Review of discharge characteristics – physical properties (every 10mins) monitoring licence conditions for the Adelaide Desalination Plant:
June 2014

Prepared for

AdelaideAqua Pty Ltd

Report number 12 in the series

By

Prof. Anthony Cheshire B.Sc. Ph.D. MAICD

Science to Manage Uncertainty

Adelaide, South Australia.

http://www.science-to-manage-uncertainty.com.au

18-Jun-2014

Document control

Title	Review of discharge characteristics – physical properties (every 10mins) monitoring licence conditions for the Adelaide Desalination Plant
Revision	5
Author	Anthony Cheshire
Client	AdelaideAqua Pty Ltd
Date finalised	18-Jun-2014
Distribution	Vanesa Ayala
Version	Final version for publication

For citation purposes this document should be referred to as:

CHESHIRE, A.C. (2014). REVIEW OF DISCHARGE CHARACTERISTICS – PHYSICAL PROPERTIES (EVERY 10MINS) MONITORING LICENCE CONDITIONS FOR THE ADELAIDE DESALINATION PLANT, JUNE 2014. REPORT 12 IN A SERIES PREPARED FOR ADELAIDEAQUA PTY LTD BY SCIENCE TO MANAGE UNCERTAINTY PP: 17.

Table of contents

EXECUTIVE SUMMARY

Purpose

This document represents a report on the extent to which monitoring of discharge character - physical characteristics from selected sites in the vicinity of Port Stanvac meets with the EPA Licence Conditions for the construction and operation of the Adelaide Desalination Plant (ADP) over the period February 2009 to 12-Dec-2013. The monitoring reports were associated with the construction (including commissioning) of the desalination plant (by AdelaideAqua D&C Consortium – AAD&C) from February 2009 to 12-Dec-2012 and to the operation of the desalination plant (AdelaideAqua Pty Ltd) from 12-Dec-2012 to 12-Dec-2013.

Background

AdelaideAqua Pty Ltd is the operator of the Adelaide Desalination Plant at Port Stanvac South Australia. Operation of the ADP requires the discharge of reject water to the marine environment; this activity was originally conducted under a licence issued to AAD&C by the Environment Protection Authority of South Australia (EPA Licence Number 26902) and subsequently under another licence issued to AAPL (EPA Licence Number 39143). These licences authorised AAD&C and AAPL to undertake a series of activities of environmental significance under Schedule 1 Part A of the Environment Protection Act 1993 (the Act). The licences had specific requirements in relation to "Discharges to Marine Waters" that are the subject of this report.

Section 14 (305-626) of the licence requires that the licensee must ensure that:

1. An independent review of all marine monitoring is conducted by independent specialist(s) as approved in writing by the EPA prior to the review commencing;
2. All marine monitoring from the period commencing with the issue of the licence and ending 12 months after project handover of the 100 GL desalination plant is included in the review; and
3. The full results of the review are provided to the EPA not more than 18 months after project handover of the 100 GL desalination plant.

The EPA has also advised that prior to appointment, the independent reviewer must be able to demonstrate to the EPA that:

1. They will use their own professional judgment;
2. They will take appropriate specialised advice when the issue is outside their expertise;
3. Their opinions will be reached independently;
4. In forming opinions, they will not be unduly influenced by the views or actions of others who may have an interest in the outcome of the review; and
5. They must declare any real or apparent conflict of interest.

With the approval of the EPA, Anthony Cheshire (the author of this report) was selected by AdelaideAqua Pty Ltd (AAPL) to undertake this review.

Approach

This review of discharge characteristics – physical properties (every 10mins) monitoring encompassed a study of all documentation provided by AdelaideAqua Pty Ltd which comprised a series of 24 monitoring reports each of which was produced by staff at AAD&C, AAPL or by experts contracted by the parties for that purpose.

Each report has been critically reviewed and key issues that pertain to compliance with the licence conditions have been aggregated into a summary that has been presented in this report.

Specific requirements

To consider the work done against the Scheduled Marine Monitoring Requirements detailed in Attachment A to Licences 26902 and 39143. These being:

Licence 26902 & Licence 39143: Measure conductivity, temperature, DO, pH and Chlorine of whole of effluent discharge every 10 minutes.

General requirements

In addition the EPA require that the Independent Reviewer is to undertake a technical review of all marine monitoring results from the commencement date of the Licence 26902 (D&C) until 12 December 2013 (12 months after plant handover) in order to assess the environmental impact of the desalination plant. This matter will be addressed in a subsequent report.

