Hutchison Ports Australia

2014

HSEQ Management System

Water Quality Monitoring Report – SICTL
December 2013 – February 2014

Version 01

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Register of Amendments					
Ver No	**Page no**	**Date**	**Description of amendments**	**Prepared by**	**Approved by**
DRAFT 0	All	10 April 2014	Consultation Draft	John Ieroklis	Trevor Ballantyne (provisional)
01	All	24 April 2014	EPA Comments incorporated	John Ieroklis	Trevor Ballantyne

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Water Quality Monitoring Report

1 Environmental Protection Licence Particulars

Table 1: EPL Particulars

Parameter	Data
License number	20322
Anniversary date	14 October
Licensee	Sydney International Container Terminals Pty Ltd
Premises	150-160 Foreshore Rd Banksmeadow NSW 2019 Gate B 150- B 153 Sirius Rd, Botany NSW 2019
Scheduled activity	Chemical storage
Fee based activity	General chemical storage
Scale	0 – 5000kL
Ancillary activity	Shipping facilitates

2 Introduction and Purpose

SICTL as operator of the new container terminal in Port Botany, and as holder of an Environmental Protection Licence is compelled to undertake a water quality monitoring program for the Stormwater Quality Improvement Devices installed at the new terminal. The effectiveness of these devices over the initial three month operational period is documented here.

This report is an example of the commitment of Hutchison Ports Australia and Sydney International Container Terminals Pty Limited to comply with the Environmental Protection Licence (EPL) in addition to the Consent Conditions and manage environmental risks proactively to achieve good operational and community outcomes. The content of this report aims to achieve partial fulfilment of EPL condition E2.1.

This reporting period was originally scheduled to span November 2013 – January 2014 however given the very low rainfall during January, the monitoring period was extended to capture February 2014.

3 Progress of Operational Commencement

The SICTL terminal is in the process of becoming progressively operational over five phases outlined below.

- Phase 1 – October 2013 to March 2014:
- Phase 2 – 2014:
- Phase 3 – 2016 - 2017:
- Phase 4 – 2018 - 2019:
- Phase 5 – 2021 - 2022:

The commencement process is volume-driven and will be adjusted to meet operational demands.

3.1 Milestones Achieved to Date

- the first shuttle carriers, reach stackers and small plant were delivered;
- Quay Cranes (QCs) 1 - 4 installed and commissioned;
- berths 1 and 2 commissioned;
- First vessel serviced on 6 November 2013;
- temporary office sheds established on the North end of the quay before the terminal office building was completed;
- containers were stacked on the quay apron in 2013 until the Automated Stacking Crane (ASC) blocks were commissioned;
- Automated Stacking Crane (ASC) blocks were commissioned in December 2013, all containers on the quay apron were removed and placed in ASC blocks;
- the maintenance building and operations building were completed in late February and handed over in March 2014;

3.2 Future Progress of Operational Commencement

- Additional ASC blocks will be built;
- Additional shuttle carriers delivered.
- Additional Quay Cranes installed and commissioned;
- Additional berths commissioned.

4 Water Quality Management On-Site

The design of SICTL's drainage system incorporates separator units called Stormwater Quality Improvement Devices (SQIDs) made by two manufacturers, SPEL and Humes. Diagrams of these units are shown below:

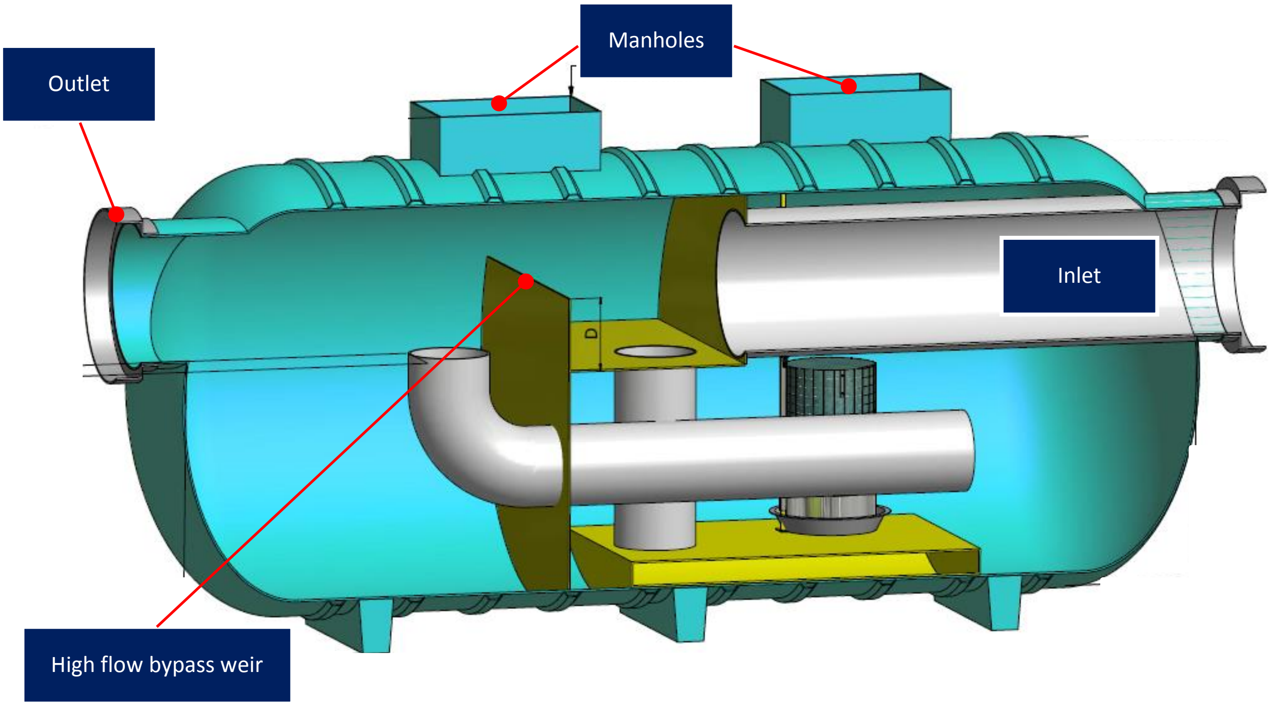

Figure 1 Cut away diagram of the SPEL Environmental 'Stormceptor' separator unit.

Figure 2 A SPEL Environmental 'Stormceptor' installed during construction of the SICTL Terminal in 2013.

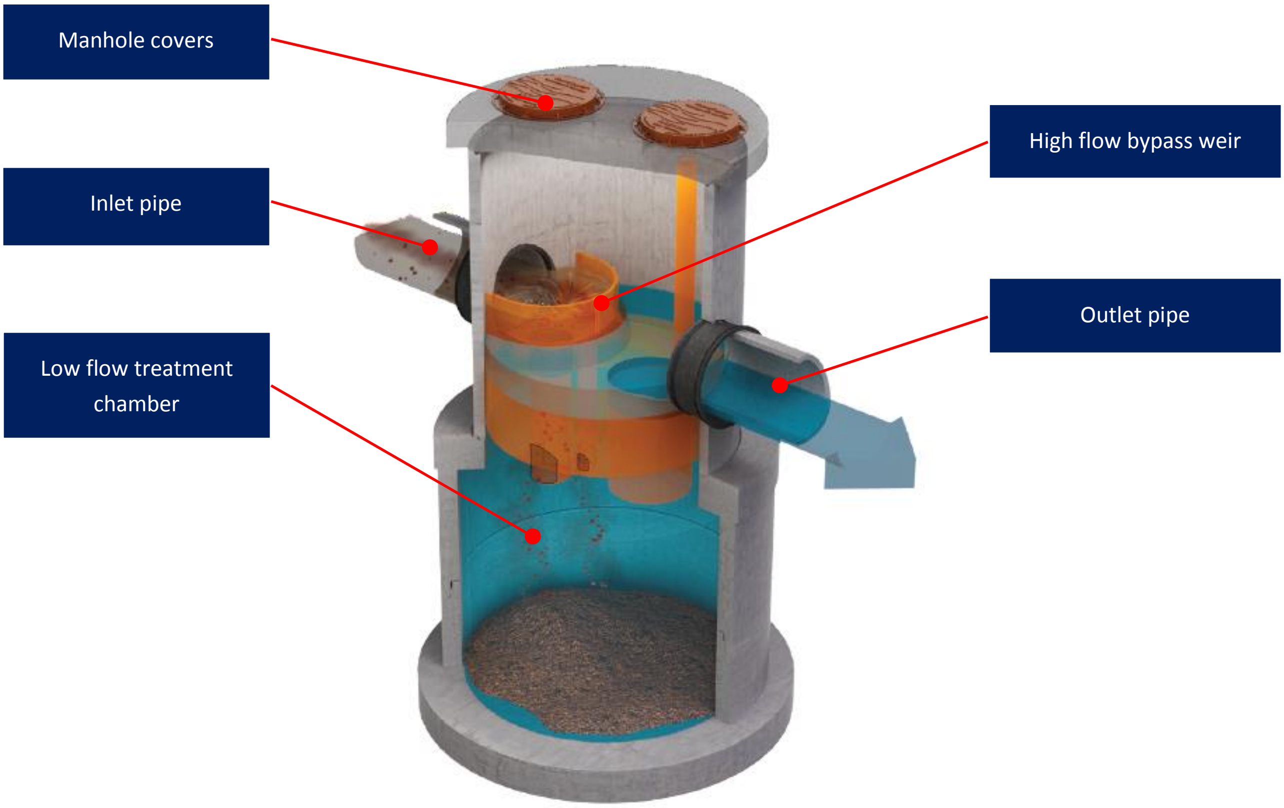

Figure 3 Cut away diagram of the Humes 'Aquaceptor' separator unit.

These units continually separate sediments and heavy metals from stormwater flows and trap these pollutants so they are not discharged. The manufacturer's documentation describing the operation and capabilities of these units is in section 7 of this report. The separator units require ongoing maintenance to perform effectively. SICTL will undertake to inspect the SQIDs every 3 months and after every spill event. Cleanout is scheduled for every 6 months and after every spill event. Inspections and cleanouts can be scheduled more frequently as determined by SICTL.

Figure 4 SQID 7 being cleaned out by vacuum truck in December 2013 prior to handover.

5 Water Quality Monitoring Program

5.1 Stormwater Discharge Locations

A total of forty nine (49) stormwater outlets were constructed as part of the new container terminal. Forty two of these discharge stormwater from the SICTL terminal with the remaining seven servicing the Patricks Stevedores container terminal on the adjacent property. For convenience, the outlet side of each Stormwater Quality Improvement Device is deemed to be its discharge point as it connects directly to the outlet pipe (see figure 6). Using the outlet side of the SQIDs allows for easier and safer access to the discharge points for sampling. The downstream inverts of the outlet pipes are located within the waters of Botany Bay or Penrhyn Estuary and are usually below the water line during high tides.

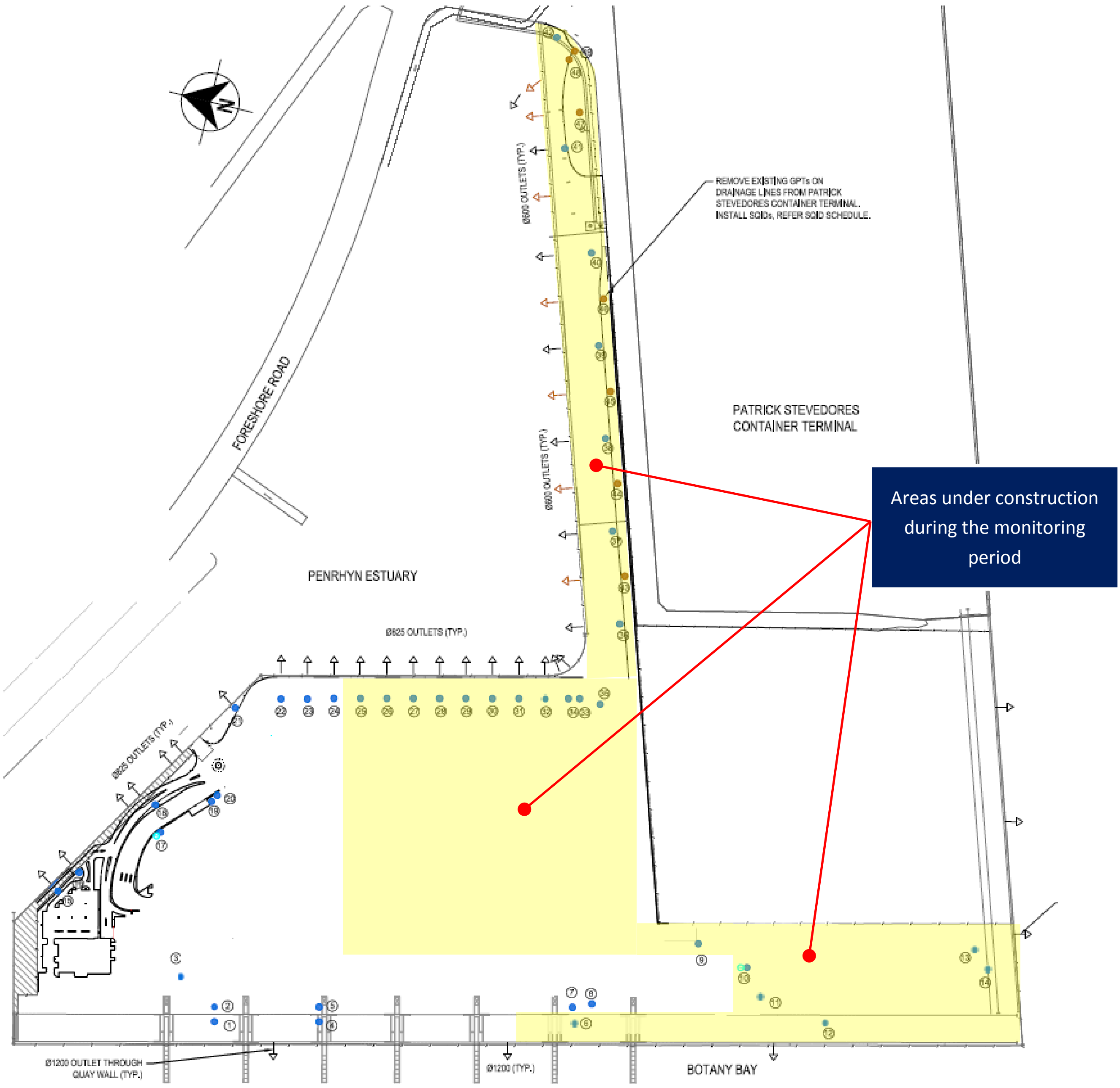

Figure 5 Overview map showing all SICTL stormwater discharge locations.

Table 3: Overview of SQID catchments and discharge points.

SQID number	Description
1, 2 and 4 to 14	Quay apron catchment draining to Botany Bay through quay wall. SQID number 10 is a Humes 'Aquaceptor' unit.
3 and 15 to 21	Plant refuelling area, main buildings, internal roadways, truck marshalling area and general parking area catchments discharging to the Flushing Channel.
22 to 35	All Automated Stacking Area catchments draining to Penrhyn Estuary.
36 to 42	All Rail siding area catchments draining to Penrhyn Estuary. These SQIDs are all the Humes 'Aquaceptor' type.
43 to 49	Outlets from Patricks Stevedores catchments interleaved with SICTL Rail siding outlets discharging into Penrhyn Estuary. Patrick's SQIDs are located within the SICTL Lease area and are coloured brown to set them apart from the SICTL SQIDs coloured blue. These SQIDs are not sampled.

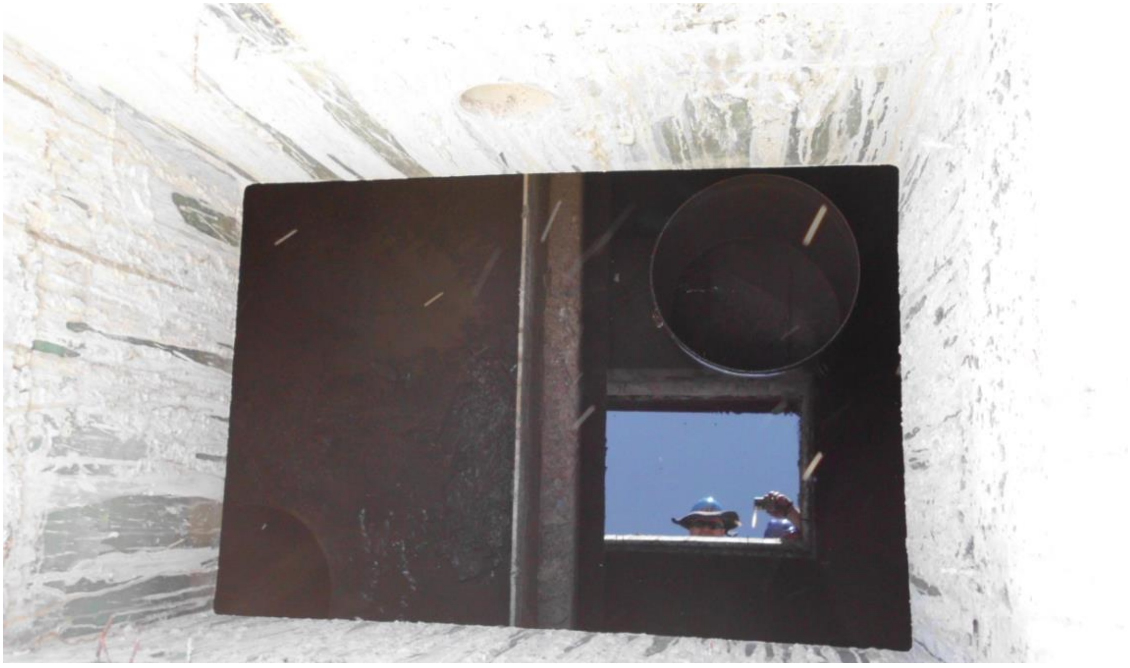

Figure 6 View inside the downstream manhole of a SPEL Stormceptor (SQID 7) showing the inlet side (right), the overflow weir (centre) and the outlet side (left). The direction of flow is from right to left.

5.2 Stormwater Sampling Locations

The stormwater sampling locations were selected on the basis of best-representing the various catchments characteristic of the SICTL terminal. During the monitoring period, certain areas were under construction or commissioning at different times and were not able to be included for sample collection (refer to figure 4). Additionally, operational constraints arising from the loading of a cargo vessel during the 18-19 December 2013 dictated the order in which the SQIDs were sampled resulting in two batches over two days. Overall these batches describe two (2) different storm events.

5.2.1 Batch 1 – 18 December 2013

The choice of samples in this batch was governed by ship operations underway at the time. Quay areas were quite busy with container movements and plant traffic so could not be sampled safely on this day. Additionally, SQID 15 was inaccessible as it is located within the Tug Berth Area (land not leased by SICTL) and so was postponed. The 'Landside' areas of the terminal were sampled as shown below, all sampled during fine weather three (3) days after a 23mm storm event. The general characteristics of these catchments were:

- Internal roadways and car park areas for light vehicles – SQIDs 16, 17, 18 and 21;
- Truck marshalling area serving heavy trucks – SQIDs 17, 19, 20 and 21;
- The three ASC Blocks that were undergoing commissioning – SQIDs 22, 23 and 24 (there were some containers within these blocks at the time);
- A seawater sample from Botany Bay (BOT 1).

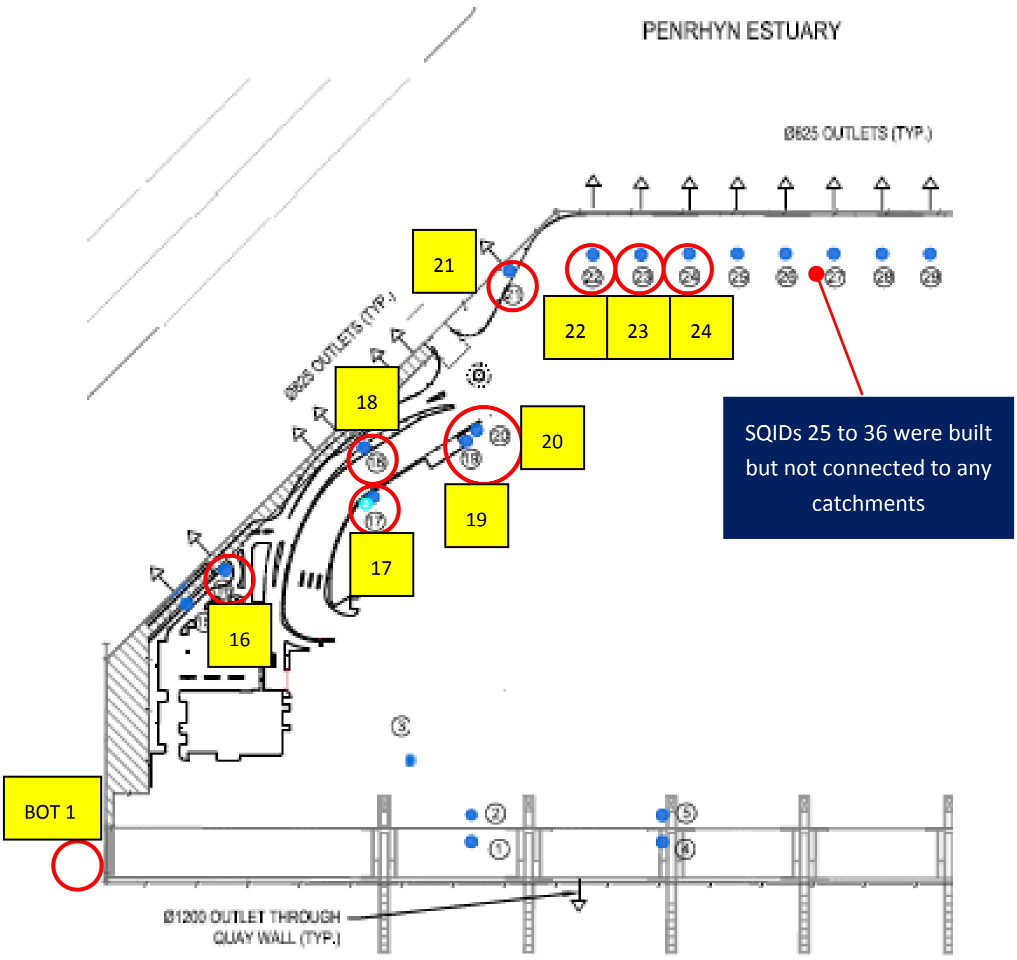

Figure 7 Overview map showing all SICTL stormwater discharge locations.

5.2.2 Batch 2 – 19 December 2013

The ship operations conducted the previous day had concluded thus leaving the Quay areas available to be sampled in safety under fine weather conditions four (4) days after a 23mm storm event. Access to SQID 15, located within the Tug Berth, was granted by NSW Ports allowing that SQID to be sampled also. The general characteristics of these catchments were:

- Internal roadways and car park areas for light vehicles – SQIDs 15;
- Quay apron area serving heavy plant and containers – SQIDs 1, 2, 4, 5, 7 and 8;
- A second seawater sample from Botany Bay (BOT 1).

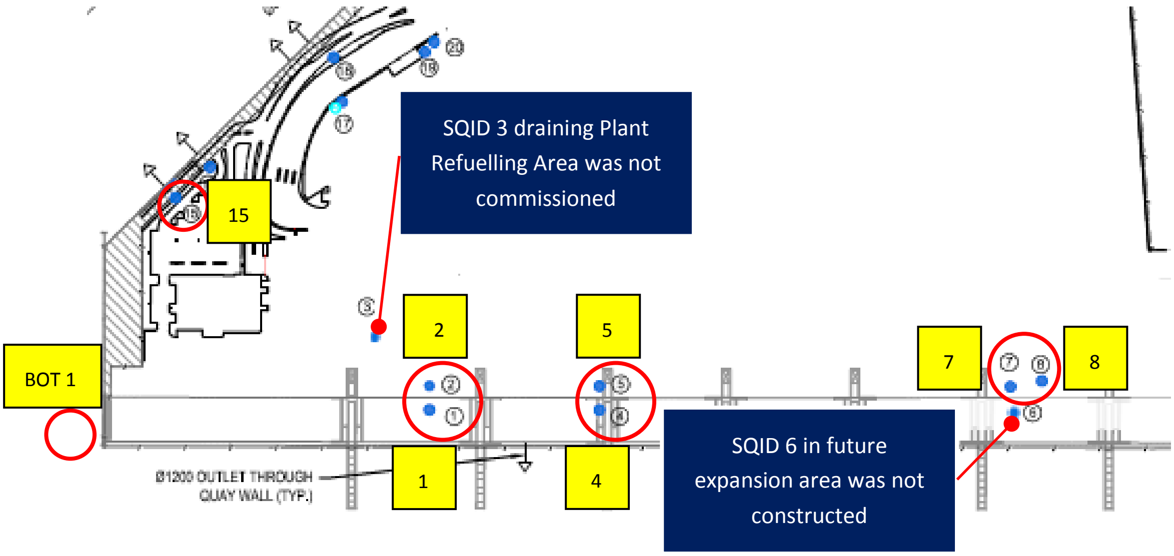

Figure 8 Overview map showing all SICTL stormwater discharge locations.

5.2.3 Batch 3 – 20 February 2014

Due to the low rainfall experienced during January 2014 (refer to section 7.5 for rainfall records), SICTL applied for and was granted permission by the EPA to extend the monitoring period into February. A full-site sampling effort was undertaken on this day one (1) day after a 24mm storm event. The aim of this batch was to obtain a general snapshot of all types of catchment characteristics, namely:

- Roadways and carpark areas for light vehicles – SQID 15;
- Truck marshalling area serving heavy trucks – SQID 17;
- The three ASC Blocks were by now operational, ASC Block 2 was sampled as indicative – SQID 23
- Quay apron area serving heavy plant and containers – SQIDs 4 and 5;
- The recently completed SQID 10 which was the first Humes Aquaceptor-type SQID available for sampling within the overall sampling period.

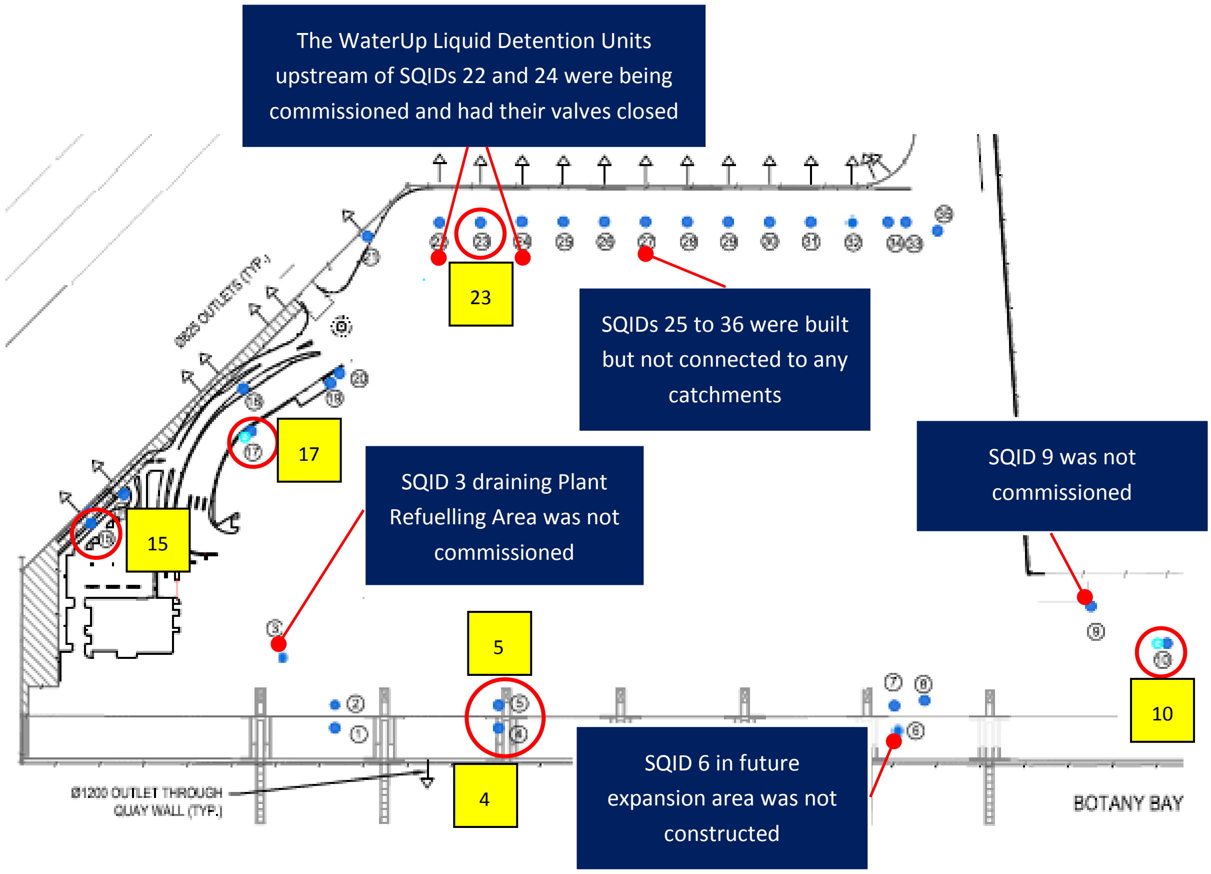

Figure 9 Overview map showing all SICTL stormwater discharge locations.

ASC Blocks 1 and 3 (SQIDs 22 and 24 respectively) were omitted from testing because the ‘WaterUp’ Liquid Detention Units in these drainage lines had their valves closed to enable commissioning of the LDUs. The closed valves meant that runoff from the most recent storm event was still contained within these drainage lines (upstream of each valve and each SQID) and had not passed through SQIDs 22 and 24. Sampling SQIDs 22 and 24 would not have yielded samples indicative of the recent runoff but of stagnant water instead.

Liquid Dangerous Goods cargo is not placed within ASC Block 2 (SQID 23) and so it is not fitted with an LDU to catch this type of pollution. The runoff caught was free to flow into SQID 23 and was indicative of the recent storm event.

5.3 Sampling and Analysis of the Inlets and Outlets of the Separator Units

5.3.1 Sampling Methodology

All sampling was performed by the SICTL Environmental & Safety Compliance Engineer with assistance from SICTL Maintenance and Operations personnel using a 3m sampling pole. All samples were obtained by dipping the actual sample bottle into the stormwater and then sealing it once withdrawn. There was no decanting from an intermediate container.

Three specimens were drawn from both the inlet and outlet side of each SQIDs (with the exception of SQID 10, see below) to create a composite sample of each side (referred to under one sample number), each sample consisted of:

- One 1L plastic bottle for pH, Total Suspended Solids (TSS), Turbidity (NTU), total Nitrogen (TN) and total Phosphorus (TP);
- One 125mL plastic bottle for heavy metals Arsenic, Cadmium, Chromium, Copper, Nickel, Zinc, Mercury and Lead;
- One 1L or 500mL glass bottle for oil and grease (containing hydrochloric acid preservative)

All bottles were labelled with the relevant sample number in the below format:

batch_number / SQID_number / sequence_number

The above convention provides for full traceability and straightforward identification of every sample. Batch 1 was refrigerated the night of 18 December and was collected, along with Batch 2 on 19 December. Batches 2 and 3 were placed in eskies with ice bricks and were collected on the same days they were drawn. All batches were accompanied with chain of custody forms back to SGS Environmental Services for testing.

Table 4: Overview batch sizes.

Batch number	Summary
Batch 1	19 samples drawn (57 bottles), consisting of: • 1 seawater sample • 18 samples from 9 SQIDs (all SPEL Stormceptors)
Batch 2	15 samples drawn (45 bottles), consisting of: • 1 seawater sample • 14 samples from 7 SQIDs (all SPEL Stormceptors)
Batch 3	11 samples drawn (33 bottles), consisting of: • 10 samples from 5 SPEL Stormceptor SQIDs • 1 sample from 1 Humes Aquaceptor SQID

5.3.2 SQID number 10 (Humes Aquaceptor) – Special Notes

All SPEL Stormceptor SQIDs were able to be sampled on both the inlet and the outlet sides without any problems. The first built and only Humes Aquaceptor (SQID 10) that was available for sampling has only one chamber as the design of this device is simpler than the SPEL units which feature a weir to separate the two halves. This drop-inlet style of chamber employed by Humes acts like the outlet side of the SPEL units because the solid pollutants that enter have had a chance to settle out of the retained water and are no longer in suspension (as they would be during inflow). Given this type of design, the only way to obtain a sample of water representative of the inflow conditions would be to sample the inflow during an actual storm event as runoff is entering the unit. With the resources available and timing required, this was neither practicable nor safe to perform. Sample number 3/10/123 was noted as ‘unable to be sampled’ on the Water Quality Register in section 7.6 for the above reason.

With only one reliable item of data available for this SQID (sample number 3/10/456) it is difficult to deduce removal efficiency based on field results. A solution that was trialled was to take the inflow data from the closest catchment within the same batch whose characteristics would most closely match the catchment draining to SQID 10 and use these to calculate the removal efficiency. The catchment of SQID 4 was chosen for this comparison however not enough confidence in the data and the calculations could be demonstrated by using just one Aquaceptor unit. For this reason, this approach was abandoned.

In consultation with the NSW EPA, and after a detailed review of the available data, it was decided to simply report the outflow discharge parameters for the Aquaceptor units as this provides a reliable measure of the pollutants discharged.

5.3.3 Analysis Methodology

The main focus of the analysis of these results in the following sections is to compare the **outlet side** of each SQID against the background levels for all parameters of Botany Bay measured by samples 1/ BOT1 and 2/ BOT1. Where 1/ BOT1 and 2/ BOT1 are equal for a particular parameter, the background is deemed to be a constant. In cases where these two values are not the same, the average has been taken to make analysis straightforward. Of important note is that these background values are also used for the comparison of Batch 3 (no background value was obtained in batch 3 due to sampling constraints). A key assumption in this analysis is that the parameters of Botany Bay are considered constant and stable because of factors such as dilution, mixing and the volume of water in the Bay.

5.3.4 Analysis of pH Results

The pH results were generally within the range of pH 7.8 to 8.8 with two outliers of pH 9.5 and 9.6 registered from SQIDS 23 and 17 respectively. Both of these SQIDs drain areas trafficked by trucks and appear to be moderately higher than the background of pH 7.8. Possible reasons for the outliers as well as the slight overall rise above background may be:

- Increased truck traffic in these areas;
- Concrete works undertaken by the Civil Contractor at the time (increased concrete agitator truck traffic using some internal roads within operational areas), and/ or
- Generally warmer weather during the sampling period.

The average value of all SICTL **discharges** from batches 1 – 3 is pH 8.3, slightly above the background level of pH 7.8.

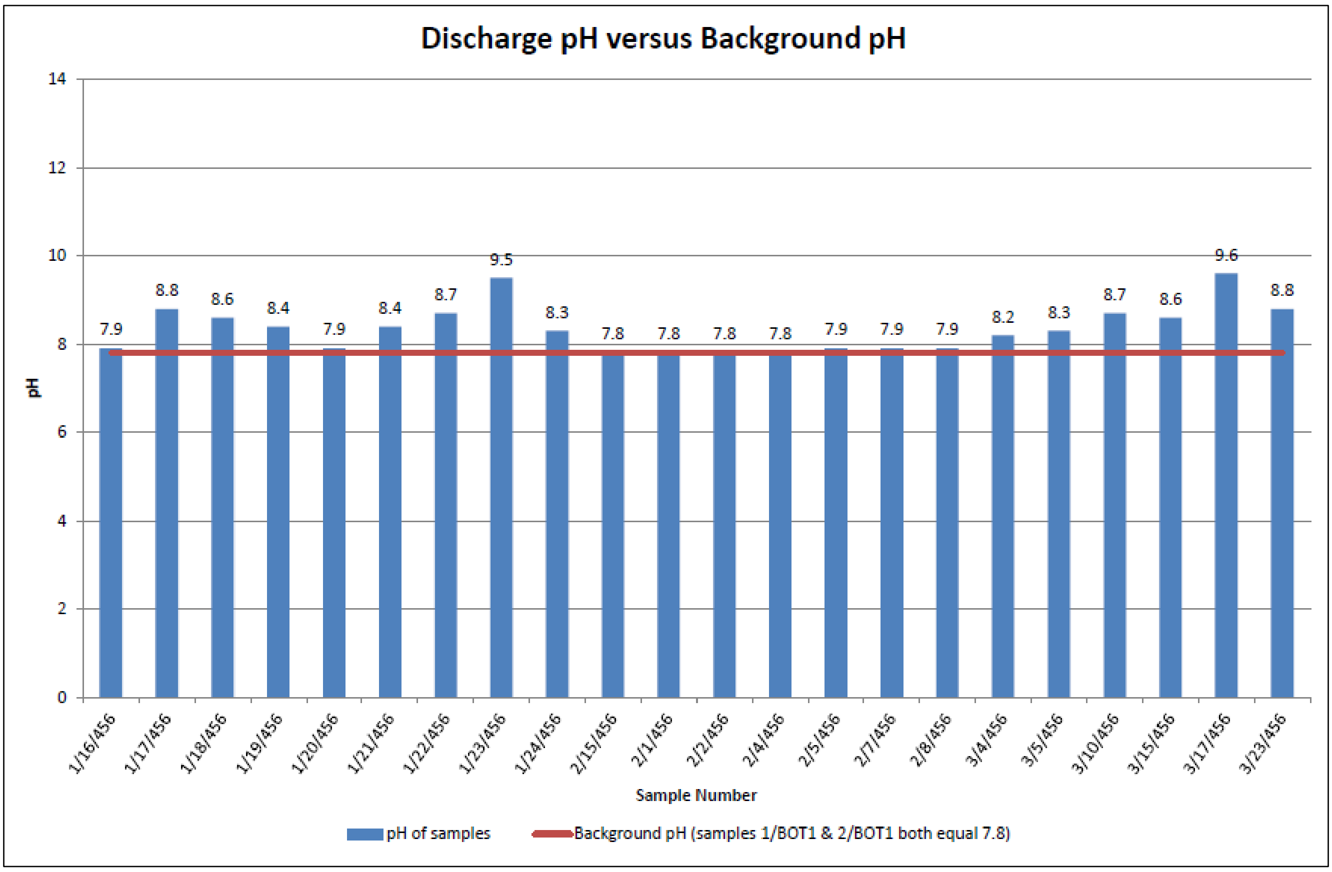

Figure 10 Discharge pH versus Background pH for Batches 1 – 3.

5.3.5 Analysis of Turbidity Results

The Turbidity results were generally within the range of 2.4 to 39 NTU with three outliers of 66, 82 and 110 NTU registered from SQIDS 15 and 17. Both of these SQIDs drain areas trafficked by trucks and light vehicles. Possible reasons for the outliers as well as the overall results higher than background may be:

- Increased truck traffic in these areas;
- Spray-sealing operations carried out in the truck marshalling area, this would affect SQID 17;
- Construction of the terminal operations building underway with construction traffic accessing the construction site (unsealed) via the operations car park (sealed - draining to SQID 15)
- Generally warmer weather during the sampling period (this would affect any seawater reflux during high and king tides);

The average value of all SICTL **discharges** from batches 1 – 3 is 24 NTU and the average background level is 1.2 NTU from two samples.

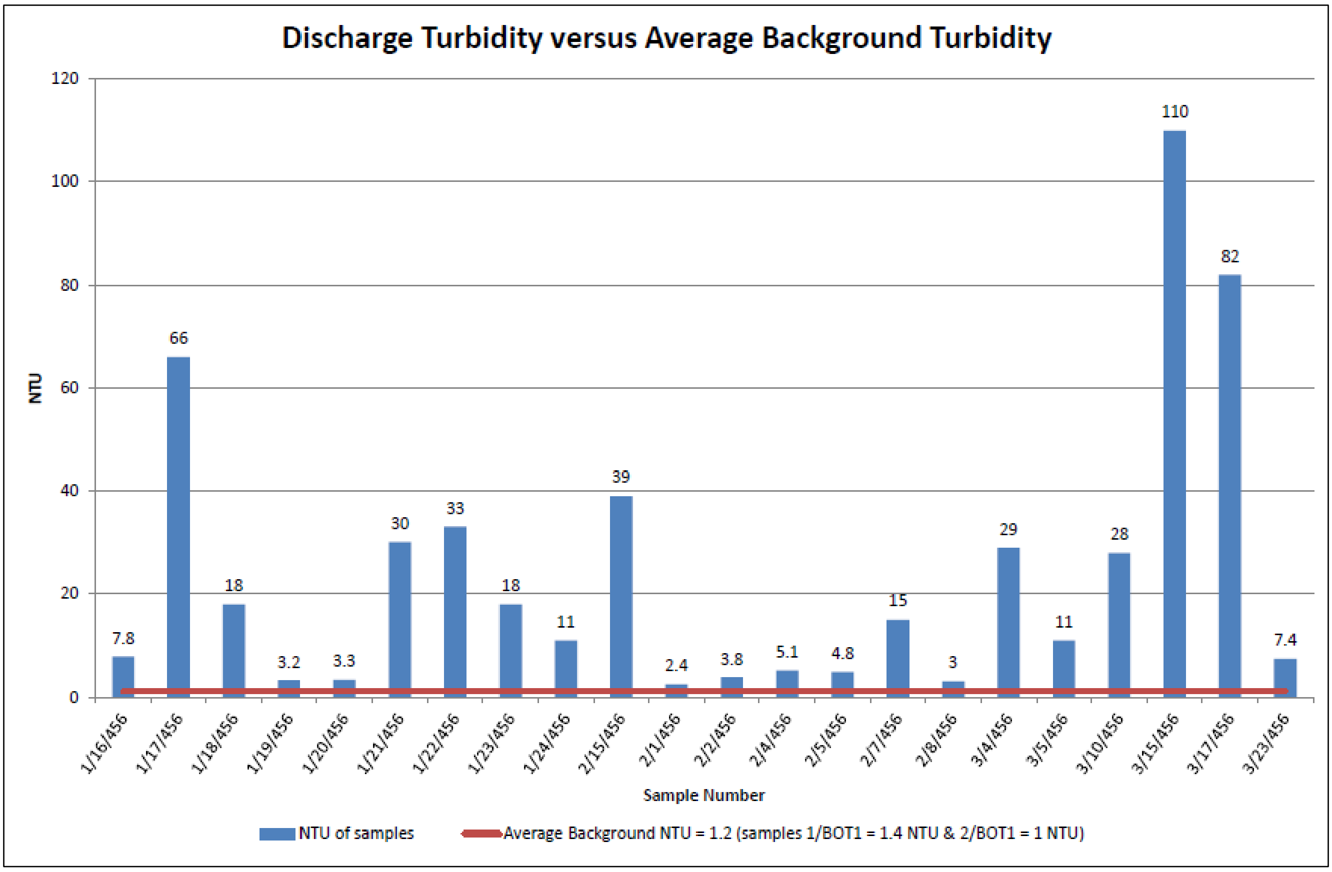

Figure 11 Discharge Turbidity versus Background Turbidity for Batches 1 - 3

5.3.6 Analysis of Total Suspended Solids Results

The Total Suspended Solids results were generally within the range of 6 to 37 mg/L with two outliers of 79 and 59 mg/L registered from SQIDS 15 and 17. Both of these SQIDs drain areas trafficked by trucks and light vehicles. Possible reasons for the outliers as well as the overall results higher than background may be:

- Increased truck traffic in these areas;
- Spray-sealing operations carried out in the truck marshalling area, this would affect SQID 17;
- Construction of the terminal operations building underway with construction traffic accessing the construction site (unsealed) via the operations car park (sealed - draining to SQID 15)

The average value of all SICTL **discharges** from batches 1 – 3 is 22 mg/L and the average background level is 70 mg/L from two samples.

