



# **Green and Golden Bell Frog Monitoring, Arncliffe, March - May 2021**

Prepared by AMBS Ecology & Heritage Pty Ltd  
for Transport for NSW

Final Report

AMBS Reference: 17499

## Document Information

<b>Citation:</b>	AMBS Ecology & Heritage 2021, <i>Green and Golden Bell Frog Monitoring, Arncliffe, March - May 2021</i> . Consultancy report to Transport for NSW.
<b>AMBS Reference:</b>	17499
<b>Versions:</b>	Version 1: Draft Report issued 30 July 2021 Version 2: Final Report issued 4 August 2021
<b>Recipient:</b>	Courtney Moran
<b>Authors:</b>	Lachlan Pettit, Chris Jackson
<b>Approved by:</b>	Glenn Muir

## Contents

<b>1</b>	<b>Introduction.....</b>	<b>1</b>
1.1	Background .....	1
1.2	Study Area.....	1
1.3	Scope and Methodology .....	1
<b>2</b>	<b>Results.....</b>	<b>4</b>
2.1	Water Quality Monitoring.....	4
2.2	Tadpole Monitoring .....	1
2.3	Nocturnal GGBF Monitoring in the M8 Marsh Street habitat area .....	2
2.4	Nocturnal Frog Monitoring in the Wider Study Area.....	3
2.5	Maintenance Observations.....	5
2.5.1	<i>M8 Marsh Street habitat area</i> .....	5
2.5.2	<i>RTA Ponds</i> .....	5
2.5.3	<i>Enhancement Area</i> .....	5
<b>3</b>	<b>Discussion.....</b>	<b>5</b>
<b>4</b>	<b>References.....</b>	<b>5</b>
	<b>Appendix 1: Water Quality Results .....</b>	<b>6</b>

## Tables

Table 2.1:	Summary of water quality results. ....	1
Table 2.2:	Summary of tadpole net sweep results. ....	1
Table 2.3:	GGBF survey results, M8 Marsh Street habitat area.....	2
Table 2.4:	Summary of frog survey results outside of the M8 Marsh Street Habitat Area .....	3

## Figures

Figure 1.1:	Study area. ....	3
Figure 2.1:	Locations where GGBFs were observed, March – May 2021. ....	4

# 1 Introduction

## 1.1 Background

AMBS Ecology & Heritage Pty Ltd (AMBS) was commissioned by Transport for NSW to undertake monitoring of the Green and Golden Bell Frog (*Litoria aurea*) (GGBF) at Arncliffe. This quarterly report presents the results of monitoring and other GGBF management actions undertaken by AMBS for the three-month period March 2021 to May 2021 inclusive.

## 1.2 Study Area

The Study Area includes the following locations (Figure 1.1):

- M8 Marsh Street habitat area (previously known as the “New M5 Marsh Street habitat area”) – an area set aside for the establishment of potential GGBF habitat, including three ponds and surrounding terrestrial habitat, located between Marsh Street and Eve Street;
- “Perimeter” and “Creek” areas outside of the M8 Marsh Street habitat area;
- RTA Ponds – two ponds constructed about 20 years ago as replacement habitat for the GGBF, by the NSW Roads and Traffic Authority, when the existing M5 was built, located near the Marsh Street/M5 intersection and adjacent to the Kogarah Golf Course;
- Enhancement Area – six small ponds located near a drainage line that runs along the southern boundary of the Kogarah Golf Course, east of the RTA ponds;
- Kogarah Golf Course – a golf course located between Marsh Street and the Cooks River, which contains a number of ponds, including some where GGBFs have been recorded;
- Extended search area in Barton Park – parts of the area between the golf course and Spring Street where GGBFs have been recorded or potentially suitable habitat occurs;
- Eastern Frog Corridor – a passageway below the M5, between the Golf Course and Barton Park, which currently contains a pedestrian/bicycle path and a fenced-off containment pond.

