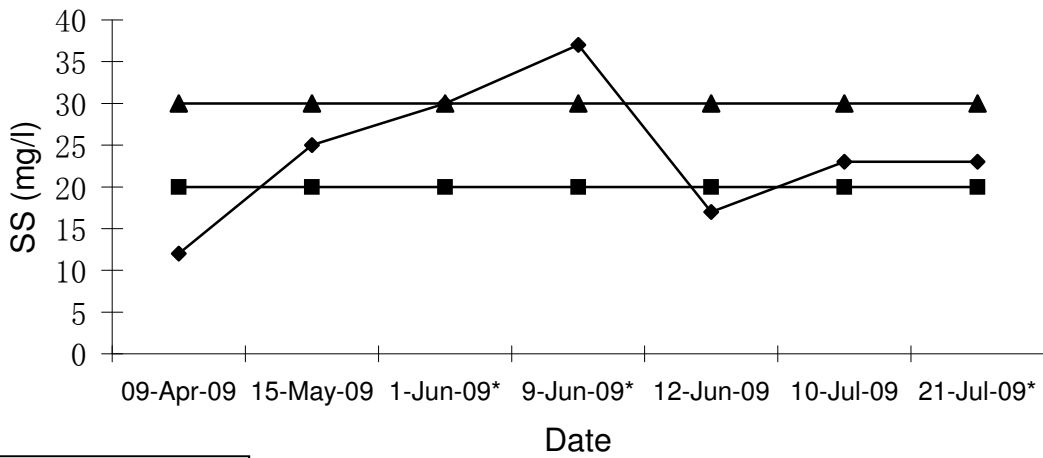
SkyCity Golf Lake Water Quality Monitoring SS at W3



\* indicates follow-up monitoring

◆ SS ■ Action Level ▲ Limit Level

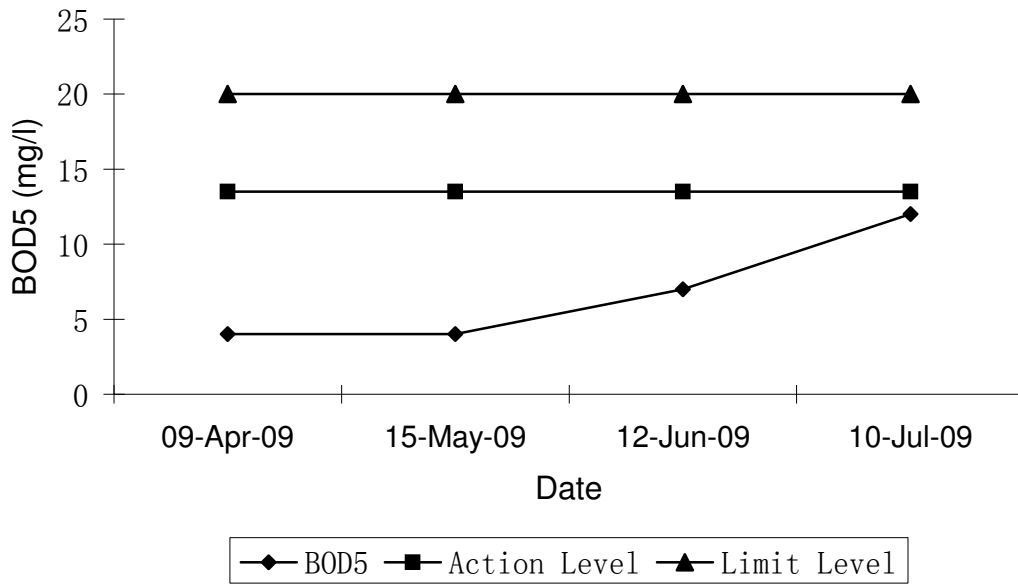
SkyCity Golf Lake Water Quality Monitoring SS at W4