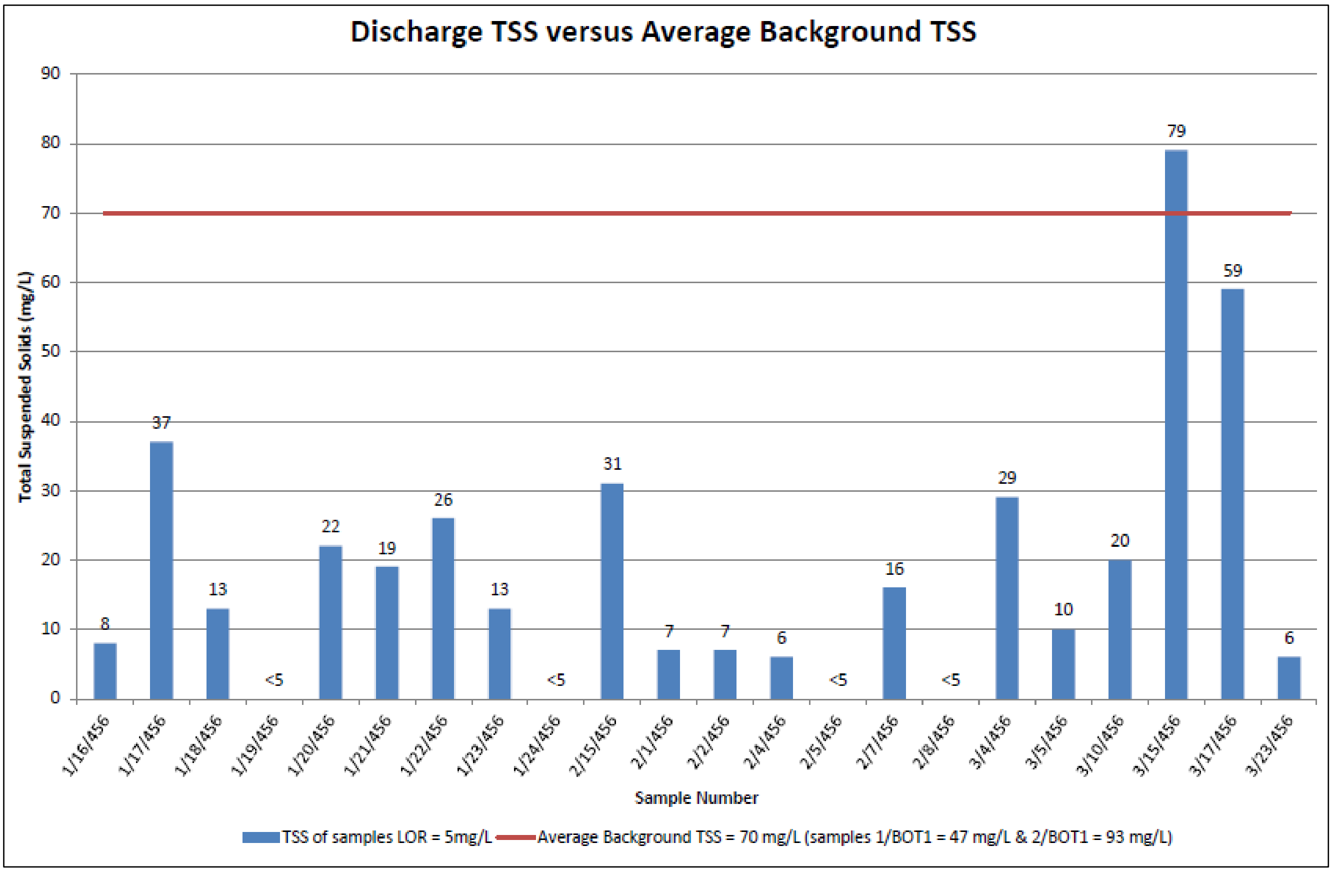

Figure 12 Discharge Total Suspended Solids versus Background Total Suspended Solids Batches 1 – 3.

A correlation between Turbidity and Total Suspended Solids for **all results** (inlets, outlets and backgrounds) was performed using 45 data pairs. There is an informal relationship between Turbidity and Total Suspended Solids and the correlation can be used to show how the actual solids in the water (TSS) relate to the ability of light to pass through it (Turbidity). Correlations such as this are usually unique to a particular site or even to a particular time of year at that site and can be influenced by vegetation, salinity, soil types amongst other things. The SICTL correlation yielded a result of **30 mg/L = 35 NTU** with a regression co-efficient of **0.9105**, (shown on the next page). This result appears to support the view that TSS and Turbidity appear to be closely related at the SICTL Terminal site.

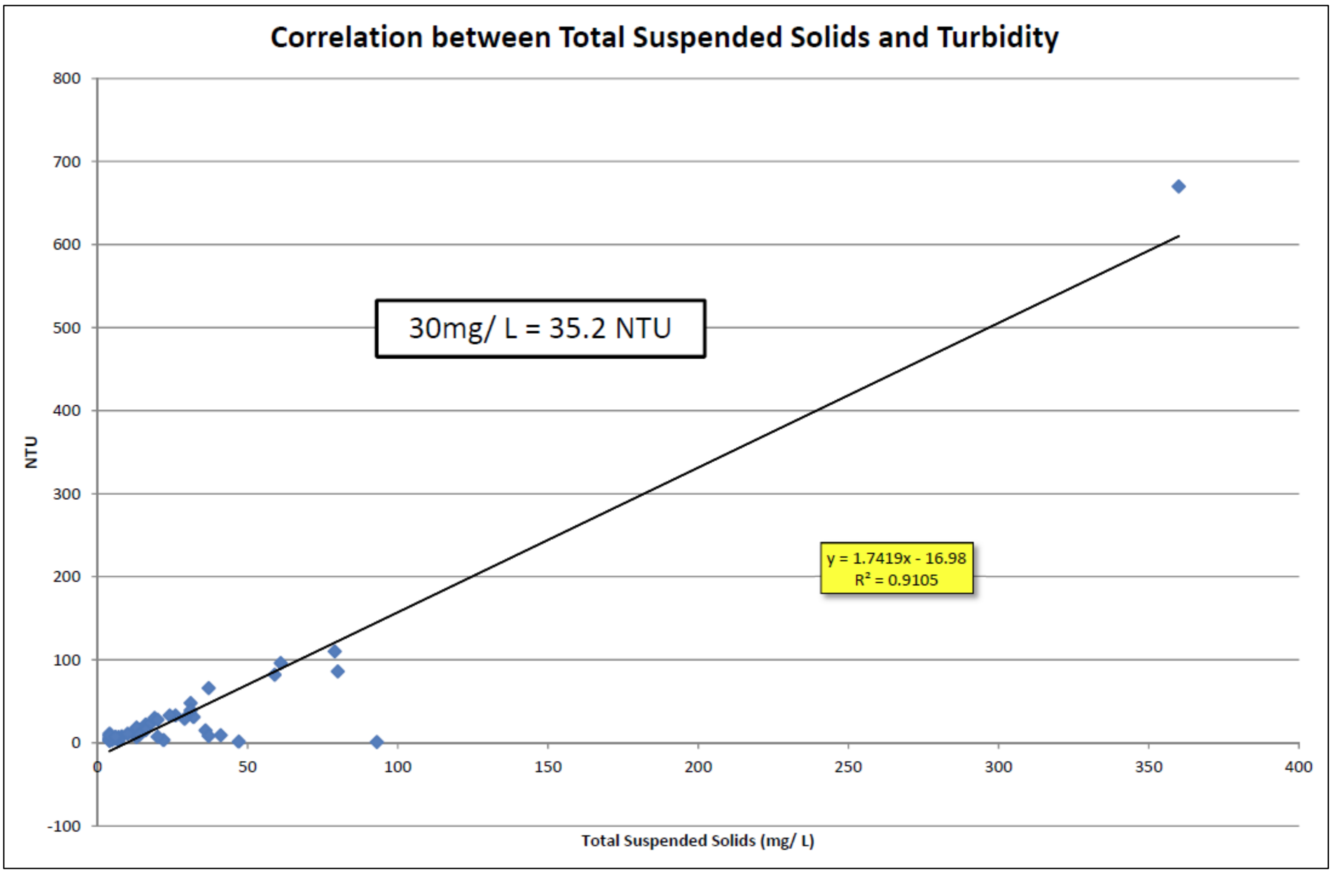

Figure 13 Correlation between Total Suspended Solids and Turbidity for all results in Batches 1 – 3.

N.B: Where test values were recorded as **below** the Limit of Reporting of 5 mg/L, these have been adjusted to an arbitrary value of 4 to enable the correlation the be calculated.

5.3.7 Analysis of Total Phosphorus Results

The Total Phosphorus results were generally within the range of 0.05 to 0.09 mg/L with no distinct outliers and many samples below the Limit of Reporting of 0.05 mg/L. All discharge results were well below the average background level of 1.35 mg/L for this nutrient. SICTL does not handle any bulk agricultural or livestock cargo which explains such as low Total Phosphorus response.

The average value of all SICTL **discharges** from batches 1 – 3 is 0.072 mg/L and the average background level is 1.35 mg/L from two samples.

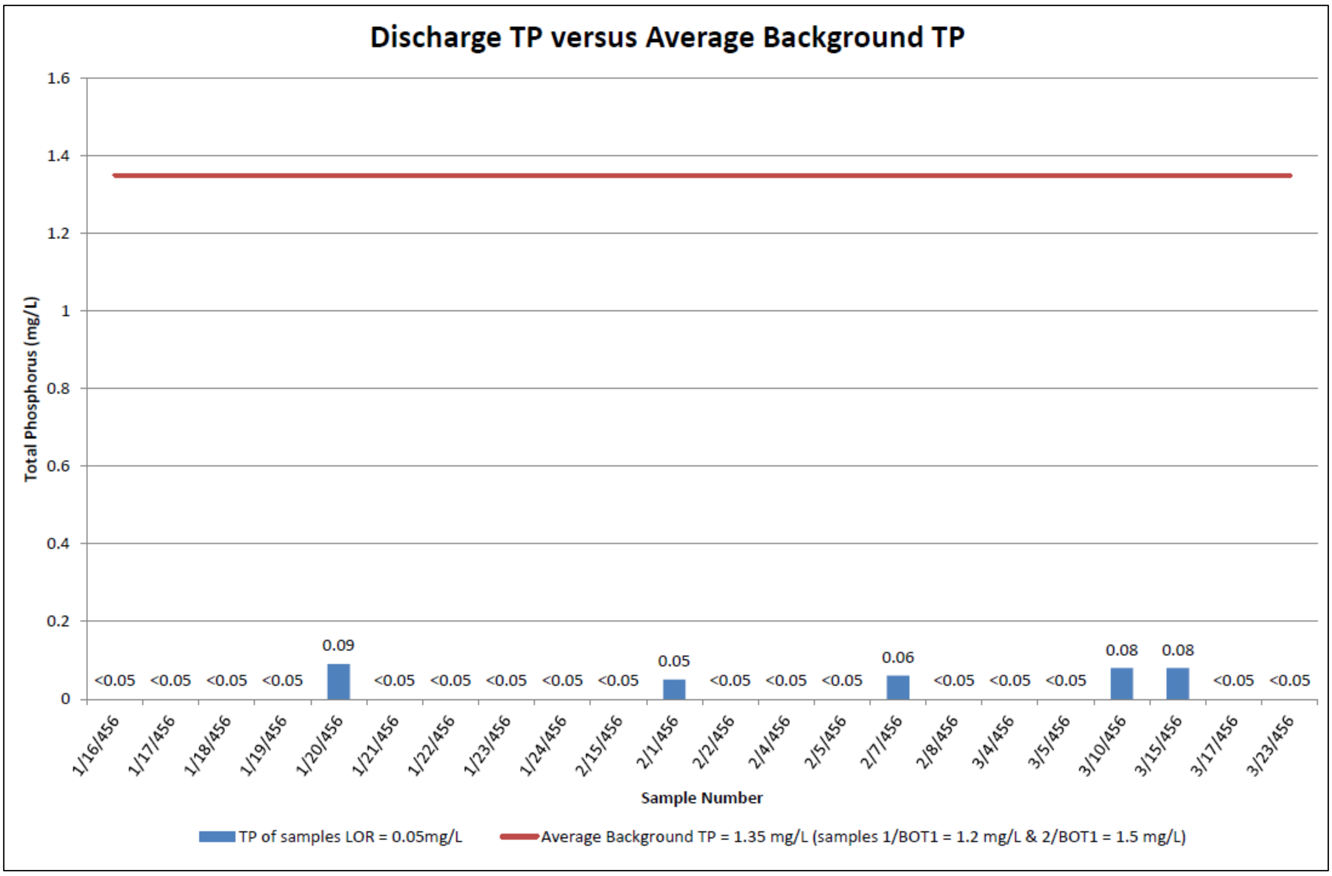

Figure 14 Discharge Total Phosphorus versus Background Total Phosphorus for Batches 1 – 3.

5.3.8 Analysis of Total Nitrogen Results

The Total Nitrogen results were generally within the range of 0.07 to 0.6 mg/L with no distinct outliers and two results below the Limit of Reporting of 0.05 mg/L from SQIDs 10 and 17. It is expected that some trace Nitrogen remains in the discharge waters even if the Total Phosphorus levels are low (as on the previous page).

Possible reasons for variance of the results and many results higher than background may be because of generally warmer weather during the sampling period (this would affect stagnant water trapped within all SQIDs in the periods between large rainfall events).

The average value of all SICTL **discharges** from batches 1 – 3 is 0.371 mg/L and the average background level is 0.38 mg/L from two samples.

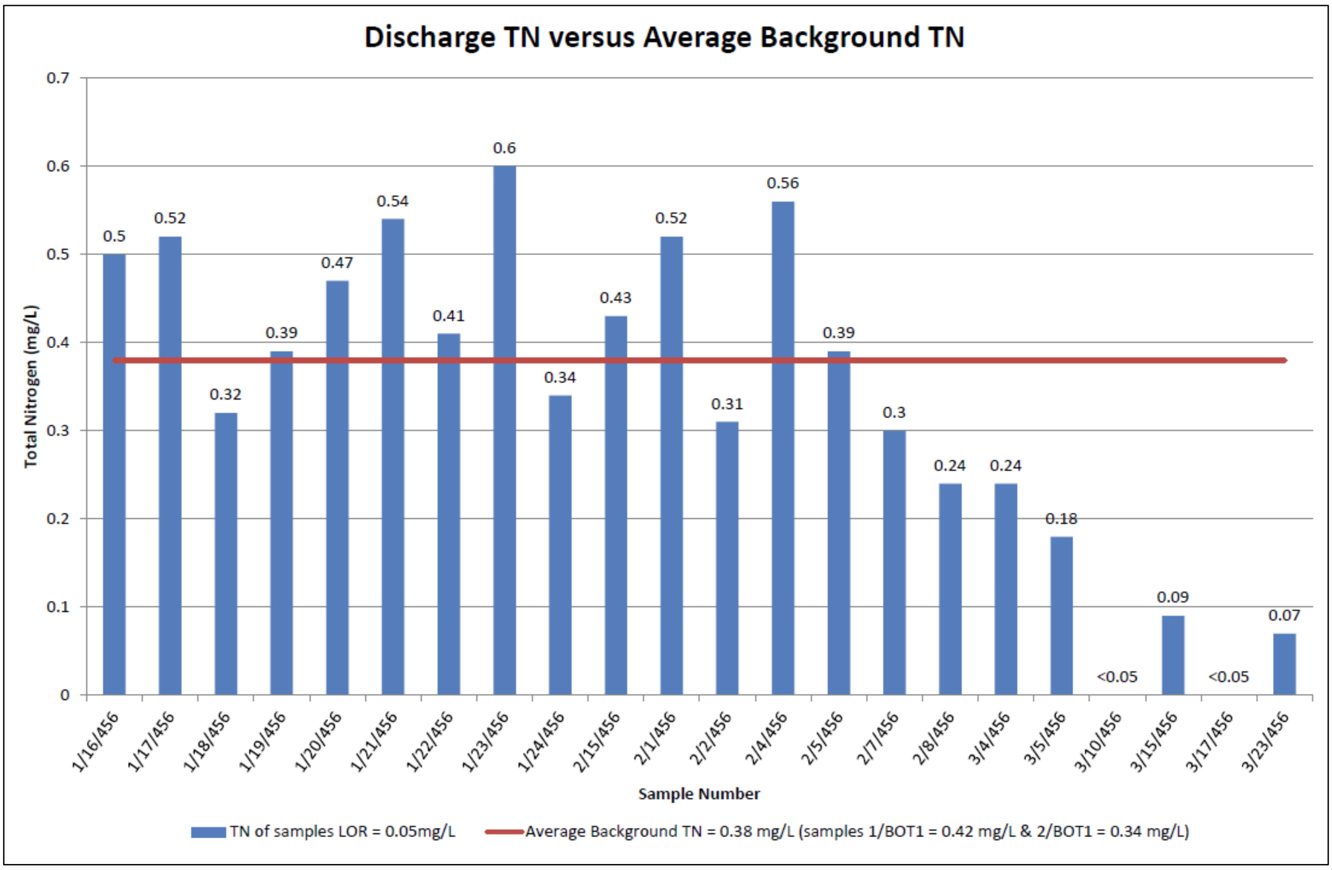

Figure 15 Discharge Total Nitrogen versus Background Total Nitrogen for Batches 1 – 3.

5.3.9 Analysis of Heavy Metals Results

5.3.9.1 Arsenic

The Arsenic results were generally within the range of 1 to 2 µg/L with one outlier of 6 µg/L registered from SQIDS 16 but with the majority of the samples below the Limit of Reporting of 1 µg/L. SQID 16 drains both Maintenance and Operations Buildings rooves as well as areas trafficked mainly by light vehicles.

The average value of all SICTL **discharges** from batches 1 – 3 is 2.4 µg/L and the average background level is 1 µg/L from two samples. Although the graph shows a distinct outlier and two results above the background level, it must be remembered that the units of measure for this parameter are **micrograms** per litre. One microgram = 0.0000001 gram (one millionth of a gram).

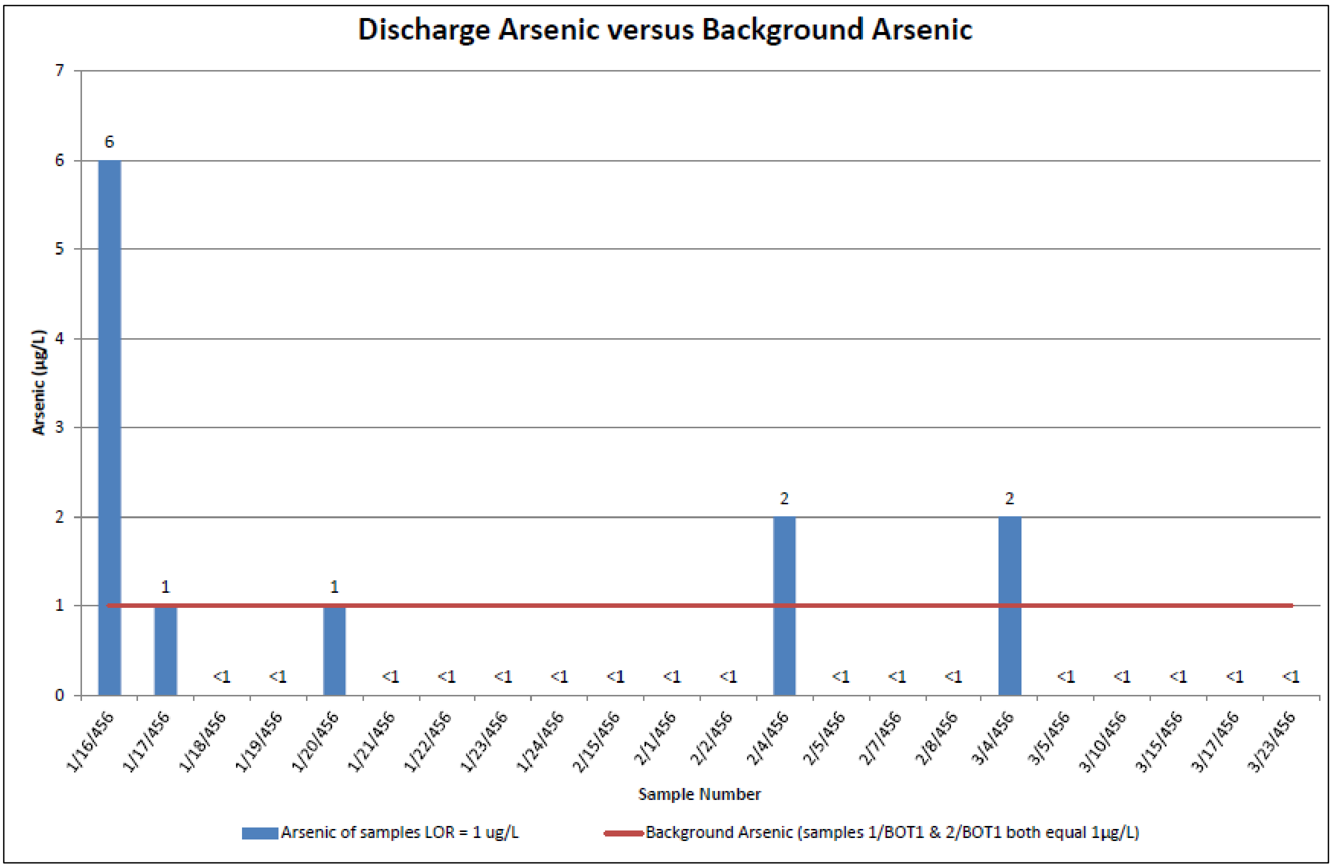

Figure 16 Discharge Arsenic versus Background Arsenic for Batches 1 – 3.

5.3.9.2 Chromium

The Chromium results were generally within the range of 1 to 9 µg/L with no distinct outliers and with two samples below the Limit of Reporting of 1 µg/L.

The average value of all SICTL **discharges** from batches 1 – 3 is 4.05 µg/L and the average background level is below the Limit of Reporting (<1 µg/L – displayed on the graph below as 0.9 µg/L for comparison) from two samples. Although the graph shows variable results above the background level, it must be remembered that the units of measure for this parameter are **micrograms** per litre. One microgram = 0.0000001 gram (one millionth of a gram).

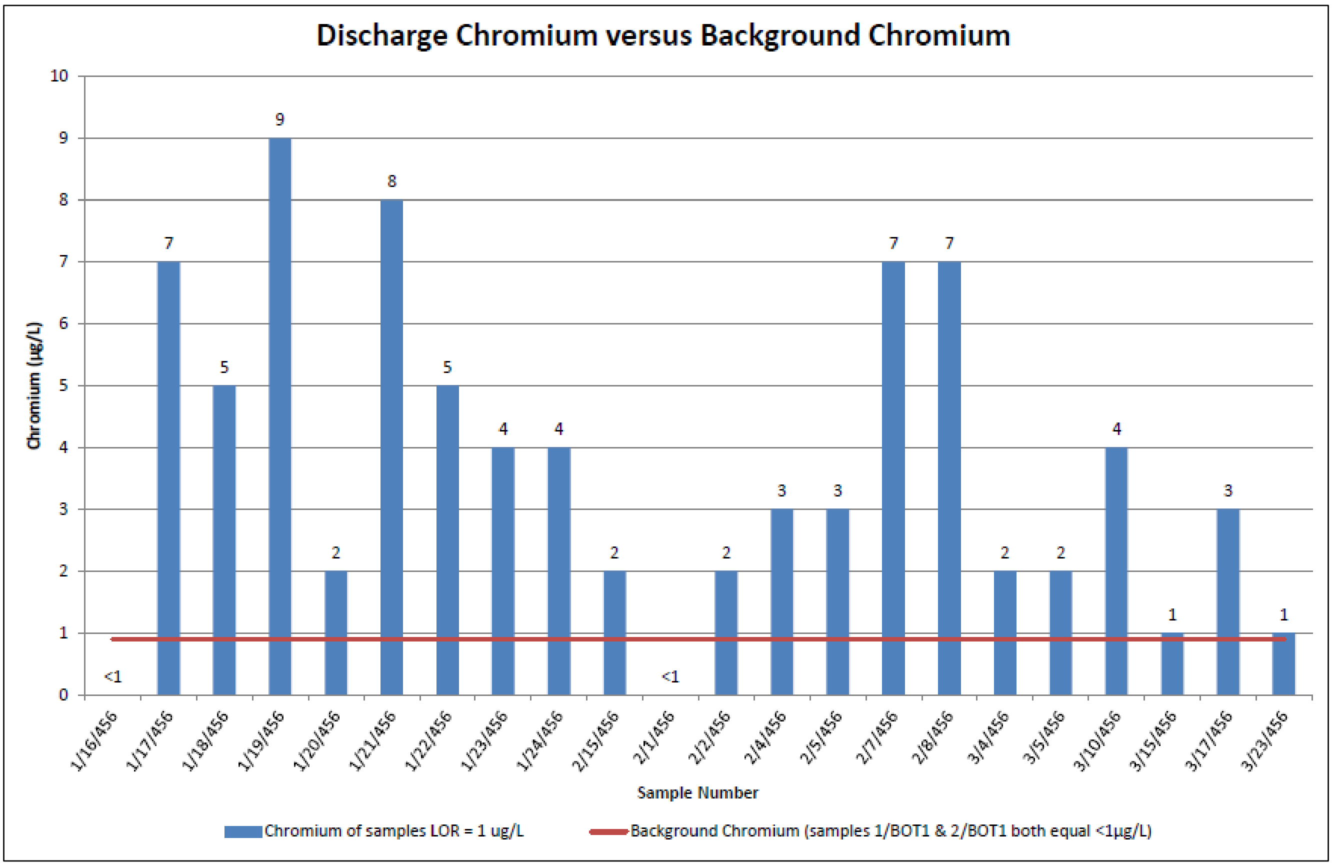

Figure 17 Discharge Chromium versus Background Chromium for Batches 1 – 3.

5.3.9.3 Copper

The Copper results were generally within the range of 1 to 2 µg/L with one outlier of 3 µg/L registered from SQIDS 17 but with the majority of the samples below the Limit of Reporting of 1 µg/L. SQID 17 drains areas trafficked mainly by trucks.

The average value of all SICTL **discharges** from batches 1 – 3 is 1.45 µg/L and the average background level is below the Limit of Reporting (<1 µg/L – displayed on the graph below as 0.9 µg/L for comparison) from two samples. Although the graph shows a distinct outlier and half of the results above the background level, it must be remembered that the units of measure for this parameter are **micrograms** per litre. One microgram = 0.0000001 gram (one millionth of a gram).

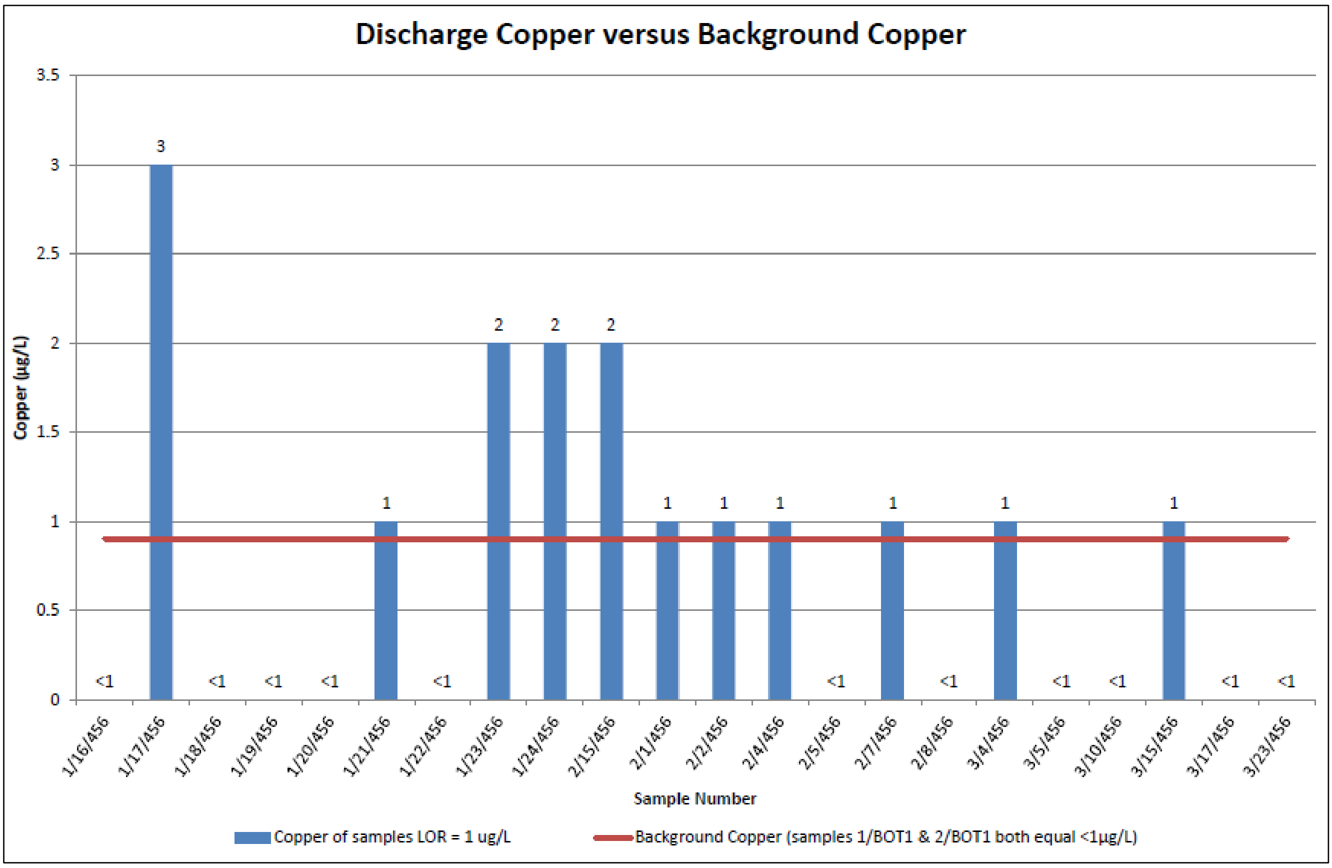

Figure 18 Discharge Copper versus Background Copper for Batches 1 – 3.

5.3.9.4 Nickel

The Nickel results were generally within the range of <1 to 1 mg/L. The three samples that managed to register any readings may actually be considered outliers as the majority of the results lie below the Limit of Reporting (<1µg/L). Most discharge results were well below the background level which was the Limit of Reporting (<1 µg/L – displayed on the graph below as 0.9 µg/L for comparison).

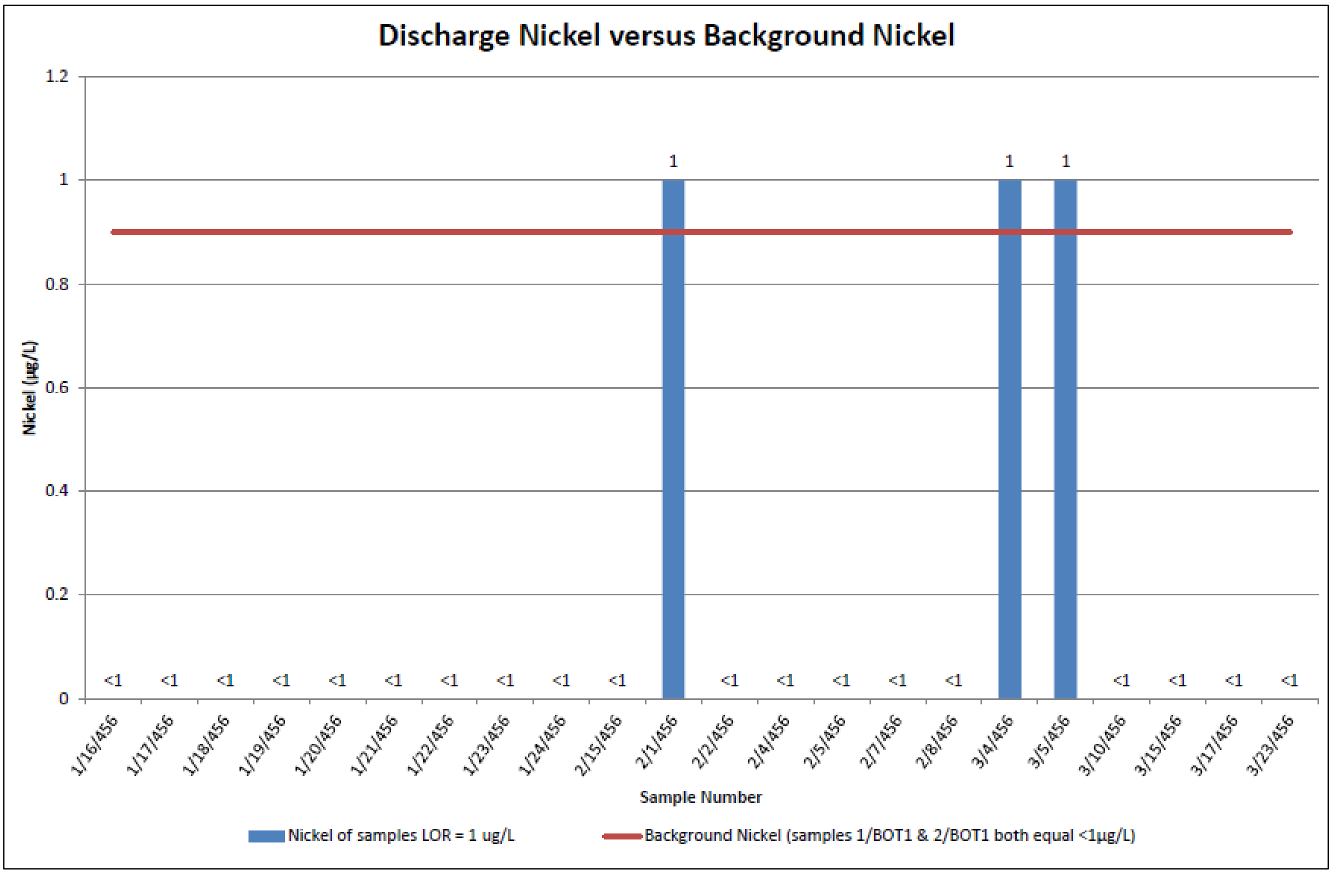

Figure 19 Discharge Nickel versus Background Nickel for Batches 1 – 3.

5.3.9.5 Zinc

The Zinc results were generally within two separate ranges:

- Values above 21 µg/L, and
- Values below 10 µg/L with 11 samples below the Limit of Reporting of 5 µg/L.

The average value of all SICTL **discharges** from batches 1 – 3 is 17 µg/L and the average background level is below the Limit of Reporting (<5 µg/L – displayed on the graph below as 4.8 µg/L for comparison) from two samples. Although the graph shows variable results above the background level, it must be remembered that the units of measure for this parameter are **micrograms** per litre. One microgram = 0.0000001 gram (one millionth of a gram).

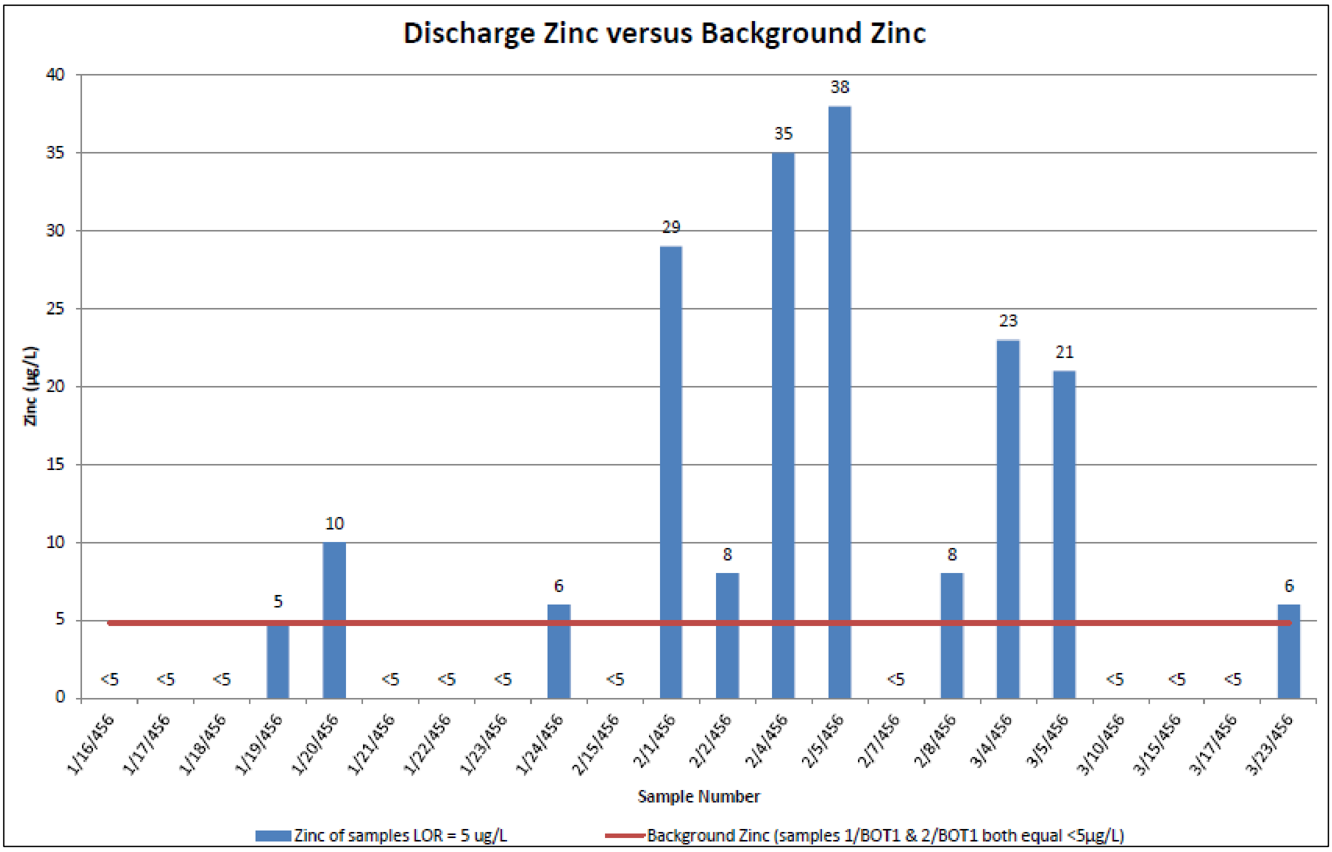

Figure 20 Discharge Zinc versus Background Zinc for Batches 1 – 3.

5.3.9.6 Cadmium, Mercury, Lead and Oil & Grease

All results for these pollutants across three batches were consistently less than the limits of reporting of:

- 0.1µg/L. for Cadmium;
- 0.0001mg/L for Mercury;
- 1µg/L. for Lead, and
- 5mg/L for Oil & Grease.

These nil results indicate that these heavy metal and hydrocarbon pollutants are not generated by (and are not being discharged from) the SICTL terminal.

5.4 Evaluation of the efficiency of the Stormceptor and Aquaceptor units

This section discusses the measured efficiency of the SPEL Stormceptor SQIDs based on the calculation of inlet values minus outlet values. Due to construction timetabling, only one Humes Aquaceptor unit (SQID 10) was able to be sampled within the allocated sampling period. From this SQID and only an outlet value was derived making efficiency and trend analysis difficult.

Upon consultation with the NSW EPA, it was decided to not attempt to infer the removal efficiency of the Humes Aquaceptor unit by using replacement inflow data (refer to section 5.3.2). Subsequently, data relating to SQID number 10 has been omitted from the graphs on the following pages.

Generally, most values that were registered are low, isolated high values are usually uncharacteristic of the trend of the bulk of the data and have been deemed outliers. There were no upward or high value trends in any of the data.

5.4.1 Evaluation of pH Correction

Given that there is no addition of pH correction agents (as all the SQIDs operate on a continuous open-circuit treatment basis), drastic improvements in pH were not expected. The usual improvement was within the range from 0 to 0.3 points. There were some values which shows a slight increase in pH.

Based on the values of pH improvement in the graph below, the SPEL Stormceptor SQID units appear to not affect pH greatly. Some mild reductions are registered however the inflow waters are not pH problematic in the first place, therefore these units appear to be suitable and economical for the current risk level. They have been primarily designed for TSS, TPH and nutrient reductions, hence the documented pH performance below.

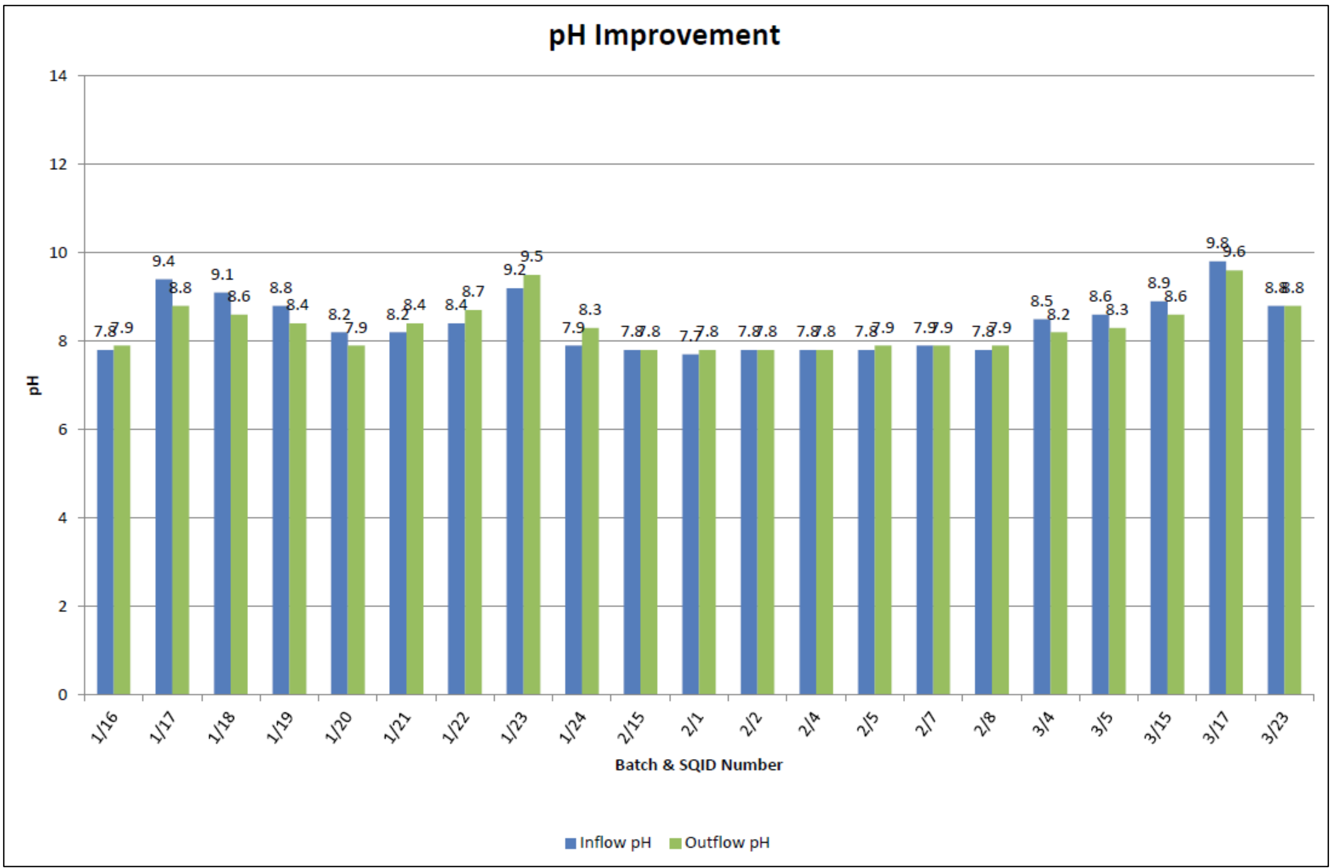

Figure 21 Change in pH for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.2 Evaluation of Turbidity Improvement

The usual improvement observed in the data was within the range from 1 to 560 points proving that the SPEL units are capable of good performance on this parameter.