## 1.3 Scope and Methodology

Monitoring and management of the GGBF at Arncliffe included:

- tadpole surveys and water quality measurements in the M8 Marsh Street habitat area, RTA Ponds, Enhancement Area, Kogarah Golf Course and the extended search area in Barton Park;
- nocturnal frog surveys in the M8 Marsh Street habitat area, RTA Ponds, Enhancement Area, Kogarah Golf Course, Perimeter, Creek, Eastern Frog Corridor and the extended search area in Barton Park;
- removal of Striped Marsh Frogs (*Limnodynastes peronii*) from the M8 Marsh Street habitat area (under Office of Environment and Heritage [OEH] Licence);
- maintenance inspections at the M8 Marsh Street habitat area, RTA Ponds and Enhancement Area.

Tadpole and water quality surveys were undertaken on:

- 7 April 2021 by Dr Arthur White and Glenn Muir;
- 30 April 2021 by Dr Arthur White and Sarsha Gorrissen;
- 26 May 2021 by Dr Arthur White and Carl Corden.

Survey techniques followed those previously undertaken by Dr White and described in the GGBF Plan of Management (PoM) (ELA 2018) and included: dip net sweeps and watching for tadpole activity; identification and staging of any tadpoles captured; and use of a hand-held probe to take water quality measurements. Maintenance inspections of the M8 Marsh Street habitat area, the

RTA Ponds and the Enhancement Area were undertaken concurrently with the tadpole and water quality surveys.

Nocturnal frog surveys were undertaken on:

- 11 March 2021 in the M8 Marsh Street habitat area (Chris Jackson, Lachlan Pettit, Mark Semeniuk and Narawan Williams);
- 23 March 2021 in the M8 Marsh Street habitat area (Chris Jackson, Lachlan Pettit, Mark Semeniuk and Henry Cook);
- 25 March 2021 in the RTA Ponds, Enhancement Area, Kogarah Golf Course, Perimeter, Creek and Eastern Frog Corridor (Chris Jackson and Lachlan Pettit);
- 1 April 2021 in the M8 Marsh Street habitat area (Chris Jackson, Glenn Muir, Carl Corden and Tom Covell);
- 8 April 2021 in the M8 Marsh Street habitat area (Chris Jackson, Glenn Muir, Chris Jolly and Tom Covell);
- 13 April 2021 in the RTA Ponds, Enhancement Area, Kogarah Golf Course, Perimeter, Creek, Eastern Frog Corridor and the extended search area at Barton Park (Chris Jackson, Lachlan Pettit, Chris Jolly and Alana de Laive);
- 15 April 2021 in the M8 Marsh Street habitat area (Chris Jackson, Lachlan Pettit, Chris Jolly and Alana de Laive);
- 22 April 2021 in the M8 Marsh Street habitat area (Chris Jackson, Mark Semeniuk, Chris Jolly and Alana de Laive);
- 26 May 2021 in the RTA Ponds, Enhancement Area, Kogarah Golf Course, Perimeter, Creek, Eastern Frog Corridor and the extended search area at Barton Park (Chris Jackson, Lachlan Pettit, Chris Jolly and Carl Corden).



Figure 1.1: Study area.

## 2 Results

### 2.1 Water Quality Monitoring

Results of the water quality measurements in comparison with threshold values (Mahony and Beranak undated) are summarised in Table 2.1. Raw data are provided in Appendix 1. All water quality variables were within the overall GGBF tadpole survival thresholds described by Mahony and Beranak (undated) in all ponds holding water, except for salinity in the Mangrove Pond on Kogarah Golf Course. Turbidity measures were variable throughout the monitoring period but were otherwise acceptable in all ponds.

Water was present throughout the survey period in all ponds sampled in the M8 Marsh Street habitat area, the RTA ponds and Kogarah Golf Course. Water levels in the Enhancement Area ponds varied throughout the survey period. In early April, three of the enhancement ponds were dry. Conditions improved in late April with only one pond being dry at the time of survey, and in May two ponds were dry.

Half of the ponds surveyed in the extended search area in Barton Park were dry for part of the monitoring period, with the exception of Southern Phragmites, Bend Swamp, and Landing Lights East which held water in a deep pool throughout the survey period. There was no access to the Number 9 pond or the Northern Phragmites site in the extended search area in Barton Park.

Table 2.1: Summary of water quality results.