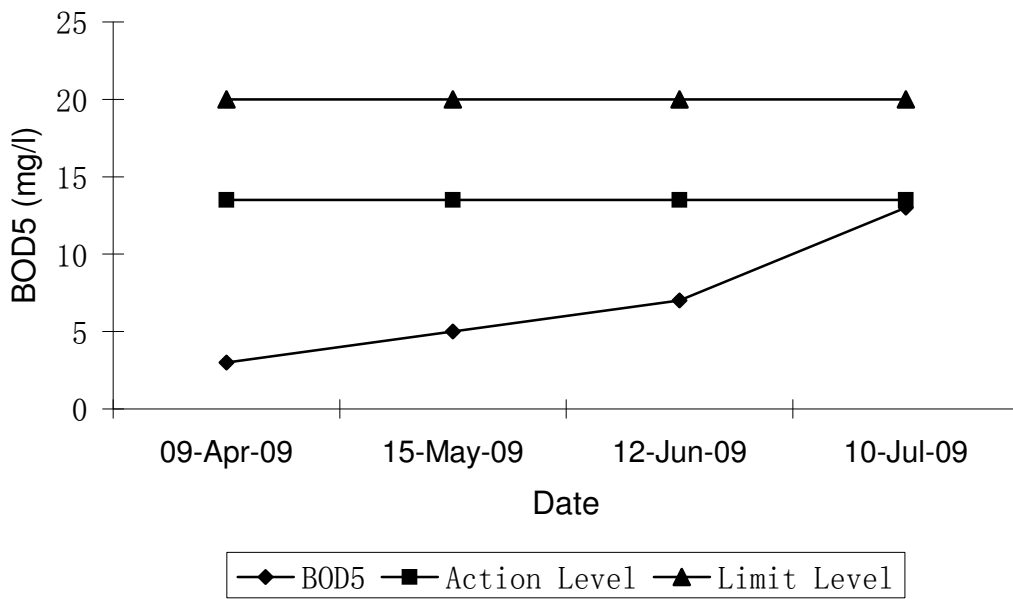
\* indicates follow-up monitoring

◆ SS ■ Action Level ▲ Limit Level

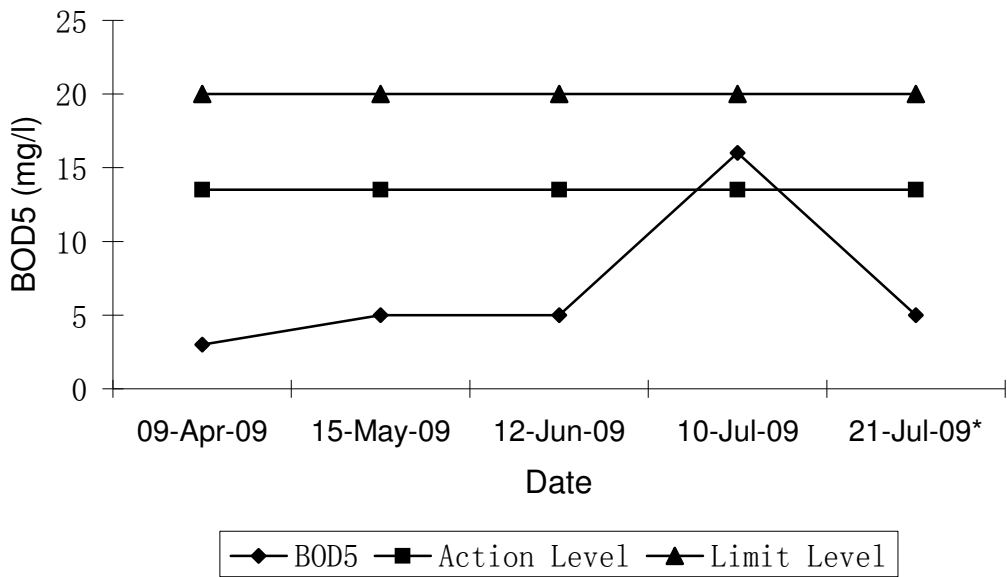
SkyCity Golf Lake Water Quality Monitoring BOD5 at W1