The data appears to support the view that these units perform better when charged with heavily turbid inflow water (note the reductions from SQIDs 4, 5, 15 and 17). Coupled with the observation that (for the SICTL terminal site) Turbidity appears to correlate well with Total Suspended Solids this is a good outcome that aligns with the current risk level.

Some SQIDs show an increase in Turbidity however this phenomenon contradicts the physics of operation of the units and usually occurs at the lower values (inflow 31 NTU or below) hence the view that the dirtier the inflow, the more Turbidity can be removed. These increases may arise from algae growth be due to water/ seawater stagnation affected by warmer weather or the settled pollutants in the stationary outflow water agitated by the probe and collected during the sampling process.

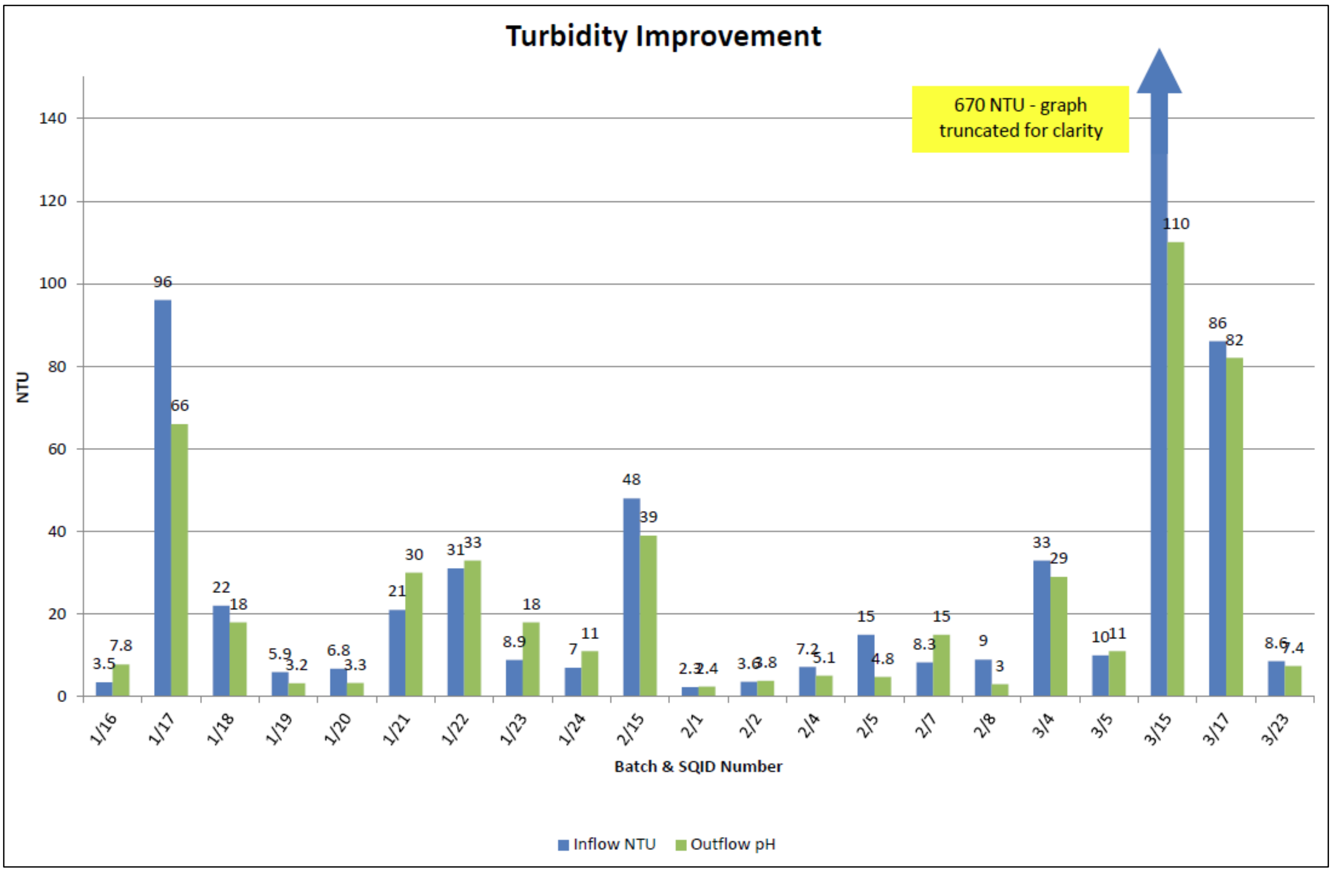

Figure 22 Change in Turbidity for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.3 Evaluation of Total Suspended Solids Reduction

The usual improvement observed in the data was within the range from 4 to 281 points proving that the SPEL units are capable of good performance on this parameter.

The data appears to support the view that these units perform better when charged with heavily polluted inflow water (note the reductions from SQIDs 5, 7 and 17). As mentioned in section 5.4.2, Turbidity appears to correlate well with Total Suspended Solids for the SICTL terminal site and this TSS performance is a good outcome that aligns with the current risk level.

Some SQIDs show an increase in TSS however this phenomenon contradicts the physics of operation of the units and usually occurs at the lower values (inflow 24 mg/L or below) hence the view that the dirtier the inflow, the more TSS can be removed. Some increases were registered even though the inflow value was zero, possible reasons for this would be that some TSS are being picked up by the sample probe on the outlet side of the SQID for the possibilities discussed in the latter part of section 5.4.2.

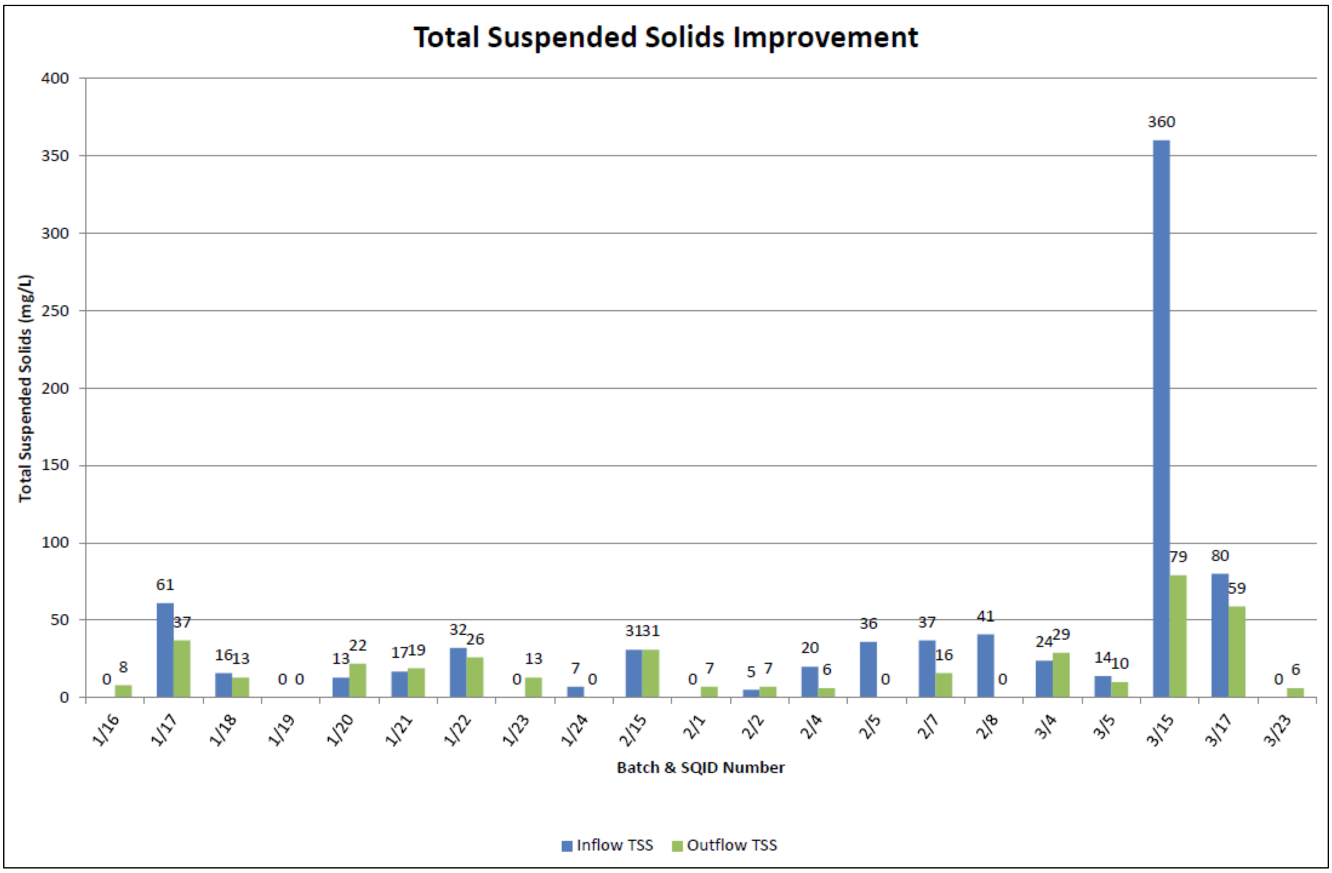

Figure 23 Change in Total Suspended Solids for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.4 Evaluation of Total Phosphorus Improvement

From the limits data available, SQIDs 7 and 15 show some reduction however the majority of the inflow values are below the Limit of Reporting. For the values that managed to register, Total Phosphorus levels are very low and are thus not identified as a current risk requiring management.

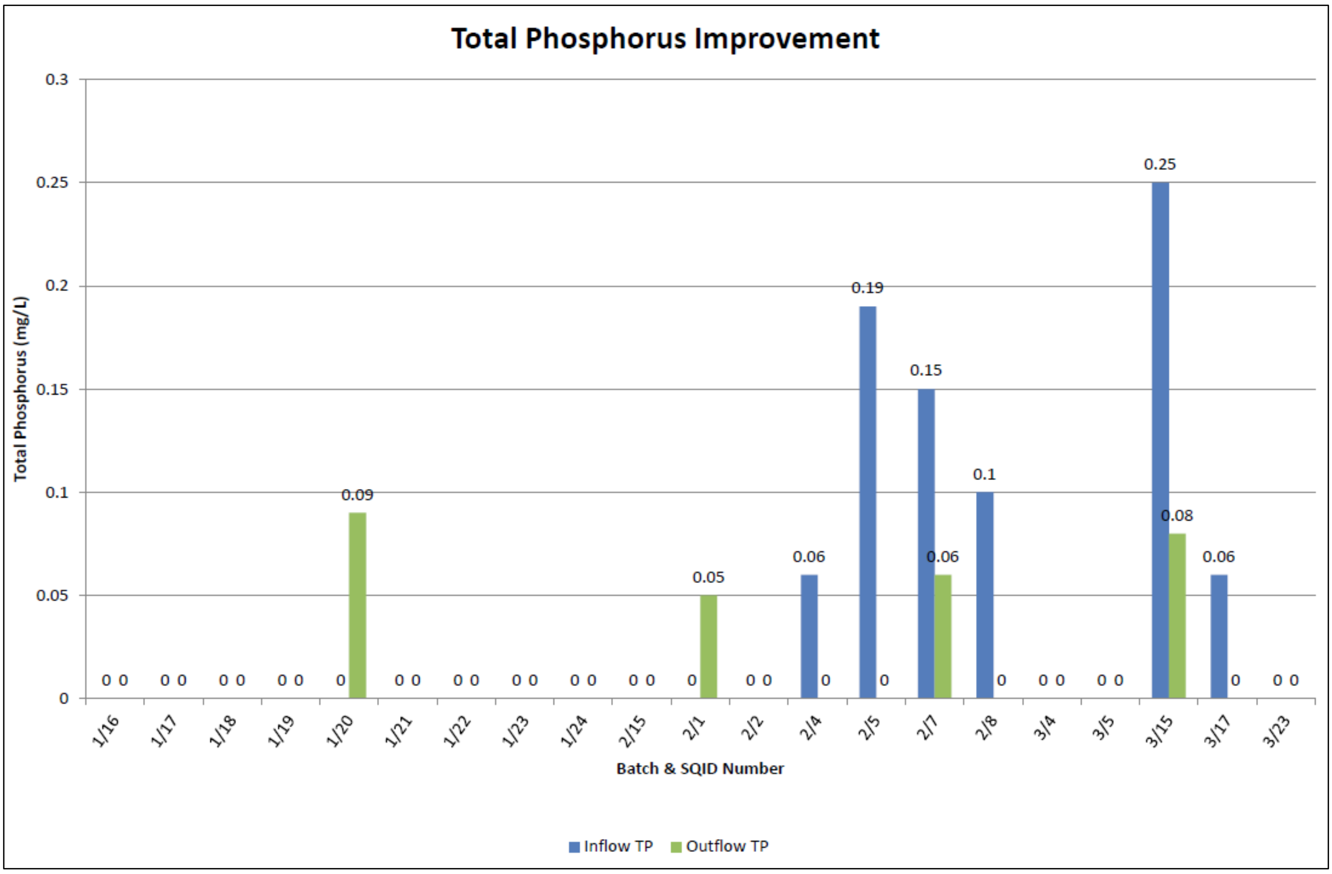

Figure 24 Change in Total Phosphorus for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.5 Evaluation of Total Nitrogen Improvement

Compared with Total Phosphorus, Total Nitrogen is the more difficult nutrient to remove from water, especially given the continuous open-circuit treatment process employed by the SQIDs installed at SICTL. Only five out of the twenty-one samples showed an increase which can only be attributed to the state of the outflow water at the time of sampling. The general trend is that the SPEL units are somewhat effective in reducing nitrogen however the units and levels are very low and are tending towards the Limit of Reporting in all cases (all values under 1.5 milligrams per litre).

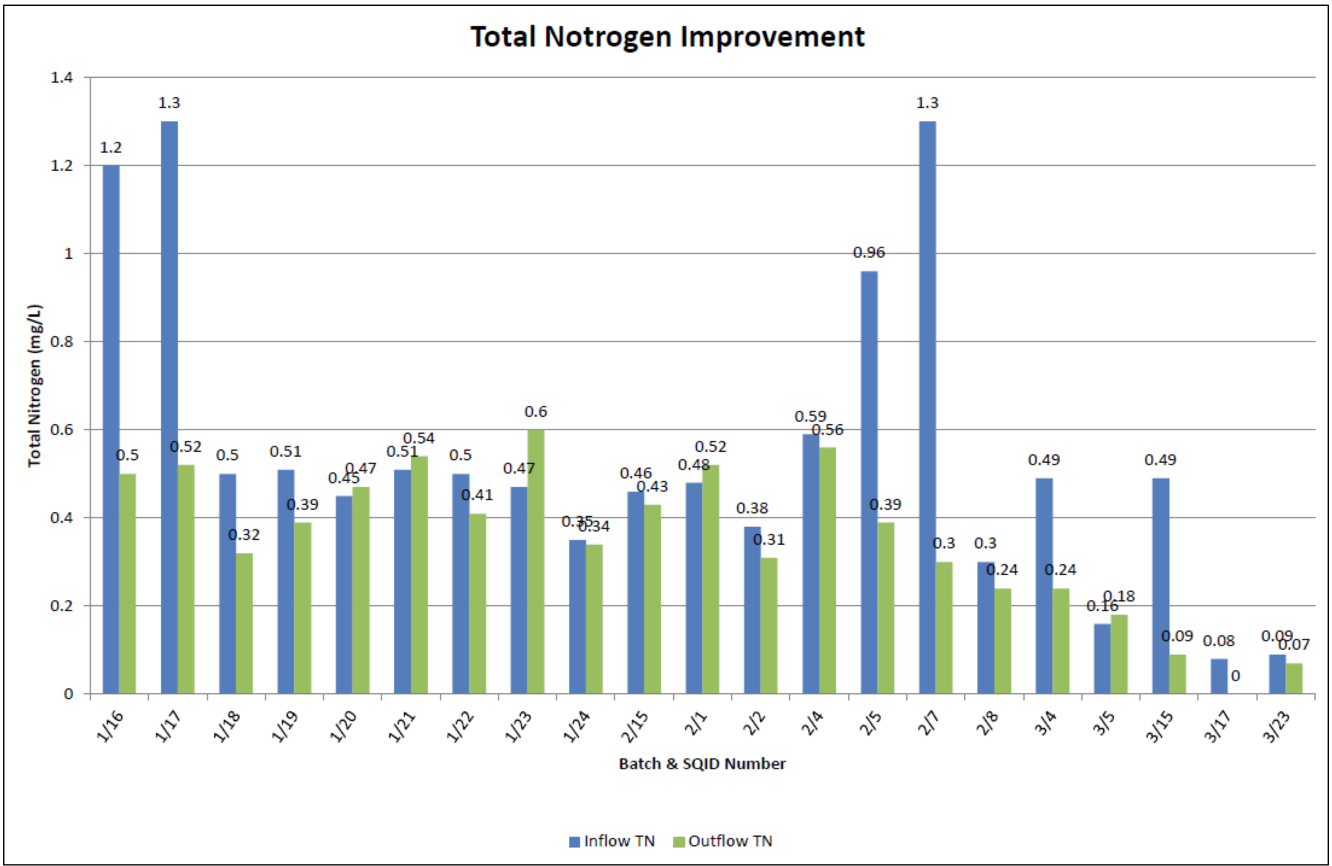

Figure 25 Change in Total Nitrogen for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.6 Evaluation of Heavy Metals Reduction

5.4.6.1 Arsenic

Arsenic is not identified as particularly abundant in any of the samples tested however one SQID did register a reduction in the heavy metal. Owning to the limited data and the very low levels of this parameter, Arsenic is not identified as a high-risk pollutant at the SICTL Terminal.

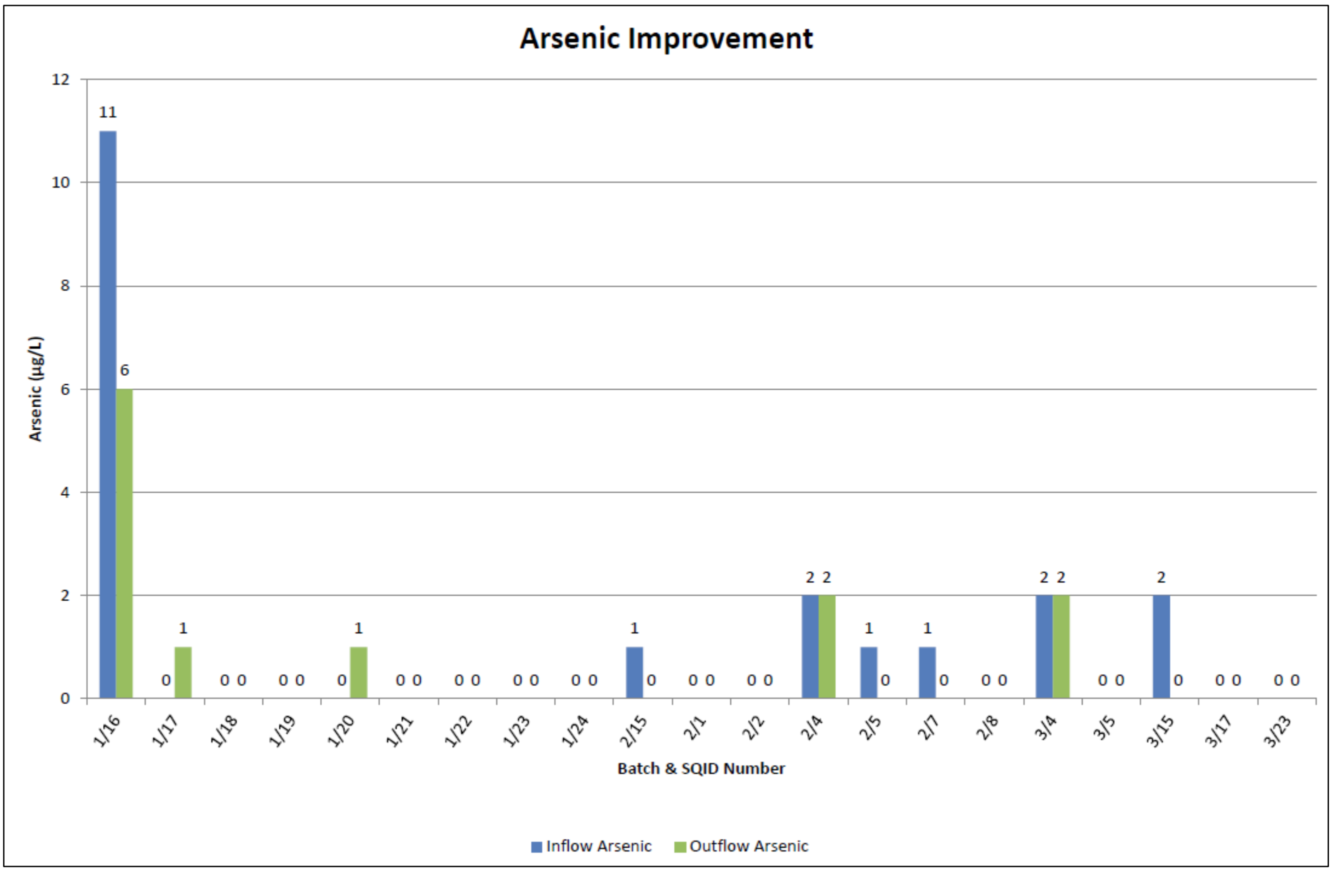

Figure 26 Change in Arsenic for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.6.2 Chromium

The efficiencies shown in the graph are quite variable (with some actually upward-trending) thus precluding an evaluation for this heavy metal that would provide a confident assessment. Although the below graph has clear spikes, all levels are below 9 micrograms per litre leading SICTL to view Chromuim as a low-risk pollutant in the samples collected.

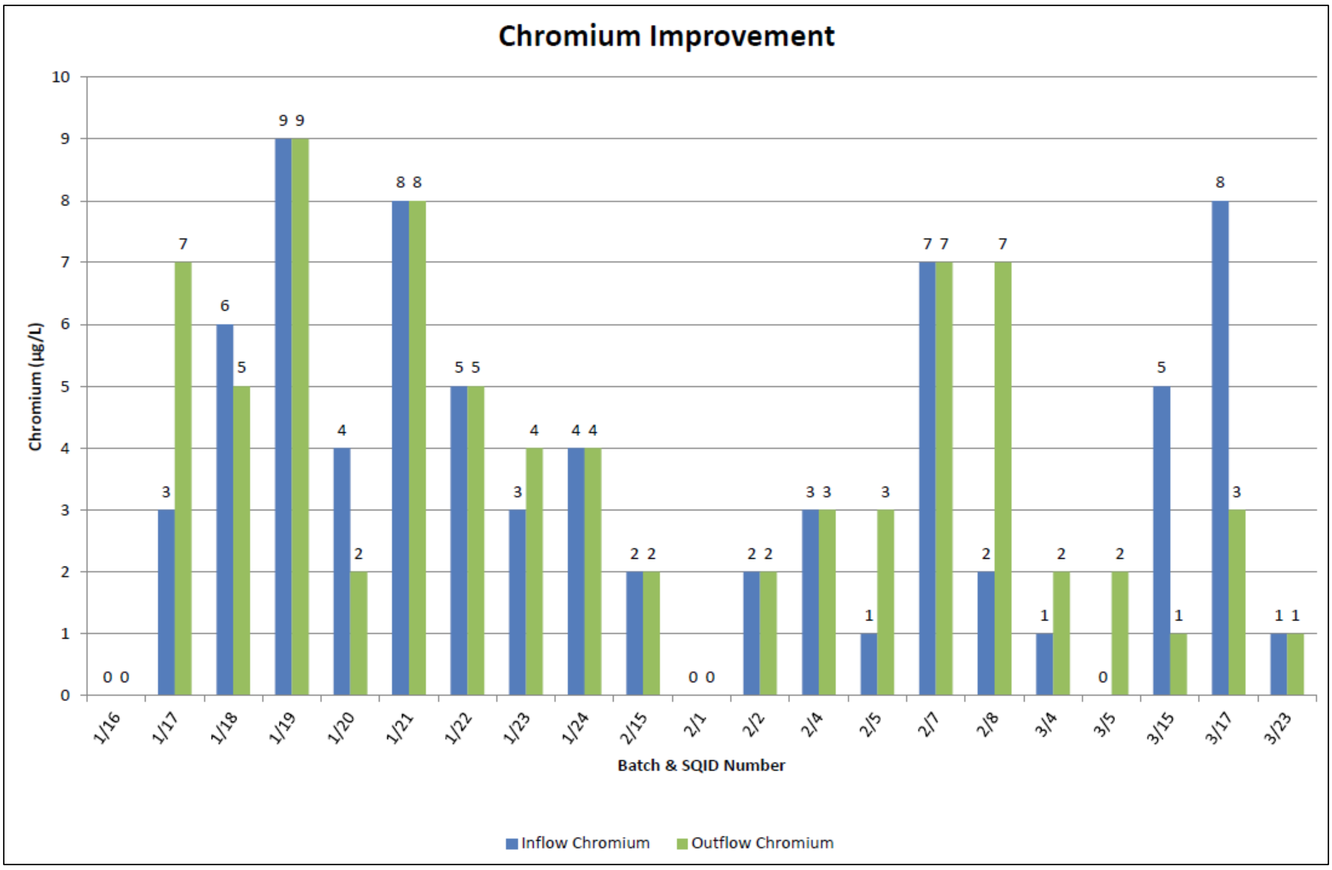

Figure 27 Change in Chromium for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.6.3 Copper

The efficiencies shown in the graph are somewhat variable (with two actually upward-trending) thus precluding an evaluation for this heavy metal that would provide a confident assessment. Although the below graph has clear spikes and dips, all levels are below 3 micrograms per litre leading SICTL to view Copper as a low-risk pollutant in the samples collected.

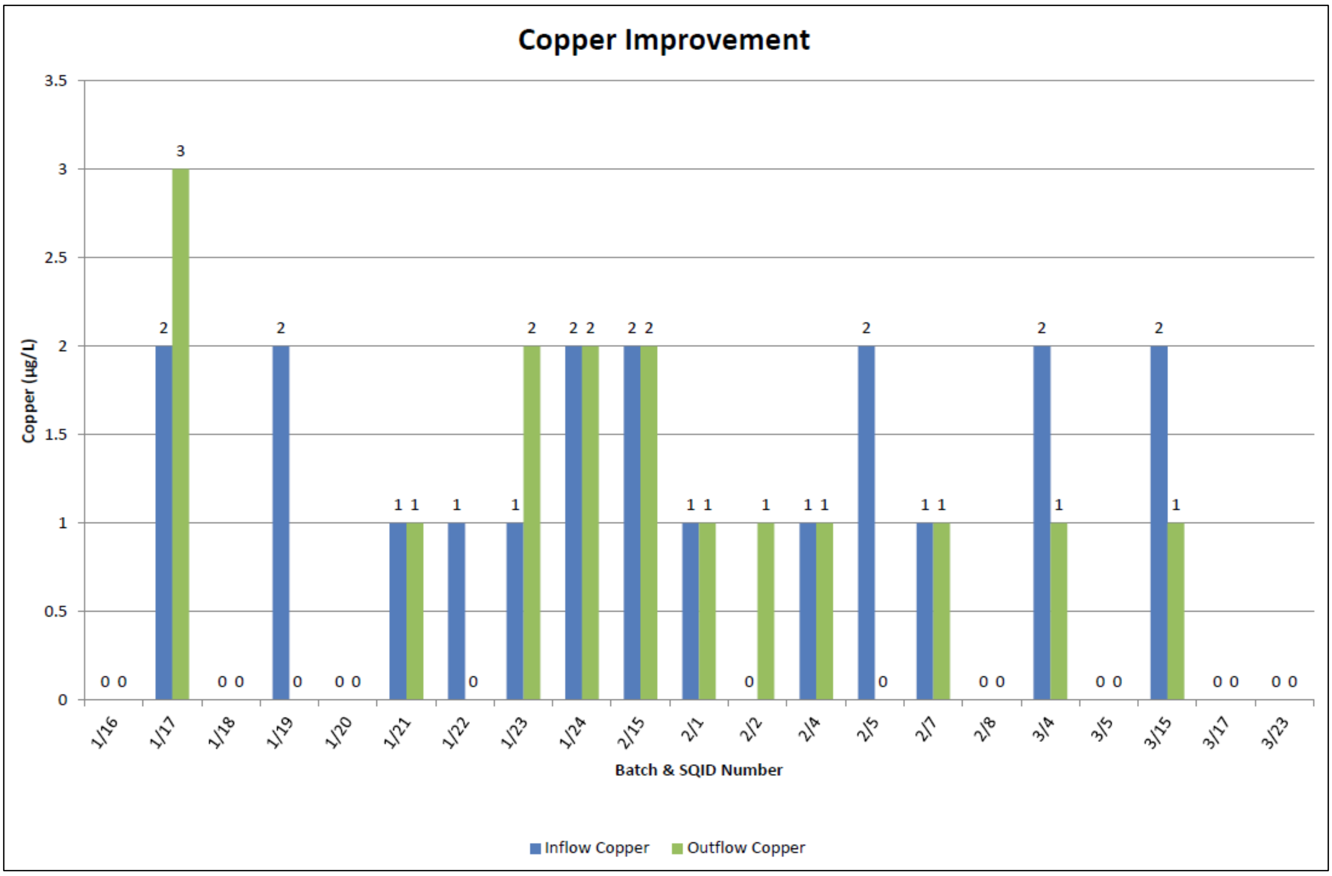

Figure 28 Change in Copper for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.6.4 Nickel

There is not enough data for Nickel removal to allow for a confident evaluation as many of the levels were close to or below the Limit of Reporting for this parameter. Although the below graph has a clear spike, all levels are below 3 micrograms per litre leading SICTL to view Nickel as a low-risk pollutant in the samples collected.

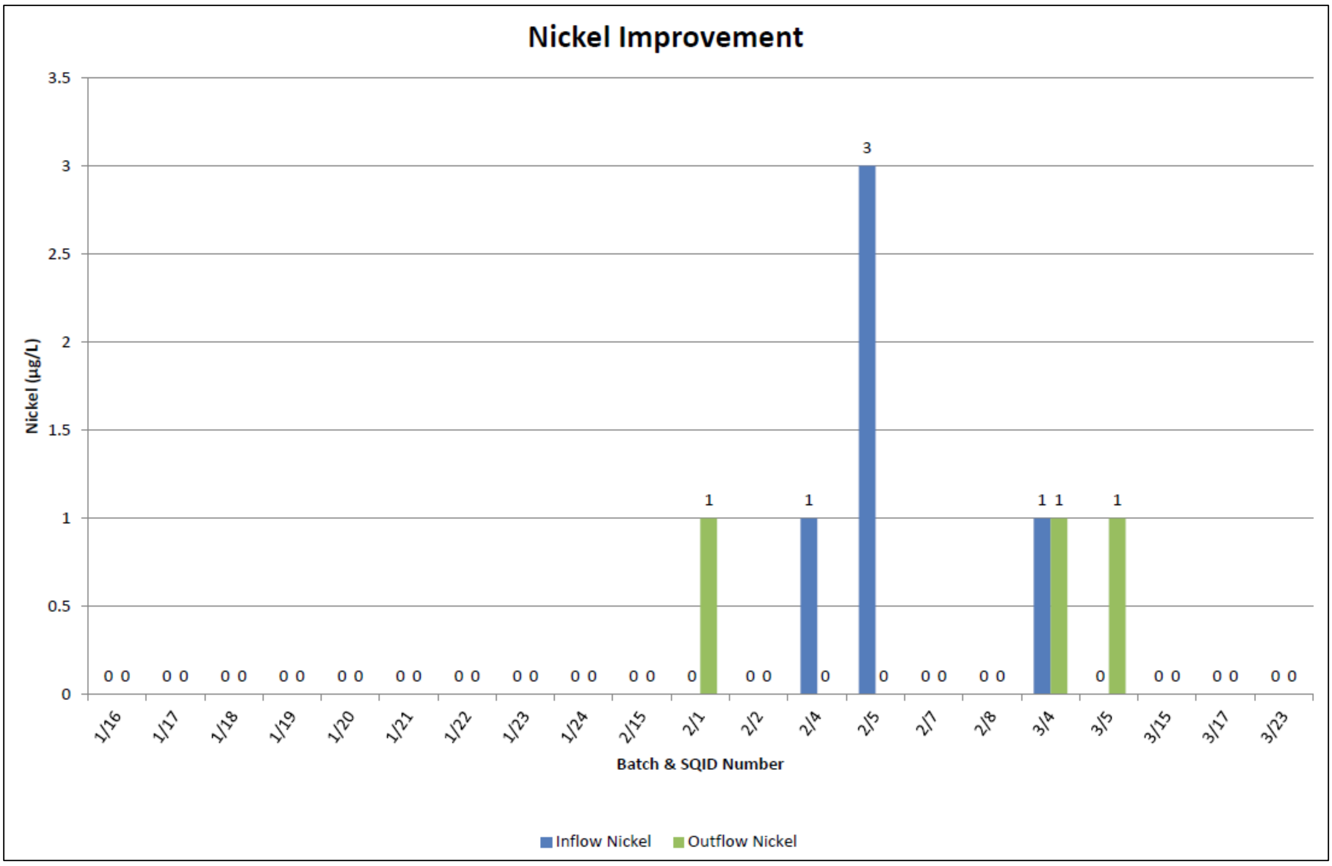

Figure 29 Change in Nickel for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.6.5 Zinc

Many samples did not manage to register above the Limit of Reporting (LOR) for Zinc and there are no distinct trends. The proportion of decreasing versus increasing efficiencies is almost equal. Overall there is not enough reliable data for Zinc removal to allow for a confident evaluation as many of the levels were or below the LOR. Although the below graph has a clear spike, all levels are below 86 micrograms per litre leading SICTL to view Nickel as a low-risk pollutant in the samples collected.

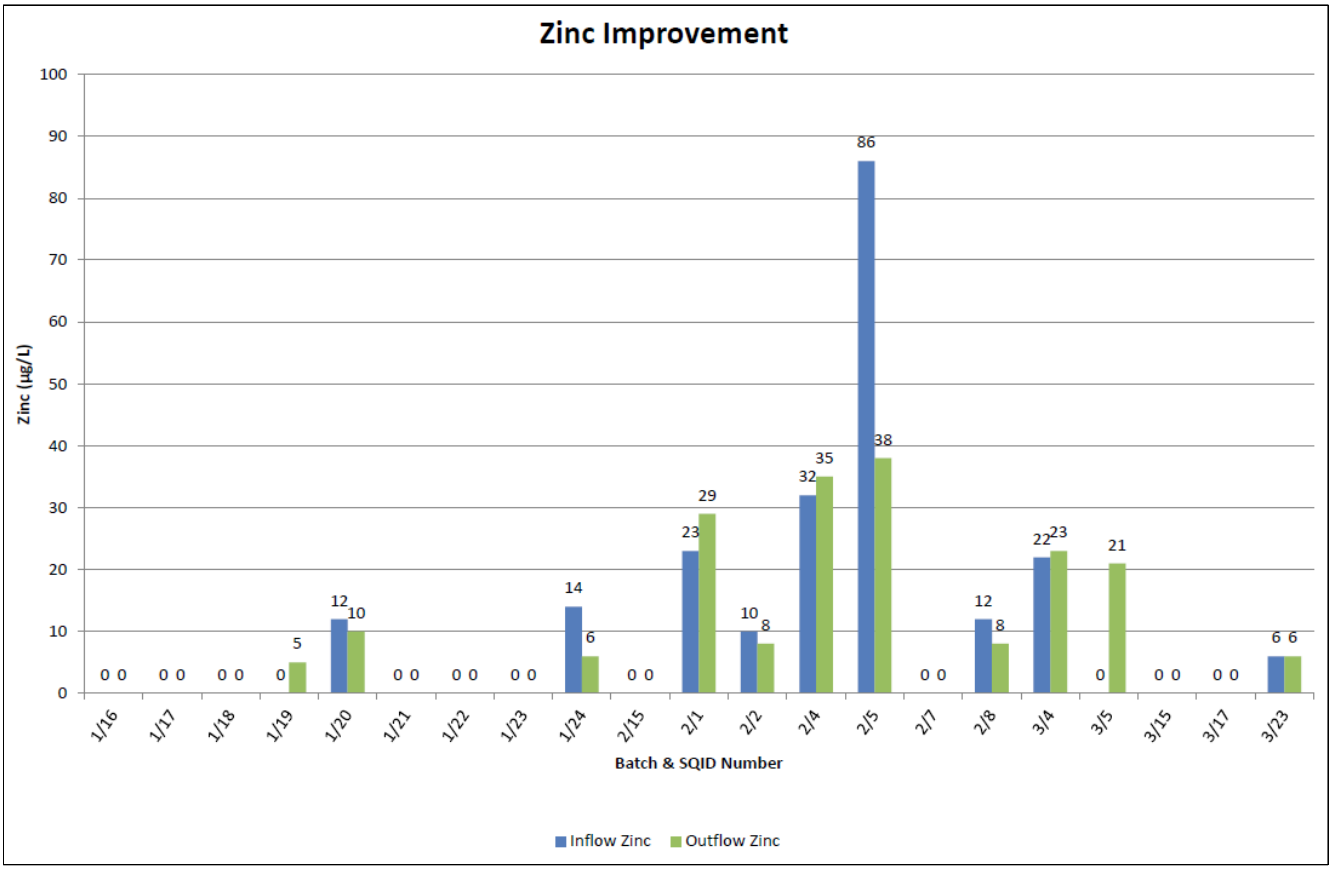

Figure 30 Change in Zinc for each SQID of Batches 1 – 3 (SQID 10 omitted).

5.4.6.6 Cadmium, Mercury, Lead and Oil & Grease

All results for these pollutants across batches 1-3 were consistently less than the Limits of Reporting of:

- 0.1µg/L. for Cadmium;
- 0.0001mg/L for Mercury;
- 1µg/L. for Lead, and
- 5mg/L for Oil & Grease.

This was true for both inlet and outlet samples meaning that a percentage reduction was unable to be calculated. More importantly however, these results show that the actual generation of these pollutants is negligible as is the discharge.

5.4.7 Summary of Evaluations

Table 5: Evaluations of each parameter.

Parameter	Evaluation
pH	Mild reductions achieved but these SQID units are not designed for pH improvements.
Turbidity	Capable of good performance but the SPEL units may be operating at the lower end of their efficiency range because of generally low levels of inflow pollutants. It appears they may actually need a large amount of pollutants to see a good removal.
Total Suspended Solids	As per Turbidity, capable of good performance but SQIDs appear to be under-utilised.
Total Phosphorus	Limited data, some reductions observed.
Total Nitrogen	Mild reductions achieved but operating near the LOR for this parameter.
Arsenic	Limited data, some reductions observed.
Chromium	Variable data, generally stable trends, some reductions observed.
Copper	Variable data, generally stable trends, some reductions observed.
Nickel	Limited data with generally stable trend.
Zinc	Variable data, generally stable trends, some reductions observed.
Cadmium Mercury Lead Oil & Grease	No data for inflow or background samples precluding an evaluation for the removal of these pollutants.

5.5 Recommendations

Based on the results described within this report overall, SICTL has confidence in the operation and efficiency of the SQID units installed at the SICTL terminal. A major component of this confidence is the mitigation-in-depth approach adopted by SICTL to not rely upon the SQIDs units as an end-of-line control.

Regular sweeping combined with the sitrict control of dust from construction activities nearby, litter, gross pollutants and spills contributed to the generally low inflow values observed.

SICTL will continue with the water quality sampling and testing in accordance with the Environmental Protection Licence and consult with the NSW EPA at regular intervals to discuss progress and any issues potentially affecting the quality of stormwater that may arise.

Further reporting may be negotiated between SICTL and NSW EPA upon review of future data.

6 Ongoing Monitoring and Reporting

SICTL is continuing with ongoing stormwater monitoring in accordance with the EPL conditions at six monthly intervals. The sampling locations for this ongoing monitoring are shown below.

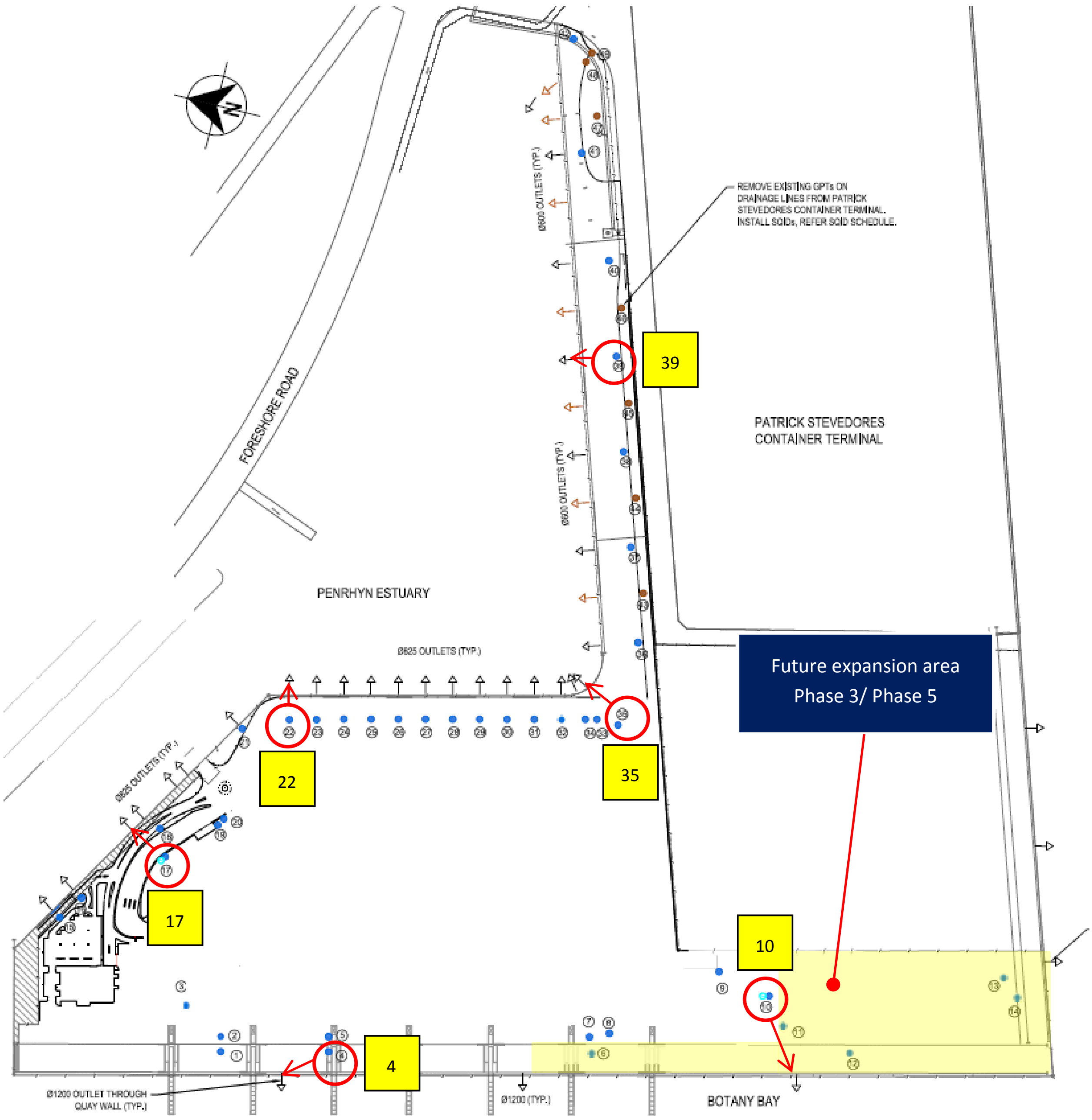

Figure 31 Overview map showing all SICTL stormwater discharge locations.