Conclusion

The average coverage for the physical properties of the discharge is 79% (number of valid data readings relative to the number expected for complete coverage). Overall the data coverage for Temperature (87%) and pH (85%) was better than for Conductivity (79%), Chlorine (73%) and DO (70%). This is largely to be expected as Chlorine and DO probes both require substantially more maintenance and calibration than other sensors.

There were some notable periods when data coverage was insufficient notably:

1. Prior to 1-Jan-2012 when no data were recorded.
2. There was no data coverage in March 2012.
3. There were many months (Table 1) where data coverage was below 60% for one or more of the discharge sources, for one or more of the sensors. However, when a weighted average is taken that adjusts the number of data records for the actual number of ten minute periods when flow occurred from one or more of these sources then these periods of reduced coverage have only a minor impact on the overall coverage).

LICENCE CONDITION: DISCHARGE MONITORING - DISCHARGE EVERY 10MINS MONITORING

In the following the specific requirements pertaining to the licence condition (discharge characteristics – physical properties (every 10mins)) are summarised along with information about the documents that have been reviewed.

Documents reviewed for this licence condition:

Document Name	Reference
2012_1 EPA_january discharge charcteristics 12 All.xlsx	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for January 2012. AdelaideAqua Pty Ltd.
2012_2 EPA_February_Discharge characteristics 12.xlsx	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for February 2012. AdelaideAqua Pty Ltd.
2012_3 EPA_March Discharge 12 All.xlsx	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for March 2012. AdelaideAqua Pty Ltd.
2012_4_EPA_APRIL_12 ALL.XLSX	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for April 2012. AdelaideAqua Pty Ltd.
2012_5_EPA_MAY_12 ALL.XLSX	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for May 2012. AdelaideAqua Pty Ltd.
2012_6_EPA_JUNE_12 ALL.XLSX	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for June 2012. AdelaideAqua Pty Ltd.
2012_7 EPA_JULY_ ALL discharge characteristics_12.XLSX	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for July 2012. AdelaideAqua Pty Ltd.
2012_8 EPA_AUGUST_All discharge characteristics 12.xlsx	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for August 2012. AdelaideAqua Pty Ltd.
2012_9 EPA_SEPTEMBER_12 ALL discharge characteristics.XLSX	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for September 2012. AdelaideAqua Pty Ltd.
2012_10_EPA_October_c_12.xlsx	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for October 2012. AdelaideAqua Pty Ltd.
2012_11_EPA_November_c_12.xlsx	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for November 2012. AdelaideAqua Pty Ltd.
2012_12_EPA_December_c_12.xlsx	AdelaideAqua, (2012). Discharge Characteristics - Physical Properties (10 minute data) for December 2012. AdelaideAqua Pty Ltd.
2013_01_EPA_January_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for January 2013. AdelaideAqua Pty Ltd.
2013_02_EPA_February_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for February 2013. AdelaideAqua Pty Ltd.
2013_03_EPA_March_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for March 2013. AdelaideAqua Pty Ltd.

Document Name	Reference
2013_04_EPA_April_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for April 2013. AdelaideAqua Pty Ltd.
2013_05_EPA_May_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for May 2013. AdelaideAqua Pty Ltd.
2013_06_EPA_June_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for June 2013. AdelaideAqua Pty Ltd.
2013_07_EPA_July_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for July 2013. AdelaideAqua Pty Ltd.
2013_08_EPA_August_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for August 2013. AdelaideAqua Pty Ltd.
2013_09_EPA_September_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for September 2013. AdelaideAqua Pty Ltd.
2013_10_EPA_October_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for October 2013. AdelaideAqua Pty Ltd.
2013_11_EPA_November_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for November 2013. AdelaideAqua Pty Ltd.
2013_12_EPA_December_c_12.xlsx	AdelaideAqua, (2013). Discharge Characteristics - Physical Properties (10 minute data) for December 2013. AdelaideAqua Pty Ltd.

Specific requirement (see Attachment A – Marine Monitoring Schedule):

Licence 26902 & Licence 39143: Measure conductivity, temperature, DO, pH and Chlorine of whole of effluent discharge every 10 minutes.

Overall summary in relation to monitoring of discharge

The discharge characteristics for the outfall are made up out of six streams from different parts of the plant. The information below lists the details of the various discharge streams and the tanks and instrumentation used for reporting purposes for the plant.