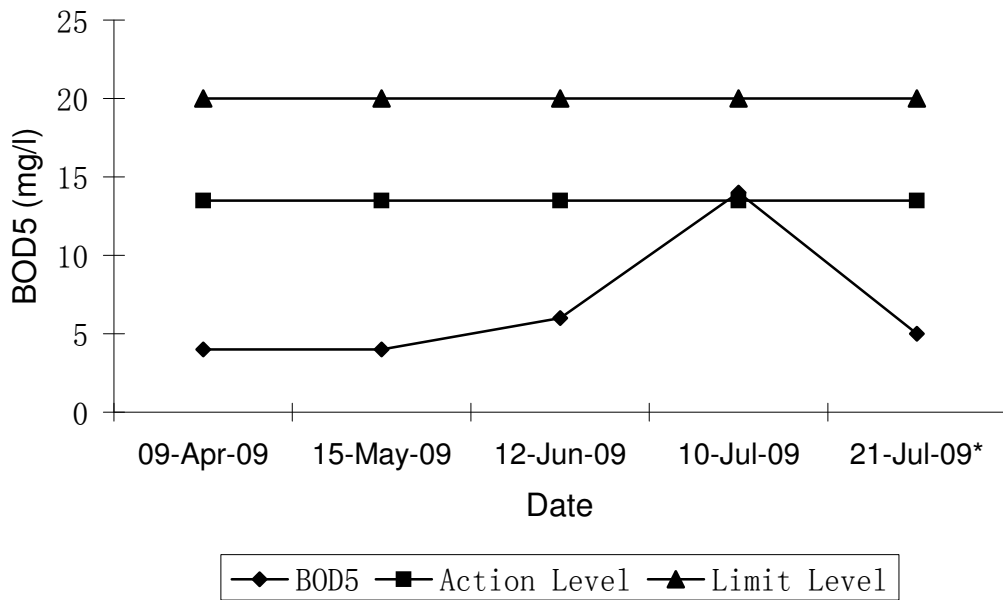
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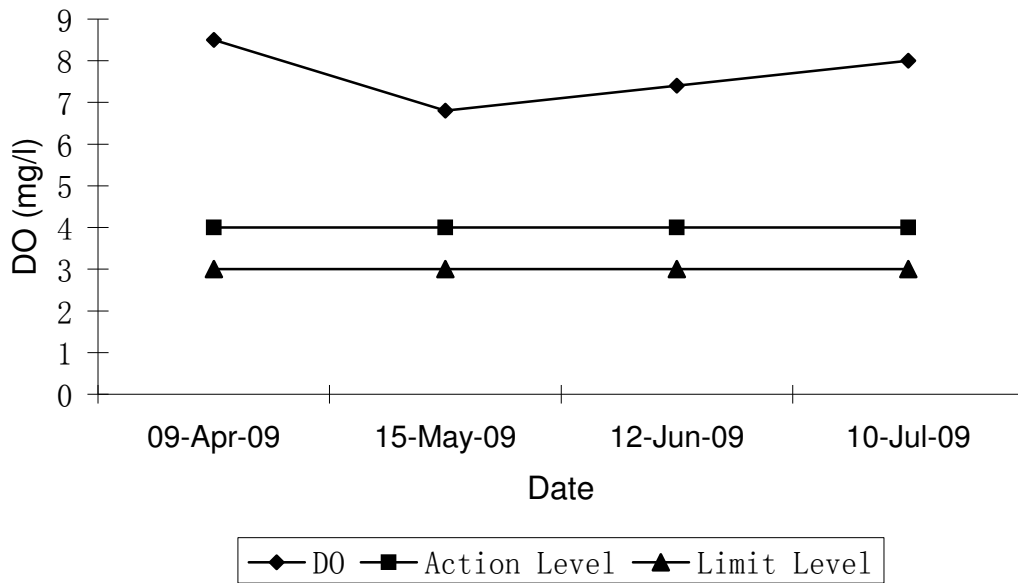
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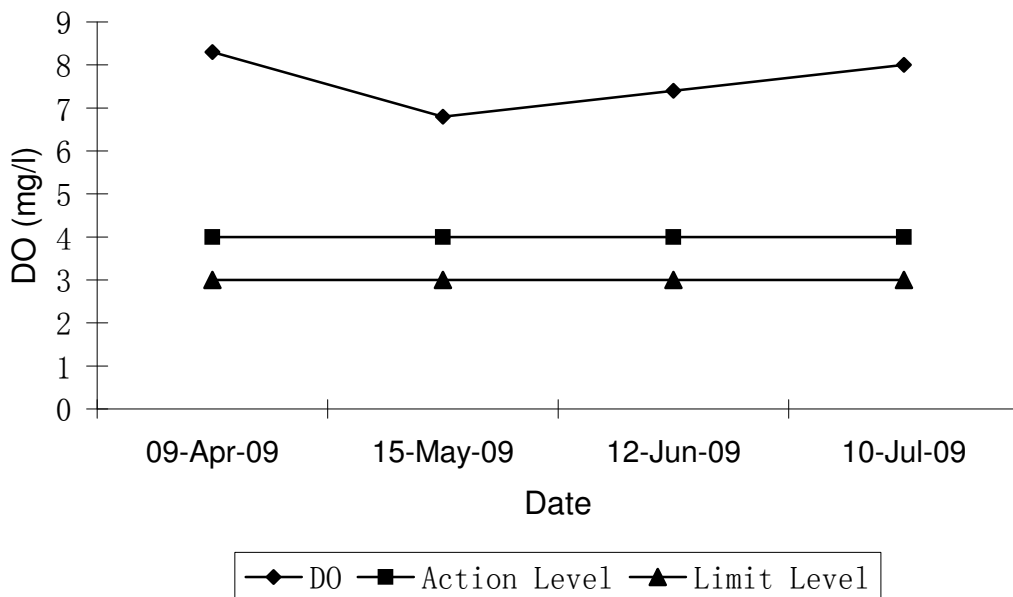
SkyCity Golf Lake Water Quality Monitoring BOD5 at W4