All monitoring results obtained by SICTL under the various environmental monitoring programs are made public on the corporate website at http://www.hutchisonports.com.au/Sydney-Monitoring-Reporting . Stormwater quality monitoring is conducted at six monthly intervals. The figure below shows the location of the SICTL monitoring data.

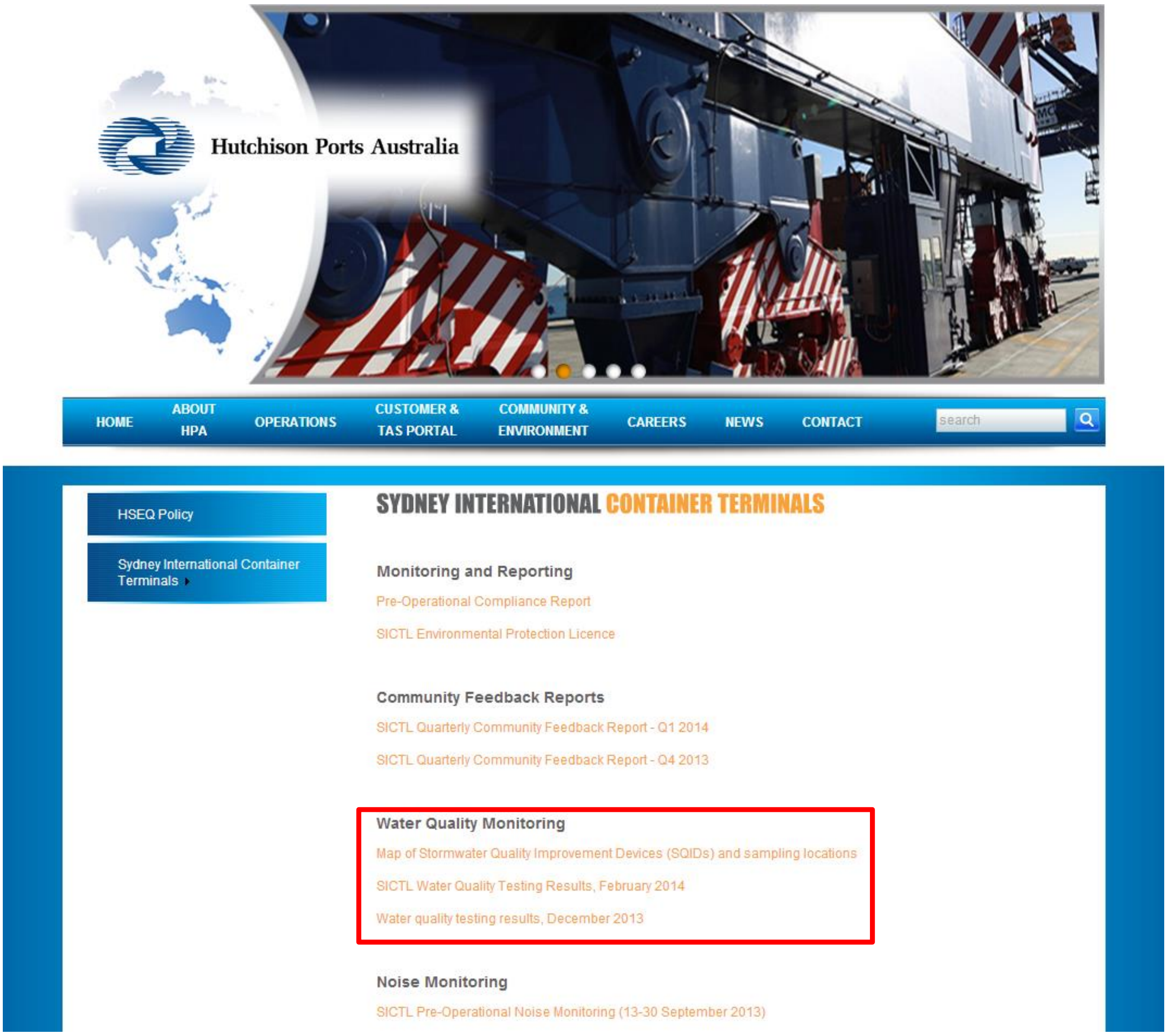

Figure 32 The Monitoring and Reporting page on the Hutchison Ports Australia website.

7 Supporting Documentation and Records

HSEQ5.1.7f Stormwater Management Sub-Plan - SICTL

7.1 Stormceptor Manufacturer's Documentation

SPEL STORMCEPTOR CLASS 1: Technical Profile

Executive Summary

The SPEL Stormceptor Class 1™ is a secondary treatment stormwater treatment device or is more commonly referred to as a Stormwater Quality Improvement Device (SQID).
It is a fibreglass, self-contained one-piece construction and is suitable for impervious catchments for the reduction of total suspended solids (TSS), nutrients, Total Petroleum Hydrocarbons (TPH), oil & grease for surface water runoff from impervious catchments.
Where TPH and oil & grease are the limiting factors for pollutant removal the device is certified to the world's most stringent standard, the European (British) Standard 858.1 for hydrocarbons removal.

SPEL Class 1™ Treatment Dynamics

The SPEL Stormceptor Class 1™ is a gravitational, passive stormwater treatment device that treats stormwater through two chambers. Low velocity flow produces quiescent conditions enabling separation of the pollutants in all flow events. Contaminated water cannot flow directly across the surface before effective separation has taken place.

Treatment Flow (TFR)
Treatment flow (TFR) enters the primary chamber where sediment is collected. Flow then passes into the secondary separation chamber (Quiescent Zone) and finally through a high-reticulated coalescing media trapping and separating fine particulate suspended solids, and hydrocarbons.

Bypass Flow
In high flow conditions (storm event) flow bypasses the secondary separation chamber over a weir arrangement.

Continual & Optimal Treatment Performance
This unique SPEL Class 1™ flow action in conjunction with the internally sealed secondary treatment chamber and filter media maintains the quiescent conditions, (no turbulence or agitation) ensuring optimal treatment performance whilst the device is in `bypass mode`.

No Scouring or Re-suspension
The SPEL Class 1™ function ensures there is no scouring or re-suspension of separated pollutants, making it suitable for flood and tidal zones.

Performance Analysis

University of South Australia flow test analysis
SPEL Class 1™ devices have undergone rigorous and comprehensive testing for total suspended solids, and hydrocarbons. The reduction values listed within are from flow tests conducted by the University of South Australia Hydraulics Research Laboratory (UNISA)

Total Suspended Solids: Particle Size Distribution (PSD)
In depth investigation of particle size capture performance was developed for the first time at the UNISA hydraulic research facilities for assessment for typical stormwater TSS characteristics.

The make-up of particulate size was weighted fine fraction <125um which makes up 90% of the load reflecting MUSIC load characteristics. The test was conducted at the UNISA research facility with the device in flow mode. This is stressed as the most accurate method in determining reduction as opposed to accumulative loads analysis.
In summary the reduction of **Total Suspended Solids:** particle size distribution (PSD)

- >97% >75um
- >55% <75um.

TSS UNISA Test Methodology

The sediment added to the inlet of the SPEL Stormceptor Class 1™ consisted of 10 kg of dry material. Half of this material (by weight) was a sand material sourced from a brick sand quarrying operation in Noarlunga, SA which was pre-sieved to remove particles finer than 600 µm. The second half (by weight) was a commercially sourced silica product (Unimin Silica 60G). The particle size distribution (PSD) of the sediment produced was determined to 75 µm by sieving in accordance with AS 1289.3.6.1 – 2009 prior to adding the material to the concentrated pollutant mixture. The PSD of material less than 75 µm was determined using laser diffraction.

Page 1

SPEL STORMCEPTOR CLASS 1: Technical Profile

At the completion of the test the suspended solids retained by Chamber 1 and Chamber 2 of the SPEL unit were collected. The collected sediment was harvested by draining all water from the tank at the completion of the test through a geofabric filter to manually collect retained sediment. Retained sediment was then dried in the oven at 105°C and sieved to 75 µm in accordance with AS 1289.3.6.1 – 2009. The sediment fraction which was not collected was assumed to pass through the tank in normal running conditions.

Although the loss of retained sediment during the retained sediment collection method is considered possible, it was considered appropriate because this method represents a conservative approach to determining the total mass of retained sediment as losses are considered to pass through the SPEL Stormceptor Class 1™. Furthermore, as sediment that is lost through the cloth filter is most likely to be in the smaller particle size range, this added a further degree of conservatism as it leads to an under-estimation of the amount of retained low diameter particles.

TSS Results

Overall, 10 kg of sediment was added to the SPEL Class 1™ unit, and 8.486 kg of sediment was retained.

Analysis of the PSD of sediment indicated that the retained sediment was predominantly larger particle sizes. The SPEL Stormceptor Class 1™ removed more than 95% of sediment larger than 75 µm, and more than half the particles less than 75 µm. These results are based on repeated tests of approximately 100 to 200 g of retained material, and for this reason the retained percentages are approximate - the percentage reduction for particles greater than 125 µm, for example, was consistently greater than 95%, with minor fluctuations between 95 and 100%.

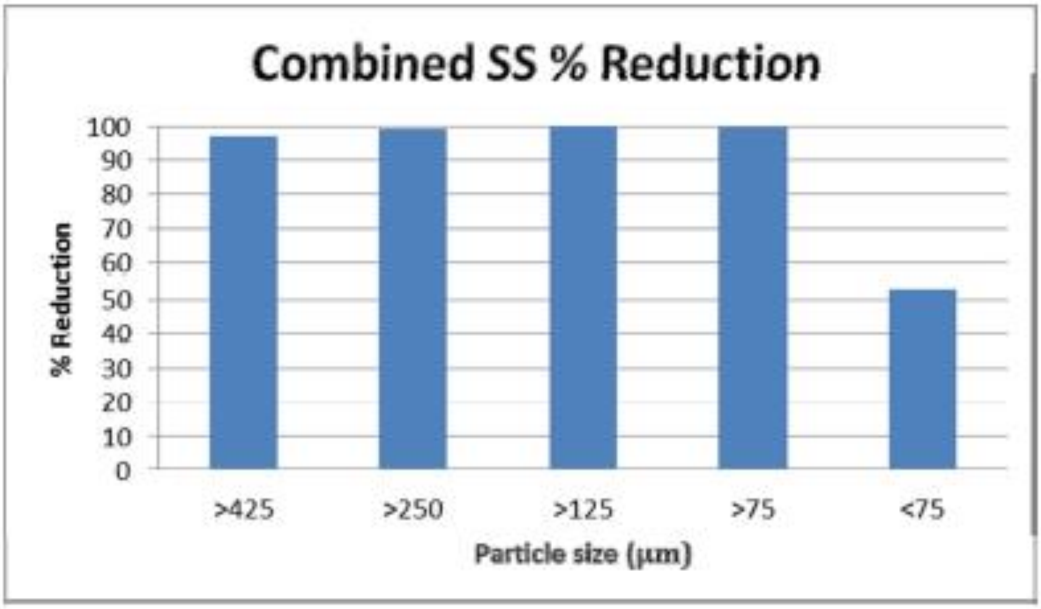

Figure 1: Test: Percentage of sediment retained by the SPEL Stormceptor based on particle size

The PSD of sediment which was placed into the pollutant mixture and that which was retained within the SPEL unit (retained) is shown in Figure 1. The data was determined by laser diffraction.

SPEL STORMCEPTOR CLASS 1: Technical Profile

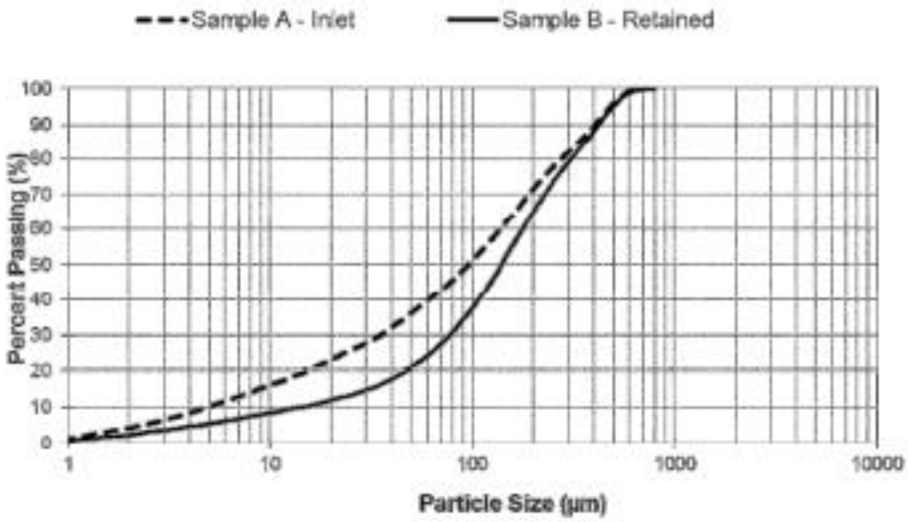

Figure 2 - Test: PSD of sediment at the inlet and retained by the SPEL Stormceptor (by laser diffraction)

Figure 3 compares the inlet PSD of sediment used in this test with the assumed PSD of sediment in the MUSIC model. The comparison indicates that there was generally a broader PSD distribution than that assumed by the MUSIC software.

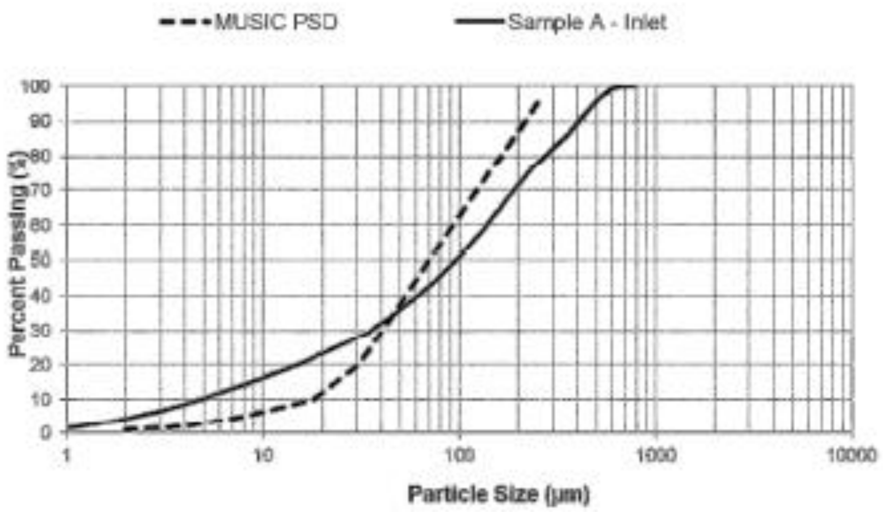

Figure 4- Test: PSD of sediment at the inlet of the SPEL Stormceptor compared to that assumed in the MUSIC model (by laser diffraction)

SPEL STORMCEPTOR CLASS 1: Technical Profile

TSS: Summary of Findings

- The results indicate that there is a consistent reduction in the sediment concentrations.
- Sieve testing of sediment at the inlet and retained by the SPEL Stormceptor Class 1™ indicated that most particles retained were in the larger particle size range. Removal of sediment was determined based on particle size as follows:
  - For particles greater than 425 µm, over 96% of particles were retained
  - For particles between 425 µm and 250 µm, over 98% of particles were retained
  - For particles between 250 µm and 125 µm, over 99% of particles were retained
  - For particles between 125 µm and 75 µm, over 99% of particles were retained
  - For particles less than 75 µm, over 52% of particles were retained

Total Petroleum Hydrocarbons (TPH)

Tests were performed at the UNISA Hydraulics Research facility and at HR Wallingford UK with the device in flow mode, with the following results. Test methodology was done to European Standard BS EN 85.1 Section 8.3

Figure 5 shows that discharge water quality reduction remains constant at <0.1ppm of TPH translating to `no visible trace` from a constant inflow concentration of 5,000ppm.

Hydrocarbon Fraction	EQL*	Inflow Concentration Total 5699.0	Outlet Samples TPH Fraction Concentrations					Calculated Mean Concentration
			1	2	3	4	5	
C6-C9	0.02	0.15	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
C10-C14	0.04	125.43	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
C15-C28	0.10	5570.62	<0.1	0.162	<0.1	<0.1	<0.1	< 0.032
C29-C36	0.1	3.42	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
* Sensitivity: Estimated Quantitation Limit Results expressed in mg/l								

Figure 5: Reduction of Total Petroleum Hydrocarbons (TPH)

Results show `no detection` of hydrocarbons of all carbon fractions with the exception of Sample 2 C15-C28 with 1 sample showing` no visible trace". Inflow concentration of >5,000ppm.

Caution: Claims made of 98% Hydrocarbon Reduction:
Data expressed by competitors in terms of percentages are erroneous. Claims expressed in percentage form are unreliable and misleading. A 98% reduction of TPH off catchments with vehicular activity would result in discharge loads ranging from 20ppm to 100ppm. This exceeds the concentration of TPH `visibility` which is approximately 10ppm rendering such devices as non-compliant.

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STORMWATER SOLUTIONS - STORMWATER QUALITY IMPROVEMENT DEVICES

MUSIC (Model of Urban Stormwater Improvement Conceptualisation)

Flow rates and Total Suspended Solids (TSS) have been modeled through MUSIC Version 5 for surface water runoff on the Port Botany 3 site.
Parameter values for the modeling have been selected in accordance with the *Sydney Metropolitan Catchment Authority NSW Modelling Guidelines 2010.*
The site catchment area is 60ha divided into sub catchments of approximately 1.5 ha each.

Modeling Input Values
Catchment Size: 1.5ha
Impervious Fraction: 100%
Catchment Type: Industrial
Climate Data: Sydney Airport: 06.07.1962 - 31.05.2010
Time step: 6 minute
Base Flow & Storm Flow Parameters: Industrial

Modeling Results
Flow:
Peak: 775 l/s
Daily Maxima Mean: 13.7l/s
90th percentile Flow: 41.7 l/s.
TSS
Annual Loads: 1,990 kg/year
Daily Maxima: 4.2mg/l
Daily Maxima 90th percentile: 4.24mg/l

Stormceptor Treatment Effectiveness:
TSS Residual Loads: 264kg/year
TSS Reduction: 86.7%

SPEL SQID Specification
Model: 470.C1.2C
Pipe: 825mm
Length: 6000mm
Diameter: 1850mm
Capacity: 15000L
Sediment Capacity: 6000L
Oil capacity: 4500L
Peak Flow Rate: 1.05cum/s
Treatable Flow Rate: 0.07cum/s

STORMCEPTOR™ PURACEPTOR™ TRICEPTOR™

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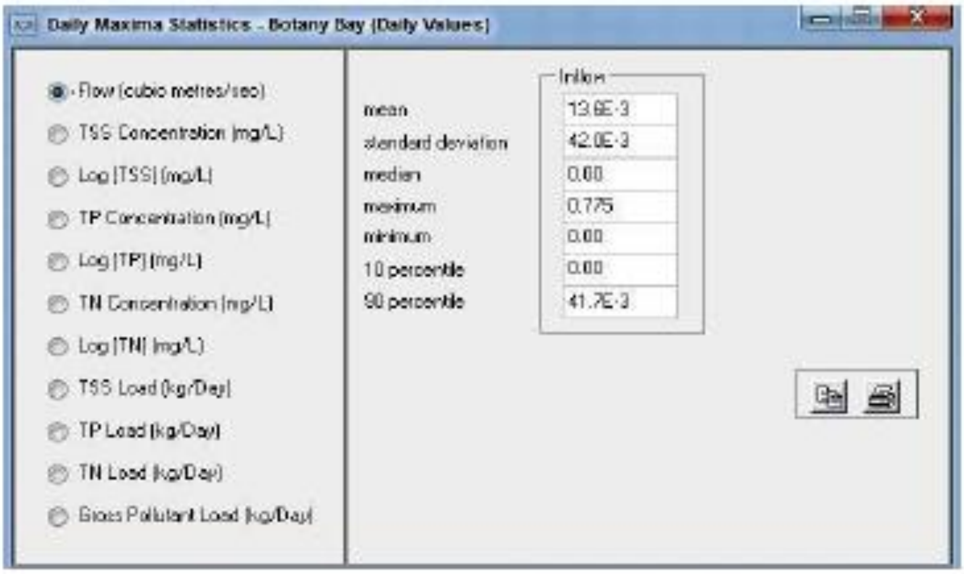

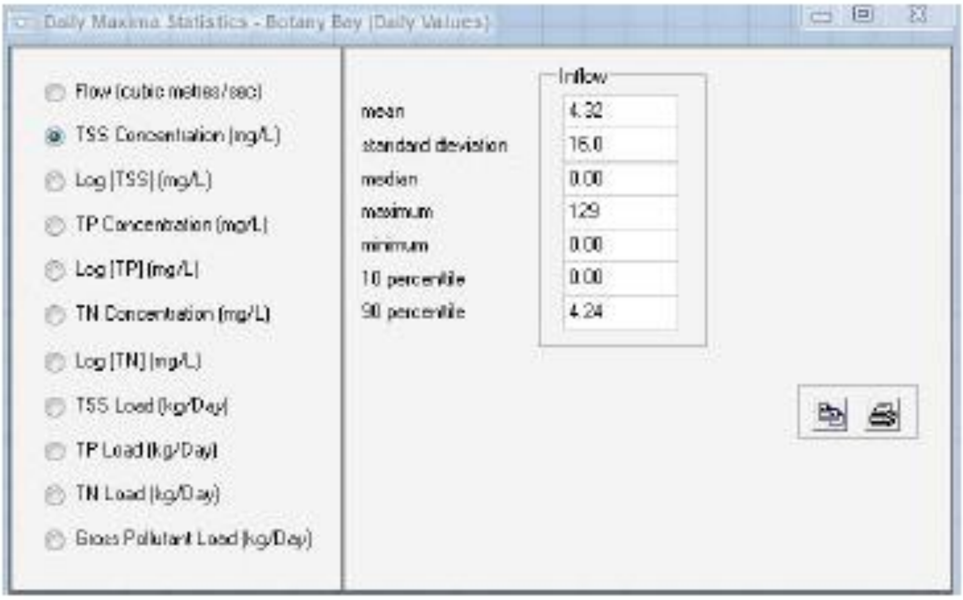

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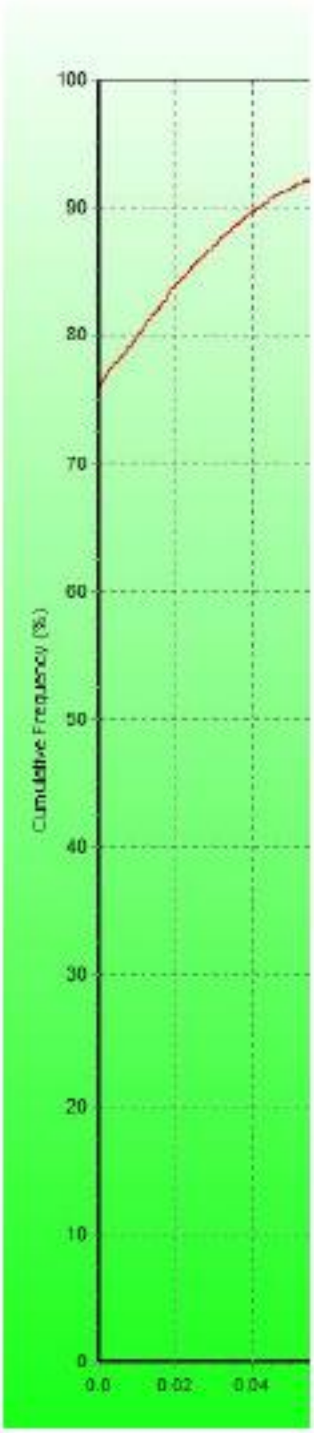

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7.2 Aquaceptor Manufacturer's documentation

Humes
Water Solutions

Strength. Performance. Passion.

HumeCeptor® technical manual

Issue 1

Contents

The HumeCeptor® system

The HumeCeptor® system is a patented hydrodynamic separator, specifically designed to remove hydrocarbons and suspended solids from stormwater runoff, preventing oil spills and minimising non-point source pollution entering downstream waterways.

The HumeCeptor® system is an underground, precast concrete stormwater treatment solution that utilises hydrodynamic and gravitational separation to efficiently remove Total Suspended Solids (TSS) and entrained hydrocarbons from runoff. First designed as an 'at source' solution for constrained, commercial and industrial sites it has been improved and expanded to service large catchments, mine and quarry sites, inundated drainage systems, and capture large volume emergency spill events. The system is ideal for hardstands/wash bays, car parks, shopping centres, industrial/commercial warehouses, petrol stations, airports, major road infrastructure applications, quarries, mine sites and production facilities.

Independently tested, and installed in over 30,000 projects worldwide, the HumeCeptor® system provides effective, and reliable secondary treatment of stormwater for constrained sites.

- **The system reliably removes a high level of TSS and hydrocarbons**
  The HumeCeptor® system was developed specifically to remove fine suspended solids and hydrocarbons from stormwater, and has been certified to achieve high pollutant removal efficiencies for TSS (>80%) and Total Nutrients (TN) (>30%) on an annual basis.
- **It captures and retains hydrocarbons and TSS down to 10 microns**
  Each system is specifically designed to maintain low treatment chamber velocities to capture and retain TSS down to 10 microns. It also removes up to 98% of free oils from stormwater.
- **Each device is sized to achieve the necessary Water Quality Objectives (WQO) on an annual basis**
  Utilising the latest build-up and wash-off algorithms, PCSWMM software for the HumeCeptor® system ensures that the device chosen achieves the desired WQO (e.g. 80% TSS removal) on an annual basis.
- **Its performance has been independently verified**
  The HumeCeptor® system's technology has been assessed by independent verification authorities including the New Jersey Department of Environmental Protection (NJDEP), The Washington Department of Environment (USA), and by the Canadian Environmental Technology Verification program (ETV).

Right:
The bypass chamber of a HumeCeptor® system

- **The system is proven**
  The HumeCeptor® system was one of the first stormwater treatment devices introduced to Australia, and now after 30,000 installations, its popularity is testament to its performance, quality and value for money.
- **High flows won't scour captured sediment**
  The unique design of the HumeCeptor® unit ensures that as flows increase and exceed the treatment flow, the velocity in the storage chamber decreases.
- **Nutrients are captured along with the sediment**
  The effective capture of TSS results in the capture of particulate nutrients shown to be >30% of TN and Total Phosphorous (TP).
- **Designs allow for emergency spill storage, directional change, multiple pipes and tidal inundation**
  A new range of HumeCeptor® systems are now available, built specifically to manage emergency spills (50,000 L storage), change of pipe directions, the joining of multiple pipes, or to manage high tail water levels as a result of tides or downstream water bodies.
- **Fully trafficable to suit land use up to class G**
  The HumeCeptor® system is a fully trafficable solution, it can be installed under pavements and hardstands to maximise above ground land use.
- **We are experienced in the provision of world class treatment solutions**
  Humes has a team of water specialists dedicated to the advancement of economical sustainable solutions, and the provision of expert advice and support.

System operation

The HumeCeptor® stormwater treatment system slows incoming stormwater to create a non-turbulent treatment environment, allowing free oils and debris to rise and sediment to settle. Each HumeCeptor® system maintains continuous positive treatment of TSS, regardless of flow rate, treating a wide range of particle sizes, as well as free oils, heavy metals and nutrients that attach to fine sediment.

The HumeCeptor® system's patented scour prevention technology ensures pollutants are captured and contained during all rainfall events.

Bypass chamber

1. Stormwater flows into the inlet (weir) area of the bypass chamber.
2. Design flows are diverted into the offline treatment chamber by a weir, orifice and drop pipe arrangement (refer to Figure 1).
3. The weir and orifice have been developed to create a vortex that sucks floating oils and sediment down into the treatment chamber.
4. During high flow conditions, stormwater in the bypass chamber overflows the weir and is conveyed to the stormwater outlet directly (refer to Figure 2).
5. Water which overflows the weir stabilises the head between the inlet drop pipe and outlet decant pipe ensuring that excessive flow is not forced into the treatment chamber, protecting against scour or re-suspension of settled material. The bypass is an integral part of the HumeCeptor® unit since other oil/grit separators have been found to scour during high flow conditions (Schueler and Shepp, 1993).

Figure 1 – HumeCeptor® system operation during design flow conditions

Figure 2 – HumeCeptor® system operation during high flow conditions

Treatment chamber

1. Once diverted into the treatment chamber through the weir and orifice, the drop pipe beneath the orifice is configured to discharge water tangentially around the treatment chamber wall.
2. Water flows through the treatment chamber to the decant pipe which is submerged similar to the drop pipe.
3. Hydrocarbons and other entrained substances with a specific gravity less than water will rise in the treatment chamber and become trapped beneath the fibreglass insert since the decant pipe is submerged.
4. Sediment will settle to the bottom of the chamber by gravity forces. The large volume of the treatment chamber assists in preventing high velocities and promoting settling.
5. Water flows up through the decant pipe based on the head differential at the inlet weir, and is discharged back into the bypass chamber downstream of the weir.

Independent verification testing

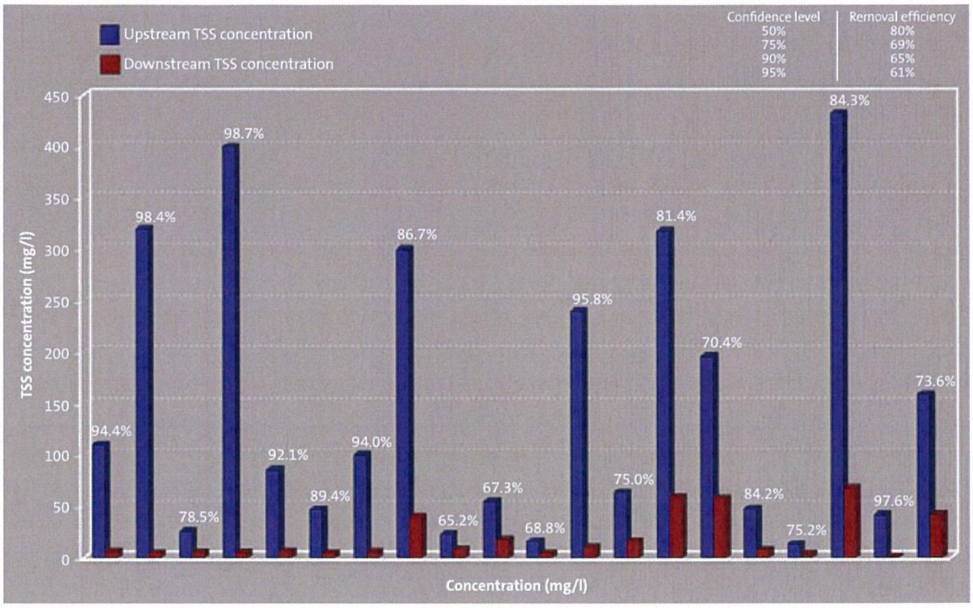
The HumeCeptor® system has been extensively researched by more than 15 independent authorities to validate its performance; it has now gained Environmental Technology Verification (ETV) certificates from ETV Canada, New Jersey Department of Environmental Protection (NJDEP) and Washington Department of Environment (WDOE).

A number of agencies have conducted independent studies; their results from these studies (over 100 test events) have been summarised in Table 1 below.

Table 1 – HumeCeptor® systems performance summary

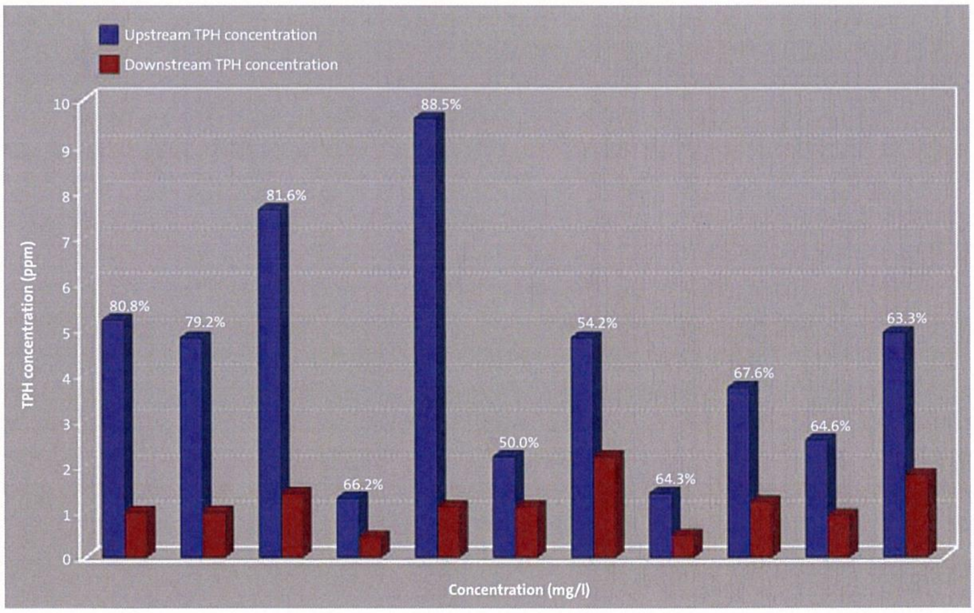
Pollutant	Average removal efficiency	Details
TSS	80%	Laboratory and field results, stable, hardstand, roads, commercial and industrial sites
TN	53%	Field results
TP	37%	Field results
Chromium	44%	Field results
Copper	29%	Field results
TPH	65%	<10 ppm inflow concentration
	95%	10 ppm - 50 ppm inflow concentration (typical stormwater)
	99%	>500 ppm inflow concentration (emergency spills)

Figure 3 – The HumeCeptor® system field performance results for Total Suspended Solids (TSS) removal



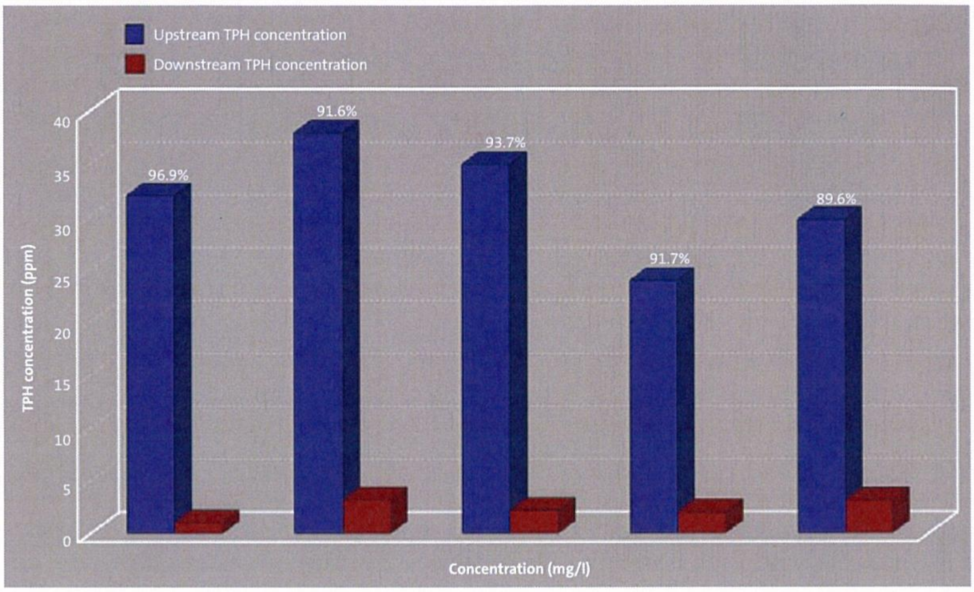
Note: Percentage values represent removal efficiencies

Figure 4 – The HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration <10 ppm)



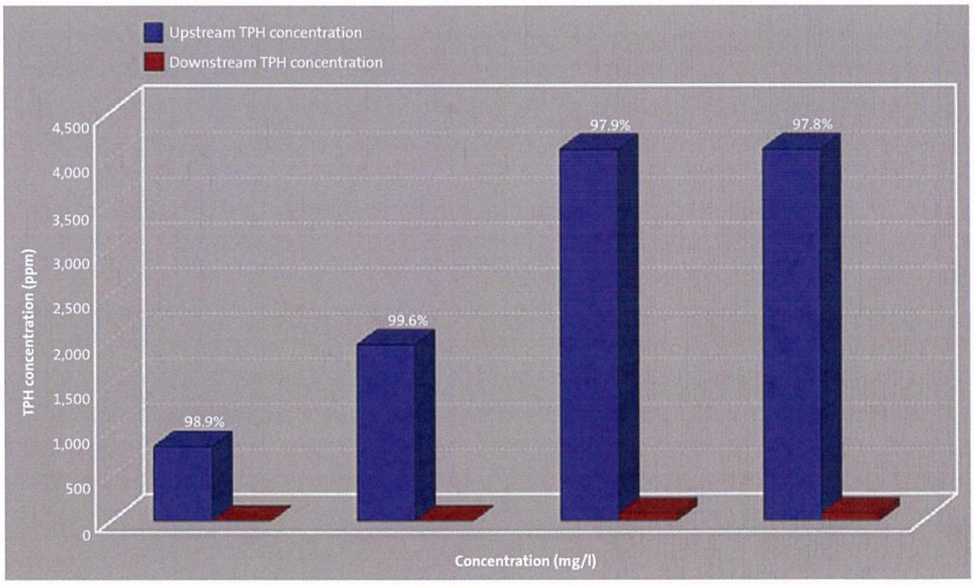
Note: Percentage values represent removal efficiencies

Figure 5 – The HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration >10 ppm)



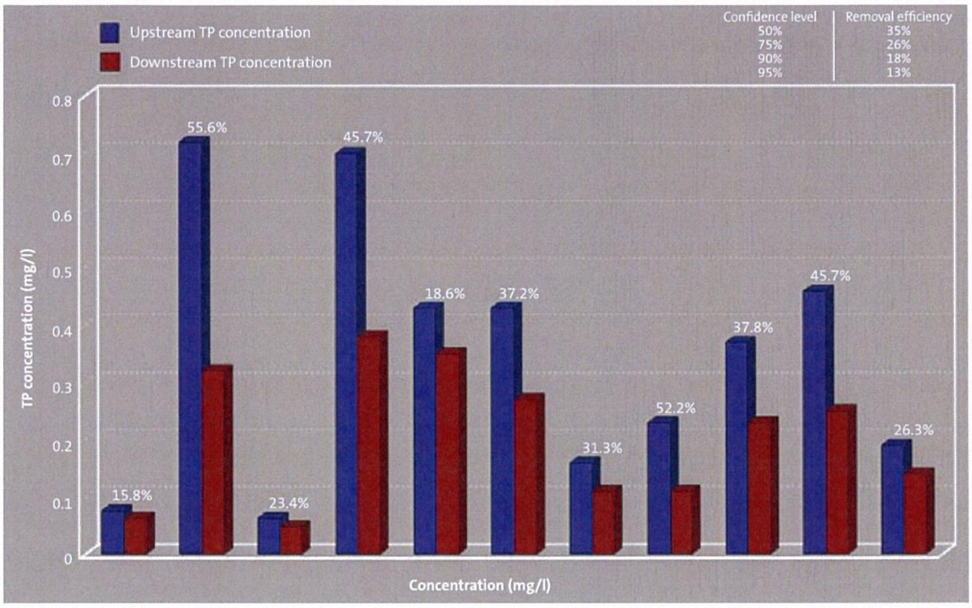
Note: Percentage values represent removal efficiencies

Figure 6 – The HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration >1,000 ppm)



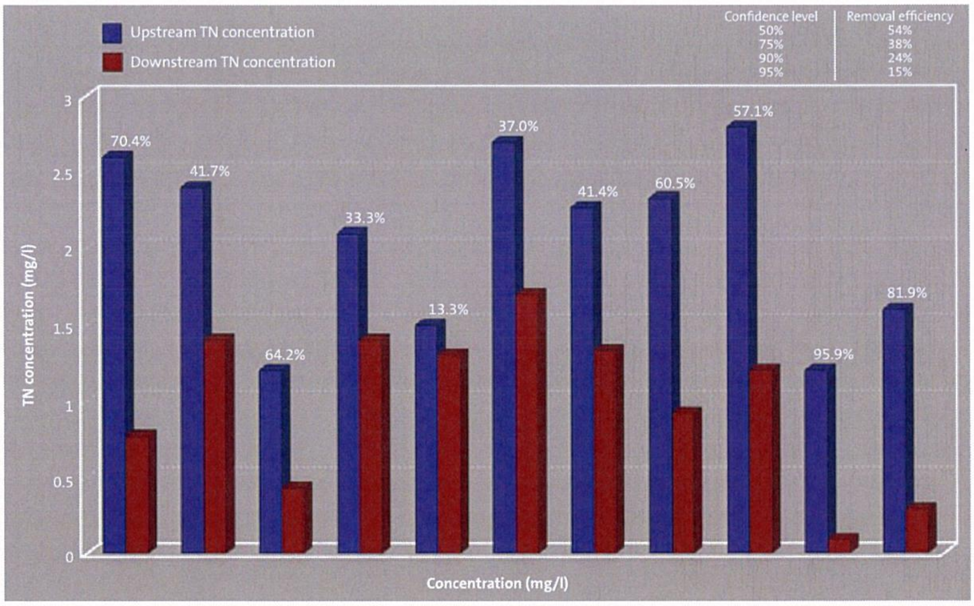
Note: Percentage values represent removal efficiencies

Figure 7 – The HumeCeptor® system field performance for Total Phosphorous (TP) removal



Note: Percentage values represent removal efficiencies

Figure 8 – The HumeCeptor® system field performance for Total Nitrogen (TN) removal



Note: Percentage values represent removal efficiencies

System options

There are a number of HumeCeptor® systems available to meet the requirements of various WQO for maintaining catchments and local hydrology. The standard range is detailed in Table 2 below.

Table 2 – HumeCeptor® model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert* (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
STC 2 (inlet)	100 - 600	1,200	1.7	1	350	1,740
STC 3	100 - 1,350	1,800	1.68	2	1,020	3,410
STC 5			2.13	3		4,550
STC 7			3.03	5		6,820
STC 9		2,440	2.69	6	1,900	9,090
STC 14			3.69	10	2,980	13,640
STC 18		3,060	3.44	14		18,180
STC 23			4.04	18		22,730
STC 27			3.84	20	4,290	27,270

Note:
*Depths are approximate.

Variants

Continual improvement over the last 14 years of HumeCeptor® system installations has provided a number of enhancements to address specific treatment and design requirements.

- **The HumeCeptor® STC 2 (inlet) model**
  This model features a grated inlet to directly capture runoff from hardstand areas, replacing the need for a stormwater pit (refer to Figure 9).
- **The AquaCeptor™ model**
  This model has been designed with a weir extension to increase the level at which flows bypass the treatment chamber, and accommodate downstream tail water levels or periodic inundation (e.g. tidal situations). This weir extension is provided in standard heights of 100 mm intervals, up to a maximum of 500 mm.

  To maintain the hydrocarbon capture capabilities, an additional "high level" inlet pipe is also fitted. This facilitates the formation of the surface vortex from the bypass chamber into the treatment chamber and draws floating hydrocarbons into the unit.

  The selection of the appropriate weir extension height is undertaken in conjunction with the downstream engineering design and/or tidal range charts for the specific location. Figure 10 displays the AquaCeptor™ model; these are available in the same sizes as the standard HumeCeptor® units (refer Table 2 on the previous page).