Saline concentrate buffering tanks from SP1 and SP2 (Source SCBT1 and SCBT2 respectively) hold saline concentrate for pH buffering prior to discharge. To determine if there was a discharge occurring from the Saline Concentrate Buffering tank number 1 flow meter 951-FIT-1001B was used and for SCBT2 flow meter 951-FIT-2001B.

- Salinity data will be valid in the range of 32-85ppt.
- Conductivity meter used: 951-CIT-1501 for SP1 and 951-CIT-2501 for SP2.
- Brine pH will be in the range >4. pH meter used: 951-AIT-1504 and 951-AIT-2504.
- Brine DO will be in the range 4-11.5 mg/L. DO meter used: 951-AIT-1502 and 951-AIT-2502.
- Temperature – no range limitation. Temperature meter used: 951-TIT-1501 and 951-TIT-2501.

- Chlorine range <0.1mg/L. Chlorine meter used 951-AIT-1501 and 951-AIT-2501. During the commissioning stages significant problems were encountered with the on line Chlorine analyser and analysis was done manually for most of the time until such a point that the instrument was running reliably. A hand held chlorine testing unit (Palintest) was used during times that the online chlorine instrument was not available. The Palintest unit has a practical limit of detection of <0.1mg/l . Data is presented as >0.1mg/l to represent this. If both the on-line and the hand held instrument were providing reliable data this overlap is included in the data presented.

If any of the data are outside those ranges, data will not be considered representative. These criteria are established based on the WQ of the water in Gulf St. Vincent and includes a relatively large margin of error.

UF CIP Neutralization tank 1 and 2 (Source UFCIP1 and UFCIP2 respectively). To determine if there was a discharge occurring from UFCIP1 valve 910-XV-1001E was used and for UFCIP2 valve 910-XV-2001E was used. Values above 1% of the valve value were considered to represent discharges from these tanks.

- Salinity - no range limitation. Conductivity meter used: 910-CIT-1001E for SP1 and 910-CIT-2001E for SP2.
- pH - no range limitation. pH meter used: 910-AIT-1001A and 910-AIT-2001A.
- DO will be <11.5 mg/L. DO meter used: 910-AIT-1001F and 910-AIT-2001F.
- Temperature - no range limitation. Temperature meter used: 910-TIT-1001 and 910-TIT-2001.
- Chlorine - no range limitation. Chlorine meter used 910-AIT-1001C and 910-AIT-2001C. Same comments as per the previous tank.

Holding tank (Source Holding). To determine if there was a discharge occurring from the holding tank the flow meter 951-FIT-1001A was used.

- Salinity - no range limitation. Conductivity meter used: 904-CIT-0204.
- pH – no range limitation. pH meter used: 904-AIT-0201.
- DO will be <11.5 mg/L. DO meter used: 904-AIT-0205.
- No limits for temperature. Temperature meter used: 951-TIT-0002.
- Chlorine - no range limitation. Chlorine meter used 910-AIT-0202. Same comments as per the previous tank.

Waste and Drains tank (Source W&D). To determine if there was a discharge occurring from the Waste and Drains tank the valve 904-XV-0008 was used that when it opens empty the tank. Values above 0.1% of the valve were considered discharge from the tanks.

- Salinity - no range limitation. Conductivity meter used: 904-CIT-0204.
- pH - no range limitation. pH meter used: 904-AIT-0201.
- DO will be <11.5 mg/L. DO meter used: 904-AIT-0205.
- Temperature - no range limitation. Temperature meter used: 951-TIT-0001.

- Chlorine - no range limitation. Chlorine meter used 910-AIT-0202. Same comments as per the previous tank.

Table 1 presents a summary of the data obtained from monitoring each of these sources. Overall a total of 264,784 data records were expected for each of Conductivity, Temperature, Dissolved Oxygen (DO), pH and Chlorine. The values shown in Table 1 are weighted averages across all monitoring periods and take account of the number of "valid readings" for each month from 1-Jan-2012 to 31-Dec-2013. Given that the various sources were not discharging constantly any estimate of the number of valid records needs to take specific account of the operating periods for each discharge source.

For the purposes of this Licence condition the data have been validated against a series of reasonableness criteria; values that do not meet those criteria have been excluded. Percentage coverage has been determined based on the number of valid data records obtained as a percentage of the number of records expected based on the assumption that one data record would be required for each parameter for every 10 minute period that a discharge was occurring from any given source.