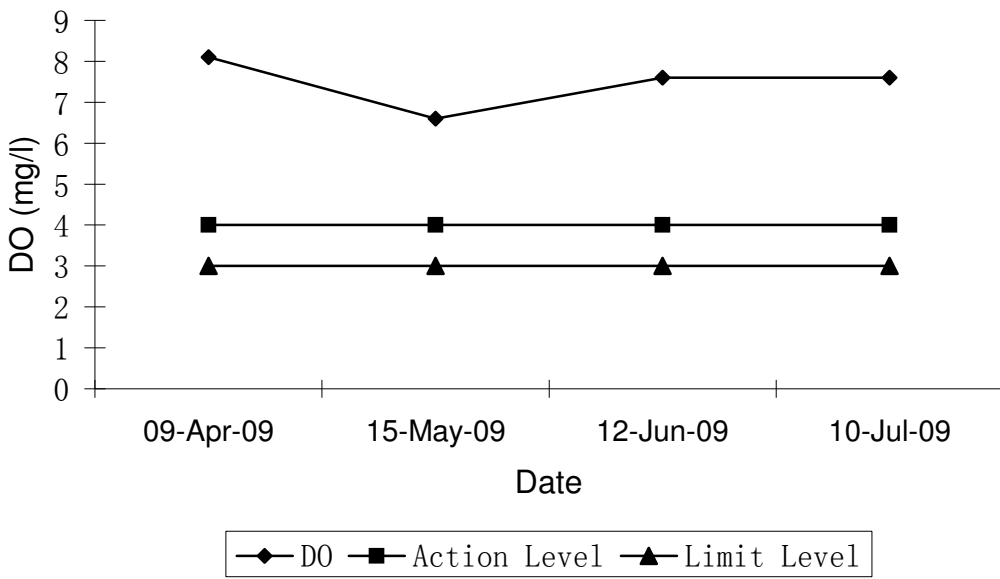
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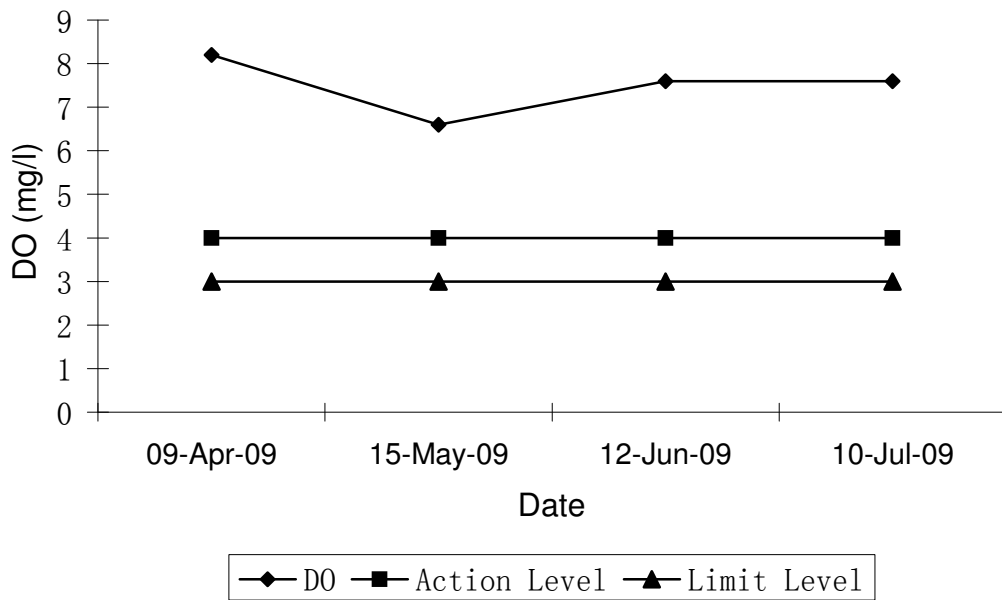
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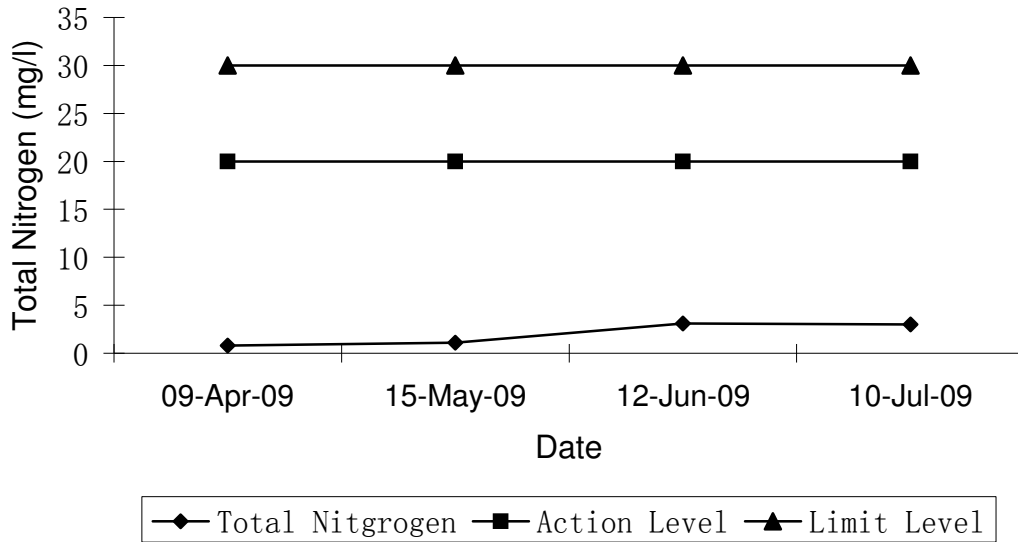
SkyCity Golf Lake Water Quality Monitoring DO at W3