Figure 9 – The HumeCeptor® STC 2 (inlet) model

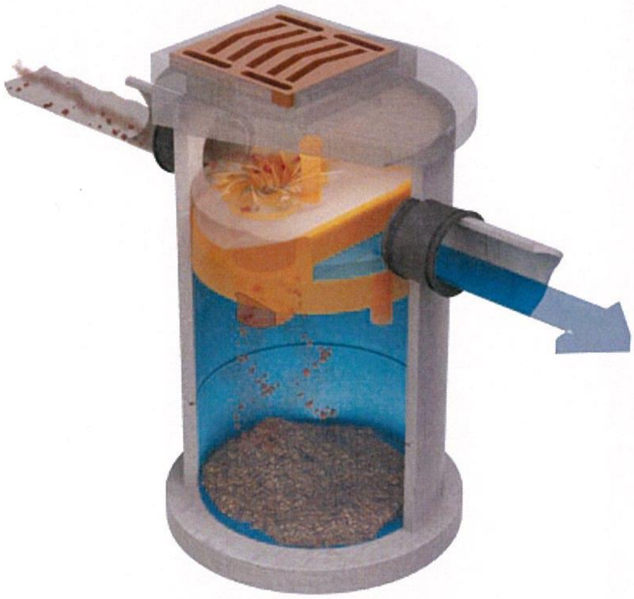


Figure 10 – The AquaCeptor™ model

- **The MultiCeptor™ model**

  The MultiCeptor™ model (refer to Figure 11) was developed to facilitate the replacement of junction pits while still providing the treatment abilities of the original HumeCeptor® system and reducing time and costs during installation. These units reverse the weir structure to allow for:

  - change of pipe direction
  - multiple inlet pipes
  - differing invert levels of multiple inlet pipes
  - grated inlets.

  The MultiCeptor™ model is available in the same sizes as the standard HumeCeptor® units (refer to Table 3 below) and a 2,400 mm diameter MultiCeptor™ unit is also available to accommodate drainage pipes up to 1,800 mm diameter.

Figure 11 – The MultiCeptor™ model

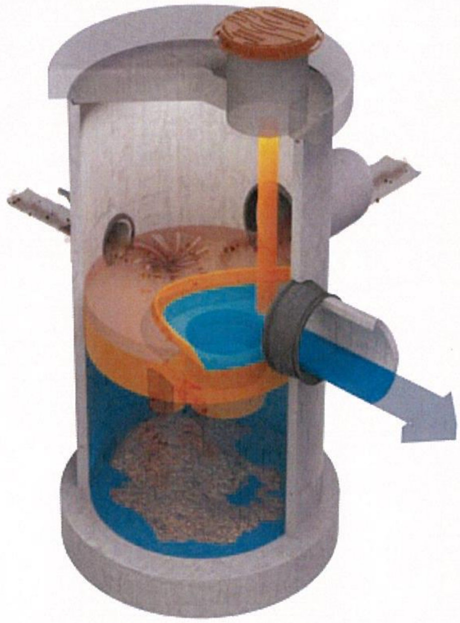


Table 3 – MultiCeptor™ model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
MI3	100 - 1,350	1,800	1.68	2	1,020	3,410
MI5			2.13	3		4,550
MI7			3.03	5		6,820
MI9		2,440	2.69	6	1,900	9,090
MI14			3.69	10	2,980	13,640
MI18		3,060	3.44	14		18,180
MI23			4.04	18		22,730
MI27			3.84	20	4,290	27,270
MI9 - MI27 (2,400)	100 - 1,800	2,400	2.69 - 3.84	6 - 20	1,900 - 4,290	9,090 - 27,270

- **The DuoCeptor™ model**

The DuoCeptor™ model has been developed to treat larger catchments (2 Ha - 6 Ha) because some constrained developments can only accommodate a single, large device instead of several smaller devices.

The unit operates by splitting the flow and treating half of the design flow through the first chamber. The untreated half of the design flow bypassed from the first chamber then passes through the split connection pipe into the second chamber for treatment. Treated flow from the first chamber exits and flows through the other side of the split connection pipe, and bypasses the second chamber to join the treated flow from the second chamber at the outlet of the DuoCeptor™ model.

Figure 12 displays the DuoCeptor™ model and Table 4 details the range of capacities available.

Figure 12 – The DuoCeptor™ model

Table 4 – DuoCeptor™ model range and details

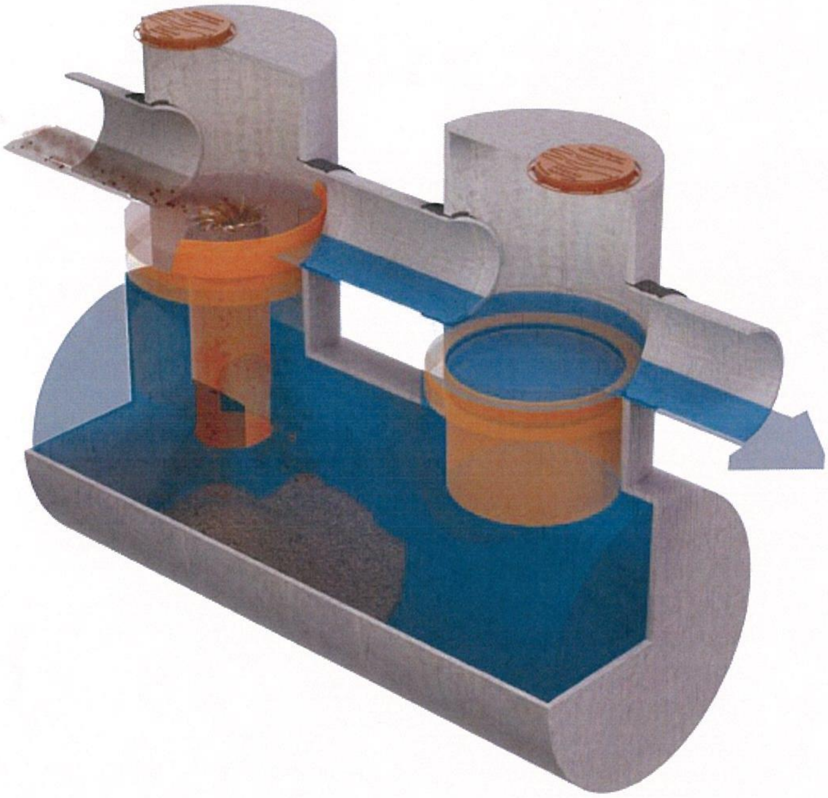
DuoCeptor™ model	Pipe diameter (mm)	Device footprint (L x W)	Depth from pipe invert (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
STC 40	600 - 1,350	7,750 x 3,500	3.41	27	10,585	42,370
STC 50			4.01	35	10,585	50,525
STC 60		9,150 x 4,200	3.89	42	11,560	60,255

- **The HumeCeptor® MAX model**
  The HumeCeptor® MAX model (refer to Figure 13) was developed to meet the market need for a single, large, end-of-pipe solution for TSS and hydrocarbon removal. Utilising the HumeCeptor® system's proven capture and scour prevention technology, it is ideal for very large commercial and industrial sites (>6 Ha) (eg. quarries, mine sites and stockpile areas) that need to achieve at least 50% TSS removal and hydrocarbon capture. The HumeCeptor® MAX model can be expanded to almost any capacity required.

  Sizing for the HumeCeptor® MAX model must be calculated separately from the PCSWMM software for the HumeCeptor® system. Contact Humes Water Solutions for assistance.

- **The HumeCeptor® EOS model**
  The HumeCeptor® EOS (Emergency Oil Spill) system provides you with the maximum protection against hydrocarbon spills at petrol stations, highway interchanges and intersections. It combines the passive, always-operating functions of the HumeCeptor® system, with additional emergency storage to capture the volume of spill required by your road authority. Standard designs include 30,000 L and 50,000 L of total hydrocarbon storage but these can be modified to suit any specified volume.

Figure 13 – The HumeCeptor® MAX model



Design information

To design a system suitable for your project it is necessary to review the configuration of the stormwater system, the location and purpose of other stormwater management (WSUD) controls, the catchment area and hydrology.

Configuration of the stormwater system

As a cylindrical system, HumeCeptor® hydrodynamic separators are much more flexible for accommodating inlet and outlet pipes on angles than rectangular systems.

Location in the stormwater system

Specifically designed for capturing fine sediment and hydrocarbons, the HumeCeptor® system is best suited to "at source" applications. Therefore, it should be located immediately downstream of the catchment area to be treated, e.g. car parks, loading bays, refuelling stations, wash bays.

Catchment area

As a general rule, larger catchment areas require larger HumeCeptor® units. If the catchment area is unstable (e.g. exposed soil) or contributes unusually high pollutant loads (e.g. landscape supply yards), larger units are more appropriate.

Sizing the HumeCeptor® system

PCSWMM software for the HumeCeptor® system is the decision support tool used for identifying the appropriate model. In order to size a unit, the following six design steps should be followed.

- **Step 1 – Project details and WQOs**
  Enter the project details in the appropriate cells, clearly identifying the water quality objectives (WQO) for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a Particle Size Distribution (PSD). In most Australian situations, this WQO is for 80% TSS removal, but a PSD is not defined. This can be determined from relevant research data or from site monitoring.
- **Step 2 – Site details**
  Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of paved surfaces, sidewalks and rooftops.
- **Step 3 – Upstream detention/retention**
  The HumeCeptor® system is designed as a water quality device and is sometimes used in conjunction with on site water quantity control such as ponds or underground detention systems. Where possible, it is more beneficial to install a HumeCeptor® unit upstream of a detention system, as the sediment load is reduced and the maintenance interval between cleaning is maximised.

  Where the HumeCeptor® system is installed downstream of a detention system it will alter the hydrology of the catchment and will influence the size of the unit selected by the software. When a detention system is installed upstream of a HumeCeptor® unit, enter the footprint area and flow characteristics into the model.

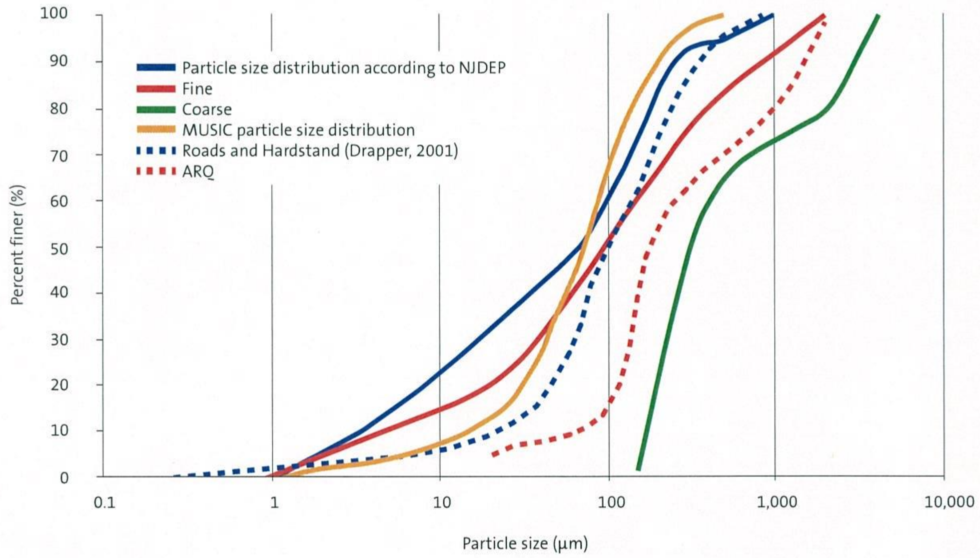
- **Step 4 – Particle Size Distribution (PSD)**
  It is critical that the PSD is defined as part of the WQO. The design of the treatment system relies on a Stoke's Law settling (and floating) process, and selection of the target PSD influences the model outcomes.

  If the objective is for long term removal of 80% of TSS on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (>150 microns) only provides relatively poor removal efficiency of finer particles (<75 microns) that may be naturally present in site runoff. PCSWMM allows the user to enter their own PSD or select from a range of options in the program (refer to Figure 14 below).

- **Step 5 – Rainfall records**
  The rainfall data provided with PCSWMM for the HumeCeptor® system provides an accurate storm hydrology estimation by modelling actual historical storm events including duration, intensities and peaks. Local historical rainfall has been acquired from the Bureau of Meteorology. Select the nearest rainfall station from the list.

- **Step 6 – Summary**
  At this point, the software is able to predict the level of TSS removal from the site. Once the simulation has been completed, a table is generated identifying the TSS removal of each unit. Based on the WQO identified in Step 1, the recommended HumeCeptor® system unit will be highlighted.

Figure 14 – PSCWMM for HumeCeptor® system - PSD



MUSIC/pollutant export model inputs

Many local authorities utilise MUSIC or other pollutant export models to assist in stormwater treatment train selection, and recommend generic inputs for GPTs and hydrodynamic separators.

Considering these against the independent research results in Table 1 on page 4, and PCSWMM modelling used to size a HumeCeptor® unit, the conservative removal efficiencies in Table 5 below are recommended on an annual basis (i.e. no bypass). Humes Water Solutions can optimise the values to suit your specific site.

Table 5 – MUSIC inputs for the HumeCeptor® system

Pollutant	Removal efficiency
TSS	80%
TN	30%
TP	30%

System installation

Top:
Installation of the base section (step 3)

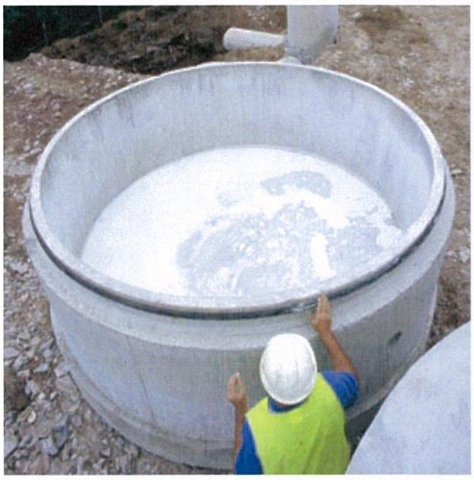
Middle:
Installation of the bypass chamber (step 6)

Bottom:
System ready for connection of the inlet and outlet pipes (step 8)

The installation of the HumeCeptor® unit should conform in general to local authority's specifications for stormwater pit construction. Detailed installation instructions are dispatched with each unit.

The HumeCeptor® system is installed as follows:

1. Excavate and stabilise the site.
2. Prepare the geotextile and aggregate base.
3. Install the treatment chamber base section.
4. Install the treatment chamber section/s (if required).
5. Prepare the transition slab (if required).
6. Install the bypass chamber section.
7. Fit the inlet drop pipe and decant pipe (if required).
8. Connect inlet and outlet pipes as required.
9. Backfill to transition slab level.
10. Install the maintenance access chamber section (if required).
11. Install the frame and access cover/grate.
12. Backfill to finished surface/base course level and complete surface pavement.



System maintenance

The design of the HumeCeptor® system means that maintenance is conducted with a vacuum truck which avoids entry into the unit.

If the HumeCeptor® unit is sized using the PCSWMM guidelines, a maximum interval of annual maintenance is recommended.

A typical maintenance procedure includes:

1. Open the access cover.
2. Insert the vacuum hose into the top of the treatment chamber via the decant (outlet) pipe.
3. Remove the oily water until the level is just below the lower edge of the decant pipe.
4. Lower a sluice gate into the nearest upstream junction pit and decant the water from the treatment chamber into the upstream pit until the sediment layer is exposed.
5. Remove the sediment layer into the vacuum truck for disposal.
6. Raise the upstream sluice gate and allow water to return into the HumeCeptor® unit.
7. Replace access cover.

FAQs

- **Will it capture litter?**
  Yes, items such as cigarette butts, plastic bags and smaller gross pollutants will be captured by the HumeCeptor® system. It is, however, primarily designed for hydrocarbon and fine sediment removal, so if litter is expected from the catchment an upstream GPT is recommended.
- **Do I need to model a bypass flow for the HumeCeptor® system in MUSIC?**
  No, PCSWMM software for the HumeCeptor® system analyses all flows from the catchment to determine 80% TSS removal on an annual basis. Therefore, the output efficiency of PCSWMM for the selected model can be incorporated into a MUSIC treatment node without a bypass flow.
- **Does it matter if I can't remove all of the captured sediment during maintenance?**
  These systems are designed with a factor of safety so it will continue to function effectively even if maintenance does not completely remove all captured sediment.
- **What if the PSD from my site is different to those in the software?**
  Humes Water Solutions has the ability to model a user-defined PSD in PCSWMM software for the HumeCeptor® system. If you have PSD results contact us for assistance.
- **Do I have to use the model that PCSWMM software highlights?**
  No, in most stormwater treatment trains, there are other measures upstream and/or downstream. Select the unit size that you need to achieve your desired removal efficiency in the context of your overall concept. Remember that selecting a model that removes less TSS will also remove less TN and TP.
- **Is it possible to change the hydrology model defaults in PCSWMM?**
  Yes, Humes Water Solutions has the ability to vary these inputs. Please contact us for further assistance.
- **Will the HumeCeptor® system wet sump release nutrients?**
  Over time organic material will break down and release nutrients in all treatment measures whether natural or manufactured. As part of a treatment train, downstream natural measures can remove nutrients released during dry weather flows. A regular maintenance program will reduce the amount of break down occurring (Ball and Powell, 2006).

- **Why is the HumeCeptor® system not sized on flow rate?**
  The HumeCeptor® system is sized using actual historical rainfall and an algorithm based on research (Novotny and Chesters 1981, Charbeneau and Barrett, 1988, Ball and Abustan 1995, Sartor and Boyd 1972) showing that pollutants build up and wash off a catchment which is influenced by time, Particle Size Distribution (PSD), rainfall volume and intensity. These form a pollutograph that the software uses to calculate the HumeCeptor® system performance for all flows in every event over the rainfall period. The software then recommends the model that will remove 80% of TSS load from all of these events.

- **How is the HumeCeptor® system different to a GPT?**
  The HumeCeptor® system is specifically designed to target fine sediment and hydrocarbons. Therefore, it is designed to maintain velocities through the treatment chamber <0.02 m/s. A GPT is designed to capture gross pollutants (>1 mm). For a GPT to function in an equivalent way to a HumeCeptor® system, the treatment chamber velocity must be <0.02 m/s.

- **Why would I use a HumeCeptor® system when I can use a biofilter?**
  Using a HumeCeptor® system upstream of a biofilter acts as a non- scouring sediment forebay, containing sediment to a confined location for easy removal. This protects the biofilter and lengthens its lifespan.

References

- Novotny, V and Chesters, G (1981) "Handbook of Non-Point Pollution Sources and Management", John Wiley and Sons, New York.
- Charbeneau ,RJ and Barrett, M.E (1998) "Evaluation of Methods for Estimating Stormwater Pollutant Loads", Water environment research 70 (7): 1,295 - 1,302.
- Ball, J and Abustan, I (1995) "An Investigation of the Particle Size Distribution During Storm Events on an Urban Catchment", Prol. the 2nd Int. Symposium on Urban Stormwater Management 1995 pp 531 - 535, IEAUST, Melbourne, Nat. Conf. Pub. 95/3.
- Sartor, J.D and Boyd, G.B (1972) "Water Pollutant Aspects of Street Surface Contaminants", US EPA (EPA - R2 - 72 - 081) Washington, DC.
- Ball, J and Powell, M (2006) "Influence of Anaerobic Breakdown on the Selection of Appropriate Urban Stormwater Management Measures", SIA Annual Conference.
- Schueler, Tom and David Shepp (1993) "The Quality of Trapped Sediments and Pool Water Within Oil Grit Separators in Suburban Maryland", Metropolitan Council of Governments.

The HumeCeptor® system

Humes Water Solutions

Humes Water Solutions is a specialist division within the Humes business, dedicated to the provision of stormwater treatment, harvesting and reuse, and detention solutions.

Our team has been developed to provide an unparalleled depth of knowledge and experience for our customers, which takes Humes Water Solutions beyond the traditional barriers of company-based solutions. A combination of graduate and post graduate personnel with working backgrounds in the private and public sector ensures the delivery of well-measured and practical advice for our customers.

We are dedicated to the development and protection of our water resources and to this end we undertake rigorous research and development of our products, stay abreast of stormwater issues and solutions around the world, and publish peer-reviewed technical papers on issues relevant to the stormwater industry.

As a part of the Humes business, Humes Water Solutions has access to a national infrastructure, a dedicated engineering design team, and over 100 years design, manufacturing and construction experience.

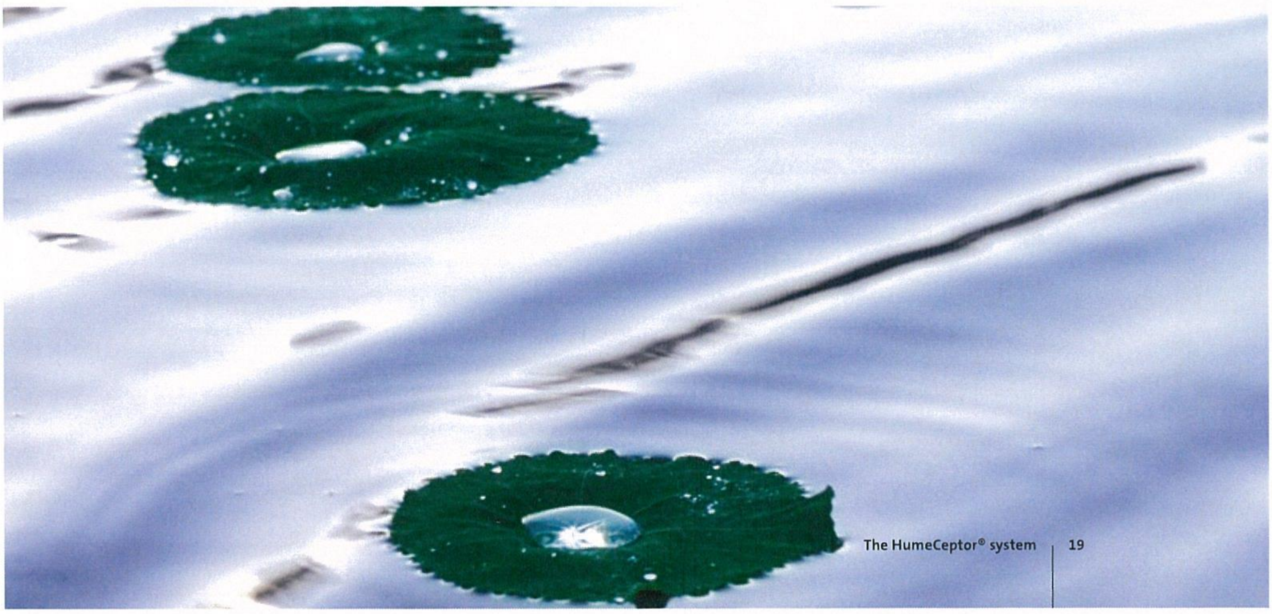
Humes now operates 16 accredited plants (ISO9001) and 20 sales offices to provide a truly national footprint and meet the needs of our customers irrespective of their location.

Our range of stormwater solutions also includes our multi-award winning* RainVault® harvesting and reuse system, and the new StormTrap® detention system.

For Humes and its parent company, Holcim Ltd, sustainable development is a key priority. Our stormwater treatment products demonstrate our commitment to protecting the environment.

For more information on any of our products, or for a selection of technical papers published by Humes Water Solutions, please visit us at humeswatersolutions.com.au.

*
- 2008 Winner - Excellence in Stormwater Harvest & Reuse for the Riverstone Crossing RainVault from the Stormwater Industry Association.
- 2008 Fieldforce Environmental Product of the Year Award from the Master Plumbers and Mechanical Services Association of Australia.
- 2006 CivEnEx - Most Innovative Product.



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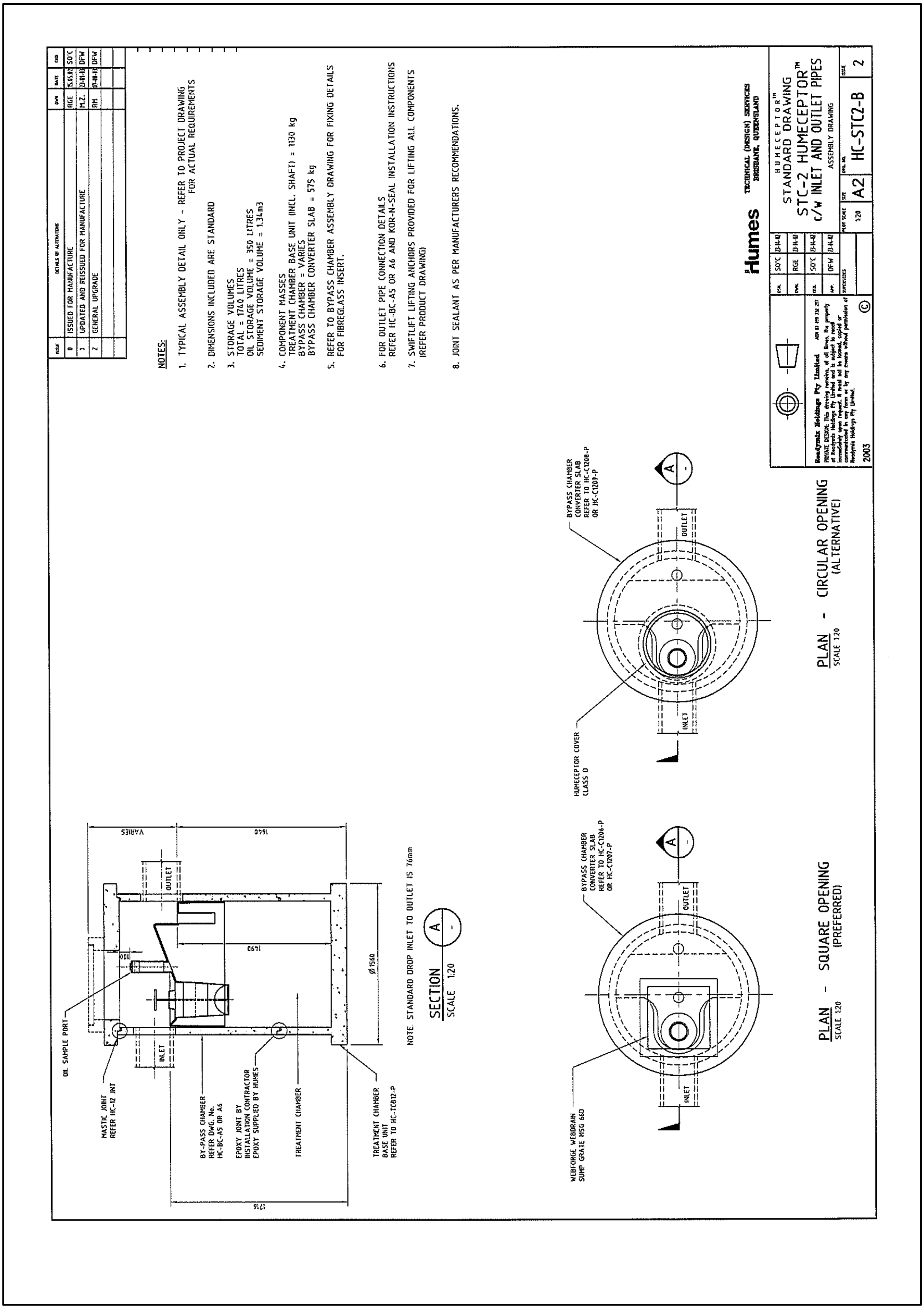
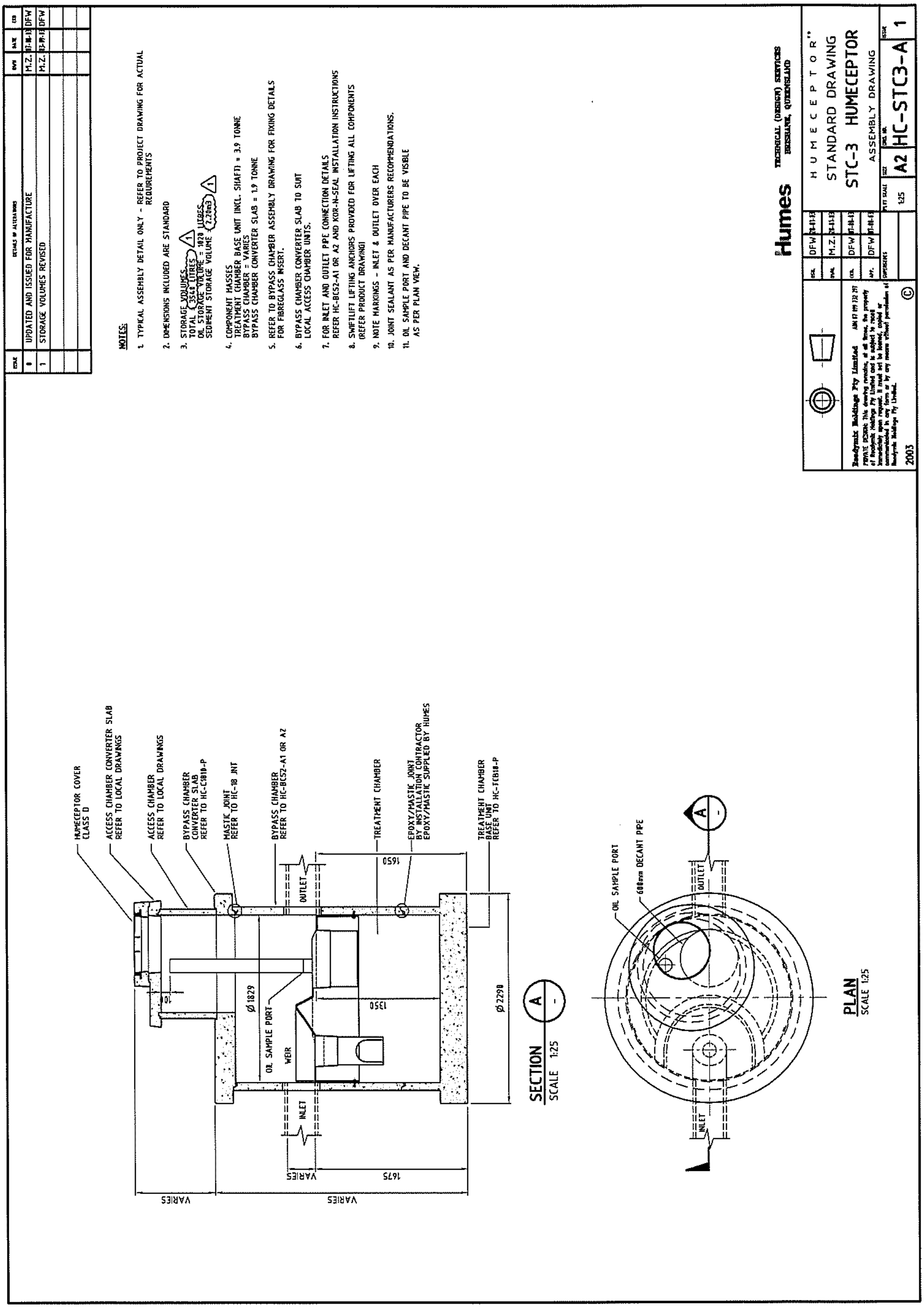
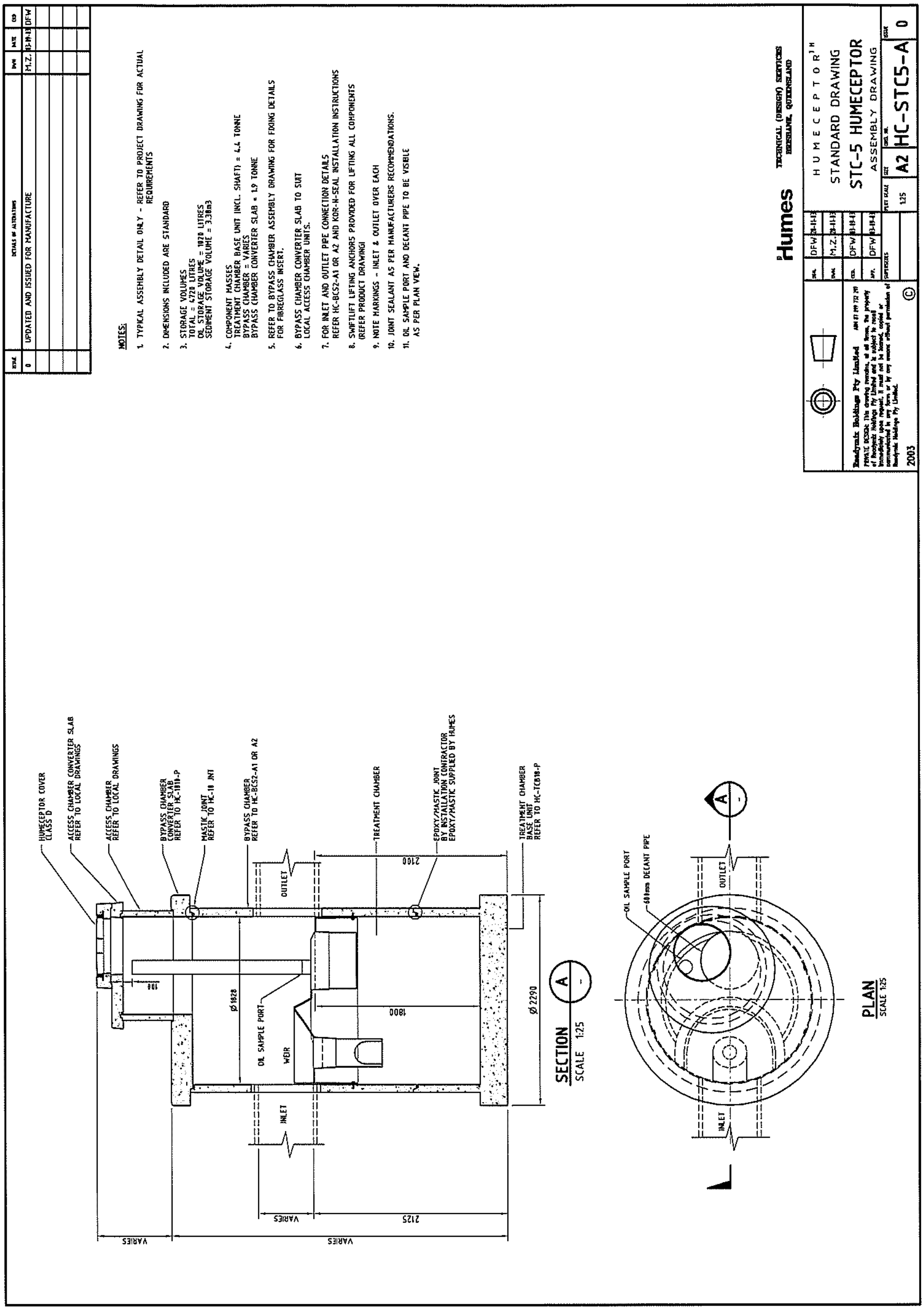
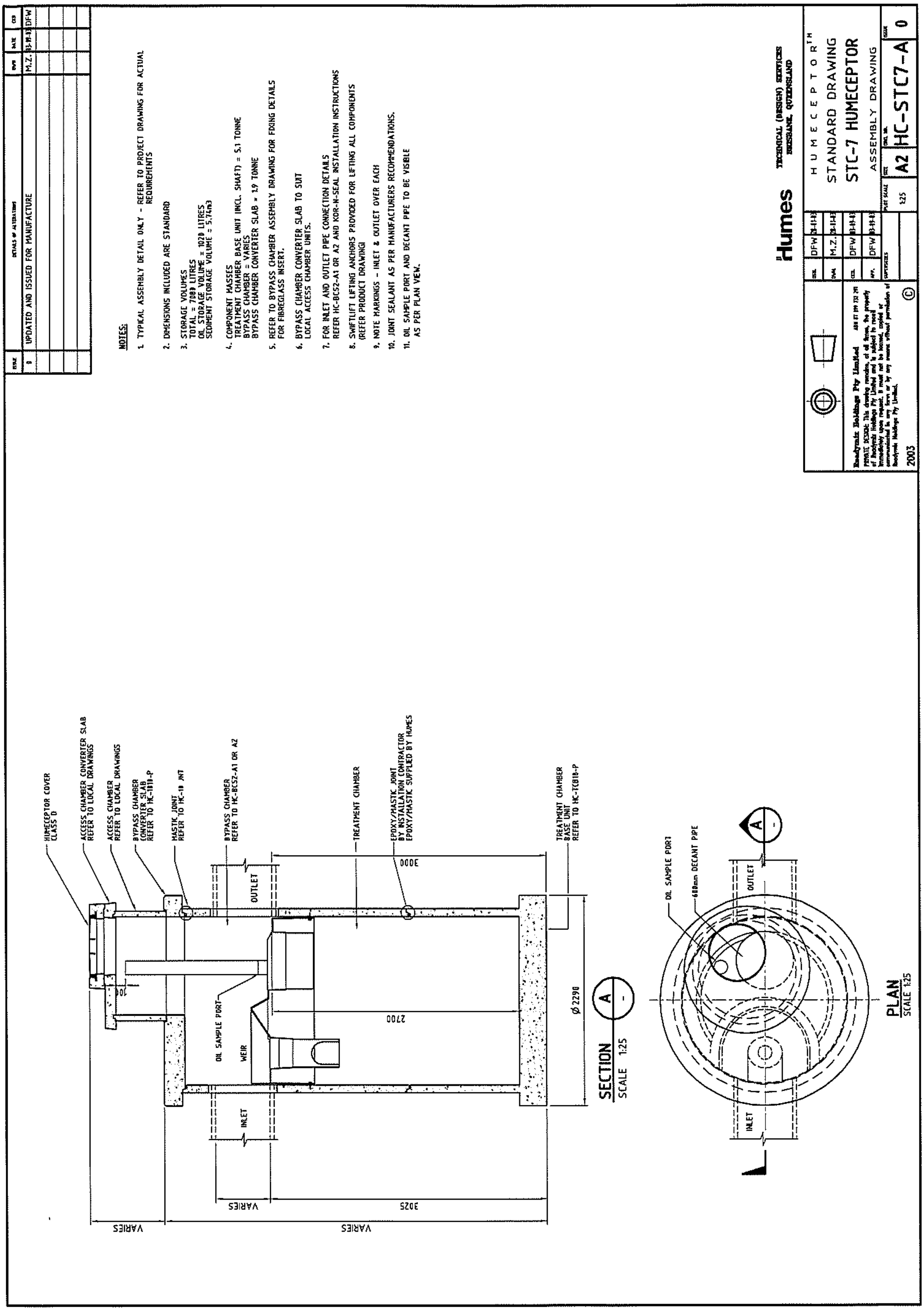
Appendices

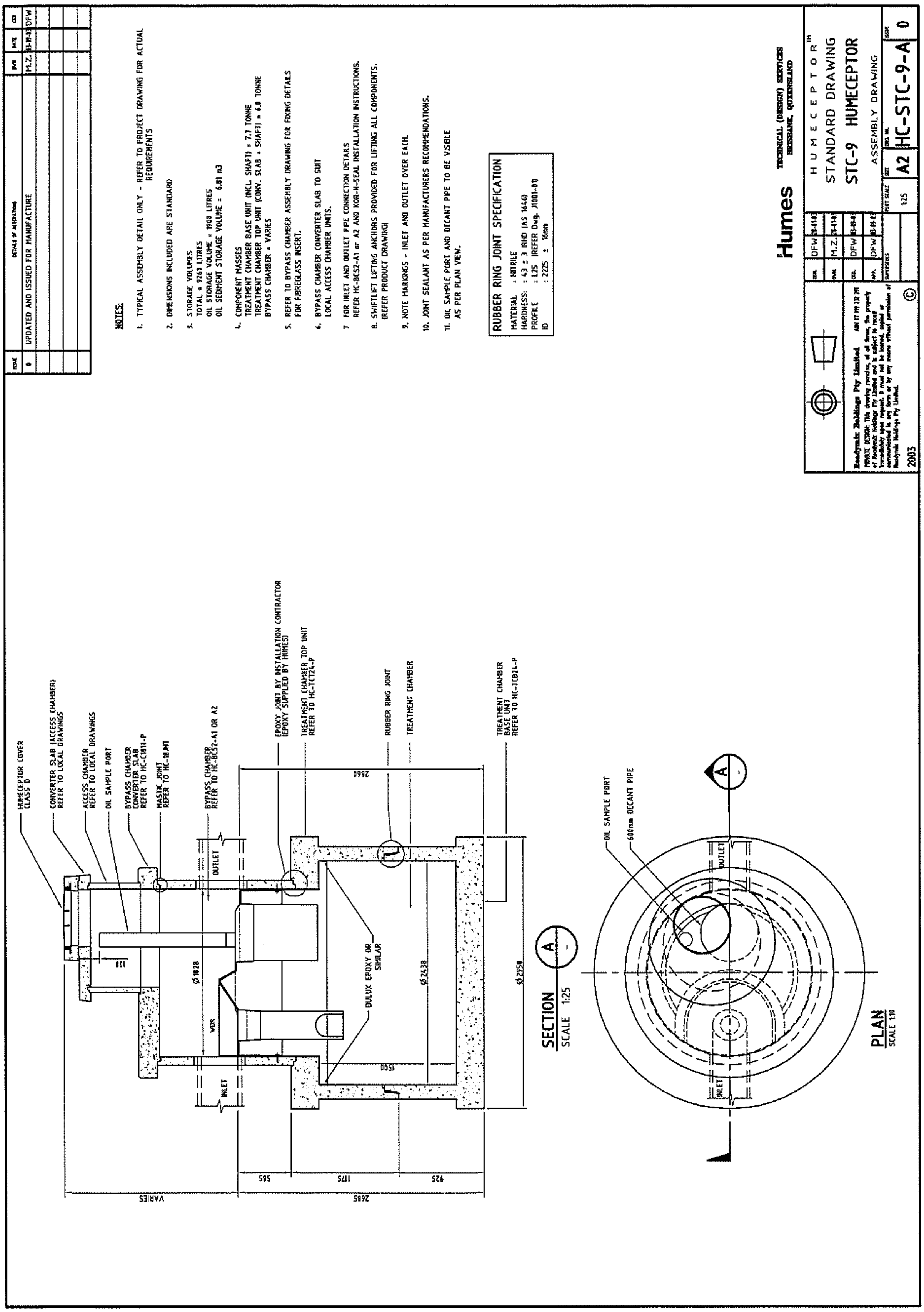
HumeCeptor® system technical drawings
HumeCeptor® system design worksheet
HumeCeptor® system quotation and order form

