
# HANNA WASH AUSTRALIA

# CAR WASH PROCESS VALIDATION

March 2011

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# 1 Introduction

Hanna Wash Australia have developed and installed a recycled water processing system at the Froggies Ecowash car wash facility at Rocla Road, Traralgon.

In order to determine the effectiveness the recycled water treatment process is, the system was investigated using the Australian Car Wash Association's "Guidelines for Water Recycling in Commercial Car Wash Facilities".

The guidelines required a risk assessment and a number of water quality tests at appropriate locations within the process train. Volumetric water use tests were also undertaken for both manual and automatic bays.

# 2 Methodology

The methodology essentially follows that set out in the guidelines for validation.

## 2.1 Risk assessment of the recycled water process

A risk assessment of the recycled water process was undertaken using the Guidelines for Water Recycling in Commercial Car Wash Facilities. This involved following the guidelines, developing a process flow diagram and answering questions relating to each process and critical control point within the process.

## 2.2 Sample and analysis of the process water

Based on the process flow diagram developed from the risk assessment, two sample points were chosen to represent the 'before' and 'after' treatment within the process. These water samples will be taken and transported to a laboratory and tested for the following parameters (as per the Guidelines):

- *E. Coli;*
- Heterotrophic Plate Count;
- Free Residual Chlorine (if chlorine is used to disinfect);
- Turbidity;
- Suspended Solids;
- Biological Oxygen Demand; and
- pH.

Water sampling was undertaken on 5 separate runs. The sampling runs reflected a range of busy / normal / quiet times for the auto wash.

The sampling procedures generally followed those set out in the guidelines:

**Pre-run Setup**

Prior to the commencement of sampling, the following was conducted:

1. appropriate sample bottles were prepared for both source water and final effluent sampling;

2. sample collection devices were rinsed with water then dried (sample bailer for samples that cannot be reached);

3. field sheets were printed and ready to complete, and a digital camera was available; and

4. freezer bricks or equivalent were placed in the esky to keep samples cool.

**On-site Sampling Procedure**

1. site owner / manager &/or system manufacturer representative was on-site during sampling to ensure the system is operating normally and to direct sampling staff to appropriate sample points;

2. system was visually inspected and any log books should be examined to observe any recent operational issues that should be noted prior to sampling (note log books were not observed in this project, however Max Hill provided verbal advice to ALS staff);

3. source water origin and final use of treated water was documented (i.e. 1 automatic bay only).

4. flow rate measurements were taken as part of the volumetric audit.

5. source water and final effluent samples were collected from the appropriate sample points;

6. sample bottles were labelled with the following information: time & date, source water / final effluent, site name. Chlorine residual was not applicable (there was no chlorination in the process), however field tests for chlorine residual were undertaken on the second sampling run to confirm this;

7. sample points were recorded to ensure the same sample point is used for all sampling events; and

8. sample bottles were placed immediately in esky with ice bricks and transported promptly to the laboratory for testing.

**Quality Assurance Samples**

The following additional samples were collected on randomly selected sampling runs for quality assurance (QA) purposes:

1. Trip Blank – laboratory grade reagent water, contained in the same type of sample bottle being used in the sampling, and managed in exactly the same way as the samples for the duration of the round trip.

2. Field Duplicate – sampled in the same manner and maintained under the same conditions as the other samples.

Quality Assurance was undertaken on sample run #3 (28th February 2011).


**Figure 2-1: Location of sample point #1 (source water) – Tank #1**


**Figure 2-2: Location of sample point #2 (final effluent) – inside control room**


**Figure 2-3: Location of some of the onsite process equipment**

## 2.3 Volumetric water audit

A water audit of the facility wash undertaken to determine average use in both the manual self serve bays and the automatic bay. The methods used were as per standard methodology for volumetric car wash audit.

Manual Self Serve Bays.

For each bay (4 in total at this facility), a volumetric test was undertaken for both low pressure and high pressure settings of the hose / nozzle unit.

The low pressure setting was first selected within the control unit, and a stopwatch used to measure the volume used in 1 minute of operation. The volume was determined by running the hose / nozzle into a 60 litre plastic bin with a small hole in the lid for the nozzle, and weighing the bin and water before and after the test. The volume of water was determined using the relationship of 1 litre = 1 kg of water.

The same approach was used for the high pressure setting. As per the standard audit procedure, the high pressure test was for 3 minutes duration as recycled water was available. (If no recycled water available, the test is run for 5 minutes). The manual bay provides the user with recycled water option for the high pressure green rinse function. Other recycled water options could be provided to customers (i.e. during water restrictions) for high pressure soap, high pressure rinse and foam brush functions, which use no potable water. As such, while the 3 minute test is appropriate within the context of the ACWA Guidelines, it would not reflect a realistic potable water use for a typical car wash in a manual bay at the Hanna Wash facility, which would use less potable water due to the other recycled water options available. This is further discussed in section 4 of this report.

Automatic Bay

The automatic bay uses recycled wastewater as its main source of water, however some potable water is used within the process for final rinses and for mixing with various detergent and wax products. The potable water used within the auto bay was determined by reading the water meter (Gippsland Water's asset) attached to the property water connection, before and after each test.

As per standard audit procedure, the reverse osmosis unit was isolated for the test. The audit procedure calls for 5 'base' runs of the auto bay (i.e. the most basic of options for the customer) and then 5 'premium' runs of the auto bay. The meter was read before and after each of the runs, to establish the volume used for each run. Results were recorded.

# 3 Results

## 3.1 Risk assessment of the recycled water process

As per the Guidelines for Water Recycling in Commercial Car Wash Facilities a risk assessment was undertaken, and results are shown in the tables and figures below.

**Site details**

**Table 3-1: Site Details**

| | |
|---|---|
| Business name | Hanna Wash Australia Pty Ltd trading as Froggies Ecowash |
| Site location (property address) | Rocla Road, Traralgon Victoria |
| Site owner | Max Hill |
| Site manager | Max Hill |
| Other employees | Not presently but intend to. |
| Person Responsible for the recycling system | Max Hill |
| Backup Person Responsible for the recycling system | Max Hill |