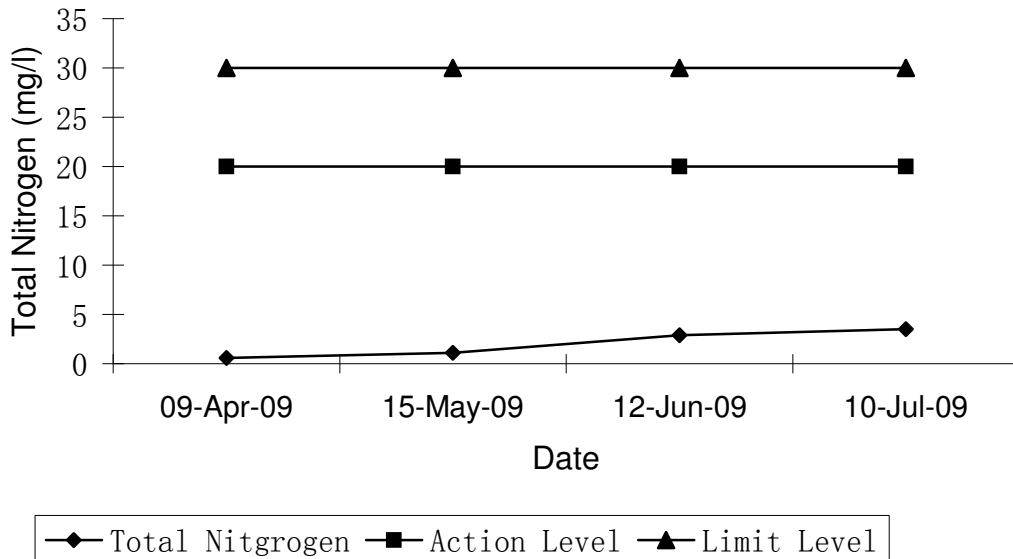
SkyCity Golf Lake Water Quality Monitoring DO at W4