No attempt has been made to interpret the data other than to report the coverage the various parameters (noting that data were provided for review in a series of EXCEL files as detailed above).

Overall data coverage for the physical properties of the discharge water (Table 1) was good[1] comprising an average coverage of 79%. Overall the data coverage for Temperature (87%) and pH (85%) was better than for Conductivity (79%), Chlorine (73%) and DO (70%). This is largely to be expected as Chlorine and DO probes both require substantially more maintenance and calibration than other sensors.

There were some notable periods when data coverage was insufficient notably:

1. Prior to 1-Jan-2012 no data were recorded.
2. There was no data coverage in March 2012.
3. There were many months (Table 1) where data coverage was below 60% for one or more of the discharge sources, for one or more of the sensors. However, when a weighted average is taken that adjusts the number of actual data records for the actual number of ten minute periods when flow actually occurred from one or more of these sources then these periods of reduced coverage have only a minor impact on the overall coverage).

[1] Qualitative evaluation of the data coverage has been based on the following scale; Excellent >= 90%, Good >=75%, Fair >= 60%, Materially deficient < 60%.

Table 1 – Condition 12 metals, nitrogen, phosphorus and suspended solids within intake water.

Source	Year and Month	File	Operating records	Conductivity %	Temperature %	Dissolved oxygen %	pH %	Chlorine %	Overall %	Notes
Holding	2012-01	2012_1 EPA_january discharge charcteristics 12 All.xlsx	906	66%	70%	100%	70%	100%	81%	
Holding	2012-02	2012_2 EPA_February_Discharge characteristics 12.xlsx	1,359	57%	50%	55%	58%	58%	56%	
Holding	2012-03	2012_3 EPA_March Discharge 12 All.xlsx	1,418	91%	91%	83%	90%	66%	84%	
Holding	2012-04	2012_4_EPA_APRIL_12 ALL.XLSX	84	90%	100%	100%	100%	100%	98%	
Holding	2012-05	2012_5_EPA_MAY_12 ALL.XLSX	3,465	0%	100%	50%	92%	100%	68%	
Holding	2012-06	2012_6_EPA_JUNE_12 ALL.XLSX	1,431	0%	100%	26%	94%	100%	64%	
Holding	2012-07	2012_7 EPA_JULY_ ALL discharge characteristics_12.XLSX	4,458	100%	73%	100%	18%	90%	76%	
Holding	2012-08	2012_8 EPA_AUGUST_All discharge characteristics 12.xlsx	3,821	98%	95%	33%	65%	100%	78%	
Holding	2012-09	2012_9 EPA_SEPTEMBER_12 ALL discharge characteristics.XLSX	4,320	100%	95%	38%	71%	100%	81%	
Holding	2012-10	2012_10_EPA_October_c_12.xlsx	4,458	100%	100%	62%	100%	73%	87%	
Holding	2012-11	2012_11_EPA_November_c_12.xlsx	4,320	82%	82%	81%	82%	62%	78%	
Holding	2012-12	2012_12_EPA_December_c_12.xlsx	4,464	88%	88%	88%	88%	88%	88%	
Holding	2013-01	2013_01_EPA_January_c_12.xlsx	4,464	99%	99%	99%	99%	99%	99%	
Holding	2013-02	2013_02_EPA_February_c_12.xlsx	4,032	99%	100%	99%	98%	90%	97%	
Holding	2013-03	2013_03_EPA_March_c_12.xlsx	4,464	99%	99%	99%	99%	66%	92%	
Holding	2013-04	2013_04_EPA_April_c_12.xlsx	4,326	94%	94%	94%	94%	0%	75%	
Holding	2013-05	2013_05_EPA_May_c_12.xlsx	4,464	96%	96%	96%	96%	0%	77%	
Holding	2013-06	2013_06_EPA_June_c_12.xlsx	4,320	100%	100%	100%	100%	90%	98%	
Holding	2013-07	2013_07_EPA_July_c_12.xlsx	4,464	95%	95%	95%	95%	95%	95%	
Holding	2013-08	2013_08_EPA_August_c_12.xlsx	4,464	100%	100%	47%	100%	100%	89%	
Holding	2013-09	2013_09_EPA_September_c_12.xlsm	4,320	92%	93%	42%	92%	92%	82%	
Holding	2013-10	2013_10_EPA_October_c_12.xlsm	46	100%	100%	0%	100%	100%	80%	