Area	Pond	Temperature			Salinity			Dissolved O <sup>2</sup>			pH		
		Apr 7	Apr 30	May 26	Apr 7	Apr 30	May 26	Apr 7	Apr 30	May 26	Apr 7	Apr 30	May 26
Marsh Street Habitat	A	Pass	Pass*	Pass*	Pass	Pass	Pass	Pass	-	-	Pass*	Pass	Pass
	B	Pass	Pass*	Pass*	Pass	Pass	Pass	Pass	-	-	Pass*	Pass	Pass
	C	Pass	Pass*	Pass*	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass
RTA Ponds	Western	Pass	Pass*	-	Pass	Pass	-	Pass	-	-	Pass	Pass	-
	Eastern	Pass	Pass*	-	Pass	Pass	-	Pass	-	-	Pass	Pass	-
Enhancement Area	1	Pass*	Pass*	Pass*	Pass	Pass	Pass*	Pass	-	-	Pass*	Pass*	Pass*
	2	Dry	Pass*	Pass*	Dry	Pass	Pass*	Dry	-	-	Dry	Pass*	Pass*
	3	Dry	Pass*	Dry	Dry	Pass	Dry	Dry	-	-	Dry	Pass	Dry
	4	Pass*	Dry	Pass*	Pass	Dry	Pass*	Pass	-	-	Pass*	Dry	Pass*
	5	Dry	Pass*	Pass*	Dry	Pass	Pass	Dry	-	-	Dry	Pass	Pass
	6	Pass	Pass*	Dry	Pass	Pass*	Dry	Pass	-	-	Pass	Pass*	Dry
Kogarah Golf Course	Circular	Pass	Pass*	Pass*	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass
	Long	Pass	Pass*	Pass*	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass
	Mangrove Pond	Pass*	Pass*	Pass*	Fail	Fail	Fail	Pass	-	-	Pass*	Pass	Pass
	Eastern	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	-	Dry	Dry	Dry
	Skinny	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	-	Dry	Dry	Dry
	Northern	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	-	Dry	Dry	Dry
Barton Park	No.9 Pond	-	-	-	-	-	-	-	-	-	-	-	-
	Eastern Channel	Pass*	Pass*	Dry	Pass	Pass	Dry	Pass	-	-	Pass	Pass	Dry
	Southern Phragmites	Pass*	Pass*	Pass*	Pass	Pass	Pass	Pass	-	-	Pass*	Pass	Pass
	Northern Phragmites	-	-	-	-	-	-	-	-	-	-	-	-
	Bend Swamp	Pass*	Pass*	Pass*	Pass	Pass	Pass*	Pass	-	-	Pass*	Pass	Pass*
	Southern Jungle	Dry	Dry	Pass*	Dry	Dry	Pass	Dry	-	-	Dry	Dry	Pass
	Landing Lights East	Pass	Pass*	Pass*	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass
	Landing Lights West	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	-	Dry	Dry	Dry
	Driving Range Wetland	Dry	Pass*	Dry	Dry	Pass	Dry	Dry	-	-	Dry	Pass	Dry

\* Indicates outside higher survival range but within survival threshold as described in Mahony and Beranak (undated)

- Indicates ponds that were inaccessible or a reading that could not be obtained due to an equipment fault



## 2.2 Tadpole Monitoring

The combined results of the tadpole monitoring surveys are summarised in Table 2.2. No GGBF tadpoles were recorded in any M8 Marsh Street habitat area ponds, nor any other ponds outside the of the M8 Marsh Street habitat area during the surveys

Tadpoles of one other frog species were recorded across the survey area during targeted tadpole surveys. Striped Marsh Frog (*Limnodynastes peronii*) tadpoles were recorded in Pond A of the M8 Marsh Street habitat area. Outside the compound Striped Marsh Frog tadpoles were recorded in both RTA Ponds, Enhancement Area ponds 1, 5, and 6, and all ponds sampled in the Barton Park extended search area.