SkyCity Golf Lake Water Quality Monitoring Total Nitrogen at W1

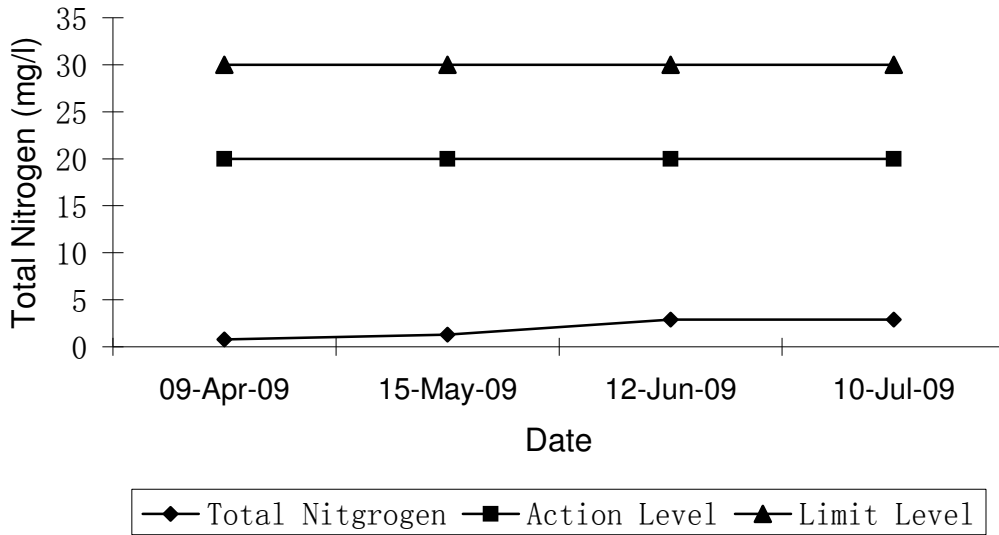


SkyCity Golf Lake Water Quality Monitoring Total Nitrogen at W2

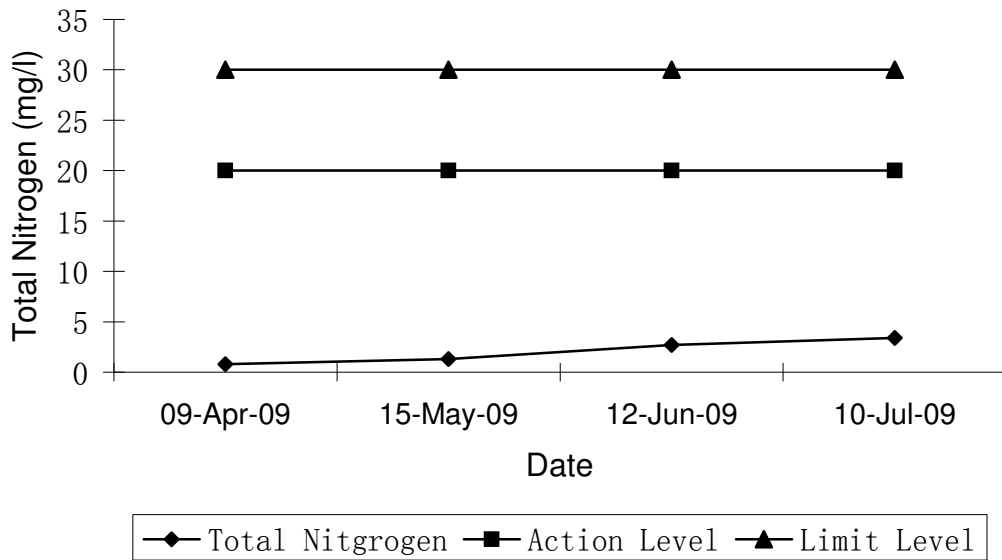




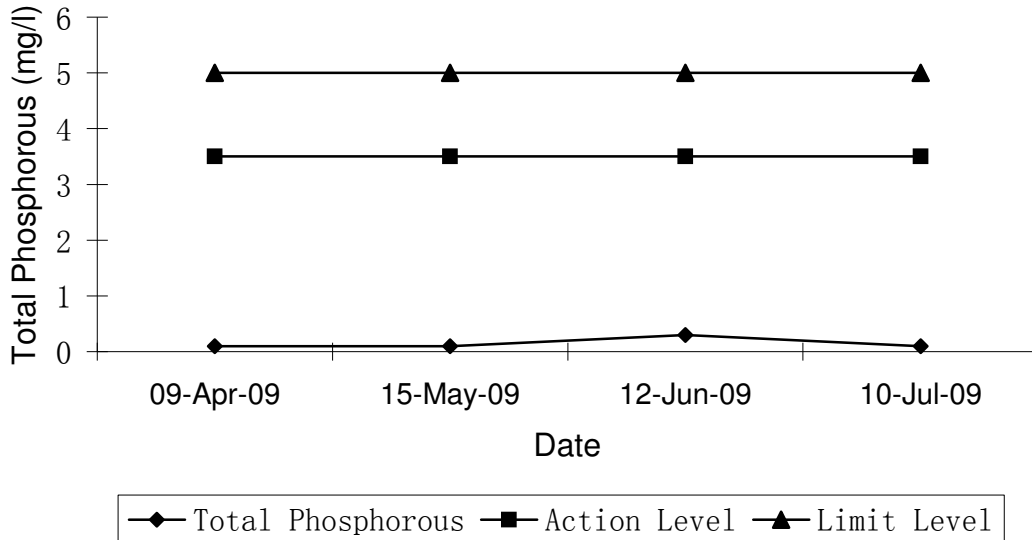
SkyCity Golf Lake Water Quality Monitoring Total Nitrogen at W3



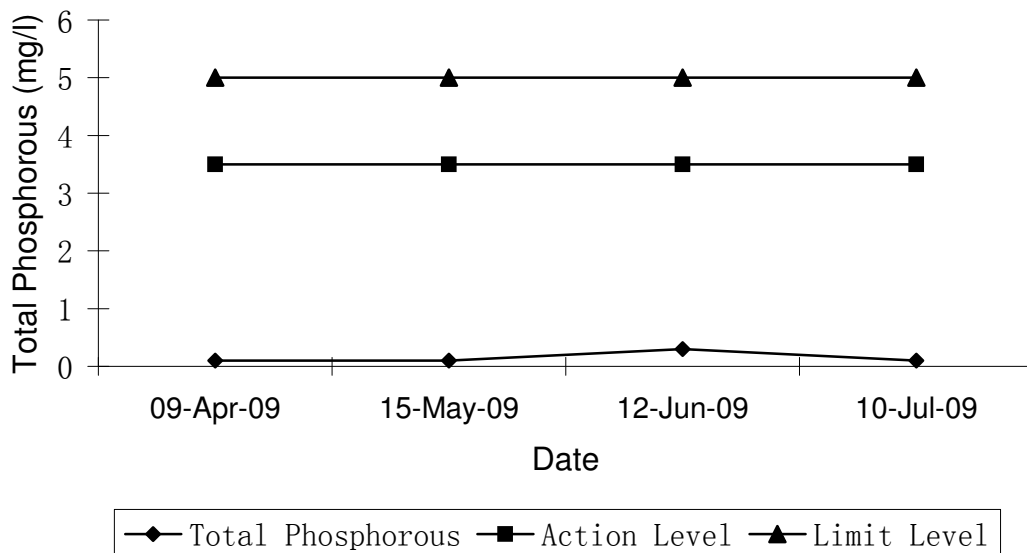
SkyCity Golf Lake Water Quality Monitoring Total Nitrogen at W4



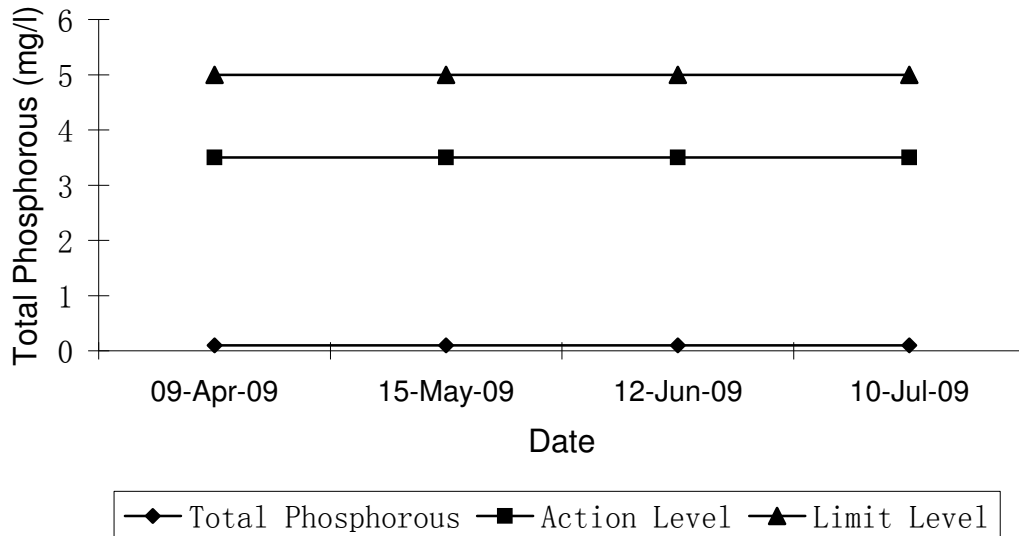
SkyCity Golf Lake Water Quality Monitoring Total Phosphorous at W1