**System Details**

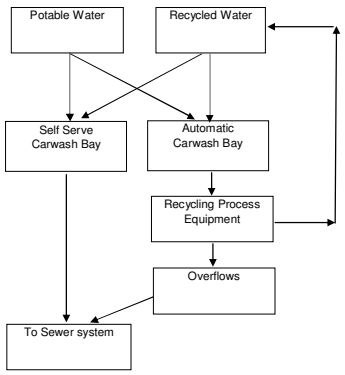

**Figure 3-1: Overview of water sources and destinations on site**

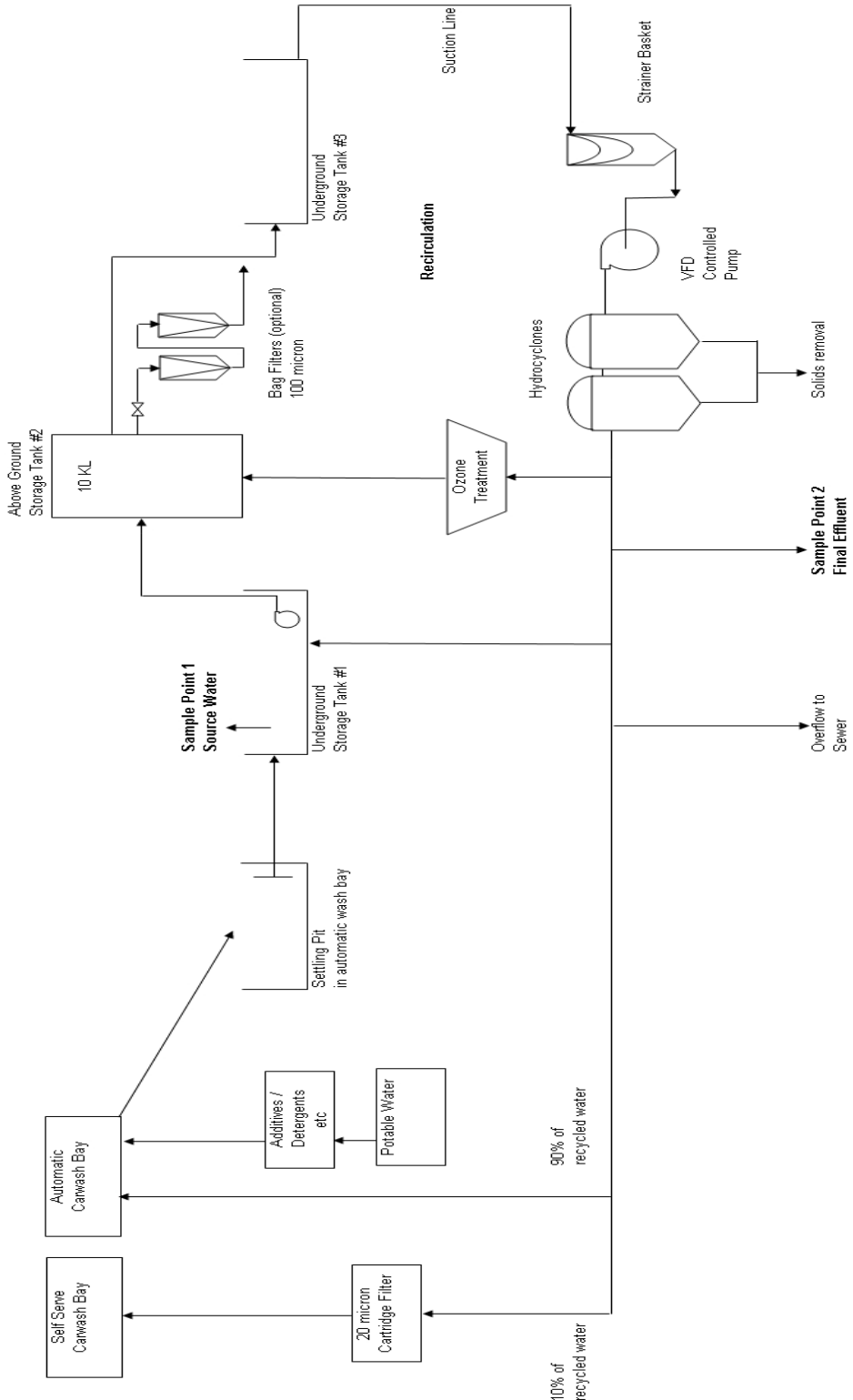

**Figure 3-2: Process flow diagram for recycled water**

**Table 3-2: System Details**

| | |
|---|---|
| **Water recycling system supplier** | Hanna Wash Australia |
| **Water recycling system supplier contact details** (include contact persons name and business and after hours telephone number) | Max Hill, Hanna Wash |
| **Water recycling system supplier secondary contact details** (include the same information for the secondary contact in the event that the primary contact is unreachable) if applicable | Max Hill, Hanna Wash |
| **Source water origin** (is water recycled from the auto bays, self serve bays, both or from other origins. If other, specify) | Auto bay – recycled water and potable water<br>Manual bays – recycled water and potable water |
| **Treated water final use** (is treated water used in the auto bays, self serve bays, both or other areas. If other, specify) | Main use is in the auto bay (estimated to be 90%), the remainder is used in the manual bays as an option for customers. |
| **Who is responsible for day-to-day operation of the recycling system?** (Include company name, contact person's business and after hours telephone numbers) | Max Hill, Hanna Wash |
| **Major system technologies** (including filtration, flocculation, sedimentation, hydrocyclone separation etc) | Settling pit, bag filtration (optional), hydrocyclones, ozone treatment, advanced oxidisation, optional enzyme additive. |
| Mode/s of disinfection (if any) | Ozonation, advanced oxidisation, optional enzyme additive. |

## Critical Control Points

The following critical control points were identified in the audit and results of standard questions were answered in the tables below.

- Bag Filter
- Flow through process tanks
- Final Product Storage Tank*
- Ozonation
- Source Water
- Recycled water Supply

*The final product storage tank is continuously recycling.

**Table 3-3: Bag Filters**

| Hazards associated with Bag Filters | Assessment of Management of Risks Associated with Bag Filters | Risk Management Details. |
|---|---|---|
| | Does your system incorporate bag filtration?<br>☑ Yes (if yes, continue with this section)<br>☐ No (if no, move on to next section) | Yes, however the bags are not part of the recycled water system as such, they are operated manually for the removal of sludge on an as needs basis. |
| Carry over of solids and carry over of pathogens | Does you bag filter/s have any alarms in place?<br>☐ Yes<br>☑ No | Alarms are not needed at this time as there as is typically 6 – 12 months of operation before bag system would be used. |
| | Are all staff trained in maintaining bag filters?<br>☑ Yes<br>☐ No | At present there is only one staff member and there is a full manual available. |
| | How often are bag filters replaced? | As required, they are throw away bags. |
| | Is regular inspection of your bag filters part of your maintenance program?<br>☑ Yes<br>☐ No | As per details above, the bags are not a continuous part of the process and are only operated manually as required. They would be inspected as part of this manual operation. |
| | Other issues associated with bag filters? | - |

**Table 3-4: Flow Through Process Tanks**

| Hazards associated with Flow through process tanks | Assessment of Management of Risks Associated with Bag Filters | Risk Management Details. |
|---|---|---|
| | Does your system incorporate any flow through process tanks?<br>☑ Yes (if yes, continue with this section)<br>☐ No (if no, move on to next section) | |
| Pathogen survival (lack of disinfection) | Does your system incorporate disinfection?<br>☑ Yes<br>☐ No | If no, how will you address the risk of pathogen growth through the treatment system? |
| Carry over pathogens | How often are the insides of the process tanks inspected for cleanliness? Does this appear adequate to avoid excessive slime build up?<br>☑ Yes<br>☐ No | The process tanks do not appear to be building up slime growth. Tanks are part of the ozonated water recycling loop so is continuously disinfected.<br>Inspection generally occurs once per week for the whole system. |
| | Are process tanks drained when system is shut down or idle for extended periods of time?<br>☐ Yes<br>☐ No | n/a. System has not been shut down since current owners have installed new system.<br>Drainage not required. |
| | Other issues associated with holding / storage tanks. | - |