Source	Year and Month	File	Operating records	Conductivity %	Temperature %	Dissolved oxygen %	pH %	Chlorine %	Overall %	Notes
Holding	2013-11	2013_11_EPA_November_c_12.xlsm	2,591	100%	100%	7%	100%	100%	81%	
Holding	2013-12	2013_12_EPA_December_c_12.xlsm	3,047	99%	99%	44%	99%	99%	88%	
SCBT1	2012-01	2012_1 EPA_january discharge charcteristics 12 All.xlsx	906	0%	52%	81%	100%	91%	65%	
SCBT1	2012-02	2012_2 EPA_February_Discharge characteristics 12.xlsx	1,360	52%	56%	12%	65%	65%	50%	
SCBT1	2012-03	2012_3 EPA_March Discharge 12 All.xlsx	1,409	79%	67%	9%	81%	81%	63%	
SCBT1	2012-04	2012_4_EPA_APRIL_12 ALL.XLSX								No discharge
SCBT1	2012-05	2012_5_EPA_MAY_12 ALL.xlsm	3,089	97%	100%	10%	99%	100%	81%	
SCBT1	2012-06	2012_6_EPA_JUNE_12 ALL.xlsm	3,963	100%	99%	8%	81%	100%	78%	
SCBT1	2012-07	2012_7 EPA_JULY_ ALL discharge characteristics_12.XLSX	4,283	100%	100%	13%	87%	100%	80%	
SCBT1	2012-08	2012_8 EPA_AUGUST_All discharge characteristics 12.xlsx	3,427	100%	98%	1%	62%	100%	72%	
SCBT1	2012-09	2012_9 EPA_SEPTEMBER_12 ALL discharge characteristics.XLSX	2,284	91%	98%	26%	76%	100%	78%	
SCBT1	2012-10	2012_10_EPA_October_c_12.xlsx	481	95%	99%	71%	99%	99%	93%	
SCBT1	2012-11	2012_11_EPA_November_c_12.xlsx	3,177	39%	76%	74%	76%	65%	66%	
SCBT1	2012-12	2012_12_EPA_December_c_12.xlsx	1,768	69%	69%	69%	69%	67%	69%	
SCBT1	2013-01	2013_01_EPA_January_c_12.xlsx	3,506	98%	98%	98%	98%	0%	78%	
SCBT1	2013-02	2013_02_EPA_February_c_12.xlsx	1,431	96%	96%	95%	96%	0%	77%	
SCBT1	2013-03	2013_03_EPA_March_c_12.xlsx	3,307	99%	99%	99%	99%	0%	79%	
SCBT1	2013-04	2013_04_EPA_April_c_12.xlsx	2,255	88%	88%	53%	88%	0%	63%	
SCBT1	2013-05	2013_05_EPA_May_c_12.xlsx	4,092	95%	95%	92%	95%	49%	85%	
SCBT1	2013-06	2013_06_EPA_June_c_12.xlsx	2,284	99%	99%	97%	99%	99%	99%	
SCBT1	2013-07	2013_07_EPA_July_c_12.xlsx	228	0%	0%	0%	0%	0%	0%	
SCBT1	2013-08	2013_08_EPA_August_c_12.xlsx								No discharge