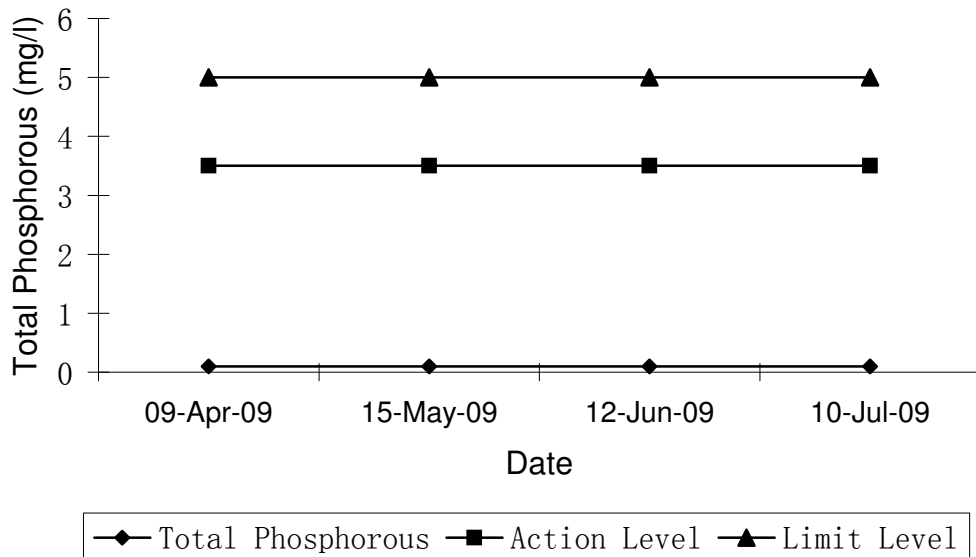
SkyCity Golf Lake Water Quality Monitoring Total Phosphorous at W2



SkyCity Golf Lake Water Quality Monitoring Total Phosphorous at W3



SkyCity Golf Lake Water Quality Monitoring Total Phosphorous at W4



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## Appendix 3

# Equipment Calibration Details

# CERTIFICATE OF ANALYSIS




Date of Issue: 12/06/2009  
Client: HYDER CONSULTING LTD  
Client Reference:

## Calibration of DO System

Item : YSI Multimeter  
Model No. : YSI 85  
Serial No. : 98A0725AB  
Calibration Method : This meter was calibrated in accordance with standard method APHA (18th Ed.) 4500-0C & G  
Date of Calibration : 12 May, 2009

## Testing Results :

Expected Reading	Recording Reading
4.69 mg/L	4.60 mg/L
6.44 mg/L	6.41 mg/L
8.10 mg/L	8.11 mg/L
Allowing Deviation	±0.2 mg/L

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

# CERTIFICATE OF ANALYSIS



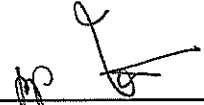
Date of Issue: 12/06/2009  
Client: HYDER CONSULTING LTD  
Client Reference:

## Calibration of Thermometer

Item : YSI Multimeter  
Model No. : YSI 85  
Serial No. : 98A0725AB  
Calibration Method : In-house Method  
Date of Calibration : 12 May, 2009

### Testing Results :

Reference Temperature (°C)	Recorded Temperature (°C)
22.0 °C	21.8 °C
31.0 °C	30.7 °C
Allowing Deviation	±2.0°C

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

# CERTIFICATE OF ANALYSIS



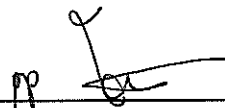
Date of Issue: 16/07/2009  
Client: HYDER CONSULTING LTD  
Client Reference:

## Calibration of DO System

Item : YSI Multimeter  
Model No. : YSI 85  
Serial No. : 98A0725AB  
Calibration Method : This meter was calibrated in accordance with standard method APHA (18th Ed.) 4500-0C & G  
Date of Calibration : 12 May, 2009

## Testing Results :

Expected Reading	Recording Reading
4.69 mg/L	4.60 mg/L
6.44 mg/L	6.41 mg/L
8.10 mg/L	8.11 mg/L
Allowing Deviation	±0.2 mg/L