**Table 3-5: Final Product Storage Tank**

| Hazards associated with Final Product Storage Tanks | Assessment of Management of Risks Associated with Bag Filters | Risk Management Details. |
|---|---|---|
| | Does your system incorporate a final product storage tank?<br>☑ Yes (if yes, continue with this section)<br>☐ No (if no, move on to next section) | Yes, but it operates as an on demand tank rather than a final storage tank. As the system continuously recycles water, it's not really a 'final' storage. |
| Pathogen survival (lack of disinfection) | Does your system incorporate disinfection?<br>☑ Yes<br>☐ No | Yes, ozonation, advanced oxidisation, optional enzyme additive. |
| Low / malfunctioning ozone treatment | | See risk table for ozonation below |
| Carry over pathogens | How often are the insides of the final product storage tanks inspected for cleanliness? Does this appear adequate to avoid excessive slime build up?<br>☑ Yes<br>☐ No | The final product storage tank does not appear to be building up slime growth.<br>Inspection generally occurs once per week for the whole system. |
| | Is water from the final storage tank recirculated to avoid stagnation?<br>☑ Yes<br>☐ No | Yes, and continuously re-treated. |
| | Are process tanks drained when system is shut down or idle for extended periods of time?<br>☐ Yes<br>☐ No | n/a. System has not been shut down since current owner has installed new system.<br>Drainage on shut down is not necessary. |
| | Other issues associated with final storage tanks. | - |

**Table 3-6: Ozonation**

| Hazards associated with Ozonation | Assessment of Management of Risks Associated with Bag Filters | Risk Management Details. |
|---|---|---|
| | Does your system incorporate Ozonation?<br>☑ Yes (if yes, continue with this section)<br>☐ No (if no, move on to next section) | Yes. |
| Ozone system maintenance | How often is the ozone system serviced? Who services the system? | Max Hill services the system. |
| Low ozone does rate | Do you have an alarm on your ozone system to indicate when it has failed?<br>☐ Yes<br>☑ No | An alarm could be installed in the future as required. |
| | Are their clearly designed maintenance procedures in the event of ozone system failure?<br>☑ Yes<br>☐ No | There is a full manual for the whole reclaimed water system. |
| | Are staff trained in detecting ozone system failure and administering these procedures?<br>☑ Yes<br>☐ No | Max Hill is the only staff present at this point, and is fully trained. |
| | Are you aware whether or not your ozone dosage rate has been optimised to perform the desired function (remove odour, pathogens etc)?<br>☑ Yes<br>☐ No | Optimisation has occurred and is a continuous process. |
| Carry over pathogens | Is water from the final storage tank recirculated to avoid stagnation?<br>☑ Yes<br>☐ No | Yes, and continuously re-treated. |
| | Are process tanks drained when system is shut down or idle for extended periods of time?<br>☐ Yes<br>☐ No | n/a. System has not been shut down since current owner has installed new system.<br>Drainage not necessary. |
| | Does your system incorporate any other disinfection barrier?<br>☑ Yes<br>☐ No | Advanced oxidisation, optional enzyme additive |
| | Other issues associated with ozonation. | - |

**Table 3-7: Source Water**

| Hazards associated with Source Water | Assessment of Management of Risks Associated with Bag Filters | Risk Management Details. |
|---|---|---|
| **Elevated suspended solids (SS)** | Are solids traps maintained sufficiently to minimise the build-up of solids and subsequent elevation in SS in source water?<br>☑ Yes<br>☐ No | Yes, the solids traps are regularly cleaned out by a septic tank cleaning contractor, estimated to be every 6 – 12 months. |
| Elevated nutrients, chemicals, oil / petroleum products | Do you have signage to direct customers what not to dispose of in car wash bays from which water is recycled?<br>☐ Yes<br>☑ No | Signage may be erected as part of the re-branding of the site. |
| Pathogens | Do you have signage to ensure animal trailers and others are not washed in self serve bays?<br>☐ Yes<br>☐ No<br>☑ N/A | Water is recycled from the auto bay only. |
| | Do you recycle wastewater from the dog wash?<br>☐ Yes<br>☐ No<br>☑ N/A | No dog wash on site. |
| | Other issues associated with source water. | - |

**Table 3-8: Recycled Water Supply**

| Hazards associated with Recycled Water Supply | Assessment of Management of Risks Associated with Bag Filters | Risk Management Details. |
|---|---|---|
| Odours, pathogens, soaps and wax residuals in recycled water. | Are their clearly defined maintenance procedures for the recycled system?<br>☑ Yes<br>☐ No | There is a full manual for the recycled water system. |
| | Are all staff trained in administering these procedures?<br>☑ Yes<br>☐ No | Max Hill is the only staff member at present and is fully trained to administer procedures. |
| | Are the alarms on the system to alert operator when something goes wrong?<br>☐ Yes<br>☑ No | Alarms are to be installed, however the current computer controlled system has the ability to record/send alarms. |
| | Other issues associated with recycled water supply water. | - |

**Operational and Maintenance Plan**

There is a full manual for the recycled water system. The manual covers a broad range of procedures including Start-up, Normal Operating, Shut-down and Emergency Shut-down. Maintenance procedures for the recycled water system are contained in the manual. Maintenance is part of the on-going running of the facility.

**Incident Reporting**

It is recommended that an incident reporting protocol that all staff are aware of which is followed in response to an incident (e.g. treatment failure, pipe burst, system malfunction etc).

Max Hill is responsible for incident reporting on site. This is recorded in a diary at present. There is an intention to move to a full incident reporting system.

**Training Requirements**

Once the site is up and running, there will eventually be others trained to operate the site. There will be training requirements associated with this, a training manual and full training will be implemented in the near future.

## 3.2 Water Quality

Water samples were obtained on site on 5 separate occasions and analysed. Sample point #1 is 'source water' and sample point #2 is 'final effluent'. Results for water quality tests are shown in Table 3-9 and in Figure 3-3 to Figure 3-9.

Tank #1 was chosen as the best location for source water – i.e. sample point #1 (refer to Figure 3-2). There were several reasons for this:

- The wash bay pit is not recommended as a sampling point within the ACWA guidelines (Table 7) because it is thought to be difficult to get a homogenous sample from the pit.
- Tank #1 is the first contact point for the source water into the continuous recycling loop and provided a representation (although a diluted one) as to the source water quality, especially soon after a car was washed (which was the case during sampling runs).