Source	Year and Month	File	Operating records	Conductivity %	Temperature %	Dissolved oxygen %	pH %	Chlorine %	Overall %	Notes
SCBT1	2013-09	2013_09_EPA_September_c_12.xlsm	2,553	88%	88%	88%	88%	88%	88%	
SCBT1	2013-10	2013_10_EPA_October_c_12.xlsm	4,401	99%	100%	100%	100%	100%	100%	
SCBT1	2013-11	2013_11_EPA_November_c_12.xlsm	4,305	97%	100%	100%	100%	100%	99%	
SCBT1	2013-12	2013_12_EPA_December_c_12.xlsm	4,135	86%	99%	91%	99%	99%	95%	
SCBT2	2012-07	2012_7 EPA_JULY_ ALL discharge characteristics_12.XLSX								No discharge
SCBT2	2012-08	2012_8 EPA_AUGUST_All discharge characteristics 12.xlsx								No discharge
SCBT2	2012-09	2012_9 EPA_SEPTEMBER_12 ALL discharge characteristics.XLSX	139	36%	94%	47%	93%	94%	73%	
SCBT2	2012-10	2012_10_EPA_October_c_12.xlsx	2,029	97%	100%	23%	100%	100%	84%	
SCBT2	2012-11	2012_11_EPA_November_c_12.xlsx	3,238	19%	76%	75%	76%	76%	64%	
SCBT2	2012-12	2012_12_EPA_December_c_12.xlsx	2,642	40%	79%	40%	79%	79%	63%	
SCBT2	2013-01	2013_01_EPA_January_c_12.xlsx	3,254	98%	98%	98%	98%	98%	98%	
SCBT2	2013-02	2013_02_EPA_February_c_12.xlsx	3,612	98%	98%	98%	98%	98%	98%	
SCBT2	2013-03	2013_03_EPA_March_c_12.xlsx	3,710	99%	99%	97%	99%	99%	99%	
SCBT2	2013-04	2013_04_EPA_April_c_12.xlsx	2,193	88%	88%	88%	88%	88%	88%	
SCBT2	2013-05	2013_05_EPA_May_c_12.xlsx	4,370	96%	96%	95%	96%	76%	92%	
SCBT2	2013-06	2013_06_EPA_June_c_12.xlsx	1,980	99%	99%	99%	99%	82%	96%	
SCBT2	2013-07	2013_07_EPA_July_c_12.xlsx	228	0%	0%	0%	3%	0%	1%	
SCBT2	2013-08	2013_08_EPA_August_c_12.xlsx								No discharge
SCBT2	2013-09	2013_09_EPA_September_c_12.xlsm	2,528	86%	86%	85%	85%	85%	85%	
SCBT2	2013-10	2013_10_EPA_October_c_12.xlsm	4,158	99%	100%	100%	100%	80%	96%	
SCBT2	2013-11	2013_11_EPA_November_c_12.xlsm	4,002	91%	100%	99%	100%	100%	98%	
SCBT2	2013-12	2013_12_EPA_December_c_12.xlsm	4,234	96%	99%	97%	99%	99%	98%	
UFCIP1	2012-01	2012_1 EPA_january discharge charcteristics 12 All.xlsx								No discharge

Source	Year and Month	File	Operating records	Conductivity %	Temperature %	Dissolved oxygen %	pH %	Chlorine %	Overall %	Notes
UFCIP1	2012-02	2012_2 EPA_February_Discharge characteristics 12.xlsx	1,052	71%	3%	6%	3%	71%	31%	
UFCIP1	2012-03	2012_3 EPA_March Discharge 12 All.xlsx	-	0%	0%	0%	0%	0%	0%	No Data
UFCIP1	2012-04	2012_4_EPA_APRIL_12 ALL.XLSX	121	0%	80%	100%	80%	0%	52%	
UFCIP1	2012-05	2012_5_EPA_MAY_12 ALL.xlsm	623	0%	100%	10%	100%	0%	42%	
UFCIP1	2012-06	2012_6_EPA_JUNE_12 ALL.xlsm	359	0%	56%	38%	56%	0%	30%	
UFCIP1	2012-07	2012_7 EPA_JULY_ ALL discharge characteristics_12.XLSX	365	0%	67%	34%	54%	100%	51%	
UFCIP1	2012-08	2012_8 EPA_AUGUST_All discharge characteristics 12.xlsx	113	90%	85%	91%	0%	100%	73%	
UFCIP1	2012-09	2012_9 EPA_SEPTEMBER_12 ALL discharge characteristics.XLSX	20	0%	80%	80%	65%	100%	65%	
UFCIP1	2012-10	2012_10_EPA_October_c_12.xlsx	44	80%	86%	59%	86%	52%	73%	
UFCIP1	2012-11	2012_11_EPA_November_c_12.xlsx	914	4%	16%	11%	16%	16%	13%	
UFCIP1	2012-12	2012_12_EPA_December_c_12.xlsx	775	29%	29%	29%	29%	28%	29%	
UFCIP1	2013-01	2013_01_EPA_January_c_12.xlsx	339	68%	84%	82%	84%	57%	75%	
UFCIP1	2013-02	2013_02_EPA_February_c_12.xlsx	642	64%	90%	86%	90%	77%	81%	
UFCIP1	2013-03	2013_03_EPA_March_c_12.xlsx	485	85%	94%	93%	94%	60%	85%	
UFCIP1	2013-04	2013_04_EPA_April_c_12.xlsx	273	5%	5%	5%	5%	5%	5%	
UFCIP1	2013-05	2013_05_EPA_May_c_12.xlsx	265	41%	29%	29%	29%	29%	31%	
UFCIP1	2013-06	2013_06_EPA_June_c_12.xlsx	462	23%	96%	95%	96%	34%	69%	
UFCIP1	2013-07	2013_07_EPA_July_c_12.xlsx	754	31%	70%	68%	70%	0%	48%	
UFCIP1	2013-08	2013_08_EPA_August_c_12.xlsx	167	50%	100%	98%	100%	0%	70%	
UFCIP1	2013-09	2013_09_EPA_September_c_12.xlsm	836	38%	63%	62%	63%	63%	58%	
UFCIP1	2013-10	2013_10_EPA_October_c_12.xlsm	600	95%	100%	100%	100%	100%	99%	
UFCIP1	2013-11	2013_11_EPA_November_c_12.xlsm	443	76%	99%	97%	99%	99%	94%	
UFCIP1	2013-12	2013_12_EPA_December_c_12.xlsm	363	0%	93%	93%	92%	93%	74%	