**Table 2.2: Summary of tadpole net sweep results.**

Area	Pond	Tadpoles Present	Species	Number and Stage			
				A	B	C	D
M8 Marsh Street habitat area	A	Yes	<i>Limnodynastes peronii</i>		1	1	
	B	No					
	C	No					
RTA Ponds	Western	Yes	<i>Limnodynastes peronii</i>		1		
	Eastern	Yes	<i>Limnodynastes peronii</i>		5		
Enhancement Area	1	Yes	<i>Limnodynastes peronii</i>	20			
	2	No					
	3	No					
	4	No					
	5	Yes	<i>Limnodynastes peronii</i>		20		
	6	Yes	<i>Limnodynastes peronii</i>		2		
Kogarah Golf Course	Circular	No					
	Long	No					
	Eastern	Not surveyed					
	Skinny	Not surveyed					
	Northern	Not surveyed					
	Mangrove Pond	No					
Extended search area in Barton Park	No.9 Pond	No access					
	Eastern Channel	Yes	<i>Limnodynastes peronii</i>		30		
	Southern Phragmites	Yes	<i>Limnodynastes peronii</i>		23		
	Northern Phragmites	No access					
	Bend Swamp	Yes	<i>Limnodynastes peronii</i>		8		
	Southern Jungle	Yes	<i>Limnodynastes peronii</i>		20		
	Landing Lights East	Yes	<i>Limnodynastes peronii</i>		1		
	Landing Lights West	No					
	Driving Range Wetland	No					

## 2.3 Nocturnal GGBF Monitoring in the M8 Marsh Street habitat area

Five hundred and ninety (590) GGBFs were captured and processed during six timed-search surveys in the M8 Marsh Street habitat area (Table 2.3). Two hundred and ninety-four (294) adults were recorded, two hundred and twenty-two (222) were recaptured frogs and sixty-two (62) were juveniles.

The average weight and SVL of GGBF captured are displayed in Table 2.3.

Striped Marsh Frogs were the only other frog species recorded in the M8 Marsh Street habitat area during the survey period.

**Table 2.3: GGBF survey results, M8 Marsh Street habitat area**

Date	Pond	Juvenile / Subadult	Recapture	Number microchipped	Total	Average SUL (mm)	Average weight (g)
11-Mar-21	A	6	0	16	22	52.8	11.7
	B	2	5	18	25		
	C	0	3	49	52		
	Swale	5	0	4	12		
	Perimeter	-	-	-	9		
23-Mar-21	A	0	11	24	35	55.7	14.6
	B	1	6	18	25		
	C	1	3	19	23		
	Swale	2	1	7	10		
	Perimeter	9	1	12	22		
1-Apr-21	A	0	11	13	24	54.8	13.0
	B	0	8	8	16		
	C	0	19	13	32		
	Swale	3	1	1	5		
	Perimeter	0	2	0	2		
8-Apr-21	A	1	14	14	29	53.8	12.1
	B	0	18	2	20		
	C	0	20	11	31		
	Swale	0	4	4	8		
	Perimeter	9	16	8	33		
15-Apr-21	A	11	17	7	35	51.4	10.3
	B	2	11	8	21		
	C	2	20	25	47		
	Swale	0	1	1	2		
	Perimeter	4	0	0	4		
22-Apr-21	A	4	10	3	17	55.5	14.4
	B	0	11	5	16		
	C	0	8	4	12		
	Swale	0	0	0	0		
	Perimeter	0	1	0	1		
<b>Total</b>		<b>62</b>	<b>222</b>	<b>294</b>	<b>590</b>		

## 2.4 Nocturnal Frog Monitoring in the Wider Study Area

Results of the frog monitoring surveys in the wider study area are summarised in Table 2.4. A total of sixty (60) GGBFs were recorded in a number of sites outside of the M8 Marsh Street habitat area, including the Eastern and Western RTA Ponds, the Creek area (east and west), the Eastern Frog Corridor, Enhancement Area ponds 1, 2, 4, and 5, in three ponds on the Kogarah Golf Course and at the Landing Lights East and Bend Swamp sites in the extended search area at Barton Park. Of the Sixty (60) GGBFs observed, forty-seven (47) were captured and processed during nocturnal frog monitoring across the wider study area (outside of the M8 Marsh Street habitat area). Of these, forty-five (45) were adults, eighteen (18) were recaptures, and two (2) were juveniles (not microchipped).