Sample point #1 represents a combination of both source water and treated water and as such, the difference in analyses results between sample points #1 and #2 provides only a 'lower bound' estimation of the effectiveness of the process train. It is a reasonable assumption that the source water was probably 'dirtier' and contained higher levels of all analysed parameters including E. Coli, than is reflected in the results of the analyses of water from sample point #1 in this study. The actual treatment effectiveness is likely to be better than by comparison of results from sample points #1 and #2, and this needs to be taken into account when considering Table 3-9 and Figure 3-9.

The ACWA Guidelines are based on 'Batch' processing systems where source water is typically untreated (and easily sampled) prior to entering the treatment train. The AquaChem/Hanna Wash Australia Reclaim System at the Traralgon facility is a 'Continuous' process system so it is not possible to locate a source water sample point in the system that is not the wash bay pit.

Sample point # 2 does however provide a good representation of the final effluent quality, and these water quality results can be directly compared to the target water quality limits within the ACWA guidelines.

One water quality test to be undertaken was for residual chlorine. However, the process equipment at the Traralgon facility did not use chlorine as a disinfectant. To confirm this, an on-site residual chlorine test was undertaken on samples from run #2. The results showed no detectable residual chlorine present in the source or recycled water.

Of the 5 sample runs, the first test conducted on 14th February, 2011 was undertaken on the recycled water system which was operating without any enzyme additive or 'Aqua Key' being dosed into the system (Aqua Key is the active ingredient in the 'Advanced Oxidation' component of the recycled water system). During the subsequent sample runs (2-5), the recycled water system was operating with these additives included.

**Table 3-9: Water quality results for the 5 sample runs**

| Date | Sample point | pH | Biological Oxygen Demand | Suspended Solids | Turbidity | Heterotrophic Plate Count | *E. Coli* |
|---|---|---|---|---|---|---|---|
| | | pH unit | mg/L | mg/L | NTU | cells/ml | cells/ 100ml |
| Target level | | 6.5 – 8.5 | 20 | 30 | - | - | 10 |
| | | | | | | | |
| Sample Run #1 | SP1 | 7.3 | 21 | 22 | 18 | 100000 | 340 |
| 14/02/2011 | SP2 | 7.4 | 23 | 9 | 13 | 100000 | 25 |
| | | | | | | | |
| Sample Run #2 | SP1 | 7.8 | 17 | 14 | 18 | 100000 | 15 |
| 21/02/2011 | SP2 | 7.9 | 17 | 11 | 18 | 65000 | 0 |
| | | | | | | | |
| Sample Run #3 | SP1 | 7.6 | 5 | 8 | 9.6 | >10000* | 6 |
| 28/02/2011 | SP2 | 7.6 | 5 | 6 | 10 | >10000* | 0 |
| | | | | | | | |
| Sample Run #4 | SP1 | 7.7 | 21 | 23 | 23 | >10000* | 62 |
| 8/02/2011 | SP2 | 7.6 | 6 | 8 | 17 | >10000* | 4 |
| | | | | | | | |
| Sample Run #5 | SP1 | 7.2 | 33 | 26 | 30 | >10000* | 120 |
| 23/03/2011 | SP2 | 7.2 | 31 | 24 | 33 | >10000* | 44 |
| | | | | | | | |
| Average | SP1 | 7.52 | 19.4 | 18.6 | 19.72 | 100000 | 108.6 |
| | SP2 | 7.54 | 16.4 | 11.6 | 18.2 | 82500 | 14.6 |
| **Treatment effectiveness^ Removal (%)** | | **-0.3%** | **15.5%** | **37.6%** | **7.7%** | **15.2%** | **86.6%** |

*For statistical purposes, results with a '>' symbol were treated as if the symbol did not exist (i.e. a result of >10,000 was set to 10,000 in order to calculate average values for heterotrophic plate count).

^As per discussion on page 12, treatment effectiveness results shown in Table 3-9 are considered to be a minimum that could be expected. The dilution of sample point #1 (source water) with treated process within Tank #1 meant that these samples were not as 'dirty' as could be expected for source water.