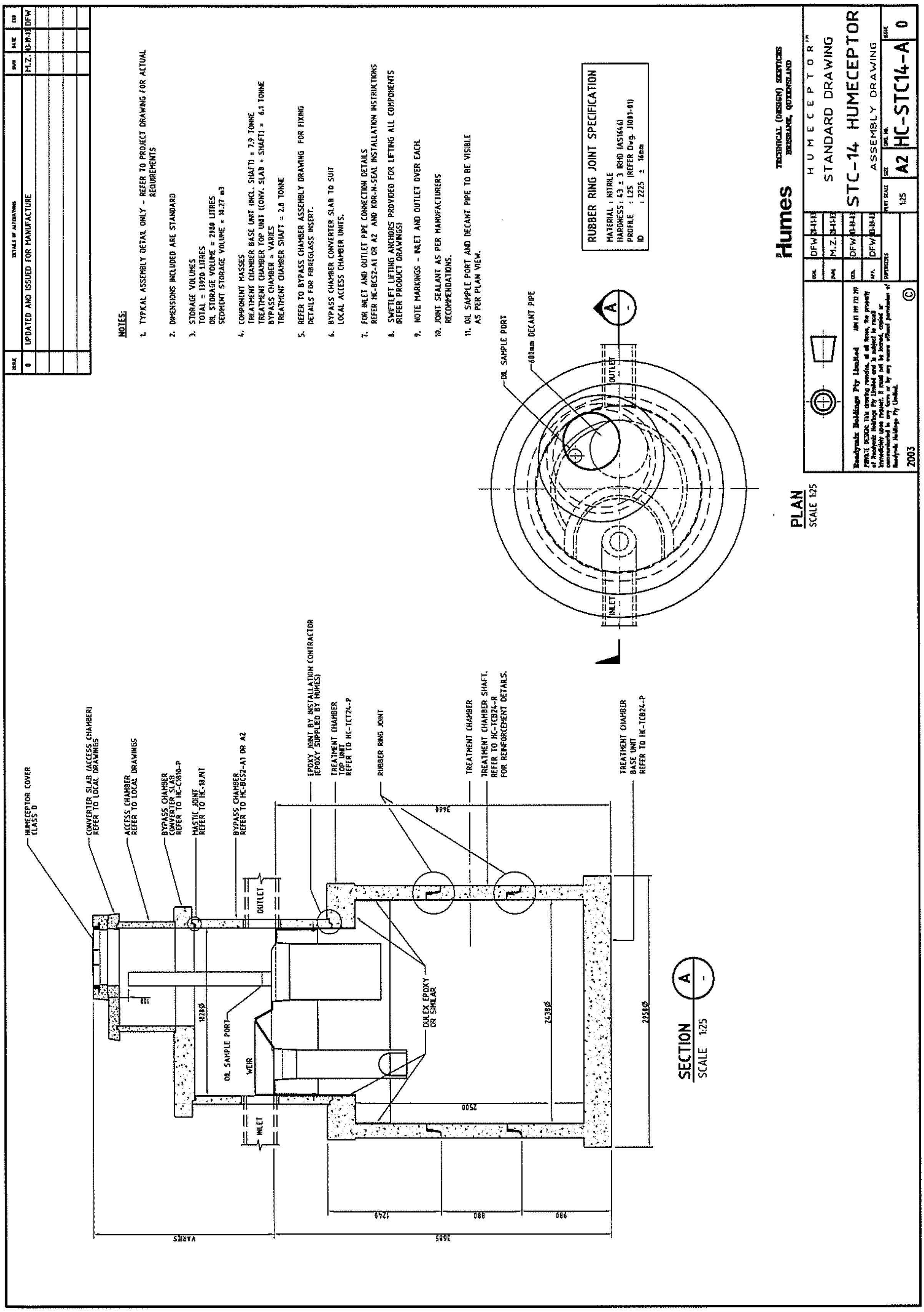

OIL SAMPLE PORT
MASTIC JOINT REFER HC-12 JNT
INLET
OUTLET
VARIES
BY-PASS CHAMBER REFER DWG. No. HC-BC-A5 OR A6
EPOXY JOINT BY INSTALLATION CONTRACTOR EPOXY SUPPLIED BY HUMES
TREATMENT CHAMBER
TREATMENT CHAMBER BASE UNIT REFER TO HC-TCB12-P
1716
1490
1640
Ø 1560
NOTE. STANDARD DROP INLET TO OUTLET IS 76mm
SECTION A
SCALE 1:20
WEBFORGE WEBDRAIN SUMP GRATE MSG 66D
BYPASS CHAMBER CONVERTER SLAB REFER TO HC-C1206-P OR HC-C1207-P
PLAN - SQUARE OPENING (PREFERRED)
SCALE 1:20
HUMECEPTOR COVER CLASS D
BYPASS CHAMBER CONVERTER SLAB REFER TO HC-C1208-P OR HC-C1209-P
PLAN - CIRCULAR OPENING (ALTERNATIVE)
SCALE 1:20
ISSUE | DETAILS OF ALTERATIONS | DWN | DATE | CKD
0 | ISSUED FOR MANUFACTURE | RGE | 15.05.02 | SO'C
1 | UPDATED AND REISSUED FOR MANUFACTURE | M.Z. | 23-01-03 | DFW
2 | GENERAL UPGRADE | RH | 07-08-03 | DFW
NOTES:
1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
TOTAL = 1740 LITRES
OIL STORAGE VOLUME = 350 LITRES
SEDIMENT STORAGE VOLUME = 1.34m3
4. COMPONENT MASSES
TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 1130 kg
BYPASS CHAMBER = VARIES
BYPASS CHAMBER CONVERTER SLAB = 575 kg
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. FOR OUTLET PIPE CONNECTION DETAILS REFER HC-BC-A5 OR A6 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
7. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
8. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
Humes
TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND
HUMECEPTOR™
STANDARD DRAWING
STC-2 HUMECEPTOR™
c/w INLET AND OUTLET PIPES
ASSEMBLY DRAWING
Readymix Holdings Pty Limited
2003
1:20
A2
HC-STC2-B
2

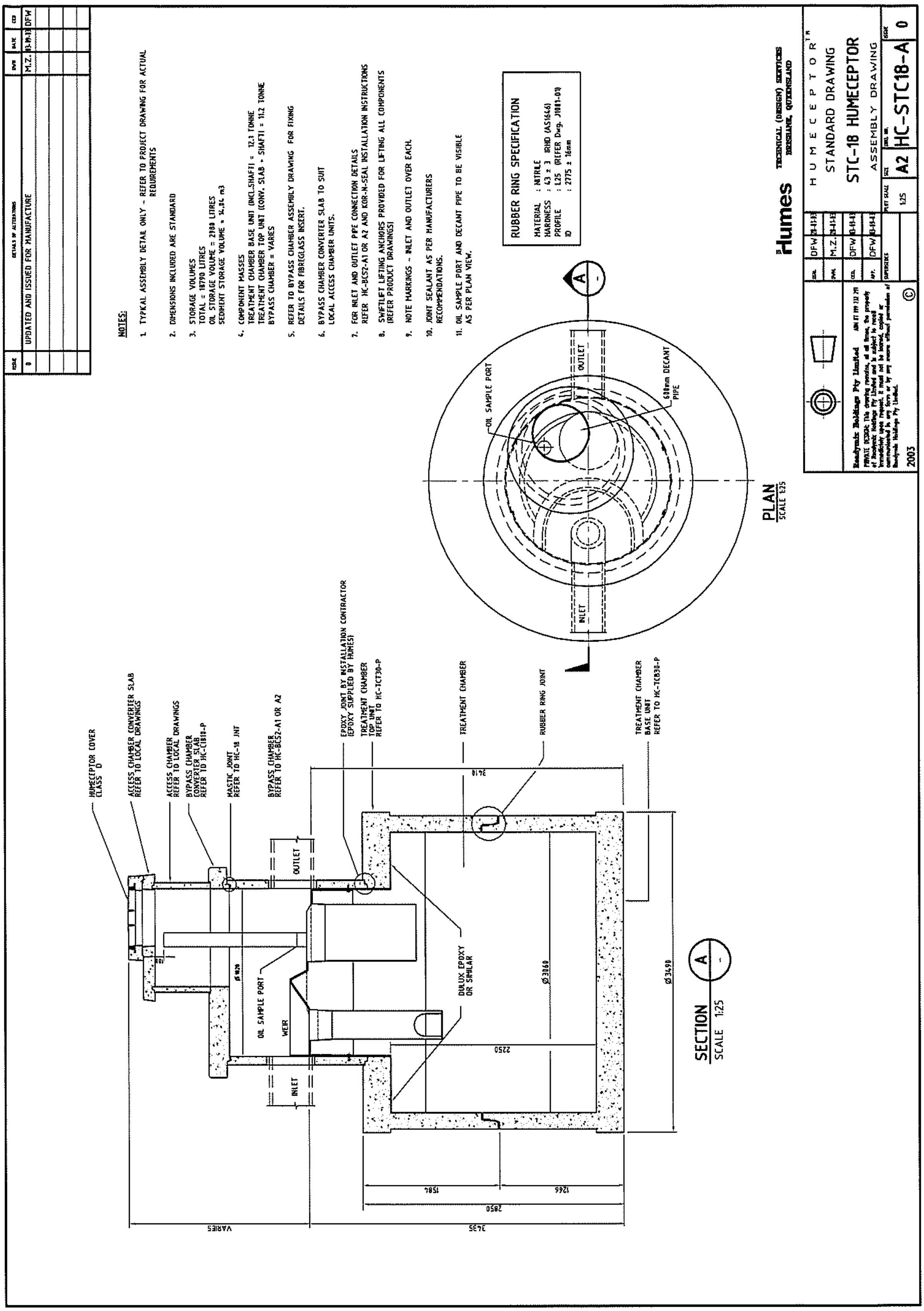

UPDATED AND ISSUED FOR MANUFACTURE
STORAGE VOLUMES REVISED
M.Z.
DFW
NOTES:
1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES TOTAL 3540 LITRES OIL STORAGE VOLUME = 1020 LITRES SEDIMENT STORAGE VOLUME 2.20m3
4. COMPONENT MASSES TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 3.9 TONNE BYPASS CHAMBER = VARIES BYPASS CHAMBER CONVERTER SLAB = 1.9 TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
9. NOTE MARKINGS - INLET & OUTLET OVER EACH
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
Humes
HUMECEPTOR
STANDARD DRAWING
STC-3 HUMECEPTOR
ASSEMBLY DRAWING
1:25
A2
HC-STC3-A
1
2003
HUMECEPTOR COVER CLASS D
ACCESS CHAMBER CONVERTER SLAB REFER TO LOCAL DRAWINGS
ACCESS CHAMBER REFER TO LOCAL DRAWINGS
BYPASS CHAMBER CONVERTER SLAB REFER TO HC-C1810-P
MASTIC JOINT REFER TO HC-18 JNT
BYPASS CHAMBER REFER TO HC-BCS2-A1 OR A2
TREATMENT CHAMBER
EPOXY/MASTIC JOINT BY INSTALLATION CONTRACTOR EPOXY/MASTIC SUPPLIED BY HUMES
TREATMENT CHAMBER BASE UNIT REFER TO HC-TCB18-P
OUTLET
INLET
OIL SAMPLE PORT
WEIR
Ø1829
Ø2290
1650
1350
1675
VARIES
SECTION SCALE 1:25
OIL SAMPLE PORT
600mm DECANT PIPE
PLAN SCALE 1:25

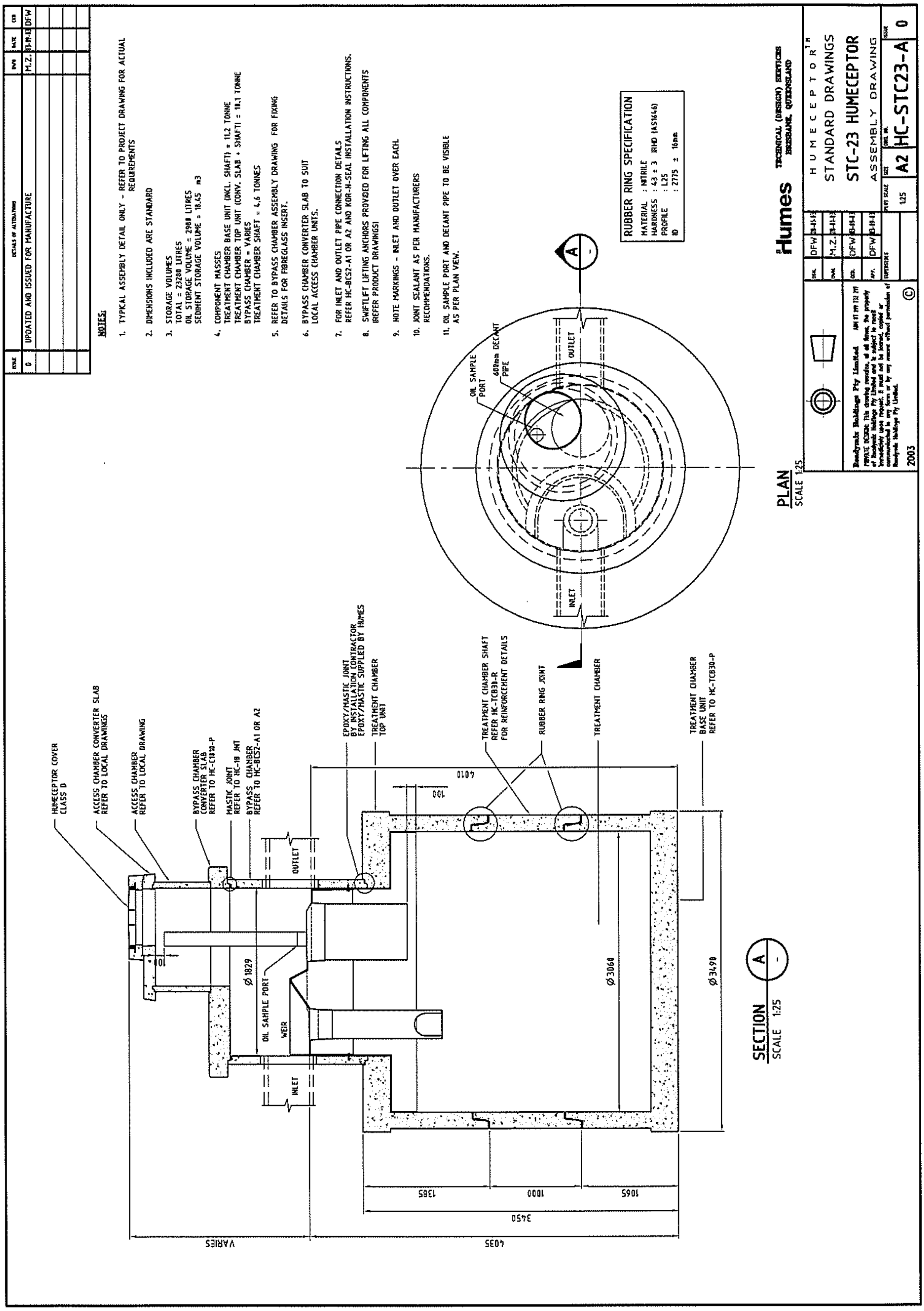

UPDATED AND ISSUED FOR MANUFACTURE
M.Z. DFW
NOTES:
1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
TOTAL = 4720 LITRES
OIL STORAGE VOLUME = 1070 LITRES
SEDIMENT STORAGE VOLUME = 3.30m3
4. COMPONENT MASSES
TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 4.4 TONNE
BYPASS CHAMBER = VARIES
BYPASS CHAMBER CONVERTER SLAB = 1.9 TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
9. NOTE MARKINGS - INLET & OUTLET OVER EACH
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
Humes
TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND
HUMECEPTOR
STANDARD DRAWING
STC-5 HUMECEPTOR
ASSEMBLY DRAWING
DFW
M.Z.
DFW
DFW
1:25
A2
HC-STC5-A
0
2003
HUMECEPTOR COVER CLASS D
ACCESS CHAMBER CONVERTER SLAB REFER TO LOCAL DRAWINGS
ACCESS CHAMBER REFER TO LOCAL DRAWINGS
BYPASS CHAMBER CONVERTER SLAB REFER TO HC-1010-P
MASTIC JOINT REFER TO HC-10 JNT
BYPASS CHAMBER REFER TO HC-BCS2-A1 OR A2
TREATMENT CHAMBER
EPOXY/MASTIC JOINT BY INSTALLATION CONTRACTOR EPOXY/MASTIC SUPPLIED BY HUMES
TREATMENT CHAMBER BASE UNIT REFER TO HC-TCB18-P
OUTLET
INLET
OIL SAMPLE PORT
WEIR
2100
1800
2125
VARIES
Ø1828
Ø2290
SECTION A SCALE 1:25
OIL SAMPLE PORT
600mm DECANT PIPE
PLAN SCALE 1:25

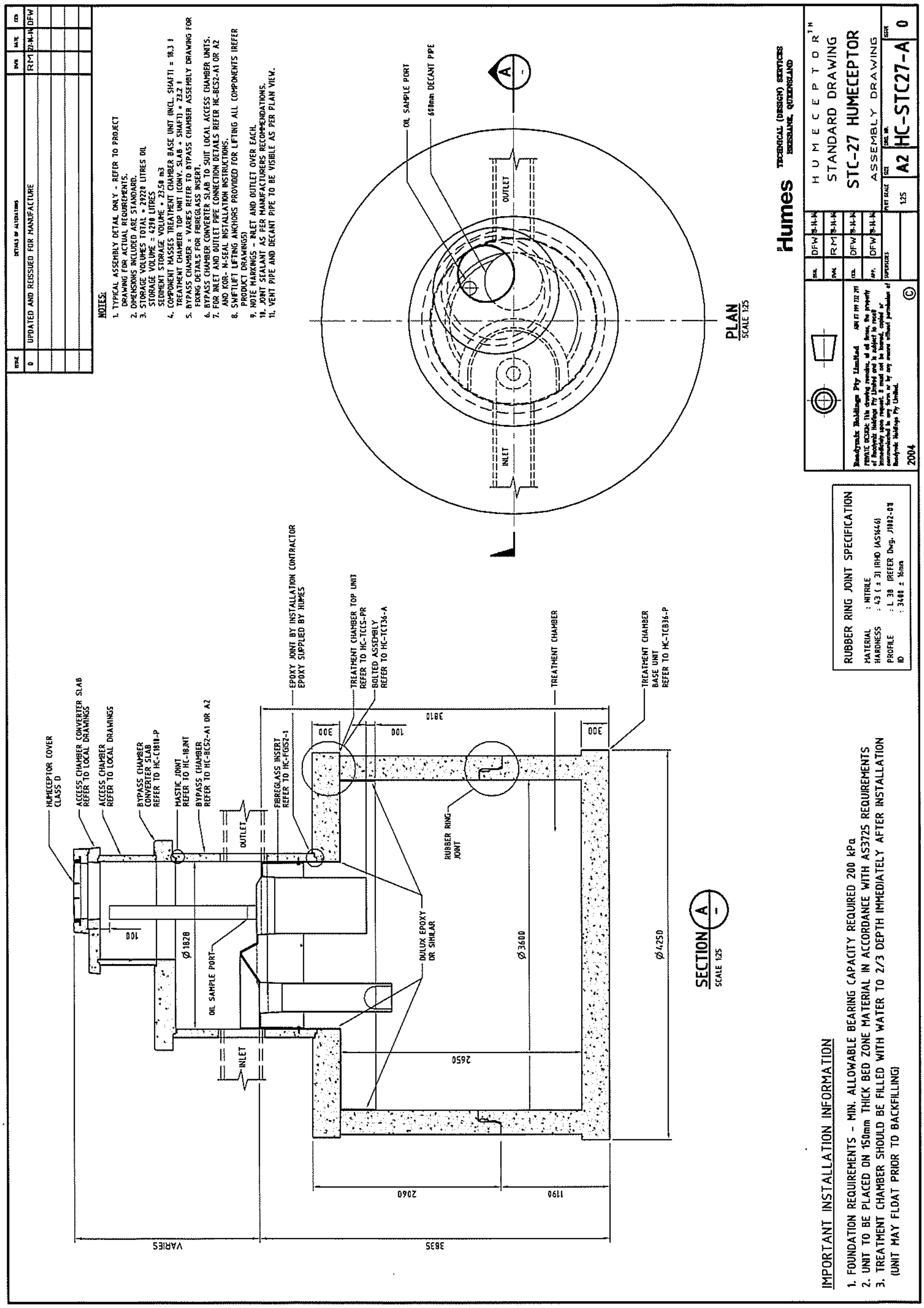

NOTES:
1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
TOTAL = 7080 LITRES
OIL STORAGE VOLUME = 1020 LITRES
SEDIMENT STORAGE VOLUME = 5.74m3
4. COMPONENT MASSES
TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 5.1 TONNE
BYPASS CHAMBER = VARIES
BYPASS CHAMBER CONVERTER SLAB = 1.9 TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
9. NOTE MARKINGS - INLET & OUTLET OVER EACH
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
UPDATED AND ISSUED FOR MANUFACTURE
M.Z.
DFW
HUMECEPTOR COVER CLASS D
ACCESS CHAMBER CONVERTER SLAB REFER TO LOCAL DRAWINGS
ACCESS CHAMBER REFER TO LOCAL DRAWINGS
BYPASS CHAMBER CONVERTER SLAB REFER TO HC-1818-P
MASTIC JOINT REFER TO HC-18 JNT
BYPASS CHAMBER REFER TO HC-BCS2-A1 OR A2
TREATMENT CHAMBER
EPOXY/MASTIC JOINT BY INSTALLATION CONTRACTOR EPOXY/MASTIC SUPPLIED BY HUMES
TREATMENT CHAMBER BASE UNIT REFER TO HC-TCB18-P
OUTLET
INLET
OIL SAMPLE PORT
WEIR
3000
2700
Ø 2290
3025
VARIES
SECTION
SCALE 1:25
OIL SAMPLE PORT
600mm DECANT PIPE
PLAN
SCALE 1:25
Humes
TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND
HUMECEPTOR™
STANDARD DRAWING
STC-7 HUMECEPTOR
ASSEMBLY DRAWING
1:25
A2
HC-STC7-A
0
2003

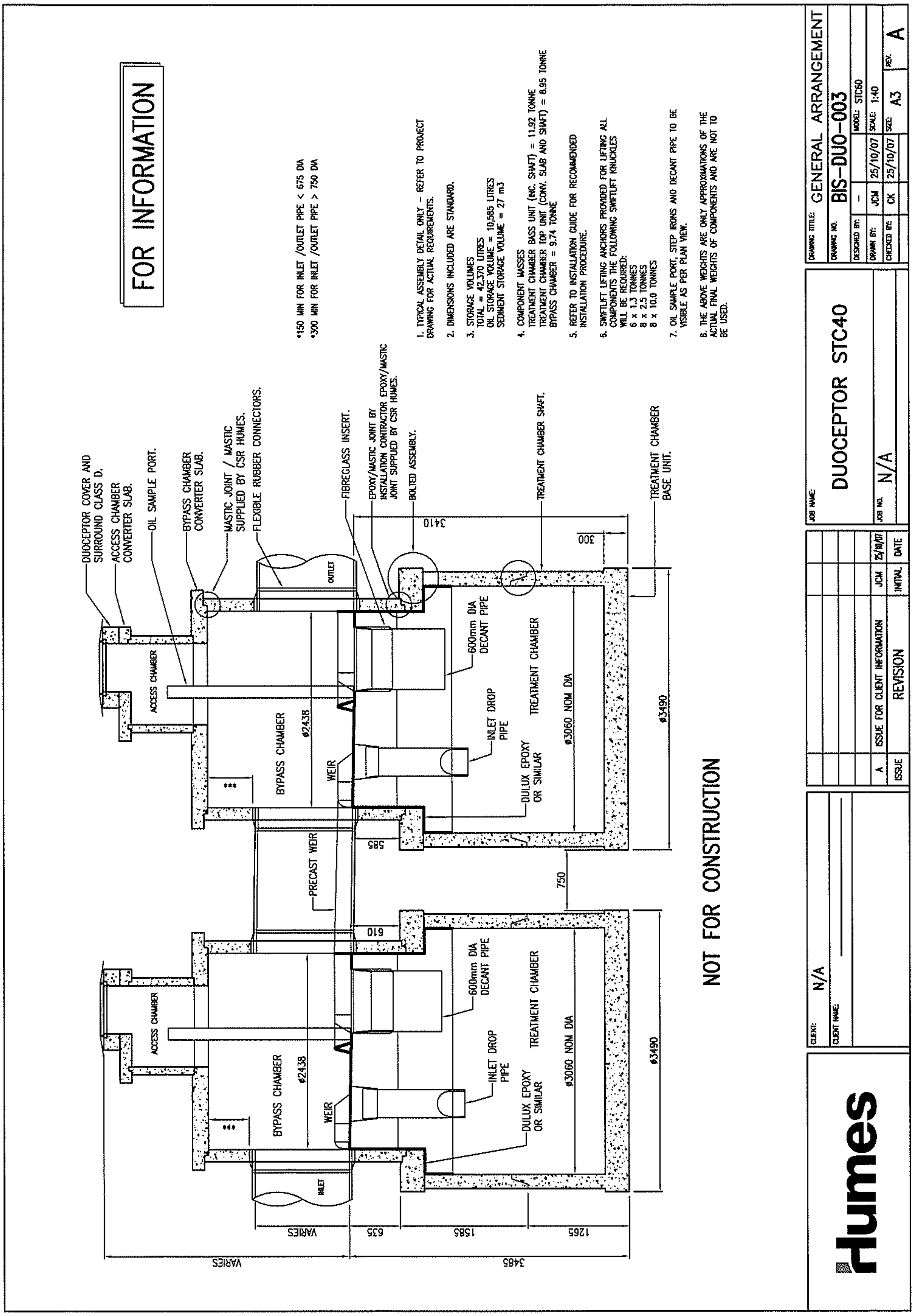

UPDATED AND ISSUED FOR MANUFACTURE
NOTES:
1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES TOTAL = 9269 LITRES OIL STORAGE VOLUME = 1908 LITRES OIL SEDIMENT STORAGE VOLUME = 6.81 m3
4. COMPONENT MASSES TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 7.7 TONNE TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 6.8 TONNE BYPASS CHAMBER = VARIES
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 or A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS.
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS. (REFER PRODUCT DRAWING)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
RUBBER RING JOINT SPECIFICATION
Humes
HUMECEPTOR
STANDARD DRAWING
STC-9 HUMECEPTOR
ASSEMBLY DRAWING
A2 HC-STC-9-A 0
SECTION SCALE 1:25
PLAN SCALE 1:10
OUTLET
INLET

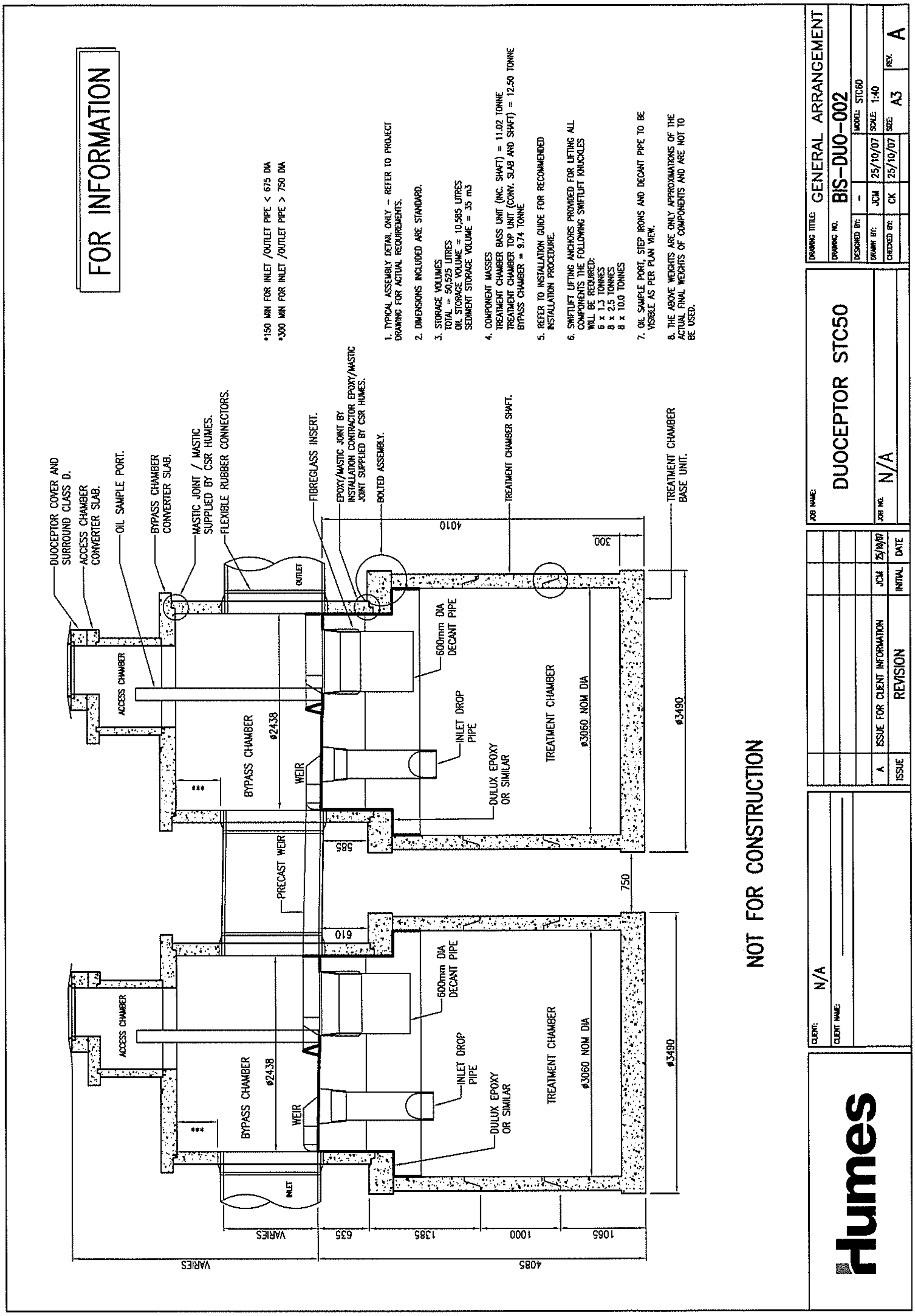

NOTES:
1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
TOTAL = 13920 LITRES
OIL STORAGE VOLUME = 2780 LITRES
SEDIMENT STORAGE VOLUME = 10.27 m3
4. COMPONENT MASSES
TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 7.9 TONNE
TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 6.1 TONNE
BYPASS CHAMBER = VARIES
TREATMENT CHAMBER SHAFT = 2.8 TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
RUBBER RING JOINT SPECIFICATION
MATERIAL : NITRILE
OIL SAMPLE PORT
600mm DECANT PIPE
INLET
OUTLET
PLAN
SCALE 1:25
SECTION
SCALE 1:25
HUMECEPTOR COVER CLASS D
CONVERTER SLAB (ACCESS CHAMBER) REFER TO LOCAL DRAWINGS
ACCESS CHAMBER REFER TO LOCAL DRAWINGS
BYPASS CHAMBER CONVERTER SLAB REFER TO HC-C1810-P
MASTIC JOINT REFER TO HC-18JNT
BYPASS CHAMBER REFER TO HC-BCS2-A1 OR A2
EPOXY JOINT BY INSTALLATION CONTRACTOR (EPOXY SUPPLIED BY HUMES)
TREATMENT CHAMBER TOP UNIT REFER TO HC-TCT24-P
RUBBER RING JOINT
TREATMENT CHAMBER
TREATMENT CHAMBER SHAFT. REFER TO HC-TCB24-R FOR REINFORCEMENT DETAILS.
TREATMENT CHAMBER BASE UNIT REFER TO HC-TCB24-P
DULEX EPOXY OR SIMILAR
OIL SAMPLE PORT
WEIR
VARIES
Humes
TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND
HUMECEPTOR
STANDARD DRAWING
STC-14 HUMECEPTOR
ASSEMBLY DRAWING
A2
HC-STC14-A
0
1:25
2003
UPDATED AND ISSUED FOR MANUFACTURE

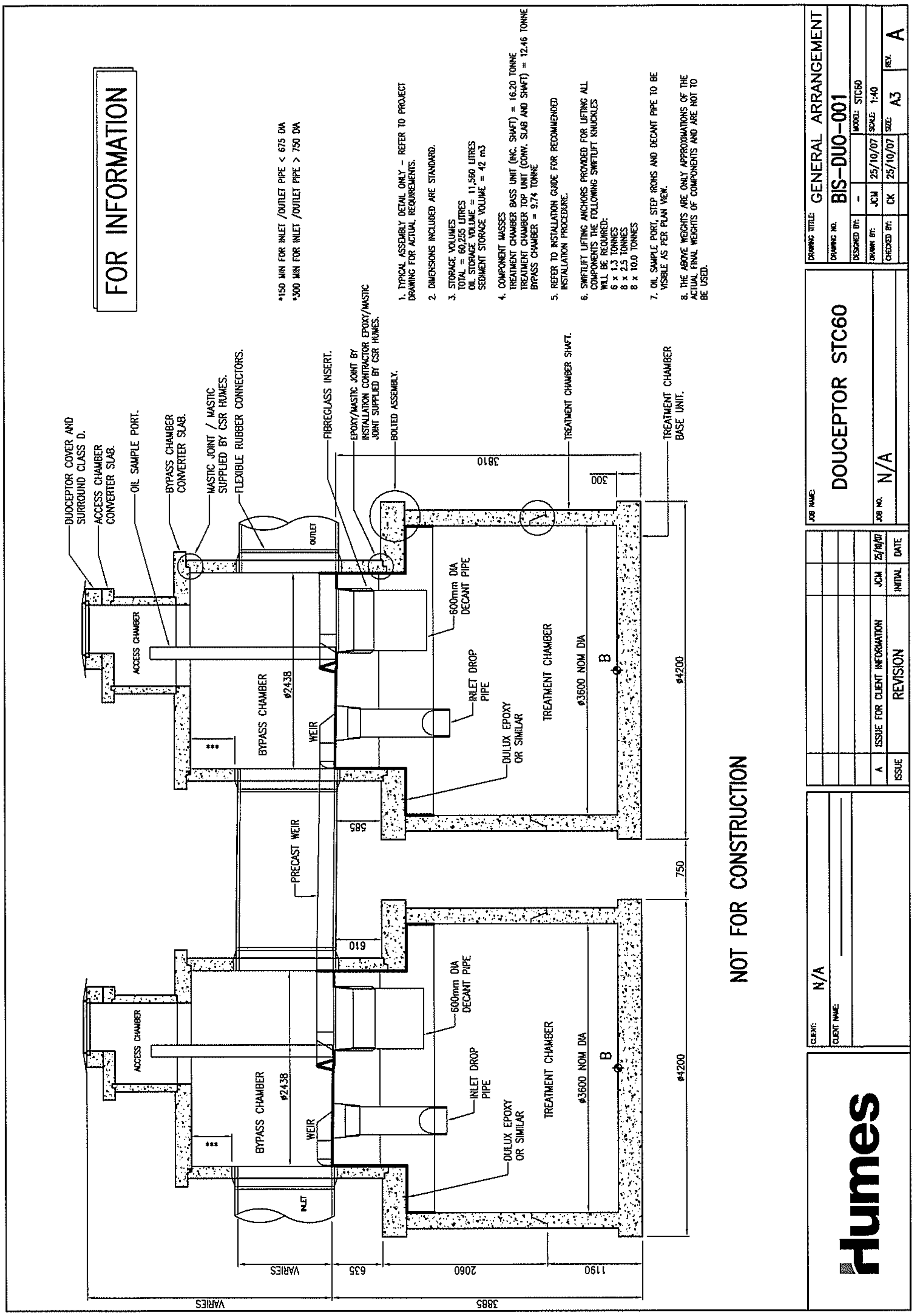

UPDATED AND ISSUED FOR MANUFACTURE
M.Z.
DFW
NOTES:
1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
TOTAL = 18790 LITRES
OIL STORAGE VOLUME = 2780 LITRES
SEDIMENT STORAGE VOLUME = 14.34 m3
4. COMPONENT MASSES
TREATMENT CHAMBER BASE UNIT (INCL.SHAFT) = 12.1 TONNE
TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 11.2 TONNE
BYPASS CHAMBER = VARIES
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
RUBBER RING SPECIFICATION
MATERIAL : NITRILE
HARDNESS : 43 ± 3 IRHD (AS1646)
PROFILE : L25 (REFER Dwg. J1081-01)
ID : 2775 ± 16mm
OIL SAMPLE PORT
OUTLET
600mm DECANT PIPE
INLET
PLAN
SCALE 1:25
HUMECEPTOR COVER CLASS D
ACCESS CHAMBER CONVERTER SLAB REFER TO LOCAL DRAWINGS
ACCESS CHAMBER REFER TO LOCAL DRAWINGS
BYPASS CHAMBER CONVERTER SLAB REFER TO HC-CIB18-P
MASTIC JOINT REFER TO HC-18 JNT
BYPASS CHAMBER REFER TO HC-BCS2-A1 OR A2
EPOXY JOINT BY INSTALLATION CONTRACTOR (EPOXY SUPPLIED BY HUMES)
TREATMENT CHAMBER TOP UNIT REFER TO HC-TCT30-P
TREATMENT CHAMBER
RUBBER RING JOINT
TREATMENT CHAMBER BASE UNIT REFER TO HC-TCB30-P
OIL SAMPLE PORT
WEIR
DULUX EPOXY OR SIMILAR
Ø 3060
Ø 3490
2250
3410
1584
1266
2850
3435
VARIES
SECTION A
SCALE 1:25
Humes
TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND
HUMECEPTOR™
STANDARD DRAWING
STC-18 HUMECEPTOR
ASSEMBLY DRAWING
A2 HC-STC18-A 0
1:25
2003


RUBBER RING SPECIFICATION
Humes
HUMECEPTOR
STANDARD DRAWINGS
STC-23 HUMECEPTOR
ASSEMBLY DRAWING
A2 HC-STC23-A 0
PLAN
SCALE 1:25
SECTION
SCALE 1:25
INLET
OUTLET
TREATMENT CHAMBER
RUBBER RING JOINT
OIL SAMPLE PORT
WEIR


NOTES:
1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS.
2. DIMENSIONS INCLUDED ARE STANDARD.
3. STORAGE VOLUMES TOTAL = 29220 LITRES OIL STORAGE VOLUME = 4290 LITRES SEDIMENT STORAGE VOLUME = 23.50 m3
4. COMPONENT MASSES TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 18.3 t TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 23.2 t
5. BYPASS CHAMBER - VARIES REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS.
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. VENT PIPE AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
0 UPDATED AND REISSUED FOR MANUFACTURE
OIL SAMPLE PORT
600mm DECANT PIPE
OUTLET
INLET
PLAN
SCALE 1:25
Humes
TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND
HUMECEPTOR™
STANDARD DRAWING
STC-27 HUMECEPTOR
ASSEMBLY DRAWING
A2 HC-STC27-A 0
1:25
2004
RUBBER RING JOINT SPECIFICATION
MATERIAL : NITRILE
HARDNESS : 43 (± 3) IRHD (AS1646)
PROFILE : L 38 (REFER Dwg. J1802-03)
ID : 3400 ± 16mm
HUMECEPTOR COVER CLASS D
ACCESS CHAMBER CONVERTER SLAB REFER TO LOCAL DRAWINGS
ACCESS CHAMBER REFER TO LOCAL DRAWINGS
BYPASS CHAMBER CONVERTER SLAB REFER TO HC-CR18-P
MASTIC JOINT REFER TO HC-18JNT
BYPASS CHAMBER REFER TO HC-BCS2-A1 OR A2
FIBREGLASS INSERT REFER TO HC-FGIS2-1
EPOXY JOINT BY INSTALLATION CONTRACTOR EPOXY SUPPLIED BY HUMES
TREATMENT CHAMBER TOP UNIT REFER TO HC-TCCS-PR
BOLTED ASSEMBLY REFER TO HC-TCT36-A
TREATMENT CHAMBER
TREATMENT CHAMBER BASE UNIT REFER TO HC-TCB36-P
RUBBER RING JOINT
DULUX EPOXY OR SIMILAR
OIL SAMPLE PORT
Ø1828
Ø3600
Ø4250
SECTION A
SCALE 1:25
VARIES
3835
2060
1190
2650
3810
300
100
IMPORTANT INSTALLATION INFORMATION
1. FOUNDATION REQUIREMENTS - MIN. ALLOWABLE BEARING CAPACITY REQUIRED 200 kPa
2. UNIT TO BE PLACED ON 150mm THICK BED ZONE MATERIAL IN ACCORDANCE WITH AS3725 REQUIREMENTS
3. TREATMENT CHAMBER SHOULD BE FILLED WITH WATER TO 2/3 DEPTH IMMEDIATELY AFTER INSTALLATION (UNIT MAY FLOAT PRIOR TO BACKFILLING)


FOR INFORMATION
NOT FOR CONSTRUCTION
*150 MIN FOR INLET /OUTLET PIPE < 675 DIA
*300 MIN FOR INLET /OUTLET PIPE > 750 DIA
1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS.
2. DIMENSIONS INCLUDED ARE STANDARD.
3. STORAGE VOLUMES TOTAL = 42,370 LITRES OIL STORAGE VOLUME = 10,585 LITRES SEDIMENT STORAGE VOLUME = 27 m3
4. COMPONENT MASSES TREATMENT CHAMBER BASS UNIT (INC. SHAFT) = 11.92 TONNE TREATMENT CHAMBER TOP UNIT (CONV. SLAB AND SHAFT) = 8.95 TONNE BYPASS CHAMBER = 9.74 TONNE
5. REFER TO INSTALLATION GUIDE FOR RECOMMENDED INSTALLATION PROCEDURE.
6. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS THE FOLLOWING SWIFTLIFT KNUCKLES WILL BE REQUIRED: 6 x 1.3 TONNES 8 x 2.5 TONNES 8 x 10.0 TONNES
7. OIL SAMPLE PORT, STEP IRONS AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
8. THE ABOVE WEIGHTS ARE ONLY APPROXIMATIONS OF THE ACTUAL FINAL WEIGHTS OF COMPONENTS AND ARE NOT TO BE USED.
DUOCEPTOR COVER AND SURROUND CLASS D.
ACCESS CHAMBER CONVERTER SLAB.
OIL SAMPLE PORT.
BYPASS CHAMBER CONVERTER SLAB.
MASTIC JOINT / MASTIC SUPPLIED BY CSR HUMES.
FLEXIBLE RUBBER CONNECTORS.
FIBREGLASS INSERT.
EPOXY/MASTIC JOINT BY INSTALLATION CONTRACTOR EPOXY/MASTIC JOINT SUPPLIED BY CSR HUMES.
BOLTED ASSEMBLY.
TREATMENT CHAMBER SHAFT.
TREATMENT CHAMBER BASE UNIT.
ACCESS CHAMBER
BYPASS CHAMBER
ø2438
WEIR
PRECAST WEIR
OUTLET
INLET
600mm DIA DECANT PIPE
INLET DROP PIPE
DULUX EPOXY OR SIMILAR
TREATMENT CHAMBER
ø3060 NOM DIA
ø3490
3410
300
585
750
610
VARIES
635
1585
1265
3485
DRAWING TITLE: GENERAL ARRANGEMENT
DRAWING NO. BIS-DUO-003
DESIGNED BY: -
MODEL: STC60
DRAWN BY: JCM 25/10/07
SCALE: 1:40
CHECKED BY: CK 25/10/07
SIZE: A3
REV. A
JOB NAME: DUOCEPTOR STC40
JOB NO. N/A
A ISSUE FOR CLIENT INFORMATION JCM 25/10/07
ISSUE REVISION INITIAL DATE
CLIENT: N/A
CLIENT NAME:
Humes


FOR INFORMATION
DUOCEPTOR COVER AND SURROUND CLASS D.
ACCESS CHAMBER CONVERTER SLAB.
OIL SAMPLE PORT.
BYPASS CHAMBER CONVERTER SLAB.
MASTIC JOINT / MASTIC SUPPLIED BY CSR HUMES.
FLEXIBLE RUBBER CONNECTORS.
FIBREGLASS INSERT.
EPOXY/MASTIC JOINT BY INSTALLATION CONTRACTOR EPOXY/MASTIC JOINT SUPPLIED BY CSR HUMES.
BOLTED ASSEMBLY.
TREATMENT CHAMBER SHAFT.
TREATMENT CHAMBER BASE UNIT.
ACCESS CHAMBER
BYPASS CHAMBER
ø2438
WEIR
PRECAST WEIR
INLET
OUTLET
600mm DIA DECANT PIPE
INLET DROP PIPE
DULUX EPOXY OR SIMILAR
TREATMENT CHAMBER
ø3060 NOM DIA
ø3490
VARIES
635
1385
1000
1065
4085
610
585
750
4010
300
*150 MIN FOR INLET /OUTLET PIPE < 675 DIA
*300 MIN FOR INLET /OUTLET PIPE > 750 DIA
1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS.
2. DIMENSIONS INCLUDED ARE STANDARD.
3. STORAGE VOLUMES
TOTAL = 50,525 LITRES
OIL STORAGE VOLUME = 10,585 LITRES
SEDIMENT STORAGE VOLUME = 35 m3
4. COMPONENT MASSES
TREATMENT CHAMBER BASS UNIT (INC. SHAFT) = 11.02 TONNE
TREATMENT CHAMBER TOP UNIT (CONV. SLAB AND SHAFT) = 12.50 TONNE
BYPASS CHAMBER = 9.74 TONNE
5. REFER TO INSTALLATION GUIDE FOR RECOMMENDED INSTALLATION PROCEDURE.
6. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS THE FOLLOWING SWIFTLIFT KNUCKLES WILL BE REQUIRED:
6 x 1.3 TONNES
8 x 2.5 TONNES
8 x 10.0 TONNES
7. OIL SAMPLE PORT, STEP IRONS AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
8. THE ABOVE WEIGHTS ARE ONLY APPROXIMATIONS OF THE ACTUAL FINAL WEIGHTS OF COMPONENTS AND ARE NOT TO BE USED.
NOT FOR CONSTRUCTION
Humes
CLIENT: N/A
CLIENT NAME:
A ISSUE FOR CLIENT INFORMATION JCM 25/10/07
ISSUE REVISION INITIAL DATE
JOB NAME: DUOCEPTOR STC50
JOB NO. N/A
DRAWING TITLE: GENERAL ARRANGEMENT
DRAWING NO. BIS-DUO-002
DESIGNED BY: –
MODEL: STC60
DRAWN BY: JCM 25/10/07
SCALE: 1:40
CHECKED BY: CK 25/10/07
SIZE: A3
REV. A


FOR INFORMATION
NOT FOR CONSTRUCTION
*150 MIN FOR INLET /OUTLET PIPE < 675 DIA
*300 MIN FOR INLET /OUTLET PIPE > 750 DIA
1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS.
2. DIMENSIONS INCLUDED ARE STANDARD.
3. STORAGE VOLUMES
TOTAL = 60,255 LITRES
OIL STORAGE VOLUME = 11,560 LITRES
SEDIMENT STORAGE VOLUME = 42 m3
4. COMPONENT MASSES
TREATMENT CHAMBER BASE UNIT (INC. SHAFT) = 16.20 TONNE
TREATMENT CHAMBER TOP UNIT (CONV. SLAB AND SHAFT) = 12.46 TONNE
BYPASS CHAMBER = 9.74 TONNE
5. REFER TO INSTALLATION GUIDE FOR RECOMMENDED INSTALLATION PROCEDURE.
6. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS THE FOLLOWING SWIFTLIFT KNUCKLES WILL BE REQUIRED:
6 x 1.3 TONNES
8 x 2.5 TONNES
8 x 10.0 TONNES
7. OIL SAMPLE PORT, STEP IRONS AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.
8. THE ABOVE WEIGHTS ARE ONLY APPROXIMATIONS OF THE ACTUAL FINAL WEIGHTS OF COMPONENTS AND ARE NOT TO BE USED.
DUOCEPTOR COVER AND SURROUND CLASS D.
ACCESS CHAMBER CONVERTER SLAB.
OIL SAMPLE PORT.
BYPASS CHAMBER CONVERTER SLAB.
MASTIC JOINT / MASTIC SUPPLIED BY CSR HUMES.
FLEXIBLE RUBBER CONNECTORS.
FIBREGLASS INSERT.
EPOXY/MASTIC JOINT BY INSTALLATION CONTRACTOR EPOXY/MASTIC JOINT SUPPLIED BY CSR HUMES.
BOLTED ASSEMBLY.
TREATMENT CHAMBER SHAFT.
TREATMENT CHAMBER BASE UNIT.
ACCESS CHAMBER
BYPASS CHAMBER
ø2438
WEIR
PRECAST WEIR
OUTLET
INLET
600mm DIA DECANT PIPE
INLET DROP PIPE
DULUX EPOXY OR SIMILAR
TREATMENT CHAMBER
ø3600 NOM DIA
ø4200
B
3810
300
585
610
750
VARIES
635
2060
1150
3885
Humes
CLIENT: N/A
CLIENT NAME:
A
ISSUE FOR CLIENT INFORMATION
JCM
25/10/07
ISSUE
REVISION
INITIAL
DATE
JOB NAME: DOUCEPTOR STC60
JOB NO. N/A
DRAWING TITLE: GENERAL ARRANGEMENT
DRAWING NO. BIS-DUO-001
DESIGNED BY: -
DRAWN BY: JCM 25/10/07
CHECKED BY: CK 25/10/07
MODEL: STC60
SCALE: 1:40
SIZE: A3
REV. A

Humes
Water Solutions

Humes
Holcim (Australia) Pty Ltd
ABN 87 099 732 297
18 Little Cribb st
Milton QLD 4064
Australia

Phone (07) 3364 2800
Fax (07) 3364 2835
www.humes.com.au

HumeCeptor® system design request form

Project information

Date:		Total drainage area:	Hectares
Project number:		Impervious	%
Project name:		Upstream quantity control (A2):	YES NO
City/Town:		Is the unit submerged (C4):	YES NO
Development type:		Describe land cover:	
State:		Describe land use:	

A. Design for Total Suspended Solids (TSS) removal

Units are sized for TSS removal. All units are designed for spills capture for hydrocarbon with a specific gravity of 0.86.