Striped Marsh Frogs were recorded in the Eastern Frog Corridor, Enhancement Area, Kogarah Golf Course and the extended search area at Barton Park. The Eastern Dwarf Tree Frog (*Litoria fallax*) was recorded in the Eastern and Western RTA ponds, and Enhancement Pond 6. Peron's Tree Frog was recorded the Eastern Frog Corridor Underpass, and the western RTA. The Common Eastern Froglet (*Crinia signifera*) was recorded at the Eastern and Western RTA ponds.

**Table 2.4: Summary of frog survey results outside of the M8 Marsh Street Habitat Area**

Area	Pond	<i>Litoria aurea</i>	<i>Limnodynastes peronii</i>	<i>Litoria peronii</i>	<i>Litoria fallax</i>	<i>Crinia signifera</i>
Eastern Frog Corridor and Creek area	Creek (west)	12	10			
	Creek (east)	17				
	Underpass			5		
RTA Ponds	Western	8		1	6	50
	Eastern	5			1	5
Enhancement Area	1	1				
	2	1	9			
	3		4			
	4	2	14			
	5	6	3			
	6		11		1	
Kogarah Golf Course	Circular	1	2			
	Long	2				
	Eastern					
	Skinny	1				
	Northern					
	Mangrove					
Barton Park	Number 9 Pond					
	Eastern Channel					
	Southern Phragmites					
	Bend Swamp	2				
	Southern Jungle					
	Driving Range Wetland					
	Landing Lights West					
	Landing Lights East	2	2			



Figure 2.1: Locations where GGBFs were observed, March – May 2021.

## 2.5 Maintenance Observations

### 2.5.1 M8 Marsh Street habitat area

At the time of the site inspections all ponds within the M8 Marsh Street habitat area were holding water and no Plague Minnow (*Gambusia* sp.) were observed. Overall, aquatic vegetation in all ponds was healthy and spreading, in particular Typha in Pond B and Typha and Spike Rush in Pond A.

Weed control activities during the monitoring period focused primarily on cutting and hand weeding of herbaceous weeds and exotic grasses throughout the M8 Marsh Street habitat area. Weeds targeted in April and May were; *Aster subulatus*, *Anredera cordifolia*, *Araujia sericifera*, *Bidens pilosa*, *Celtis occidentalis*, *Cestrum parqui*, *Cinnamomum caphora*, *Conyza* sp., *Ipomoea indica*, *Lantana camara*, *Megathyrsus maximus*, *Pennisetum alopecuroides*, *Senecio madagascariensis* and *Sida rhombifolia*.

### 2.5.2 RTA Ponds

No Plague Minnow were recorded in either of the RTA Ponds during water quality and tadpole surveys. Water levels in both ponds were good.

### 2.5.3 Enhancement Area

Enhancement Area ponds 2, 3, and 5 were dry in the early April 2021 survey period. By late April only Pond 4 was dry, with other ponds around ¼ full. In May, Ponds 3 and 6 were dry, Pond 1 was ¼ full and the other ponds were full.

## 3 Discussion

The results of the current surveys indicate that the population of GGBFs in the M8 Marsh Street habitat area continue to occupy the site. Adult frogs were captured in all months, with 38% of frogs surveyed being recaptured individuals. Around 11% of all frogs captured were juvenile GGBFs.

GGBFs were also found in the Creek area (29), both RTA ponds (13), Kogarah Golf Course (4) and in the Enhancement Area (10). Two GGBFs were found at the Landing Lights East Pond and two at Bend Swamp in the extended search area in Barton Park. All frogs observed or captured appeared in a healthy condition.

## 4 References

ELA (2018). *Green and Golden Bell Frog Plan of Management - Arncliffe*. Prepared by Eco Logical Australia for NSW Roads and Maritime Services.

Mahony, M. and Beranak C. (undated). *Water Quality parameters measured to assess suitability for Green and Golden Bell Frog occupancy*. Unpublished report provided to NSW Roads and Maritime Services.