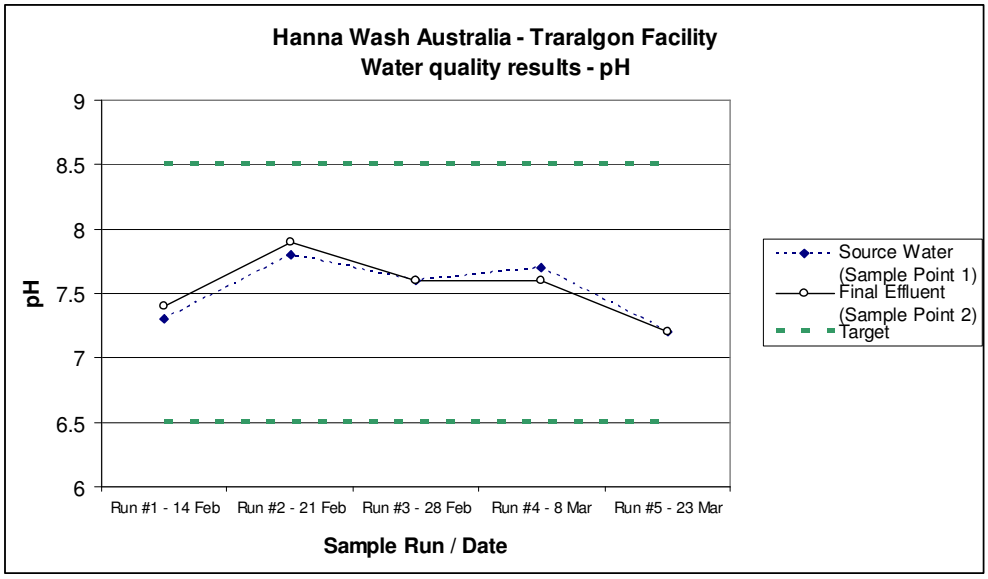


**Figure 3-3: Water Quality results - pH**

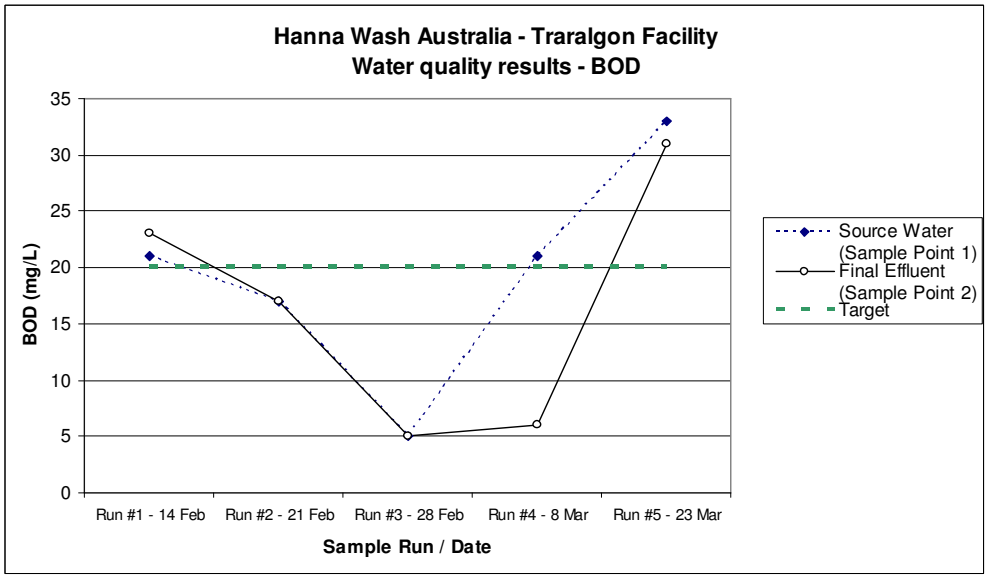


**Figure 3-4: Water Quality results - BOD**

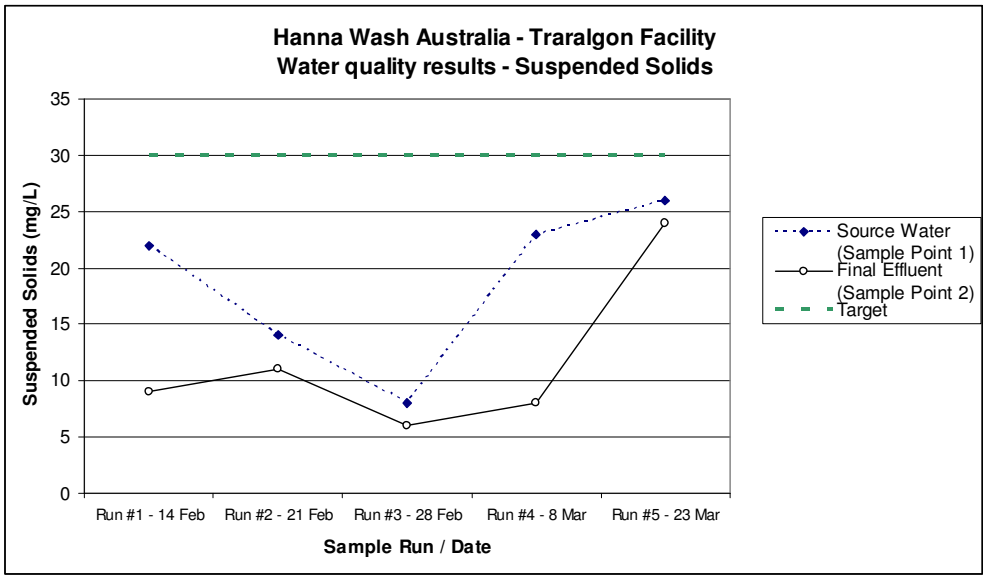


**Figure 3-5: Water Quality results – Suspended Solids**

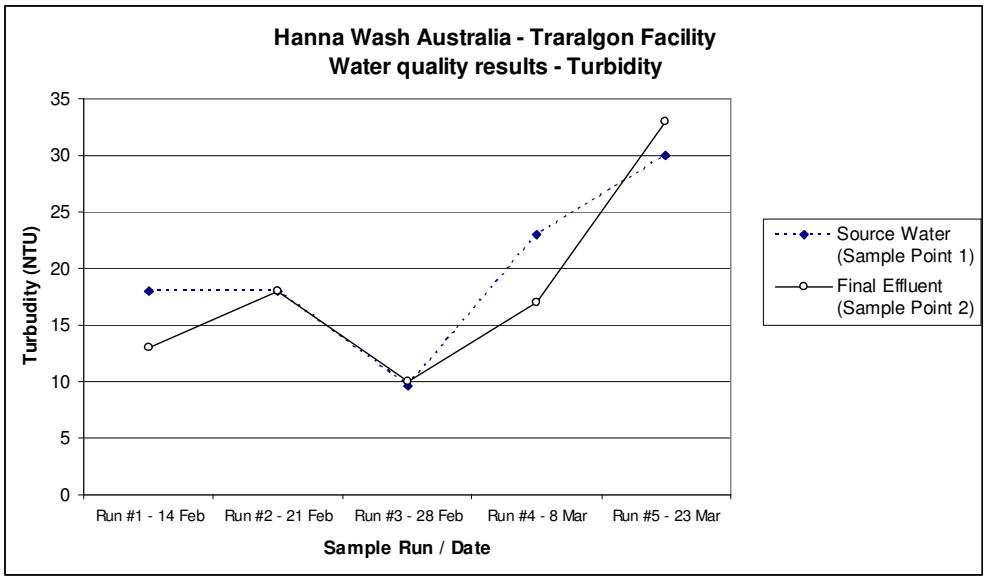


**Figure 3-6: Water Quality results - Turbidity**

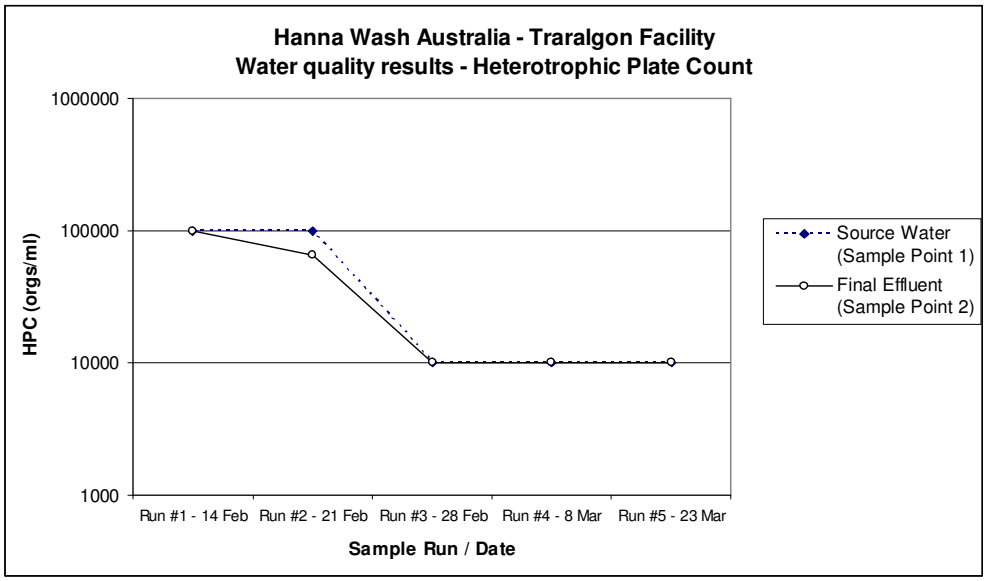


**Figure 3-7: Water Quality results – Heterotrophic Plate Count**

For statistical and graphical display purposes, results with a '>' symbol were treated as if the symbol did not exist (i.e. a result of >10,000 (e.g. run #3, #4 and #5) were set to 10,000 in order to calculate average values for heterotrophic plate count and to display data in Figure 3-7).