A1. Identify Water Quality Objectives (WQO):

Desired Water Quality Objective:		% Annual TSS removal

A2. If upstream quantity control exists, identify stage storage and discharge information:

	Elevation (m)	Storage (m^3)	Discharge (m^3/s)
Permanent water level			
5 years			
10 years			
25 years			
100 years			

A3. Select particle size distribution:

- Fine distribution

Particle size um	Distribution %
20	20
60	20
150	20
400	20
2,000	20

- Coarse distribution

Particle size um	Distribution %
150	60
400	20
2,000	20

- User defined particle size distribution identify particle size distribution (please contact your local HumeCeptor® representative)

Particle size um	Distribution %	Specific gravity

A4. Input all parameters from items A1 to A3 into the HumeCeptor® system PCSWMM program to select the model that meets the water quality objective.

Summary of HumeCeptor® system requirements for TSS removal

HumeCeptor® model:		
Annual TSS removed:		%
Annual runoff captured:		%

B. Design for hydrocarbon spills capture only

B1. Identify Water Quality Objectives (WQO)

Desired volume of hydrocarbon storage		Litres
Type of hydrocarbon:		
Specific gravity:		Unitless

B2. Select the HumeCeptor® system unit that provides the minimum volume of oil storage desired and contact Humes Water Solutions.

Summary of HumeCeptor® system requirements for spills capture

HumeCeptor® model:		
Total volume of oil storage		Litres

C. HumeCeptor® system siting considerations

C1. Difference between inlet and outlet invert elevations:

Number of inlet pipes	Inlet unit STC 2	In-line STC 3 to STC 27	Series STC 40 to STC 60
One	75 mm	25 mm	75 mm
>1	75 mm	75 mm	N/A

C2. Other considerations:

Minimum distance from top of grade to invert elevation	1.2 m
Bends:	The inlet and standard HumeCeptor® system units can accommodate turns to a maximum of 90 degrees
Multiple inlet pipe:	Yes for inlet and standard HumeCeptor® system units. Recommended maximum of two pipes where possible.
Inlet covers	Only the STC 2 can accommodate a catch basin frame and cover.

C3. Standard maximum inlet and outlet pipe diameters:

Inlet/outlet configuration	Inlet unit STC 2	In-line STC 3 to STC 27	Series STC 40 to STC 60
Straight through	600 mm	1,050 mm	2,400 mm
Bend	450 mm	825 mm	1,050 mm

Please contact Humes Water Solutions for larger pipe diameters.

C4. Submerged conditions:
A unit is submerged when the standing water elevation at the proposed location of the HumeCeptor® unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact Humes Water Solutions for further assistance.

Humes
Water Solutions

HumeCeptor® system quotation and order form

Humes
Holcim (Australia) Pty Ltd
ABN 87 099 732 297
18 Little Cribb st
Milton QLD 4064
Australia

Phone (07) 3364 2800
Fax (07) 3364 2835
www.humes.com.au

Quotation No: ______________________

Date: ______________________

Project information:

Project number: ______________________

Project name: ______________________

Closing date: ______________________

Jobsite address: ______________________

State: ______________________

Contractor information

Contact name: ______________________

Company: ______________________

Phone No: ______________________

Fax No: ______________________

E-mail: ______________________

Consultant information:

Contact name: ______________________

Company: ______________________

Phone No: ______________________

Fax No: ______________________

E-mail:

Owner information (required for maintenance):

Contact name: ______________________

Company: ______________________

Phone No: ______________________

Fax No: ______________________

E-mail:

Land Use (Check one):

- Commercial
- Gas station
- Government
- Industrial
- Military
- Street
- Residential
- Transportation
- Other ______________________

HumeCeptor® system information

Structure No.: ______________________

Top of grate elev.: ______________________

Outlet invert elev.: ______________________

Inlet invert elev.: ______________________

Catchment area ______________________

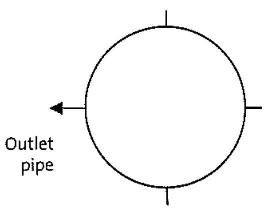
Impervious % ______________________

Outlet pipe material and diameter: ______________________

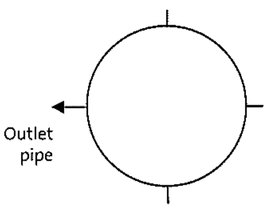
Inlet pipe material and diameter: ______________________

HumeCeptor® model required (circle model number)

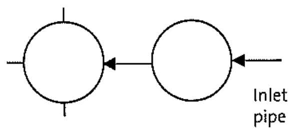
Inlet system	In-line system			Series system (DuoCeptor™)	
STC 2	STC 3	STC 5	STC 7	STC 40	STC 50
	STC 9	STC 14	STC 18	STC 60	
	STC 23	STC 27			



Show orientation of inlet pipe



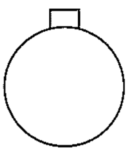
Show orientation of inlet pipe



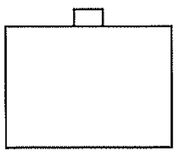
Show orientation of outlet pipe on downstream unit

HumeCeptor® MAX

Select configuration of treatment chamber



Cylindrical



Rectangular

Chamber volume: ______________________

Model number: ______________________

The HumeCeptor® system

Precast solutions

Stormwater

Stormwater treatment

Primary treatment
- HumeGard® Gross Pollutant Trap

Secondary treatment
- HumeCeptor® hydrodynamic separator

Tertiary treatment
- The HydroFilter® system

Detention and infiltration

The StormTrap® system
Soakwells

Harvesting and reuse

The RainVault® system
The ReserVault® system
The RainVault® Mini system
Precast concrete cubes
Segmental shafts
Precast concrete tanks – above ground

Stormwater drainage

Steel reinforced concrete pipes – trench
Steel reinforced concrete pipes – salt water cover
Steel reinforced concrete pipes – jacking
Corrugated Metal Pipe (CMP)
Box culverts
Uniculvert® modules
Headwalls
Stormwater pits
Access chambers/Manholes
Kerb inlet systems
Floodgates
Geosynthetics

Sewage transfer and storage

Bridge and platform

Tunnel and shaft

Walling

Potable water supply

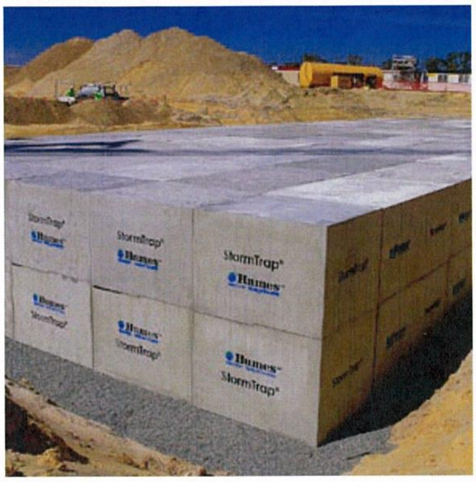
Irrigation supply

Traffic management

Cable and power management

Rail

Livestock management



Top:
The StormTrap® system

Middle:
The RainVault® system

Bottom:
Segmental shaft

Contact information

National sales 1300 361 601
humeswatersolutions.com.au
info@humeswatersolutions.com.au

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Fax: (07) 4152 5847

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Ph: (07) 4924 7900
Fax: (07) 4924 7901

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Ph: (07) 4694 1420
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Townsville
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Fax: (02) 6285 5334

Grafton
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Fax: (02) 6644 7313

Kempsey
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Lismore
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Fax: (02) 6622 1342

Newcastle
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Fax: (02) 4032 6822

Sydney
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Invermay
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Fax: (03) 6335 6330

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Western Australia

Gnangara
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Fax: (08) 9309 1625

Perth
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Fax: (08) 9351 6977

Northern Territory

Darwin
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Fax: (08) 8984 1614

Humes
Water Solutions

National sales 1300 361 601
humeswatersolutions.com.au
info@humeswatersolutions.com.au

FSC logo here

A Division of Holcim Australia

7.3 Lab Results – Batch 1

SGS

ANALYTICAL REPORT

NATA
WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS		LABORATORY DETAILS	
Contact	John Ieroklis	Manager	Huong Crawford
Client	SYDNEY INTERNATIONAL CONTAINER TERMINALS PT	Laboratory	SGS Alexandria Environmental
Address	LEVEL 19 1 MARKET STREET NSW 2000	Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	61 2 82688000	Telephone	+61 2 8594 0400
Facsimile	(Not specified)	Facsimile	+61 2 8594 0499
Email	ieroklis.john@hutchisonports.com.au	Email	au.environmental.sydney@sgs.com
Project	**SICTL Batch number**	SGS Reference	**SE123491 R0**
Order Number	**SICTL PO 172**	Report Number	0000072994
Samples	57	Date Reported	07 Jan 2014
		Date Received	19 Dec 2013

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

NO3 :due to high Ec detection limit for sample57 rise 100x.

SIGNATORIES

Dong Liang
Metals/Inorganics Team Leader

Sheila Lepasana
Senior Technician

Snezana Kostoska
2IC Inorganics Chemist

SGS Australia Pty Ltd ABN 44 000 964 278 | Environmental Services | Unit 16 33 Maddox St, PO Box 6432 Bourke Rd BC | Alexandria NSW 2015, Alexandria NSW 2015 | Australia, Australia | t +61 2 8594 0400 | f +61 2 8594 0499 | www.au.sgs.com

Member of the SGS Group

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SGS

ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.001	SE123491.002	SE123491.003	SE123491.004
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/16/1	1/16/2	1/16/3	1/16/4
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	-	<0.005	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	-	0.008	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	-	1.2	-
Total Nitrogen (calc)	mg/L	0.05	-	-	1.2	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	-	<0.05	-
pH in water Method: AN101						
pH**	No unit	-	-	-	7.8	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	-	<5	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	-	3.5	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	-	-	<5

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.001 Water 18 Dec 2013 1/16/1	SE123491.002 Water 18 Dec 2013 1/16/2	SE123491.003 Water 18 Dec 2013 1/16/3	SE123491.004 Water 18 Dec 2013 1/16/4
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	-	11	-	-
Cadmium, Cd	µg/L	0.1	-	0.1	-	-
Chromium, Cr	µg/L	1	-	<1	-	-
Copper, Cu	µg/L	1	-	<1	-	-
Lead, Pb	µg/L	1	-	<1	-	-
Nickel, Ni	µg/L	1	-	<1	-	-
Zinc, Zn	µg/L	5	-	<5	-	-
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	-	<0.0001	-	-

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SGS

ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.005 Water 18 Dec 2013 1/16/5	SE123491.006 Water 18 Dec 2013 1/16/6	SE123491.007 Water 18 Dec 2013 1/17/1	SE123491.008 Water 18 Dec 2013 1/17/2
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	**0.080**	-	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	**0.020**	-	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	**0.40**	-	-
Total Nitrogen (calc)	mg/L	0.05	-	**0.50**	-	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	<0.05	-	-
pH in water Method: AN101						
pH**	No unit	-	-	**7.9**	-	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	**8**	-	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	**7.8**	-	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	-	<5	-

ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	Sample Number: SE123491.005 Sample Matrix: Water Sample Date: 18 Dec 2013 Sample Name: 1/16/5	SE123491.006 Water 18 Dec 2013 1/16/6	SE123491.007 Water 18 Dec 2013 1/17/1	SE123491.008 Water 18 Dec 2013 1/17/2
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	**6**	-	-	<1
Cadmium, Cd	μg/L	0.1	<0.1	-	-	<0.1
Chromium, Cr	μg/L	1	<1	-	-	**3**
Copper, Cu	μg/L	1	<1	-	-	**2**
Lead, Pb	μg/L	1	<1	-	-	<1
Nickel, Ni	μg/L	1	<1	-	-	<1
Zinc, Zn	μg/L	5	<5	-	-	<5
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	-	-	<0.0001

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	Sample Number: SE123491.009 Sample Matrix: Water Sample Date: 18 Dec 2013 Sample Name: 1/17/3	SE123491.010 Water 18 Dec 2013 1/17/4	SE123491.011 Water 18 Dec 2013 1/17/5	SE123491.012 Water 18 Dec 2013 1/17/6
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.70	-	-	0.25
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.17	-	-	0.036
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	0.46	-	-	0.23
Total Nitrogen (calc)	mg/L	0.05	1.3	-	-	0.52
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	<0.05	-	-	<0.05
pH in water Method: AN101						
pH**	No unit	-	9.4	-	-	8.8
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	61	-	-	37
Turbidity Method: AN119						
Turbidity	NTU	0.1	96	-	-	66
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	<5	-	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.009 Water 18 Dec 2013 1/17/3	SE123491.010 Water 18 Dec 2013 1/17/4	SE123491.011 Water 18 Dec 2013 1/17/5	SE123491.012 Water 18 Dec 2013 1/17/6
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	-	-	**1**	-
Cadmium, Cd	µg/L	0.1	-	-	<0.1	-
Chromium, Cr	µg/L	1	-	-	**7**	-
Copper, Cu	µg/L	1	-	-	**3**	-
Lead, Pb	µg/L	1	-	-	<1	-
Nickel, Ni	µg/L	1	-	-	<1	-
Zinc, Zn	µg/L	5	-	-	<5	-
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	-	-	<0.0001	-

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SGS

ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.013	SE123491.014	SE123491.015	SE123491.016
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/18/1	1/18/2	1/18/3	1/18/4
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	-	**0.13**	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	-	**0.070**	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	-	**0.30**	-
Total Nitrogen (calc)	mg/L	0.05	-	-	**0.50**	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	-	<0.05	-
pH in water Method: AN101						
pH**	No unit	-	-	-	**9.1**	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	-	**16**	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	-	**22**	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	-	-	<5

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.013	SE123491.014	SE123491.015	SE123491.016
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/18/1	1/18/2	1/18/3	1/18/4
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	-	<1	-	-
Cadmium, Cd	μg/L	0.1	-	<0.1	-	-
Chromium, Cr	μg/L	1	-	6	-	-
Copper, Cu	μg/L	1	-	<1	-	-
Lead, Pb	μg/L	1	-	<1	-	-
Nickel, Ni	μg/L	1	-	<1	-	-
Zinc, Zn	μg/L	5	-	<5	-	-
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	-	<0.0001	-	-

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SGS

ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.017 Water 18 Dec 2013 1/18/5	SE123491.018 Water 18 Dec 2013 1/18/6	SE123491.019 Water 18 Dec 2013 1/19/1	SE123491.020 Water 18 Dec 2013 1/19/2
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	**0.11**	-	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	**0.040**	-	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	**0.18**	-	-
Total Nitrogen (calc)	mg/L	0.05	-	**0.32**	-	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	<0.05	-	-
pH in water Method: AN101						
pH**	No unit	-	-	**8.6**	-	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	**13**	-	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	**18**	-	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	-	<5	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.017	SE123491.018	SE123491.019	SE123491.020
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/18/5	1/18/6	1/19/1	1/19/2
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	<1	-	-	<1
Cadmium, Cd	μg/L	0.1	<0.1	-	-	<0.1
Chromium, Cr	μg/L	1	**5**	-	-	**9**
Copper, Cu	μg/L	1	<1	-	-	**2**
Lead, Pb	μg/L	1	<1	-	-	<1
Nickel, Ni	μg/L	1	<1	-	-	<1
Zinc, Zn	μg/L	5	<5	-	-	<5
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	-	-	<0.0001

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ANALYTICAL REPORT

SE123491 R0

Parameter	Units	LOR	SE123491.021 Water 18 Dec 2013 1/19/3	SE123491.022 Water 18 Dec 2013 1/19/4	SE123491.023 Water 18 Dec 2013 1/19/5	SE123491.024 Water 18 Dec 2013 1/19/6
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.11	-	-	0.078
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.063	-	-	0.039
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	0.34	-	-	0.28
Total Nitrogen (calc)	mg/L	0.05	0.51	-	-	0.39
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	<0.05	-	-	<0.05
pH in water Method: AN101						
pH**	No unit	-	8.8	-	-	8.4
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	<5	-	-	<5
Turbidity Method: AN119						
Turbidity	NTU	0.1	5.9	-	-	3.2
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	<5	-	-

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ANALYTICAL REPORT

SE123491 R0

Parameter	Units	LOR	SE123491.021 Water 18 Dec 2013 1/19/3	SE123491.022 Water 18 Dec 2013 1/19/4	SE123491.023 Water 18 Dec 2013 1/19/5	SE123491.024 Water 18 Dec 2013 1/19/6
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	-	-	<1	-
Cadmium, Cd	µg/L	0.1	-	-	<0.1	-
Chromium, Cr	µg/L	1	-	-	**9**	-
Copper, Cu	µg/L	1	-	-	<1	-
Lead, Pb	µg/L	1	-	-	<1	-
Nickel, Ni	µg/L	1	-	-	<1	-
Zinc, Zn	µg/L	5	-	-	**5**	-
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	-	-	<0.0001	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.025 Water 18 Dec 2013 1/20/1	SE123491.026 Water 18 Dec 2013 1/20/2	SE123491.027 Water 18 Dec 2013 1/20/3	SE123491.028 Water 18 Dec 2013 1/20/4
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	-	**0.066**	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	-	**0.027**	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	-	**0.36**	-
Total Nitrogen (calc)	mg/L	0.05	-	-	**0.45**	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	-	<0.05	-
pH in water Method: AN101						
pH**	No unit	-	-	-	**8.2**	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	-	**13**	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	-	**6.8**	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	-	-	<5

SGS ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.025	SE123491.026	SE123491.027	SE123491.028
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/20/1	1/20/2	1/20/3	1/20/4
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	-	<1	-	-
Cadmium, Cd	μg/L	0.1	-	<0.1	-	-
Chromium, Cr	μg/L	1	-	**4**	-	-
Copper, Cu	μg/L	1	-	<1	-	-
Lead, Pb	μg/L	1	-	<1	-	-
Nickel, Ni	μg/L	1	-	<1	-	-
Zinc, Zn	μg/L	5	-	**12**	-	-
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	-	<0.0001	-	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.029	SE123491.030	SE123491.031	SE123491.032
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/20/5	1/20/6	1/21/1	1/21/2
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	**0.030**	-	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	**0.020**	-	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	**0.42**	-	-
Total Nitrogen (calc)	mg/L	0.05	-	**0.47**	-	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	**0.09**	-	-
pH in water Method: AN101						
pH**	No unit	-	-	**7.9**	-	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	**22**	-	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	**3.3**	-	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	-	<5	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.029	SE123491.030	SE123491.031	SE123491.032
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/20/5	1/20/6	1/21/1	1/21/2
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	**1**	-	-	<1
Cadmium, Cd	μg/L	0.1	<0.1	-	-	<0.1
Chromium, Cr	μg/L	1	**2**	-	-	**8**
Copper, Cu	μg/L	1	<1	-	-	**1**
Lead, Pb	μg/L	1	<1	-	-	<1
Nickel, Ni	μg/L	1	<1	-	-	<1
Zinc, Zn	μg/L	5	**10**	-	-	<5
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	-	-	<0.0001

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.033 Water 18 Dec 2013 1/21/3	SE123491.034 Water 18 Dec 2013 1/21/4	SE123491.035 Water 18 Dec 2013 1/21/5	SE123491.036 Water 18 Dec 2013 1/21/6
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.12	-	-	0.15
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.061	-	-	0.045
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	0.33	-	-	0.34
Total Nitrogen (calc)	mg/L	0.05	0.51	-	-	0.54
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	<0.05	-	-	<0.05
pH in water Method: AN101						
pH**	No unit	-	8.2	-	-	8.4
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	17	-	-	19
Turbidity Method: AN119						
Turbidity	NTU	0.1	21	-	-	30
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	<5	-	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.033 Water 18 Dec 2013 1/21/3	SE123491.034 Water 18 Dec 2013 1/21/4	SE123491.035 Water 18 Dec 2013 1/21/5	SE123491.036 Water 18 Dec 2013 1/21/6
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	-	-	<1	-
Cadmium, Cd	µg/L	0.1	-	-	<0.1	-
Chromium, Cr	µg/L	1	-	-	8	-
Copper, Cu	µg/L	1	-	-	1	-
Lead, Pb	µg/L	1	-	-	<1	-
Nickel, Ni	µg/L	1	-	-	<1	-
Zinc, Zn	µg/L	5	-	-	<5	-
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	-	-	<0.0001	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.037	SE123491.038	SE123491.039	SE123491.040
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/22/1	1/22/2	1/22/3	1/22/4
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	-	0.12	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	-	0.039	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	-	0.35	-
Total Nitrogen (calc)	mg/L	0.05	-	-	0.50	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	-	<0.05	-
pH in water Method: AN101						
pH**	No unit	-	-	-	8.4	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	-	32	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	-	31	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	-	-	<5

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.037	SE123491.038	SE123491.039	SE123491.040
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/22/1	1/22/2	1/22/3	1/22/4
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	-	<1	-	-
Cadmium, Cd	μg/L	0.1	-	<0.1	-	-
Chromium, Cr	μg/L	1	-	5	-	-
Copper, Cu	μg/L	1	-	1	-	-
Lead, Pb	μg/L	1	-	<1	-	-
Nickel, Ni	μg/L	1	-	<1	-	-
Zinc, Zn	μg/L	5	-	<5	-	-
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	-	<0.0001	-	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.041 Water 18 Dec 2013 1/22/5	SE123491.042 Water 18 Dec 2013 1/22/6	SE123491.043 Water 18 Dec 2013 1/23/1	SE123491.044 Water 18 Dec 2013 1/23/2
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	0.12	-	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	0.033	-	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	0.25	-	-
Total Nitrogen (calc)	mg/L	0.05	-	0.41	-	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	<0.05	-	-
pH in water Method: AN101						
pH**	No unit	-	-	8.7	-	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	26	-	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	33	-	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	-	<5	-

ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.041	SE123491.042	SE123491.043	SE123491.044
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/22/5	1/22/6	1/23/1	1/23/2
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	<1	-	-	<1
Cadmium, Cd	μg/L	0.1	<0.1	-	-	<0.1
Chromium, Cr	μg/L	1	**5**	-	-	**3**
Copper, Cu	μg/L	1	<1	-	-	**1**
Lead, Pb	μg/L	1	<1	-	-	<1
Nickel, Ni	μg/L	1	<1	-	-	<1
Zinc, Zn	μg/L	5	<5	-	-	<5
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	-	-	<0.0001

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.045 Water 18 Dec 2013 1/23/3	SE123491.046 Water 18 Dec 2013 1/23/4	SE123491.047 Water 18 Dec 2013 1/23/5	SE123491.048 Water 18 Dec 2013 1/23/6
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.13	-	-	0.16
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.030	-	-	0.038
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	0.30	-	-	0.40
Total Nitrogen (calc)	mg/L	0.05	0.47	-	-	0.60
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	<0.05	-	-	<0.05
pH in water Method: AN101						
pH**	No unit	-	9.2	-	-	9.5
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	<5	-	-	13
Turbidity Method: AN119						
Turbidity	NTU	0.1	8.9	-	-	18
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	<5	-	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	SE123491.045 Water 18 Dec 2013 1/23/3	SE123491.046 Water 18 Dec 2013 1/23/4	SE123491.047 Water 18 Dec 2013 1/23/5	SE123491.048 Water 18 Dec 2013 1/23/6
Trace Metals (Dissolved) in Water by ICPMS Method: AN318							
Arsenic, As	μg/L	1		-	-	<1	-
Cadmium, Cd	μg/L	0.1		-	-	<0.1	-
Chromium, Cr	μg/L	1		-	-	4	-
Copper, Cu	μg/L	1		-	-	2	-
Lead, Pb	μg/L	1		-	-	<1	-
Nickel, Ni	μg/L	1		-	-	<1	-
Zinc, Zn	μg/L	5		-	-	<5	-
Mercury (dissolved) in Water Method: AN311/AN312							
Mercury	mg/L	0.0001		-	-	<0.0001	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.049 Water 18 Dec 2013 1/24/1	SE123491.050 Water 18 Dec 2013 1/24/2	SE123491.051 Water 18 Dec 2013 1/24/3	SE123491.052 Water 18 Dec 2013 1/24/4
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	-	**0.085**	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	-	**0.023**	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	-	**0.25**	-
Total Nitrogen (calc)	mg/L	0.05	-	-	**0.35**	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	-	<0.05	-
pH in water Method: AN101						
pH**	No unit	-	-	-	**7.9**	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	-	**7**	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	-	**7.0**	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	-	-	<5

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.049	SE123491.050	SE123491.051	SE123491.052
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/24/1	1/24/2	1/24/3	1/24/4
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	-	<1	-	-
Cadmium, Cd	µg/L	0.1	-	<0.1	-	-
Chromium, Cr	µg/L	1	-	**4**	-	-
Copper, Cu	µg/L	1	-	**2**	-	-
Lead, Pb	µg/L	1	-	<1	-	-
Nickel, Ni	µg/L	1	-	<1	-	-
Zinc, Zn	µg/L	5	-	**14**	-	-
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	-	<0.0001	-	-

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ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	SE123491.053	SE123491.054	SE123491.055	SE123491.056
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/24/5	1/24/6	1/BOT 1/1	1/BOT 1/2
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	-	0.094	-	-
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	-	0.014	-	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	-	0.23	-	-
Total Nitrogen (calc)	mg/L	0.05	-	0.34	-	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	-	<0.05	-	-
pH in water Method: AN101						
pH**	No unit	-	-	8.3	-	-
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	-	<5	-	-
Turbidity Method: AN119						
Turbidity	NTU	0.1	-	11	-	-
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	-	-	<5	-

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Parameter	Units	LOR	SE123491.053	SE123491.054	SE123491.055	SE123491.056
Sample Matrix			Water	Water	Water	Water
Sample Date			18 Dec 2013	18 Dec 2013	18 Dec 2013	18 Dec 2013
Sample Name			1/24/5	1/24/6	1/BOT 1/1	1/BOT 1/2
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	<1	-	-	**1**
Cadmium, Cd	µg/L	0.1	<0.1	-	-	<0.1
Chromium, Cr	µg/L	1	**4**	-	-	<1
Copper, Cu	µg/L	1	**2**	-	-	<1
Lead, Pb	µg/L	1	<1	-	-	<1
Nickel, Ni	µg/L	1	<1	-	-	<1
Zinc, Zn	µg/L	5	**6**	-	-	<5
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	-	-	<0.0001

SGS ANALYTICAL REPORT SE123491 R0

Parameter	Units	LOR	Sample Number: SE123491.057 Sample Matrix: Water Sample Date: 18 Dec 2013 Sample Name: 1/BOT 1/3
Anions by Ion Chromatography in Water Method: AN245			
Nitrate Nitrogen, NO3-N	mg/L	0.005	<0.50↑
Nitrite in Water Method: AN277/WC250.312			
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292			
Total Kjeldahl Nitrogen	mg/L	0.05	0.42
Total Nitrogen (calc)	mg/L	0.05	0.42
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293			
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	1.2
pH in water Method: AN101			
pH**	No unit	-	7.8
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114			
Total Suspended Solids Dried at 103-105°C	mg/L	5	47
Turbidity Method: AN119			
Turbidity	NTU	0.1	1.4
Oil and Grease in Water Method: AN185			
Oil and Grease	mg/L	5	-
Trace Metals (Dissolved) in Water by ICPMS Method: AN318			
Arsenic, As	µg/L	1	-
Cadmium, Cd	µg/L	0.1	-
Chromium, Cr	µg/L	1	-
Copper, Cu	µg/L	1	-
Lead, Pb	µg/L	1	-
Nickel, Ni	µg/L	1	-
Zinc, Zn	µg/L	5	-

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ANALYTICAL REPORT

SE123491 R0

Parameter	Units	LOR	Sample Number: SE123491.057 Sample Matrix: Water Sample Date: 18 Dec 2013 Sample Name: 1/BOT 1/3
Mercury (dissolved) in Water Method: AN311/AN312			
Mercury	mg/L	0.0001	-

SGS

QC SUMMARY

SE123491 R0

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Anions by Ion Chromatography in Water Method: ME-(AU)-[ENV]AN245

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate Nitrogen, NO3-N	LB050201	mg/L	0.005	<0.005	0 - 3%	104%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB050306	mg/L	0.0001	<0.0001	0 - 143%	98%	93%

Nitrite in Water Method: ME-(AU)-[ENV]AN277/WC250.312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Nitrite Nitrogen, NO_2 as N	LB050172	mg/L	0.005	<0.005	0 - 6%	104%	80 - 95%

Oil and Grease in Water Method: ME-(AU)-[ENV]AN185

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Oil and Grease	LB050522	mg/L	5	<5	89%
	LB050524	mg/L	5	<5	87%

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
pH**	LB050187	No unit	-	0%	100 - 101%

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281/AN292

Parameter	QC Reference	Units	LOR	DUP %RPD	MS %Recovery
Total Kjeldahl Nitrogen	LB050269	mg/L	0.05	1%	103%
	LB050347	mg/L	0.05	1%	103%

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QC SUMMARY

SE123491 R0

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB050287	mg/L	5	<5	0 - 19%	97 - 99%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB050271	mg/L	0.05	<0.05	0%	106%	109%
	LB050355	mg/L	0.05	<0.05	0%	116%	113%

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB050382	μg/L	1	<1	1 - 2%	89%	101%
Cadmium, Cd	LB050382	μg/L	0.1	<0.1	0 - 8%	98%	100%
Chromium, Cr	LB050382	μg/L	1	<1	0 - 2%	92%	89%
Copper, Cu	LB050382	μg/L	1	<1	0%	90%	82%
Lead, Pb	LB050382	μg/L	1	<1	0%	97%	94%
Nickel, Ni	LB050382	μg/L	1	<1	0%	83%	85%
Zinc, Zn	LB050382	μg/L	5	<5	0 - 3%	98%	95%

Turbidity Method: ME-(AU)-[ENV]AN119

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Turbidity	LB050193	NTU	0.1	<0.1	4 - 6%	99%

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METHOD SUMMARY

SE123491 R0

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN185	Gravimetric Oil & Grease and Hydrocarbons: A known volume of sample is extracted using an organic solvent and the solvent layer with dissolved oils and greases is transferred to a pre-weighed beaker. The solvent is evaporated over low heating and the beaker reweighed. The concentration of oil and grease is determined by the increase in mass of the collection beaker per volume of sample extracted. O&G is suitable for lubricating oils and other high boiling point products but is not suitable for volatiles. Reference APHA 5520 B. Internal Reference AN185
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN277/WC250.312	Nitrite ions, when reacted with a reagent containing sulphanilamide and N-(1-naphthyl)-ethylenediamine dihydrochloride produce a highly coloured azo dye that is measured photometrically at 540nm.
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.

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SE123491 R0

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

7.4 Lab Results – Batch 2

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ANALYTICAL REPORT

NATA WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS		LABORATORY DETAILS	
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Project	**SICTL Batch number**	SGS Reference	**SE123536 R0**
Order Number	**SICTL PO 172**	Report Number	0000073044
Samples	15	Date Reported	08 Jan 2014
		Date Received	20 Dec 2013

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

Detection limit for NO3 rise accordinly due to high EC

SIGNATORIES

Dong Liang	Sheila Lepasana	Snezana Kostoska
Metals/Inorganics Team Leader	Senior Technician	2IC Inorganics Chemist

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ANALYTICAL REPORT

SE123536 R0

Parameter	Units	LOR	SE123536.001	SE123536.002	SE123536.003	SE123536.004
Sample Matrix			Water	Water	Water	Water
Sample Date			19/12/13 12:00	19/12/13 12:05	19/12/13 11:40	19/12/13 11:49
Sample Name			2/1/123	2/1/456	2/2/123	2/2/456
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	<0.025↑	<0.025↑	<0.025↑	<0.025↑
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.014	0.015	0.016	0.017
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	0.45	0.48	0.36	0.28
Total Nitrogen (calc)	mg/L	0.05	0.48	0.52	0.38	0.31
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	<0.05	0.05	<0.05	<0.05
pH in water Method: AN101						
pH**	No unit	-	7.7	7.8	7.8	7.8
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	<5	7	5	7
Turbidity Method: AN119						
Turbidity	NTU	0.1	2.3	2.4	3.6	3.8
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	<5	<5	<5
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	<1	<1	<1	<1
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	<1	<1	2	2
Copper, Cu	µg/L	1	1	1	<1	1
Lead, Pb	µg/L	1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	<1	1	<1	<1
Zinc, Zn	µg/L	5	23	29	10	8

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ANALYTICAL REPORT SE123536 R0

			Sample Number	SE123536.001	SE123536.002	SE123536.003	SE123536.004
			Sample Matrix	Water	Water	Water	Water
			Sample Date	19/12/13 12:00	19/12/13 12:05	19/12/13 11:40	19/12/13 11:49
			Sample Name	2/1/123	2/1/456	2/2/123	2/2/456
Parameter	Units	LOR					
Mercury (dissolved) in Water Method: AN311/AN312							
Mercury	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001

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ANALYTICAL REPORT SE123536 R0

Parameter	Units	LOR	SE123536.005 Water 19/12/13 12:15 2/4/123	SE123536.006 Water 19/12/13 12:20 2/4/456	SE123536.007 Water 19/12/13 12:25 2/5/123	SE123536.008 Water 19/12/13 12:30 2/5/456
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.13	0.14	<0.25↑	0.063
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.037	0.046	0.012	0.013
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	0.43	0.38	0.92	0.32
Total Nitrogen (calc)	mg/L	0.05	0.59	0.56	0.96	0.39
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	0.06	<0.05	0.19	<0.05
pH in water Method: AN101						
pH**	No unit	-	7.8	7.8	7.8	7.9
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	20	6	36	<5
Turbidity Method: AN119						
Turbidity	NTU	0.1	7.2	5.1	15	4.8
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	<5	<5	<5
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	2	2	1	<1
Cadmium, Cd	μg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	μg/L	1	3	3	1	3
Copper, Cu	μg/L	1	1	1	2	<1
Lead, Pb	μg/L	1	<1	<1	<1	<1
Nickel, Ni	μg/L	1	1	<1	3	<1
Zinc, Zn	μg/L	5	32	35	86	38

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ANALYTICAL REPORT SE123536 R0

		Sample Number	SE123536.005	SE123536.006	SE123536.007	SE123536.008
		Sample Matrix	Water	Water	Water	Water
		Sample Date	19/12/13 12:15	19/12/13 12:20	19/12/13 12:25	19/12/13 12:30
		Sample Name	2/4/123	2/4/456	2/5/123	2/5/456
Parameter	Units	LOR				
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001

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ANALYTICAL REPORT SE123536 R0

Parameter	Units	LOR	Sample Number: SE123536.009 Sample Matrix: Water Sample Date: 19/12/13 12:43 Sample Name: 2/7/123	SE123536.010 Water 19/12/13 12:48 2/7/456	SE123536.011 Water 19/12/13 13:00 2/8/123	SE123536.012 Water 19/12/13 13:05 2/8/456
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	<0.25↑	<0.25↑	<0.10↑	0.048
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.018	0.028	0.010	0.019
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	1.3	0.27	0.29	0.17
Total Nitrogen (calc)	mg/L	0.05	1.3	0.30	0.30	0.24
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	0.15	0.06	0.10	<0.05
pH in water Method: AN101						
pH**	No unit	-	7.9	7.9	7.8	7.9
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	37	16	41	<5
Turbidity Method: AN119						
Turbidity	NTU	0.1	8.3	15	9.0	3.0
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	<5	<5	<5
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	1	<1	<1	<1
Cadmium, Cd	μg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	μg/L	1	7	7	2	7
Copper, Cu	μg/L	1	1	1	<1	<1
Lead, Pb	μg/L	1	<1	<1	<1	<1
Nickel, Ni	μg/L	1	<1	<1	<1	<1
Zinc, Zn	μg/L	5	<5	<5	12	8

ANALYTICAL REPORT SE123536 R0

		Sample Number	SE123536.009	SE123536.010	SE123536.011	SE123536.012
		Sample Matrix	Water	Water	Water	Water
		Sample Date	19/12/13 12:43	19/12/13 12:48	19/12/13 13:00	19/12/13 13:05
		Sample Name	2/7/123	2/7/456	2/8/123	2/8/456
Parameter	Units	LOR				
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001

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ANALYTICAL REPORT SE123536 R0

Parameter	Units	LOR	SE123536.013	SE123536.014	SE123536.015
Sample Matrix			Water	Water	Water
Sample Date			19/12/13 13:20	19/12/13 13:30	19/12/13 13:40
Sample Name			2/15/123	2/15/546	2/Bot 1/123
Anions by Ion Chromatography in Water Method: AN245					
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.19	0.15	<0.50↑
Nitrite in Water Method: AN277/WC250.312					
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.027	0.022	<0.005
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292					
Total Kjeldahl Nitrogen	mg/L	0.05	0.25	0.26	0.34
Total Nitrogen (calc)	mg/L	0.05	0.46	0.43	0.34
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293					
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	<0.05	<0.05	1.5
pH in water Method: AN101					
pH**	No unit	-	7.8	7.8	7.8
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114					
Total Suspended Solids Dried at 103-105°C	mg/L	5	31	31	93
Turbidity Method: AN119					
Turbidity	NTU	0.1	48	39	1.0
Oil and Grease in Water Method: AN185					
Oil and Grease	mg/L	5	<5	<5	<5
Trace Metals (Dissolved) in Water by ICPMS Method: AN318					
Arsenic, As	µg/L	1	1	<1	1
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	2	2	<1
Copper, Cu	µg/L	1	2	2	<1
Lead, Pb	µg/L	1	<1	<1	<1
Nickel, Ni	µg/L	1	<1	<1	<1
Zinc, Zn	µg/L	5	<5	<5	<5

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ANALYTICAL REPORT SE123536 R0

Parameter	Units	LOR	SE123536.013	SE123536.014	SE123536.015
Sample Matrix			Water	Water	Water
Sample Date			19/12/13 13:20	19/12/13 13:30	19/12/13 13:40
Sample Name			2/15/123	2/15/546	2/Bot 1/123
Mercury (dissolved) in Water Method: AN311/AN312					
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001

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QC SUMMARY

SE123536 R0

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Anions by Ion Chromatography in Water   Method: ME-(AU)-[ENV]AN245

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate Nitrogen, NO3-N	LB050346	mg/L	0.005	<0.005	1%	99%

Mercury (dissolved) in Water   Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB050558	mg/L	0.0001	<0.0001	0%	96%	96%

Nitrite in Water   Method: ME-(AU)-[ENV]AN277/WC250.312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Nitrite Nitrogen, NO_2 as N	LB050325	mg/L	0.005	<0.005	0 - 7%	98 - 105%	90 - 95%

Oil and Grease in Water   Method: ME-(AU)-[ENV]AN185

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Oil and Grease	LB050562	mg/L	5	<5	89%
	LB050568	mg/L	5	<5	89%
	LB050590	mg/L	5	<5	95%

pH in water   Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
pH**	LB050395	No unit	-	0 - 1%	99%

TKN Kjeldahl Digestion by Discrete Analyser   Method: ME-(AU)-[ENV]AN281/AN292

Parameter	QC Reference	Units	LOR	DUP %RPD	MS %Recovery
Total Kjeldahl Nitrogen	LB050347	mg/L	0.05	1%	103%
	LB050348	mg/L	0.05	4%	104%

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QC SUMMARY

SE123536 R0

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB050451	mg/L	5	<5	8 - 10%	97%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB050355	mg/L	0.05	<0.05	0%	116%	113%
	LB050356	mg/L	0.05	<0.05	28%	116%	126%

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Arsenic, As	LB050425	µg/L	1	<1	0 - 2%	89%
Cadmium, Cd	LB050425	µg/L	0.1	<0.1	0%	95%
Chromium, Cr	LB050425	µg/L	1	<1	2%	96%
Copper, Cu	LB050425	µg/L	1	<1	3%	98%
Lead, Pb	LB050425	µg/L	1	<1	0%	99%
Nickel, Ni	LB050425	µg/L	1	<1	0%	99%
Zinc, Zn	LB050425	µg/L	5	<5	0%	99%

Turbidity Method: ME-(AU)-[ENV]AN119

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Turbidity	LB050323	NTU	0.1	<0.1	1 - 6%	99%

SGS

METHOD SUMMARY

SE123536 R0

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nephelometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN185	Gravimetric Oil & Grease and Hydrocarbons: A known volume of sample is extracted using an organic solvent and the solvent layer with dissolved oils and greases is transferred to a pre-weighed beaker. The solvent is evaporated over low heating and the beaker reweighed. The concentration of oil and grease is determined by the increase in mass of the collection beaker per volume of sample extracted. O&G is suitable for lubricating oils and other high boiling point products but is not suitable for volatiles. Reference APHA 5520 B. Internal Reference AN185
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN277/WC250.312	Nitrite ions, when reacted with a reagent containing sulphanilamide and N-(1-naphthyl)-ethylenediamine dihydrochloride produce a highly coloured azo dye that is measured photometrically at 540nm.
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.