## Appendix 1: Water Quality Results

Table A1-1: Water Quality Results for 7 April 2021

Location	Pond	General Condition	mVpH	pH	ORP [mV]	% Sat (DO%)	Diss. O2 [mg/l]	Conduct [uS/cm]	Resist [ms/cm]	TDS ppm	Salinity (PSU)	Turbidity [FNU]	Temp [C°]	Gambusia
M8 Marsh Street habitat area	A	Full	51.5	6	273.6	20.6	1.85	171	141.3	10.6	0.11	31.3	20.7	No
	B	Full	12.5	6.7	100.9	20.5	1.75	854	778	42.7	0.42	14.7	20.3	No
	C	Full	-10.8	7.1	175.3	31.7	2.66	406	386	20.4	0.2	3.3	22.3	No
RTA Ponds	Western	Full	-87.3	8.3	-46.2	44	3.78	307	292	154	0.15	15.3	22.4	No
	Eastern	Full	-52.5	7.8	9.6	41.4	3.59	47	30	35	0.3	15.6	20.2	No
Enhancement Area	1		0.9	6.9	58.3	45	4.09	184	167	92	0.09	11.8	19.9	No
	2	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	3	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	4	1/10 full	-5.1	6.9	-36.1	16.4	1.24	180.4	146	78	0.08	34.1	19.6	No
	5	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	6	Full	-21.9	7.3	-154.2	19	1.65	104.6	522	8.8	0.52	18.1	20	Yes
Kogarah Golf Course	Circular	Full	-29.1	7.4	88.3	69.2	5.9	6864	6547	3442	3.82	29.3	22.4	Yes
	Long	Full	-53	7.8	83.8	43.7	3.69	3644	3481	1827	1.93	8	22.6	Yes
	Mangrove Pond	Full	-0.8	6.9	-250.6	31.6	2.13	374900	355000	188100	23.94	15.8	22.1	Yes
	Eastern	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Skinny	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Northern	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
Barton Park	No.9 Pond	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Eastern Channel	Full	-36.6	9.4	-5.7	21.1	1.89	652	580	326	0.32	2.5	19.1	no
	Southern Phragmites	Full	2.6	6.9	-188.3	17.7	1.57	693	607	345	0.34	12	18.5	no
	Northern Phragmites	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Bend Swamp	Full	13	6.9	-169.9	19.8	1.7	597	538	300	0.29	8.2	19.6	no
	Southern Jungle	1/10 full	-	-	-	-	-	-	-	-	-	-	-	-
	Landing Lights East	Full	-51.9	7.8	-25	49.2	4.26	1453	1336	732	0.74	43.3	20.5	No
	Landing Lights West	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	Driving Range Wetland	Dry	-	-	-	-	-	-	-	-	-	-	-	-

Table A1-2: Water Quality Results for 30 April 2021

Location	Pond	General Condition	mVpH	pH	ORP [mV]	% Sat (DO%)	Diss. O2 [mg/l]	Conduct [uS/cm]	Resist [ms/cm]	TDS ppm	Salinity (PSU)	Turbidity [FNU]	Temp [C°]	Gambusia
M8 Marsh Street habitat area	A	3/4 full	-6.2	7.04	152.8	1.1	0.11	2211	180	119	0.11	0.8	14.4	No
	B	Full	-11.3	7.1	157.5	1.3	0.13	1099	876	550	0.55	1	14.3	No
	C	Full	-26.7	7.4	132.6	1.6	0.15	459	385	230	0.22	1.7	16.5	No
RTA Ponds	Western	3/4 full	-41.1	7.6	116.8	0.1	0.01	186	153	42	0.06	6.4	15.9	No
	Eastern	3/4 full	-15.1	7.2	122.5	0.2	0.02	155	122	71	0.08	43	13.8	No
Enhancement Area	1	1/4 full	10.5	6.7	48.9	0	0	16	13	37	0.07	23.1	13.6	No
	2	1/4 full	11.6	6.7	154.9	0	0	244	196	126	0.13	5.1	13.7	No
	3	1/4 full	-2.6	7	123.8	0	0	216	174	110	0.11	6	14.6	No
	4	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	5		-20.1	7.3	35.6	0	0	110	90	53	0.05	2.3	15.2	No
	6	1/4 full	7.2	6.9	44.7	0	0	1487	1175	744	0.76	5.5	14	No
Kogarah Golf Course	Circular	Full	-15.9	7.3	19.8	0	0	7097	6155	3607	4	12.1	16.3	Yes
	Long	Full	-48.7	7.8	71.7	0	0	1731	2105	966	1.01	6.6	16.5	Yes
	Mangrove Pond	Full	-31.4	7.5	-136	0	0	49750	43150	25110	34.3	16.2	17.8	Yes
	Eastern	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Skinny	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Northern	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
Barton Park	No.9 Pond	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Eastern Channel		-52.6	7.9	106.3	0.1	0.02	343	286	176	0.08	9.9	16.8	No
	Southern Phragmites	3/4 full	-37.6	7.6	-12.4	2.8	0.3	698	537	351	0.35	11.1	12.6	No
	Northern Phragmites	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Bend Swamp	1/4 full	-10.6	7.1	-31.3	4.7	0.51	707	544	357	0.35	10.7	12.7	No
	Southern Jungle	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	Landing Lights East		-63.2	8.1	77.1	14.4	1.46	3795	3000	1902	2.03	18.1	13.8	No
	Landing Lights West	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	Driving Range Wetland		-14.1	7.2	14.1	11.9	1.13	2693	2319	1359	1.41	2.7	17.1	No