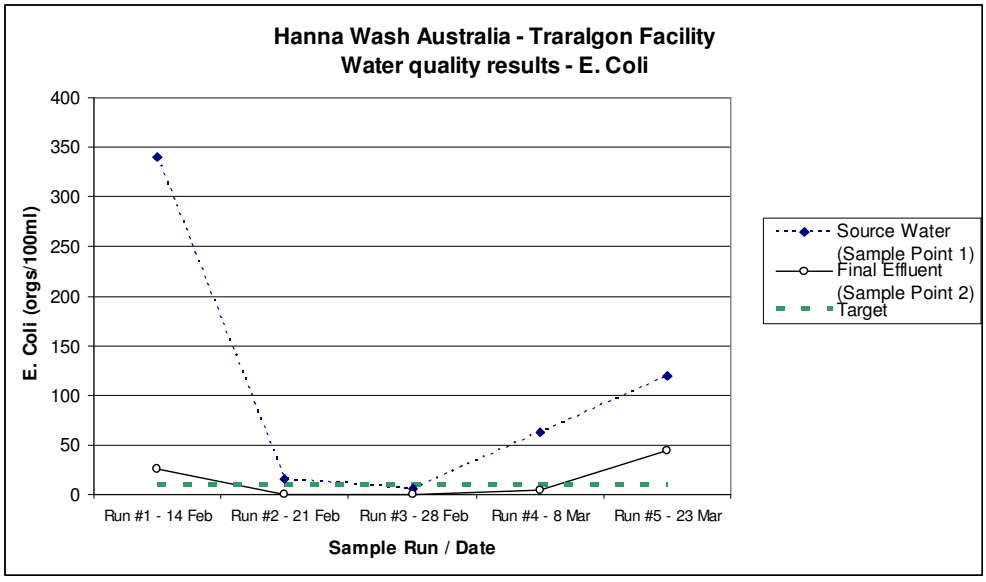


**Figure 3-8: Water Quality results – *E. Coli***

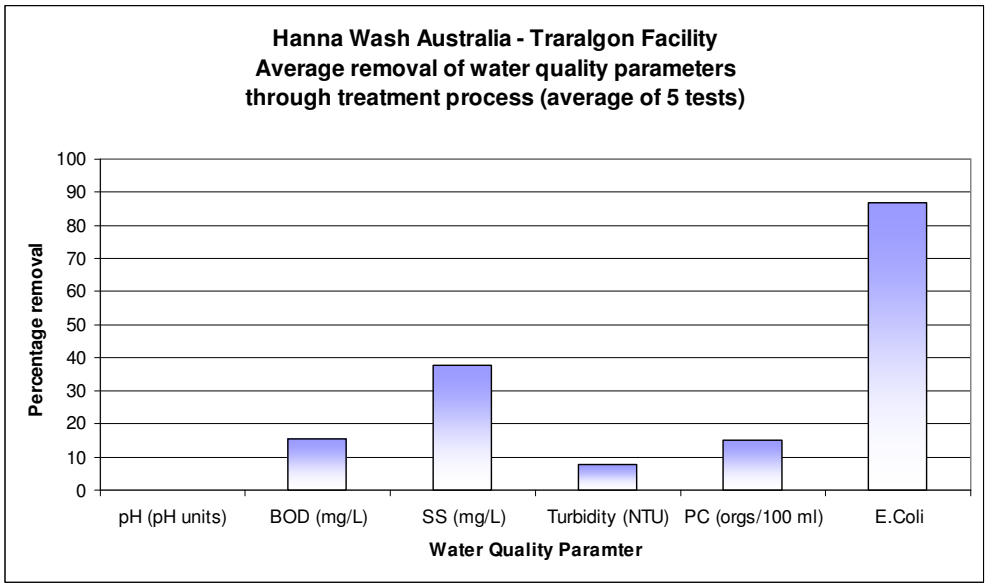


**Figure 3-9: Water quality results – average removal through water treatment process***

*As per discussion on page 12, treatment effectiveness results shown in Figure 3-9 are considered to be a minimum that could be expected. The dilution of sample point #1 (source water) with treated process within Tank #1 meant that these samples were not as 'dirty' as could be expected for source water.

It is noted that the guidelines provided by the Australian Carwash Association are best suited to batch process systems. The process equipment at the Traralgon facility is a continuously recirculating treatment system and results from the guidelines need to be put into this context when discussing results.

## Quality assurance

**Table 3-10: Water quality results from quality assurance tests**

| Date | Sample point | pH | Biological Oxygen Demand | Suspended Solids | Turbidity | Heterotrophic Plate Count | *E. Coli* |
|---|---|---|---|---|---|---|---|
| | | pH unit | mg/L | mg/L | NTU | cells/ml | cells/ 100ml |
| 28/02/2011 | DS2 | 7.6 | 4 | 7 | 7.5 | >10000 | 1 |
| 28/02/2011 | FB | 5.7 | <2 | <2 | <0.1 | 0 | 0 |

Quality assurance on the sampling runs was undertaken and results are shown in Table 3-10. These results are for DS2 - a duplicate of SP2 taken on 28th February, and a field blank (FB) also on 28th February. Results show that the duplicate samples were quite close providing confidence in the laboratory methods. The field blank also provides confidence in results – each of the results are very low or zero for microbiology.

## 3.3 Comparison of water quality results to other carwash systems

As part of the development of the Australian Carwash Association's Guideline for Water Recycling in Commercial Car Wash Facilities, a number of different car wash systems across Australia were tested to establish the range of source water and final effluent water quality results.

The different car wash systems included treatment components such as filtration, chlorination, clarification, aeration, hydrocyclones, ozonation and ultra violet disinfection. The recycled water treatment systems that were assessed are presented in Table 3-11.

**Table 3-11: Selected recycled water treatment systems assessed as part of the development of ACWA Guidelines**

| System | Process Description |
|---|---|
| A | Coarse and fine filtration, chlorination |
| B | Flocculation, clarification, filtration, and chlorination |
| C | Flocculation, clarification and filtration with chlorine and ozone disinfection |
| E | Aeration and bioreactor |
| F2 | Hydrocyclone, aeration, ozone and bag filtration |
| G | Filtration, hydrocyclone and ozonation |
| J | Hydrocyclone, filtration, and ozonation |
| K2 | Hydrocyclone, UV and aeration |
| L | Aeration, chlorination, flocculation, clarification, filtration and chlorination |

For each of the recycled water treatment systems listed in Table 3-11, the average value for final effluent for all tested car wash systems was calculated and compared to the Hanna Wash facility. Results are displayed in Table 3-12 and in Figure 3-10 and Figure 3-11 and show that the Hanna Wash facility's final effluent concentrations was lower than the average value for all water quality parameters measured.