SGS

SE123536 R0

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

7.5 Lab Results – Batch 3

SGS

ANALYTICAL REPORT

NATA WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS

Contact	John Ieroklis
Client	SYDNEY INTERNATIONAL CONTAINER TERMINALS PT
Address	LEVEL 19 1 MARKET STREET NSW 2000
Telephone	61 2 82688000
Facsimile	(Not specified)
Email	ieroklis.john@hutchisonports.com.au
Project	**SICTL Batch number 3**
Order Number	**SICTL PO 197**
Samples	11

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE125059 R1**
Report Number	0000076795
Date Reported	03 Mar 2014
Date Received	20 Feb 2014

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

This report cancels and supersedes the report No.SE125059 R0 issued by SGS Environmental Services due to amendment of sample description for sample #11 as per COC.

ANIONS : LOR rise due to high conductivity .

SIGNATORIES

Dong Liang
Metals/Inorganics Team Leader

Kamrul Ahsan
Senior Chemist

Sheila Lepasana
Senior Technician

Snezana Kostoska
2IC Inorganics Chemist

SGS

ANALYTICAL REPORT SE125059 R1

Parameter	Units	LOR	SE125059.001 Water 20 Feb 2014 3/4/123	SE125059.002 Water 20 Feb 2014 3/4/456	SE125059.003 Water 20 Feb 2014 3/5/123	SE125059.004 Water 20 Feb 2014 3/5/456
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.16	0.019	<0.005	0.12
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.021	0.025	0.008	0.026
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	0.31	0.20	0.15	<0.05
Total Nitrogen (calc)	mg/L	0.05	0.49	0.24	0.16	0.18
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	<0.05	<0.05	<0.05	<0.05
pH in water Method: AN101						
pH**	No unit	-	8.5	8.2	8.6	8.3
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	24	29	14	10
Turbidity Method: AN119						
Turbidity	NTU	0.1	33	29	10	11
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	<5	<5	<5
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	2	2	<1	<1
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	1	2	<1	2
Copper, Cu	µg/L	1	2	1	<1	<1
Lead, Pb	µg/L	1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	1	1	<1	1
Zinc, Zn	µg/L	5	22	23	<5	21

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ANALYTICAL REPORT SE125059 R1

Parameter	Units	LOR	SE125059.001	SE125059.002	SE125059.003	SE125059.004
Sample Matrix			Water	Water	Water	Water
Sample Date			20 Feb 2014	20 Feb 2014	20 Feb 2014	20 Feb 2014
Sample Name			3/4/123	3/4/456	3/5/123	3/5/456
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001

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ANALYTICAL REPORT SE125059 R1

Parameter	Units	LOR	SE125059.005 Water 20 Feb 2014 3/10/456	SE125059.006 Water 20 Feb 2014 3/15/123	SE125059.007 Water 20 Feb 2014 3/15/456	SE125059.008 Water 20 Feb 2014 3/17/123
Anions by Ion Chromatography in Water Method: AN245						
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.006	0.18	0.076	0.063
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.018	0.044	0.012	0.019
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.05	<0.05	0.27	<0.05	<0.05
Total Nitrogen (calc)	mg/L	0.05	<0.05	0.49	0.09	0.08
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	0.08	0.25	0.08	0.06
pH in water Method: AN101						
pH**	No unit	-	8.7	8.9	8.6	9.8
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	20	360	79	80
Turbidity Method: AN119						
Turbidity	NTU	0.1	28	670	110	86
Oil and Grease in Water Method: AN185						
Oil and Grease	mg/L	5	<5	<5	<5	<5
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	μg/L	1	<1	2	<1	<1
Cadmium, Cd	μg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	μg/L	1	4	5	1	8
Copper, Cu	μg/L	1	<1	2	1	<1
Lead, Pb	μg/L	1	<1	<1	<1	<1
Nickel, Ni	μg/L	1	<1	<1	<1	<1
Zinc, Zn	μg/L	5	<5	<5	<5	<5

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ANALYTICAL REPORT

SE125059 R1

Parameter	Units	LOR	SE125059.005	SE125059.006	SE125059.007	SE125059.008
Sample Matrix			Water	Water	Water	Water
Sample Date			20 Feb 2014	20 Feb 2014	20 Feb 2014	20 Feb 2014
Sample Name			3/10/456	3/15/123	3/15/456	3/17/123
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001

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ANALYTICAL REPORT

SE125059 R1

Parameter	Units	LOR	SE125059.009	SE125059.010	SE125059.011
Sample Matrix			Water	Water	Water
Sample Date			20 Feb 2014	20 Feb 2014	20 Feb 2014
Sample Name			3/17/456	3/23/123	3/23/456
Anions by Ion Chromatography in Water Method: AN245					
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.033	0.066	0.054
Nitrite in Water Method: AN277/WC250.312					
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.013	0.019	0.014
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292					
Total Kjeldahl Nitrogen	mg/L	0.05	<0.05	<0.05	<0.05
Total Nitrogen (calc)	mg/L	0.05	<0.05	0.09	0.07
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293					
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	<0.05	<0.05	<0.05
pH in water Method: AN101					
pH**	No unit	-	9.6	8.8	8.8
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114					
Total Suspended Solids Dried at 103-105°C	mg/L	5	59	<5	6
Turbidity Method: AN119					
Turbidity	NTU	0.1	82	8.6	7.4
Oil and Grease in Water Method: AN185					
Oil and Grease	mg/L	5	<5	<5	<5
Trace Metals (Dissolved) in Water by ICPMS Method: AN318					
Arsenic, As	μg/L	1	<1	<1	<1
Cadmium, Cd	μg/L	0.1	<0.1	<0.1	<0.1
Chromium, Cr	μg/L	1	3	1	1
Copper, Cu	μg/L	1	<1	<1	<1
Lead, Pb	μg/L	1	<1	<1	<1
Nickel, Ni	μg/L	1	<1	<1	<1
Zinc, Zn	μg/L	5	<5	6	6

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ANALYTICAL REPORT

SE125059 R1

Parameter	Units	LOR	SE125059.009	SE125059.010	SE125059.011
Sample Matrix			Water	Water	Water
Sample Date			20 Feb 2014	20 Feb 2014	20 Feb 2014
Sample Name			3/17/456	3/23/123	3/23/456
Mercury (dissolved) in Water Method: AN311/AN312					
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001

SGS

QC SUMMARY

SE125059 R1

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Anions by Ion Chromatography in Water Method: ME-(AU)-[ENV]AN245

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate Nitrogen, NO3-N	LB053020	mg/L	0.005	<0.005	0 - 18%	98 - 99%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB053129	mg/L	0.0001	<0.0001	0 - 199%	110%	109%

Nitrite in Water Method: ME-(AU)-[ENV]AN277/WC250.312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Nitrite Nitrogen, NO_2 as N	LB052957	mg/L	0.005	<0.005	0%	95%	92%

Oil and Grease in Water Method: ME-(AU)-[ENV]AN185

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Oil and Grease	LB053109	mg/L	5	<5	103%
	LB053200	mg/L	5	<5	100%

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
pH**	LB052885	No unit	-	0%	100%

Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB053197	mg/L	5	<5	1 - 2%	103%

SGS

QC SUMMARY

SE125059 R1

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB053190	mg/L	0.05	<0.05	12%	102%	100%

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB053142	µg/L	1	<1	0 - 8%	97%	97%
Cadmium, Cd	LB053142	µg/L	0.1	<0.1	0%	96%	97%
Chromium, Cr	LB053142	µg/L	1	<1	0 - 1%	99%	94%
Copper, Cu	LB053142	µg/L	1	<1	0%	102%	96%
Lead, Pb	LB053142	µg/L	1	<1	0%	99%	95%
Nickel, Ni	LB053142	µg/L	1	<1	0 - 2%	98%	92%
Zinc, Zn	LB053142	µg/L	5	<5	17 - 44%	102%	103%

Turbidity Method: ME-(AU)-[ENV]AN119

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Turbidity	LB052876	NTU	0.1	<0.1	1 - 5%	99%

SE125059 R1

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN185	Gravimetric Oil & Grease and Hydrocarbons: A known volume of sample is extracted using an organic solvent and the solvent layer with dissolved oils and greases is transferred to a pre-weighed beaker. The solvent is evaporated over low heating and the beaker reweighed. The concentration of oil and grease is determined by the increase in mass of the collection beaker per volume of sample extracted. O&G is suitable for lubricating oils and other high boiling point products but is not suitable for volatiles. Reference APHA 5520 B. Internal Reference AN185
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN277/WC250.312	Nitrite ions, when reacted with a reagent containing sulphanilamide and N-(1-naphthyl)-ethylenediamine dihydrochloride produce a highly coloured azo dye that is measured photometrically at 540nm.
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.

SE125059 R1

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
^	Performed by outside laboratory.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

7.6 Water Quality Register (Summary of Results)

Water Quality Testing Register

Sydney International Container Terminals Limited

Legend: Input cell | Output cell | Result pending | 123 = inlet | 456 = outlet

Sampling date	Sampling time	Days After Rain Event	Batch number	SQID number	Sample Sequence Number	Sample ID	Lab NTU	Lab pH	TSS mg/ L	TP mg/ L	TN mg/ L	Arsenic µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Nickel µg/L	Zinc µg/L	Mercury mg/L	Lead µg/L	Oil & Grease mg/L	Point of Discharge	Comments
18 December 2013	14:35:00	3	1	16	123	1/16/123	3.5	7.8	<5	<0.05	1.2	11	0.1	<1	<1	<1	<5	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
18 December 2013	14:37:00	3	1	16	456	1/16/456	7.8	7.9	8	<0.05	0.5	6	<0.1	<1	<1	<1	<5	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
18 December 2013	14:45:00	3	1	17	123	1/17/123	96	9.4	61	<0.05	1.3	<1	<0.1	3	2	<1	<5	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
18 December 2013	14:45:00	3	1	17	456	1/17/456	66	8.8	37	<0.05	0.52	1	<0.1	7	3	<1	<5	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
18 December 2013	17:15:00	3	1	18	123	1/18/123	22	9.1	16	<0.05	0.5	<1	<0.1	6	<1	<1	<5	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
18 December 2013	17:15:00	3	1	18	456	1/18/456	18	8.6	13	<0.05	0.32	<1	<0.1	5	<1	<1	<5	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
18 December 2013	15:20:00	3	1	19	123	1/19/123	5.9	8.8	<5	<0.05	0.51	<1	<0.1	9	2	<1	<5	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
18 December 2013	15:20:00	3	1	19	456	1/19/456	3.2	8.4	<5	<0.05	0.39	<1	<0.1	9	<1	<1	5	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
18 December 2013	15:40:00	3	1	20	123	1/20/123	6.8	8.2	13	<0.05	0.45	<1	<0.1	4	<1	<1	12	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
18 December 2013	15:40:00	3	1	20	456	1/20/456	3.3	7.9	22	0.09	0.47	1	<0.1	2	<1	<1	10	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
18 December 2013	16:50:00	3	1	21	123	1/21/123	21	8.2	17	<0.05	0.51	<1	<0.1	8	1	<1	<5	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
18 December 2013	16:50:00	3	1	21	456	1/21/456	30	8.4	19	<0.05	0.54	<1	<0.1	8	1	<1	<5	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
18 December 2013	16:05:00	3	1	22	123	1/22/123	31	8.4	32	<0.05	0.5	<1	<0.1	5	1	<1	<5	<0.0001	<1	<5	Penrhyn estuary	Inlet side of SQID
18 December 2013	16:05:00	3	1	22	456	1/22/456	33	8.7	26	<0.05	0.41	<1	<0.1	5	<1	<1	<5	<0.0001	<1	<5	Penrhyn estuary	Outlet side of SQID
18 December 2013	16:15:00	3	1	23	123	1/23/123	8.9	9.2	<5	<0.05	0.47	<1	<0.1	3	1	<1	<5	<0.0001	<1	<5	Penrhyn estuary	Inlet side of SQID
18 December 2013	16:15:00	3	1	23	456	1/23/456	18	9.5	13	<0.05	0.6	<1	<0.1	4	2	<1	<5	<0.0001	<1	<5	Penrhyn estuary	Outlet side of SQID
18 December 2013	16:30:00	3	1	24	123	1/24/123	7	7.9	7	<0.05	0.35	<1	<0.1	4	2	<1	14	<0.0001	<1	<5	Penrhyn estuary	Inlet side of SQID
18 December 2013	16:30:00	3	1	24	456	1/24/456	11	8.3	<5	<0.05	0.34	<1	<0.1	4	2	<1	6	<0.0001	<1	<5	Penrhyn estuary	Outlet side of SQID
18 December 2013	17:45:00	3	1	BOT1	123	1/BOT1/123	1.4	7.8	47	1.2	0.42	1	<0.1	<1	<1	<1	<5	<0.0001	<1	<5	#N/A	Seawater
19 December 2013	13:20:00	4	2	15	123	2/15/123	48	7.8	31	<0.05	0.46	1	<0.1	2	2	<1	<5	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
19 December 2013	13:20:00	4	2	15	456	2/15/456	39	7.8	31	<0.05	0.43	<1	<0.1	2	2	<1	<5	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
19 December 2013	12:00:00	4	2	1	123	2/1/123	2.3	7.7	<5	<0.05	0.48	<1	<0.1	<1	1	<1	23	<0.0001	<1	<5	Quay wall	Inlet side of SQID
19 December 2013	12:00:00	4	2	1	456	2/1/456	2.4	7.8	7	0.05	0.52	<1	<0.1	<1	1	1	29	<0.0001	<1	<5	Quay wall	Outlet side of SQID
19 December 2013	11:40:00	4	2	2	123	2/2/123	3.6	7.8	5	<0.05	0.38	<1	<0.1	2	<1	<1	10	<0.0001	<1	<5	Quay wall	Inlet side of SQID
19 December 2013	11:40:00	4	2	2	456	2/2/456	3.8	7.8	7	<0.05	0.31	<1	<0.1	2	1	<1	8	<0.0001	<1	<5	Quay wall	Outlet side of SQID
19 December 2013	12:15:00	4	2	4	123	2/4/123	7.2	7.8	20	0.06	0.59	2	<0.1	3	1	1	32	<0.0001	<1	<5	Quay wall	Inlet side of SQID
19 December 2013	12:25:00	4	2	4	456	2/4/456	5.1	7.8	6	<0.05	0.56	2	<0.1	3	1	<1	35	<0.0001	<1	<5	Quay wall	Outlet side of SQID
19 December 2013	12:25:00	4	2	5	123	2/5/123	15	7.8	36	0.19	0.96	1	<0.1	1	2	3	86	<0.0001	<1	<5	Quay wall	Inlet side of SQID
19 December 2013	12:25:00	4	2	5	456	2/5/456	4.8	7.9	<5	<0.05	0.39	<1	<0.1	3	<1	<1	38	<0.0001	<1	<5	Quay wall	Outlet side of SQID
19 December 2013	12:43:00	4	2	7	123	2/7/123	8.3	7.9	37	0.15	1.3	1	<0.1	7	1	<1	<5	<0.0001	<1	<5	Quay wall	Inlet side of SQID
19 December 2013	12:43:00	4	2	7	456	2/7/456	15	7.9	16	0.06	0.3	<1	<0.1	7	1	<1	<5	<0.0001	<1	<5	Quay wall	Outlet side of SQID
19 December 2013	13:00:00	4	2	8	123	2/8/123	9	7.8	41	0.1	0.3	<1	<0.1	2	<1	<1	12	<0.0001	<1	<5	Quay wall	Inlet side of SQID
19 December 2013	13:00:00	4	2	8	456	2/8/456	3	7.9	<5	<0.05	0.24	<1	<0.1	7	<1	<1	8	<0.0001	<1	<5	Quay wall	Outlet side of SQID
19 December 2013	13:40:00	4	2	BOT1	123	2/BOT1/123	1	7.8	93	1.5	0.34	1	<0.1	<1	<1	<1	<5	<0.0001	<1	<5	#N/A	Seawater

Water Quality Testing Register

Sydney International Container Terminals Limited

Legend: Input cell | Output cell | Result pending | 123 = inlet | 456 = outlet

Sampling date	Sampling time	Days After Rain Event	Batch number	SQID number	Sample Sequence Number	Sample ID	Lab NTU	Lab pH	TSS mg/ L	TP mg/ L	TN mg/ L	Arsenic µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Nickel µg/L	Zinc µg/L	Mercury mg/L	Lead µg/L	Oil & Grease mg/L	Point of Discharge	Comments
20 February 2014	9:40:00	1	3	4	123	3/4/123	33	8.5	24	<0.05	0.49	2	<0.1	1	2	1	22	<0.0001	<1	<5	Quay wall	Inlet side of SQID
20 February 2014	9:45:00	1	3	4	456	3/4/456	29	8.2	29	<0.05	0.24	2	<0.1	2	1	1	23	<0.0001	<1	<5	Quay wall	Outlet side of SQID
20 February 2014	9:20:00	1	3	5	123	3/5/123	10	8.6	14	<0.05	0.16	<1	<0.1	<1	<1	<1	<5	<0.0001	<1	<5	Quay wall	Inlet side of SQID
20 February 2014	9:25:00	1	3	5	456	3/5/456	11	8.3	10	<0.05	0.18	<1	<0.1	2	<1	1	21	<0.0001	<1	<5	Quay wall	Outlet side of SQID
20 February 2014		1	3	10	123	3/10/123	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Quay wall	UNABLE TO BE SAMPLED
20 February 2014	11:45:00	1	3	10	456	3/10/456	28	8.7	20	0.08	<0.05	<1	<0.1	4	<1	<1	<5	<0.0001	<1	<5	Quay wall	Outlet side of SQID
20 February 2014	10:15:00	1	3	15	123	3/15/123	670	8.9	360	0.25	0.49	2	<0.1	5	2	<1	<5	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
20 February 2014	10:20:00	1	3	15	456	3/15/456	110	8.6	79	0.08	0.09	<1	<0.1	1	1	<1	<5	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
20 February 2014	9:50:00	1	3	17	123	3/17/123	86	9.8	80	0.06	0.08	<1	<0.1	8	<1	<1	<5	<0.0001	<1	<5	Flushing channel	Inlet side of SQID
20 February 2014	10:00:00	1	3	17	456	3/17/456	82	9.6	59	<0.05	<0.05	<1	<0.1	3	<1	<1	<5	<0.0001	<1	<5	Flushing channel	Outlet side of SQID
20 February 2014	12:20:00	1	3	23	123	3/23/123	8.6	8.8	<5	<0.05	0.09	<1	<0.1	1	<1	<1	6	<0.0001	<1	<5	Penrhyn estuary	Inlet side of SQID
20 February 2014	12:30:00	1	3	23	456	3/23/456	7.4	8.8	6	<0.05	0.07	<1	<0.1	1	<1	<1	6	<0.0001	<1	<5	Penrhyn estuary	Outlet side of SQID

7.7 Weather Data for the Monitoring Period (Nov 2013 – Feb 2014)

Sydney Airport, New South Wales
November 2013 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Fr	16.9	23.2	0	8.0	7.7	NE	43	15:28	18.8	60	7	ESE	9	1023.7	21.8	54	7	ENE	30	1020.1
2	Sa	16.3	30.8	0	5.6	7.1	NE	35	14:43	20.7	63	7	NW	11	1018.0	28.3	41	7	ENE	24	1012.2
3	Su	18.6	34.9	0	7.6	7.4	S	76	15:10	25.6	32	7	WNW	11	1010.1	33.5	10	6	WSW	43	1006.4
4	Mo	14.8	18.4	0	11.2	11.7	S	63	13:56	15.4	52	1	SSW	43	1022.6	17.1	51	1	S	50	1023.8
5	Tu	13.3	19.9	0	9.8	4.3	S	48	23:33	15.9	63	7	SSW	30	1028.1	17.9	56	5	SSE	24	1026.7
6	We	11.9	23.7	0	4.6	12.2	ENE	50	14:48	19.1	48	1	W	11	1024.2	21.4	44	1	ENE	37	1019.2
7	Th	15.9	30.3	0	8.0	11.9	NE	50	16:22	21.6	53	0	NW	13	1017.0	28.2	39	1	NE	31	1011.7
8	Fr	19.1	34.0	0	9.4	8.3	NE	69	17:22	26.4	36	3	NW	15	1010.8	28.1	41	6	NE	37	1005.7
9	Sa	21.4	31.8	0.4	10.4	9.5	SE	54	17:43	26.9	35	4	NNW	17	1006.2	27.4	38	3	SSE	37	1006.8
10	Su	15.5	20.0	2.2	9.6	0.7	S	56	00:17	15.8	89	8	SSE	33	1017.4	18.9	59	7	SE	33	1017.3
11	Mo	14.7	18.8	20.8	9.4	0.0	SE	61	18:37	15.5	93	8	SSE	46	1018.2	16.9	91	7	SSE	43	1016.4
12	Tu	15.1	22.4	7.4	1.8	4.9	SSE	33	23:08	18.1	86	8		Calm	1013.4	21.6	63	7	ENE	9	1011.8
13	We	15.1	29.7	7.8	3.2	13.0	SSW	44	22:30	21.0	48	1	WNW	17	1014.4	25.6	36	3	ENE	28	1010.8
14	Th	16.9	28.6	0	9.6	13.2	W	43	10:34	21.9	27	0	WSW	20	1014.3	23.4	36	1	ESE	28	1011.4
15	Fr	16.4	23.0	0	7.8	8.0	S	50	11:19	20.5	69	3	SSW	13	1015.8	20.2	68	6	SE	31	1015.0
16	Sa	14.5	21.2	80.4		5.6	SSE	52	22:48	18.1	75	7	SSE	22	1016.1	18.9	79	7	SE	37	1014.8
17	Su	15.3	18.6	11.2	5.6	0.0	S	61	13:32	16.1	86	7	SSW	33	1015.5	17.3	79	8	S	39	1014.4
18	Mo	14.9	19.6	13.6	4.0	0.0	S	61	04:12	17.1	83	8	SSW	44	1013.4	17.7	97	8	SSE	37	1010.6
19	Tu	16.1	24.1	15.8	2.0	10.3	S	48	10:28	19.3	80	6	SSW	30	1011.5	22.8	57	2	SSE	24	1010.5
20	We	17.0	26.7	0	6.8	12.0	ENE	43	15:48	21.1	72	4	WNW	11	1012.4	25.2	55	1	ENE	28	1010.6
21	Th	19.6	27.1	0	6.2	9.8	NE	52	14:30	24.1	61	6	NE	28	1012.7	26.3	49	5	NE	35	1010.2
22	Fr	20.1	25.9	2.2	9.8	2.9	NNE	78	13:14	21.8	74	7	NE	33	1009.2	23.1	61	7	NNE	44	1006.5
23	Sa	17.8	24.9	10.2	4.0	9.3	NNE	41	15:12	22.7	69	3	W	11	1005.7	22.0	72	5	S	15	1003.1
24	Su	17.3	23.1	0.4	5.0	13.0	SSW	50	02:34	19.8	64	1	SSE	17	1006.3	21.8	50	2	SE	28	1005.2
25	Mo	16.3	22.0	0	8.2	10.3	S	78	15:03	19.9	63	3	SSW	13	1008.2	19.4	77	7	SSW	46	1009.1
26	Tu	15.8	21.1	0.4	7.4	7.7	S	56	23:10	17.6	62	7	S	30	1016.7	20.2	51	1	S	30	1016.6
27	We	14.2	24.1	0	5.6	12.6	E	41	14:26	20.5	46	1	WNW	13	1018.2	22.6	45	1	E	28	1014.7
28	Th	17.3	29.3	0	8.0	11.2	NE	57	16:25	22.9	55	6	N	17	1011.6	27.6	45	7	NE	39	1004.6
29	Fr	19.6	20.7	0	10.6	0.0	SSW	69	01:51	20.5	76	8	S	20	1005.9	17.0	82	7	SSW	41	1009.0
30	Sa	14.4	21.6	8.4	3.4	7.3	SSW	56	00:48	18.2	64	7	S	30	1018.8	19.8	56	2	S	28	1019.7
Statistics for November 2013																					
	Mean	16.4	24.7		7.0	7.7				20.1	62	4		21	1014.5	22.4	56	4		32	1012.5
	Lowest	11.9	18.4		1.8	0.0				15.4	27	0		Calm	1005.7	16.9	10	1	ENE	9	1003.1
	Highest	21.4	34.9	80.4	11.2	13.2	#	78		26.9	93	8	SSE	46	1028.1	33.5	97	8	S	50	1026.7
	Total			181.2	202.6	231.9															

Observations were drawn from Sydney Airport AMO {station 066037}

IDCJDW2125.201311 Prepared at 16:01 UTC on 16 Jan 2014

Users of this product are deemed to have read the information and accepted the conditions described in the notes at
http://www.bom.gov.au/climate/dwo/IDCJDW0000.pdf

Sydney Airport, New South Wales
December 2013 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Su	14.3	23.2	0	7.0	7.5	SSE	35	09:46	19.4	66	5	SSE	11	1025.1	21.1	47	4	E	17	1024.4
2	Mo	17.0	25.6	0	5.0	12.1	NE	44	18:12	22.0	41	4	NE	13	1022.5	25.0	39	5	ENE	30	1019.4
3	Tu	16.4	26.4	0	8.0	13.3	NE	59	16:11	22.8	47	2	N	17	1017.7	25.7	41	1	NE	37	1013.3
4	We	17.4	29.1	0	8.8	7.9	NNE	67	18:07	24.0	52	5	NNE	13	1006.1	26.7	52	7	NE	31	1000.4
5	Th	18.7	27.5	3.4	8.0	8.4	W	94	14:18	20.6	87	7	SW	13	997.0	20.5	29	6	W	54	997.5
6	Fr	13.1	21.8	0	10.0	13.6	W	54	23:42	17.1	33	1	WSW	33	1011.7	21.0	34	1	SE	24	1013.5
7	Sa	14.0	25.6	0	7.6	12.6	E	35	16:20	20.7	34	3	WNW	15	1020.5	24.1	33	6	ENE	20	1018.3
8	Su	17.3	27.6	0	7.2	11.4	NNE	52	15:11	22.4	55	3	NE	17	1019.1	26.2	35	2	NE	37	1013.4
9	Mo	20.0	32.0	0	10.0	4.1	NNE	54	17:22	25.6	48	7	WNW	11	1009.2	29.7	39	7	NNE	26	1003.8
10	Tu	24.1	34.4	0	8.0	12.0	SSE	59	12:02	29.8	30	1	NW	28	1002.5	29.1	37	1	ESE	26	1002.8
11	We	17.6	29.4	0	11.2	13.2	ENE	43	15:14	22.9	31	1	WSW	17	1009.8	26.2	32	3	ENE	30	1004.7
12	Th	19.7	27.0	0	10.4	9.7	NE	56	16:57	21.6	64	6	ENE	20	1012.0	24.4	56	2	ENE	31	1009.8
13	Fr	19.2	28.9	0	6.8	13.0	NE	56	17:02	23.0	70	1	W	9	1012.5	27.2	53	1	ENE	33	1009.9
14	Sa	20.8	24.9	0	8.8	9.8	S	54	05:08	21.8	75	3	S	37	1014.9	23.3	59	5	SSE	33	1015.4
15	Su	18.3	24.3	6.2	7.8	2.0	ESE	37	18:49	20.1	84	7	NNE	9	1018.7	22.7	70	5	SE	24	1017.1
16	Mo	18.4	25.1	23.0	7.0	6.4	ENE	41	15:25	18.6	92	7	NNW	17	1020.8	24.4	59	3	ENE	26	1019.1
17	Tu	18.6	27.7	7.8	3.6	11.9	NE	52	16:58	24.3	52	6	NNE	15	1021.6	26.5	41	1	ENE	33	1019.3
18	We	20.0	26.3	0	10.0	12.9	ENE	41	14:31	25.0	53	3	NNE	17	1024.1	25.1	50	1	ENE	31	1022.8
19	Th	19.9	27.8	0	9.0	12.9	NE	65	18:51	24.6	54	2	NNE	24	1022.4	26.5	51	1	NE	41	1018.6
20	Fr	21.1	37.8	0	10.0	10.1	NNE	41	15:30	27.0	53	2	N	13	1016.1	33.5	33	3	NNE	30	1011.1
21	Sa	21.4	26.3	0	11.6	9.9	S	61	05:12	23.1	72	6	SSW	31	1016.8	23.1	79	1	S	43	1015.6
22	Su	21.4	31.2	0	8.0	6.9	NE	63	17:24	26.0	64	7	NNE	17	1012.6	29.8	56	7	NE	28	1008.2
23	Mo	21.5	36.6	0	7.6	4.0	S	72	14:31	25.8	73	7	SSE	15	1007.3	33.2	30	7	ENE	15	1004.2
24	Tu	18.8	21.5	0	6.6	0.0	S	52	00:45	20.7	59	7	SSE	31	1018.4	20.7	66	7	S	24	1018.7
25	We	18.1	21.5	0.4	3.6	0.0	NE	37	21:44	18.9	91	8	NW	9	1019.3	20.9	89	8	NE	20	1016.5
26	Th	18.6	25.0	15.8	1.2	9.5	SW	54	03:47	21.0	84	7	SSW	20	1012.5	24.0	60	1	SE	22	1010.7
27	Fr	17.9	25.8	1.2	6.2	10.5	E	39	13:23	21.8	75	5	SW	11	1012.5	24.2	61	5	ENE	26	1011.0
28	Sa	18.7	27.6	0	5.6	12.4	NNE	57	17:27	22.8	60	4	NNE	19	1012.3	26.9	50	1	NE	37	1007.6
29	Su	20.2	22.9	0	10.2	11.7	S	89	05:31	20.5	71	2	S	59	1009.4	21.0	59	1	S	37	1013.1
30	Mo	18.4	25.6	0	11.4	10.2	ENE	48	15:54	22.1	48	5	E	13	1015.4	24.7	43	1	ENE	33	1011.7
31	Tu	18.0	30.2	0	6.4	10.6	SE	37	14:59	23.2	56	2	WNW	11	1013.3	25.7	51	1	E	24	1011.1
Statistics for December 2013																					
	Mean	18.7	27.3		7.8	9.4				22.6	60	4		18	1014.6	25.3	49	3		29	1012.4
	Lowest	13.1	21.5		1.2	0.0				17.1	30	1	#	9	997.0	20.5	29	1	ENE	15	997.5
	Highest	24.1	37.8	23.0	11.6	13.6	W	94		29.8	92	8	S	59	1025.1	33.5	89	8	W	54	1024.4
	Total			57.8	242.6	290.5															

Observations were drawn from Sydney Airport AMO {station 066037}

IDCJDW2125.201312 Prepared at 13:01 UTC on 14 Jan 2014

Sydney Airport, New South Wales
January 2014 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	We	19.6	28.1	0	7.4	5.9	NE	52	15:16	24.1	62	5	NNE	17	1014.7	26.1	55	8	NE	39	1011.2
2	Th	22.3	36.8	0	8.0	3.5	W	63	13:38	25.6	71	7	WSW	7	1003.7	26.2	62	7	SSW	35	1002.5
3	Fr	20.5	28.3	0.4	5.6	5.6	ENE	41	15:03	23.1	60	7	NE	22	1005.2	26.9	45	6	NE	28	999.8
4	Sa	20.2	26.3	0	7.4	11.2	S	65	02:48	21.9	67	1	SSW	28	1003.4	24.7	51	1	ESE	26	1002.5
5	Su	20.3	29.0	0	8.2	12.2	NE	72	17:26	24.5	58	6	NNE	17	1010.5	28.2	55	2	NE	43	1005.4
6	Mo	20.2	30.6	0	9.4	12.8	SW	50	11:01	23.9	33	1	WSW	22	1009.0	26.6	27	1	ESE	31	1007.5
7	Tu	17.6	22.4	0	11.4	1.7	S	54	10:05	19.8	64	5	S	39	1018.3	20.7	59	7	S	28	1019.3
8	We	16.9	22.5	0.2	7.6	0.4	S	44	11:34	18.2	75	7	SSW	17	1023.9	19.8	67	7	SSE	22	1022.6
9	Th	18.0	24.0	0.2	3.8	2.0	ENE	41	15:22	22.5	39	7	NE	19	1024.4	23.1	46	7	ENE	26	1023.1
10	Fr	18.7	27.8	0.6	6.6	9.3	NE	50	15:35	20.6	88	6	SSW	9	1022.3	24.9	53	3	ENE	33	1019.6
11	Sa	19.7	31.9	0	7.2	10.9	NE	37	18:50	25.0	60	1	WNW	9	1018.7	30.4	41	2	NE	28	1014.3
12	Su	21.0	27.9	0	10.4	10.3	SE	37	15:57	23.5	80	2	S	19	1017.8	26.3	65	3	SE	26	1017.0
13	Mo	20.1	26.1	0	7.6	11.5	SSW	35	05:17	21.9	69	6	SSW	17	1022.1	25.0	51	2	SE	20	1020.1
14	Tu	19.8	29.7	0	7.2	12.0	ENE	52	15:16	24.1	55	4	N	13	1022.2	28.0	41	0	ENE	35	1019.4
15	We	21.5	31.3	0	10.0	12.8	NNE	65	17:12	26.7	55	0	N	9	1021.6	30.1	45	1	NE	44	1017.8
16	Th	21.8	30.8	0	10.8	13.1	NE	46	17:57	25.7	61	0	N	19	1019.1	28.9	51	0	NE	28	1016.5
17	Fr	21.4	30.8	0	10.4	12.8	NE	63	16:00	25.6	61	2	NNE	11	1016.6	29.6	46	0	NE	31	1013.9
18	Sa	20.4	31.8	0	10.6	13.1	NE	56	16:09	25.4	60	0	WNW	7	1012.6	30.7	41	0	NE	41	1009.0
19	Su	20.3	25.5	0	10.8	6.1	SSE	52	11:27	22.9	83	7	S	26	1010.2	23.5	84	6	S	31	1009.1
20	Mo	21.4	26.2	0.2	4.2	2.8	S	44	17:05	22.8	83	6	S	13	1009.4	23.4	80	7	SSE	26	1008.2
21	Tu	19.6	25.4	2.2	5.0	0.6	ESE	30	06:57	21.4	77	7	E	20	1010.4	24.7	64	7	E	17	1008.0
22	We	19.5	23.5	3.4	2.8	0.0	SSE	48	09:46	21.7	73	7	SSE	31	1017.8	21.5	67	7	SSE	33	1020.0
23	Th	19.7	26.0	0.4	4.4	4.6	E	37	12:50	23.0	55	5	E	24	1023.3	25.0	45	7	E	26	1020.9
24	Fr	20.0	28.4	0	7.4	1.5	NE	63	15:57	24.6	65	8	N	20	1014.0	28.2	53	8	NNE	39	1007.5
25	Sa	19.5	22.9	3.4	5.6	8.0	SSE	61	14:17	21.0	75	4	S	31	1012.2	21.9	49	4	S	46	1014.9
26	Su	16.6	22.8	0.8	8.6	2.3	SE	33	23:31	18.3	79	7	SSE	15	1023.9	21.6	44	7	ENE	19	1024.2
27	Mo	17.0	27.3	0	3.6	12.7	NE	50	15:42	22.1	52	3	WNW	9	1024.4	26.7	41	3	NE	35	1022.1
28	Tu	19.8	28.7	0	9.4	13.0	NNE	65	16:36	25.3	40	1	NNE	22	1021.4	27.6	44	1	NE	46	1018.2
29	We	20.8	30.9	0	12.0	13.0	NE	57	16:56	25.5	62	0	NNW	11	1017.0	29.1	42	1	NE	31	1013.7
30	Th	20.7	30.4	0	9.6	13.0	NE	63	16:40	25.6	50	3	NE	17	1020.0	29.3	35	0	NNE	43	1016.6
31	Fr	19.4	30.5	0	12.6	13.0	NE	52	17:51	25.7	47	1	NNE	24	1015.0	29.9	35	1	NE	35	1011.7
Statistics for January 2014																					
	Mean	19.8	27.9		7.9	8.1				23.3	63	4		18	1016.3	26.1	51	3		31	1014.1
	Lowest	16.6	22.4		2.8	0.0				18.2	33	0	#	7	1003.4	19.8	27	0	E	17	999.8
	Highest	22.3	36.8	3.4	12.6	13.1	NE	72		26.7	88	8	S	39	1024.4	30.7	84	8	#	46	1024.2
	Total			11.8	245.6	251.7															

Observations were drawn from Sydney Airport AMO {station 066037}

IDCJDW2125.201401 Prepared at 16:01 UTC on 2 Mar 2014

Sydney Airport, New South Wales
February 2014 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Sa	20.8	27.8	0	11.0	10.6	SSW	44	05:12	22.4	81	6	S	24	1015.3	26.6	63	3	SE	24	1012.7
2	Su	22.1	29.7	0	7.2	12.7	NNE	52	09:51	25.4	63	3	NNE	30	1015.6	28.6	43	1	NE	39	1014.5
3	Mo	21.9	30.1	0	12.0	11.6	NNE	65	18:19	25.2	52	1	NNE	35	1015.6	29.1	38	0	NE	41	1011.8
4	Tu	20.5	25.4	0	12.0	1.2	SSE	67	16:51	24.2	70	7	ESE	19	1017.2	19.1	89	8	SSW	43	1019.6
5	We	18.4	23.6	0.8	5.2	3.1	SE	46	08:56	19.4	62	6	SE	33	1024.1	20.9	53	7	S	28	1022.5
6	Th	17.3	24.3	0.4	7.2	3.2	S	33	23:46	19.6	63	8	WSW	11	1020.5	22.5	47	7	SE	17	1017.8
7	Fr	15.9	27.7	0	4.2	12.3	NE	50	15:49	20.8	58	1	WNW	9	1017.7	25.9	44	1	NE	35	1015.0
8	Sa	19.2	29.8	0	9.2	12.1	NE	54	14:57	23.9	58	0	N	6	1018.1	28.2	38	0	NE	37	1016.0
9	Su	20.7	30.7	0	9.6	12.9	NE	57	17:59	23.7	68	2	NNE	13	1018.9	29.8	41	0	NE	35	1015.3
10	Mo	20.1	23.5	0.2	10.4	0.2	SSW	76	03:37	20.5	85	8	S	31	1019.6	23.0	69	6	S	28	1017.6
11	Tu	20.0	26.0	0	7.2	4.0	S	35	23:40	21.4	79	8	SSW	11	1017.8	23.3	77	2	S	24	1014.9
12	We	20.7	28.0	0	6.0	4.3	E	41	13:57	23.9	76	7	ESE	22	1016.5	27.0	59	7	E	30	1015.5
13	Th	21.4	29.8	1.2	4.6	7.5	ENE	50	15:47	25.8	60	4	NNE	20	1015.1	29.3	44	8	ENE	31	1011.2
14	Fr	21.6	25.7	0	8.8	0.0	NE	31	19:33	23.4	72	8	N	9	1008.2	23.1	76	8	ENE	19	1006.4
15	Sa	21.2	27.1	2.6	2.2	0.0	NNE	35	09:33	22.6	87	8	N	15	1003.6	24.4	79	8	NE	20	999.3
16	Su	22.3	24.4	4.6	2.4	0.0	SE	56	12:52	22.9	91	8	ESE	11	999.4	21.4	92	8	SSE	30	1001.4
17	Mo	18.3	25.3	17.4	7.0	8.3	S	44	01:09	19.2	90	7	SSW	20	1013.6	23.6	56	4	SE	20	1013.6
18	Tu	19.1	25.1	0	2.4	2.7	ESE	31	13:07	21.1	73	7	N	4	1013.1	23.7	68	7	ENE	20	1009.8
19	We	21.0	29.3	0	2.2	1.8	WNW	41	13:12	24.2	79	7	N	13	1004.8	24.2	91	8	NW	13	1002.2
20	Th	20.5	27.8	24.6	4.2	11.2	SE	33	13:41	22.4	45	5	WSW	20	1007.6	25.6	39	2	SE	28	1008.0
21	Fr	18.4	25.5	0	11.4	11.9	WSW	48	05:08	21.0	30	1	WSW	19	1016.0	23.5	56	1	SSE	28	1015.9
22	Sa	18.9	24.3	0	5.8	9.2	S	37	08:27	19.7	83	7	SSW	22	1020.5	22.3	63	4	SSE	24	1019.3
23	Su	19.3	24.4	0	8.0	10.7	S	43	03:04	21.4	55	1	SSE	28	1023.4	23.0	60	2	SSE	28	1022.1
24	Mo	19.7	27.0	0	6.4	11.0	ENE	41	15:50	21.7	67	2	WSW	9	1020.7	25.6	54	1	ENE	22	1018.0
25	Tu	20.0	28.9	0	7.4	11.8	NNE	56	17:40	24.1	67	3	NE	6	1017.9	28.4	41	1	NE	37	1013.4
26	We	20.6	34.9	0	9.8	6.2	S	54	15:54	25.0	58	6	N	11	1011.8	32.1	33	7	E	15	1009.8
27	Th	20.3	21.8	6.2	5.2	0.2	S	54	10:29	21.3	90	7	S	33	1017.3	20.7	83	7	SSE	35	1019.2
28	Fr	19.4	21.9	0	3.2	0.0	SE	46	10:36	19.4	89	8	SE	30	1022.9	21.6	64	7	SSE	28	1022.5
Statistics for February 2014																					
	Mean	20.0	26.8		6.9	6.5				22.3	69	5		18	1015.5	24.9	59	4		27	1013.8
	Lowest	15.9	21.8		2.2	0.0				19.2	30	0	N	4	999.4	19.1	33	0	NW	13	999.3
	Highest	22.3	34.9	24.6	12.0	12.9	SSW	76		25.8	91	8	NNE	35	1024.1	32.1	92	8	SSW	43	1022.5
	Total			58.0	192.2	180.7															

Observations were drawn from Sydney Airport AMO {station 066037}

IDCJDW2125.201402 Prepared at 13:01 UTC on 7 Mar 2014