Table A1-3: Water Quality Results for 25 May 2021

Location	Pond	General Condition	mVp H	pH	ORP [mV]	% Sat (DO%)	Diss. O2 [mg/l]	Conduct [uS/cm]	Resist [ms/cm]	TDS ppm	Salinity (PSU)	Turbidity [FNU]	Temp [C°]	Gambusia
M8 Marsh Street habitat area	A	Full	-94.3	8.6	22.5	-	-	55	43	29	0.04	6.4	14.2	No
	B	Full	-44.9	7.7	51.3	-	-	999	780	499	0.5	7.4	13.5	No
	C	Full	-40.6	7.6	39.5	-	-	452	366	226	0.22	15.3	15	No
RTA Ponds	Western	Not Surveyed	-63.3	8.1	-	-	-	459	415	228	0.22	72.3	20.1	No
	Eastern	Not Surveyed	-38.1	7.6	-	-	-	170	158	86	0.08	228	20.7	No
Enhancement Area	1	1/3 full	14.5	6.7	83.5	-	-	237	176	123	0.12	4.1	14.1	No
	2	Full	26.4	6.5	56.1	-	-	152	118	76	0.07	5.8	13.1	No
	3	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	4		35.4	6.3	-50.7	-	-	303	239	150	0.14	18.6	14.9	No
	5	Full	-20.3	7.2	-37.6	-	-	264	210	133	0.13	10.4	14.4	No
	6	Dry	-	-	-	-	-	-	-	-	-	-	-	-
Kogarah Golf Course	Circular	Full	-13.8	7.2	85.6	-	-	6667	5449	3334	3.68	24.8	15.5	Yes
	Long	Full	-58.7	8	85.5	-	-	3994	3224	1996	2.12	16.9	15.1	Yes
	Mangrove Pond	Full	-10.7	7.1	-203.4	-	-	44421	36210	28961	58.7	15.2	15.2	Yes
	Eastern	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Skinny	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Northern	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
Barton Park	No.9 Pond	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Eastern Channel	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	Southern Phragmites	Full	-43.6	7.7	-72.2	-	-	692	537	357	0.35	7	11.5	No
	Northern Phragmites	Not Surveyed	-	-	-	-	-	-	-	-	-	-	-	-
	Bend Swamp		14.6	6.8	-89.1	-	-	984	762	492	0.49	56.9	13.1	No
	Southern Jungle		-57.3	7.9	-48.4	-	-	4094	3544	2050	2.19	115	17.1	No
	Landing Lights East	Full	-63.5	8	33.7	-	-	3788	3031	1893	2.02	35	14.5	No
	Landing Lights West	Dry	-	-	-	-	-	-	-	-	-	-	-	-
	Driving Range Wetland	Dry	-	-	-	-	-	-	-	-	-	-	-	-