**Table 3-12: Comparison of average final effluent results from benchmarked carwashes and the Hanna Wash facility.**

| | Microbiology Results (average) | | Chemistry Results (average) | | | |
|---|---|---|---|---|---|---|
| | E. coli (org/100mL) | H. Plate Count (cfu/mL) | pH | BOD (mg/L) | Sus Solids (mg/L) | Turbidity (NTU) |
| Hanna Wash | 14.6 | 39,000 | 7.5 | 16.4 | 11.6 | 18.2 |
| All other car washes | 500.5 | 5,391,116 | 8.1 | 88.0 | 44.5 | 62.8 |
| **ACWA Guideline** | **10** | - | **6.5 – 8.5** | **20** | **30** | - |

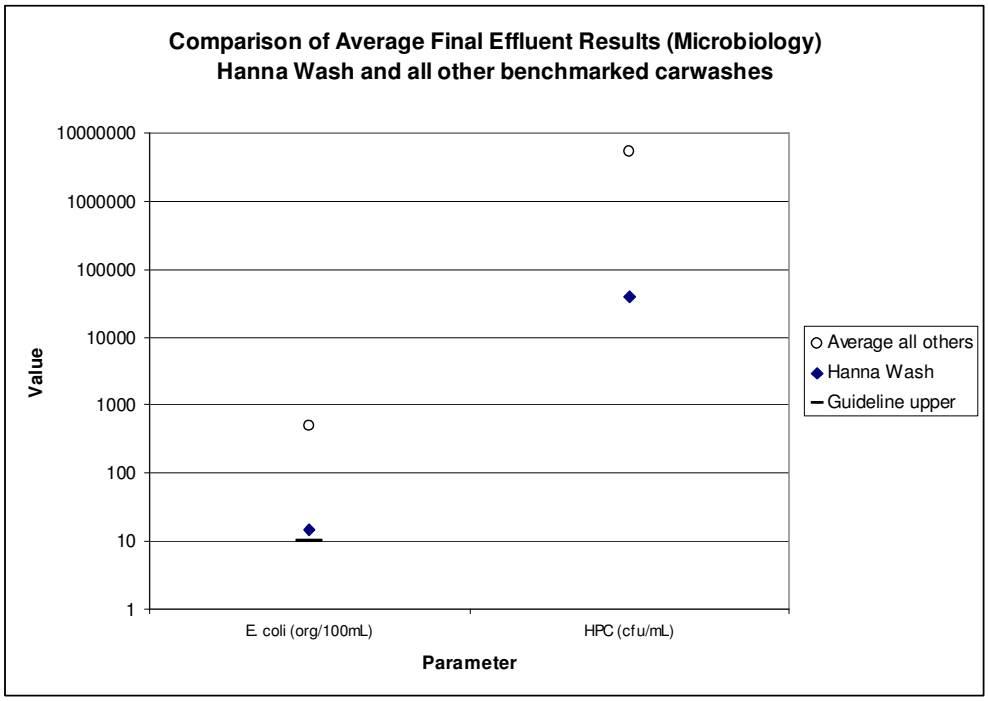


**Figure 3-10: Comparison of average final effluent results (Microbiology)**

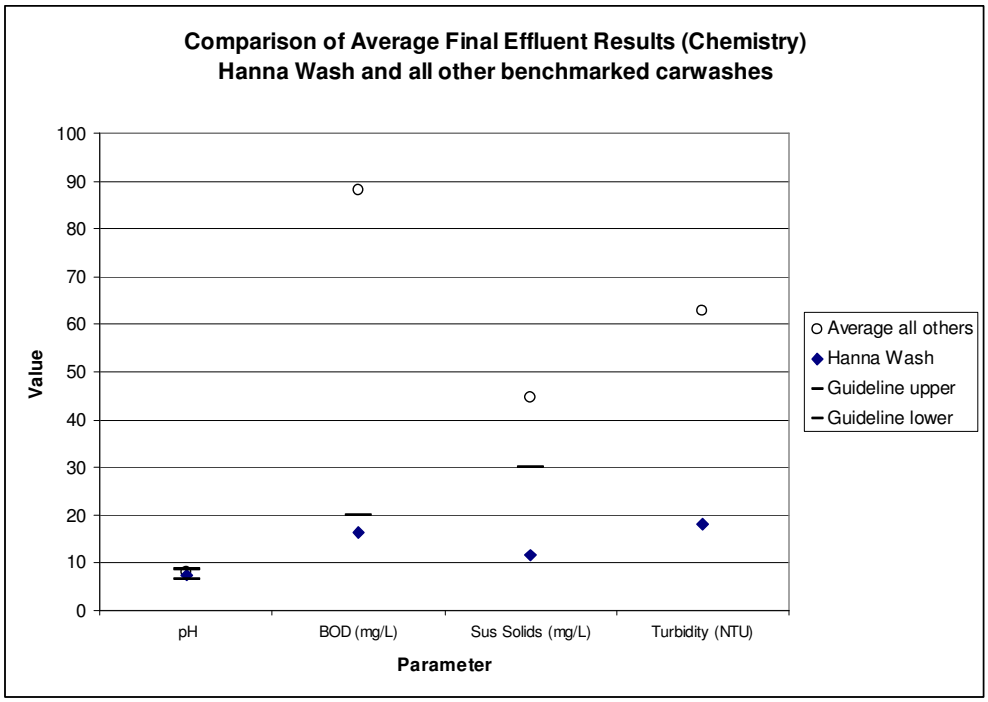


**Figure 3-11: Comparison of average final effluent results (Chemistry)**

## 3.4 Water Quantity

Water volume tests were undertaken on 23 March 2011 in both the 4 manual self serve bays and the automatic bay. Results are presented below.

**Table 3-13: Manual Self Serve Bays* – Volumetric Audit (in litres)**

| | Bay | | | | Average value |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| | | | | | |
| Low Pressure (1 min) | 1.4 | 1.5 | 1 | 1.2 | 1.3 |
| High Pressure (3 min) | 25 | 29 | 28.5 | 30 | 28.1 |
| Foam allowance | 3 | 3 | 3 | 3 | 3 |
| Total | **29.4** | **33.5** | **32.5** | **34.2** | **32.4** |
| Nozzle | Sprayflo 25050 | Sprayflo 25050 | Sprayflo 25050 | Sprayflo 25050 | |

* The manual bay can provide the user with recycled water options for high pressure soap, high pressure rinse and foam brush, which use no potable water. The average volumetric use of potable water for customers using a 1 minute low pressure and 3 minute high pressure wash across both recycled and potable water use is likely to be lower than the 32.4 litre average value calculated above (see the discussion section 4 of this report for further detail).