Source	Year and Month	File	Operating records	Conductivity %	Temperature %	Dissolved oxygen %	pH %	Chlorine %	Overall %	Notes
UFCIP2	2012-07	2012_7 EPA_JULY_ ALL discharge characteristics_12.XLSX	3,483	0%	0%	0%	0%	0%	0%	
UFCIP2	2012-08	2012_8 EPA_AUGUST_All discharge characteristics 12.xlsx								No discharge
UFCIP2	2012-09	2012_9 EPA_SEPTEMBER_12 ALL discharge characteristics.XLSX	726	27%	89%	77%	84%	100%	75%	
UFCIP2	2012-10	2012_10_EPA_October_c_12.xlsx	61	80%	90%	90%	90%	90%	88%	
UFCIP2	2012-11	2012_11_EPA_November_c_12.xlsx	1,210	16%	37%	37%	37%	37%	33%	
UFCIP2	2012-12	2012_12_EPA_December_c_12.xlsx	712	0%	23%	23%	23%	23%	18%	
UFCIP2	2013-01	2013_01_EPA_January_c_12.xlsx	185	0%	71%	71%	71%	71%	57%	
UFCIP2	2013-02	2013_02_EPA_February_c_12.xlsx	435	0%	85%	85%	85%	85%	68%	
UFCIP2	2013-03	2013_03_EPA_March_c_12.xlsx	390	54%	92%	92%	92%	92%	84%	
UFCIP2	2013-04	2013_04_EPA_April_c_12.xlsx	310	0%	16%	16%	16%	16%	13%	
UFCIP2	2013-05	2013_05_EPA_May_c_12.xlsx	487	19%	62%	62%	62%	15%	44%	
UFCIP2	2013-06	2013_06_EPA_June_c_12.xlsx	352	0%	95%	95%	95%	95%	76%	
UFCIP2	2013-07	2013_07_EPA_July_c_12.xlsx	304	0%	26%	26%	26%	26%	21%	
UFCIP2	2013-08	2013_08_EPA_August_c_12.xlsx	57	0%	100%	100%	100%	100%	80%	
UFCIP2	2013-09	2013_09_EPA_September_c_12.xlsm	388	3%	19%	19%	19%	19%	16%	
UFCIP2	2013-10	2013_10_EPA_October_c_12.xlsm	223	24%	100%	100%	100%	100%	85%	
UFCIP2	2013-11	2013_11_EPA_November_c_12.xlsm	359	24%	99%	99%	99%	99%	84%	
UFCIP2	2013-12	2013_12_EPA_December_c_12.xlsm	259	0%	90%	90%	93%	90%	73%	
W&D	2012-01	2012_1 EPA_january discharge charcteristics 12 All.xlsx	160	0%	66%	93%	96%	6%	52%	
W&D	2012-02	2012_2 EPA_February_Discharge characteristics 12.xlsx								No discharge
W&D	2012-03	2012_3 EPA_March Discharge 12 All.xlsx	682	99%	100%	77%	100%	8%	77%	
W&D	2012-04	2012_4_EPA_APRIL_12 ALL.XLSX	5	0%	100%	0%	20%	100%	44%	