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

# CERTIFICATE OF ANALYSIS




Date of Issue: 16/07/2009  
Client: HYDER CONSULTING LTD  
Client Reference:

## Calibration of Thermometer

Item : YSI Multimeter  
Model No. : YSI 85  
Serial No. : 98A0725AB  
Calibration Method : In-house Method  
Date of Calibration : 12 May, 2009

### Testing Results :

Reference Temperature (°C)	Recorded Temperature (°C)
22.0 °C	21.8 °C
31.0 °C	30.7 °C
Allowing Deviation	±2.0°C

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong



# CERTIFICATE OF ANALYSIS




Date of Issue: 04/08/2009  
Client: HYDER CONSULTING LTD  
Client Reference:

## Calibration of DO System

Item : YSI Multimeter  
Model No. : YSI 5100  
Serial No. : 02C0073AB  
Calibration Method : This meter was calibrated in accordance with standard method APHA (18th Ed.) 4500-OC & G  
Date of Calibration : 07 July, 2009

## Testing Results :

Expected Reading	Recording Reading
5.27 mg/L	5.41 mg/L
6.58 mg/L	6.76 mg/L
7.73 mg/L	7.80 mg/L
Allowing Deviation	±0.2 mg/L

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

# CERTIFICATE OF ANALYSIS



Date of Issue: 04/08/2009  
Client: HYDER CONSULTING LTD  
Client Reference:

## Calibration of Thermometer

Item : YSI Multimeter  
Model No. : YSI 5100  
Serial No. : 02C0073AB  
Calibration Method : In-house Method  
Date of Calibration : 07 July, 2009

### Testing Results :

Reference Temperature (°C)	Recorded Temperature (°C)
27.0 °C	27.0 °C
33.5 °C	33.4 °C
Allowing Deviation	±2.0°C

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

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Appendix 4

## Aqua Bio-Trol Liquid – Product Data Sheet

# Aqua Bio-Trol Liquid

## Liquid Microbial Pond Clarifier

PRODUCT DATA BULLETIN

### Features

- Eliminates pond scum and green, soupy conditions
- Improves water clarity
- Reduces foul odors and organic sediment
- Contains facultative bacteria capable of withstanding low oxygen levels
- Reduces levels of harmful nitrates & ammonia
- Effective under a wide range of climactic conditions
- Enhances conditions for all aquatic life
- Reduces biological oxygen demand
- Non-toxic, safe for fish, plants & applicator
- Microencapsulated, microbial stimulants

**Aqua Bio-Trol Liquid** is the safe, natural way to establish and maintain cleaner pond and lake water without chemicals. *Aqua Bio-Trol Liquid* eliminates pond scum and green, soupy conditions, while eliminating foul odors. *Aqua Bio-Trol Liquid* improves water clarity and digests excess organic matter in ponds, lakes and fountains.

**Aqua Bio-Trol Liquid** helps to create and maintain a healthier pond, lake and fountain water ecosystem through non-chemical treatment. *Aqua Bio-Trol Liquid* is an all natural, microbial based product effective for improving poor water conditions, and especially for maintenance of healthy water conditions once they are established. *Aqua Bio-Trol Liquid* is a concentration of naturally occurring microbes, which act to bring pond and lake water into proper ecological balance.

**Aqua Bio-Trol Liquid** is completely biodegradable and non-toxic to humans, animals and water life. The result of treatment is reduced organic sediment and particulate, reduced sludge, clear water, and enhanced conditions for all aquatic life.

**Aqua Bio-Trol Liquid** microbes preemptively consume organic matter which feeds algae and which leads to anaerobic conditions, including bad odors. The active microbes in *Aqua Bio-Trol Liquid* feed on excess nutrients in the entire water column, from sludge at the bottom to suspended particulate, to green organic matter on the surface. Routine application helps keep water in it's best condition without the use of potentially harmful chemicals.



### DIRECTIONS FOR USE

**Aqua Bio-Trol Liquid** is most effective when water temperatures range from 50° to 100° F. For best results, provide adequate surface or subsurface aeration. Subsurface aeration is preferred. For maximum efficiency, assure a minimum of 5-6 % dissolved oxygen.

Apply by distributing liquid as much as possible around pond and lake edges. Avoid dumping liquid in one location.

Pond Volume	Initial Treatment	Monthly Maintenance
Acre Foot 325,900 gallons	4 gallons	2 gallons

### Formulas to help in your calculations

- Length x Width x Depth (feet) x 7.48 = Number of Gallons
- One acre-foot of water = 325,900 gallons
- One acre-foot of water = 1,233 CuMt

### Active Ingredients

A proprietary blend of 58 strains of aerobic and facultative beneficial bacteria at a minimum concentration of 6.6 x 10<sup>7</sup> CFU per ml (including *Bacillus subtilis*)

**Warranty:** Seller warrants that the product conforms to its chemical description and is reasonably fit for the purpose stated on the label when used in accordance with directions under normal conditions of use; but neither this warranty nor any other warranty of merchantability or fitness of a particular product expressed or implied, extends to the use of this product contrary to label conditions, or under conditions not reasonably foreseeable to the seller; and buyer assumes the risk of any such use.



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