**Table 3-14: Automatic Bay – Volumetric Audit**

| Cycle | Base / Premium | Meter Start | Meter Stop | Potable Water Use | | R.O. allowance | Total | Average |
|---|---|---|---|---|---|---|---|---|
| | | KL | KL | KL | Litres | Litres | Litres | Litres |
| 1 | Base | 8591.552 | 8591.610 | 0.058 | 58 | 15 | 73 | |
| 2 | Base | 8591.610 | 8591.658 | 0.048 | 48 | 15 | 63 | |
| 3 | Base | 8591.658 | 8591.715 | 0.057 | 57 | 15 | 72 | 68.4 |
| 4 | Base | 8591.715 | 8591.771 | 0.056 | 56 | 15 | 71 | |
| 5 | Base | 8591.771 | 8591.819 | 0.048 | 48 | 15 | 63 | |
| 6 | Premium | 8591.819 | 8591.933 | 0.114 | 114 | 15 | 129 | |
| 7 | Premium | 8591.933 | 8592.044 | 0.111 | 111 | 15 | 126 | |
| 8 | Premium | 8592.044 | 8592.154 | 0.110 | 110 | 15 | 125 | 125.2 |
| 9 | Premium | 8592.154 | 8592.262 | 0.108 | 108 | 15 | 123 | |
| 10 | Premium | 8592.262 | 8592.370 | 0.108 | 108 | 15 | 123 | |
| Total Average Water Consumption per wash | | | | | | | | 96.8 |

| | | |
|---|---|---|
| Excellent | ★★★★★ | Less than 40 Litres |
| Very High | ★★★★ | 40 - 70 Litres |
| High | ★★★ | 70 - 100 Litres |
| Good | ★★ | 100 - 150 Litres |
| Moderate | ★ | 150 - 200 Litres |
| No Rating | | Greater than 200 Litres |

**Figure 3-12: Australian Carwash Association's water use star rating table for manual and automatic wash bays**

When compared to the Australian Car Wash Associations rating table, water volume results show that the manual self serve bays (average use of 32.4 L) are rated as Excellent / 5 stars, whilst the automatic bay (average usage of 96.8 L) is rated as High / 3 stars.

# 4 Discussion and Conclusion

A site audit was undertaken at Hanna Wash's facility at Traralgon, Victoria during February and March 2011. The audit was for water quality within the recycled water system and also water quantity within the manual and automatic bays.

**Risk assessment.**

A risk assessment was carried out covering a range of general processes, house keeping and critical control points throughout the process. The facility was found to be in good working order with a wide variety of treatment processes and technology in place. The system has recently been installed and a number of scheduled maintenance procedures and training manuals are soon to be consolidated. An alarm system on critical components of the process will also be installed. The ozone disinfection system is effective at removing microbiological risks (e.g. *E. Coli*) from the recycled water stream.

**Water quality results.**

Five sampling runs were undertaken during February and March 2011. Each run had a 'source water' sample and 'final effluent' sample taken for 6 parameters (pH, BOD, Suspended Solids, Turbidity, Heterotrophic Plate Count and *E. Coli*).

The source water sampling point was chosen as Tank #1, as the ACWA Guidelines have recommended against the use of the settling pit for source water collection. Tank #1 would contain both source water (especially after a car wash had recently taken place) and treated process water and as such is a 'diluted' representation of a true source water sample. This is due to the system being a continuously recirculating process rather than a batch process system.

The results from the 5 sample runs were observed to mostly show a reduction in the value of parameters of the final effluent compared to the source water. This shows the processes producing better quality water than the source water (which is to be expected).

Treatment effectiveness is measured by comparing the final effluent to the source water. As the source water was diluted, the results shown below are considered to be the minimum that would be achieved by the current process system. (i.e. it is likely that true source water is much dirtier, which would have provide better treatment effectiveness results).

Average results for source water and final effluent generally shows an improvement in water quality as follows:

**Table 4-1: Summary of water quality performance through the recycled water process equipment.**

| Parameter / Unit | Treatment effectiveness Percentage removal* | Final effluent (Sample point #2) Average | ACWA Guideline Target |
|---|---|---|---|
| pH (pH units) | -0.3% | 7.5 | 6.5 – 8.5 |
| BOD (mg/L) | 15.5% | 16.4 | 20 |
| SS (mg/L) | 37.6% | 11.6 | 30 |
| Turbidity (NTU) | 7.7% | 18.2 | - |
| Plate Count (orgs/ml) | 15.2% | 39000 | - |
| *E. Coli* (orgs/100 ml) | 86.6% | 14.6 | 10 |

*These treatment effectiveness results should be considered as the minimum performance results that could be expected, due to the dilution of the source water sample.

The largest removal is *E. Coli* with 86.6% reduction. The smallest removal is pH at -0.3, however this is not relevant given that pH is not necessarily improved by a reduction – as long as it remains within the range of 6.5 – 8.5.

The results for the final effluent (sample point #2) can be directly compared to the ACWA Guideline target values for final effluent with four parameters: pH, BOD, suspended solids and E. Coli. The final results (average) for pH, BOD and suspended solids were below the ACWA target levels. *E. Coli* average final result (14.6) was very close to the target value of 10 orgs/100ml.

It is noted that the Guidelines provided by the Australian Carwash Association are best suited to batch process systems. The process equipment at the Traralgon facility is a continuously recirculating treatment system and results from this project need to be put into context when discussing treatment effectiveness results.

**Comparison of water quality results to other car wash systems**

Results of water quality tests from the Hanna Wash facility at Traralgon were compared with other car wash systems which were tested as part of the development of the ACWA guidelines.

The data for of final effluent shows that concentrations of all six water quality parameters measured from the Hanna Wash facility were lower than the average value of all other car washes considered as part of the development of the ACWA guideline.

**Water quantity results**

Water quantity testing for the self serve (manual) and automatic bays were conducted as per the Car Wash Association's Guidelines. Results from the water volume audit showed that the manual self serve bays use on average 32.4 Litres of potable water per wash, and that the automatic bay used 96.8 L of potable water per wash. This in an Excellent / 5 star rating for the manual self serve bays and a High / 3 star rating for the automatic bay.

These guidelines provide a standardised way of measuring water use, however are not reflective of the actual water saving measures available for the self serve / manual bays at the Traralgon facility. For instance the guidelines acknowledge a 2 minute reduction in potable water use when recycled water is available in the self serve bays. This is based on recycled water being available only in the High Pressure Soap function. However, because

of the high quality of the recycled water at the Traralgon facility and the design of the bay controllers, this system can be programmed to allow recycled water to be used in the following High Pressure functions:

- High Pressure Soap,
- High Pressure GREEN Rinse, and
- Foam Brush

During the water testing, reclaim water was only used through the High Pressure GREEN Rinse option.

When customers select High Pressure Rinse they are prompted to save money (currently a 15% reduction in price) by using the High Pressure GREEN Rinse (Recycled Water) instead of the fresh water that is ordinarily supplied in the High Pressure Rinse. This provides the customer a financial incentive to use the reclaim water.

Also, as an option in times of drought (or when Gippsland Water imposes water restrictions), recycled water can also be used in replacement of potable water for the High Pressure Rinse cycle by programming this feature within the control room.

Taking into account all the recycled water options that may be made available during washing (High Pressure Soap, Green Rinse and Foam Brush), the financial incentive to use the Green rinse option and that the facility can operate on recycled water during water restriction times, it is likely that less potable water would be used in the average wash in the manual bays than the 32 litres achieved in this audit.

# 5 References

ACWA (2009). Guidelines for Water Recycling in Commercial Car Wash Facilities. Australian Car Wash Association. August 2009.

# 6 Appendix A – Water Quality Results