Source	Year and Month	File	Operating records	Conductivity %	Temperature %	Dissolved oxygen %	pH %	Chlorine %	Overall %	Notes
W&D	2012-05	2012_5_EPA_MAY_12 ALL.XLSX	1,704	3%	100%	15%	89%	100%	61%	
W&D	2012-06	2012_6_EPA_JUNE_12 ALL.XLSX	4,320	0%	7%	0%	7%	7%	4%	
W&D	2012-07	2012_7 EPA_JULY_ ALL discharge characteristics_12.XLSX	4,464	0%	80%	12%	45%	100%	47%	
W&D	2012-08	2012_8 EPA_AUGUST_All discharge characteristics 12.xlsx	4,321	0%	79%	100%	73%	0%	50%	
W&D	2012-09	2012_9 EPA_SEPTEMBER_12 ALL discharge characteristics.XLSX	141	95%	99%	77%	94%	100%	93%	
W&D	2012-10	2012_10_EPA_October_c_12.xlsx	311	98%	98%	31%	98%	98%	85%	
W&D	2012-11	2012_11_EPA_November_c_12.xlsx	1,437	46%	47%	46%	47%	29%	43%	
W&D	2012-12	2012_12_EPA_December_c_12.xlsx	2,603	79%	79%	70%	79%	69%	75%	
W&D	2013-01	2013_01_EPA_January_c_12.xlsx	3,235	97%	98%	95%	98%	0%	78%	
W&D	2013-02	2013_02_EPA_February_c_12.xlsx	3,719	100%	100%	93%	99%	9%	80%	
W&D	2013-03	2013_03_EPA_March_c_12.xlsx	3,858	99%	99%	83%	99%	99%	96%	
W&D	2013-04	2013_04_EPA_April_c_12.xlsx	1,921	87%	86%	36%	87%	87%	77%	
W&D	2013-05	2013_05_EPA_May_c_12.xlsx	4,016	95%	95%	64%	95%	95%	89%	
W&D	2013-06	2013_06_EPA_June_c_12.xlsx	3,839	61%	100%	90%	100%	100%	90%	
W&D	2013-07	2013_07_EPA_July_c_12.xlsx	3,187	68%	93%	85%	93%	93%	86%	
W&D	2013-08	2013_08_EPA_August_c_12.xlsx	4,259	87%	100%	77%	100%	100%	93%	
W&D	2013-09	2013_09_EPA_September_c_12.xlsm	4,149	90%	92%	92%	92%	92%	92%	
W&D	2013-10	2013_10_EPA_October_c_12.xlsm	4,343	98%	100%	99%	100%	91%	98%	
W&D	2013-11	2013_11_EPA_November_c_12.xlsm	4,018	100%	100%	99%	100%	57%	91%	
W&D	2013-12	2013_12_EPA_December_c_12.xlsm	3,669	99%	99%	50%	97%	69%	83%	
Compliance performance (totals and other statistics)			**264,784**	**79%**	**89%**	**70%**	**85%**	**73%**	**79%**	

Notes to Table 1:

"Sources" include:

1. "Operating records" represent the number of 10 minute periods during which a discharge was occurring for the given source during the given month.
2. "Overall %" is a measure of "valid" readings (averaged across all sensors) for a given month.
3. All other percentages are the number of "valid" readings as a percentage of the number of operating records from any given source, for any given sensor, for any given month.
4. Compliance measures are weighted averages that take account of the differences in operating times from one month to the other (note they are not equal to column averages) and thereby provide a value for the percentage of valid observations obtained relative to the total number of operating records.

Appendix A KEY DATES IN PLANT CONSTRUCTION AND OPERATION

The following provides a list of key dates in the construction and operation of the plant. This material provides background to the review and in particular places the analysis and interpretation of each of the monitoring reports into context with the activities that were occurring on-site in the period leading up to the monitoring event.

Date	Activity
01-Feb-2009	Construction activities commenced
16-Nov-2009	Maritime platform arrived on site
08-Jul-2010	Maritime platform completed operations
01-Jun-2011	First discharge and first intake of seawater
14-Oct-2011	First Water – plant production was (30 MLD)
21-Mar-2012	SP1 – Full production from first half the plant (150 MLD)
31-May-2012	SP2 – Full production from second half of the plant (150 MLD)
24-Oct-2012	Performance test – plant running at full production for 7 days (150 MLD)
07-Nov-2012	Performance test – plant running at full production for 7 days (150 MLD)
21-Nov-2012	Reliability test – continuous running at various production rates
12-Dec-2012	Plant handover from commissioning