

Stage 1

Services and Waste Insights, Reduction and
Optimisation Innovation

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1.0 Executive Summary

This final report describes the completion and findings of the installation of digital water meters on all critical water services for incoming and discharge points reporting to a single location at the processing facility. The project developed insights and allowed for identification of leakages and waste which influenced business decisions.

Data capture has provided the opportunity for the company to utilise the data for water modelling and decrease the trade waste agreement forecast by approximately 30% for incoming water. Furthermore, the project has provided the opportunity to identify key areas for water usage reduction. At the initiation of the project, the plant was utilising approximately 4,800,000 litres of water per week. There has been an average total plant consumption reduction by 10-15% over the project, with potable water having the largest reduction over the project.

Learnings from this project have been taken into consideration with future designs and opportunities. Furthermore, there is opportunity to further understand how water can be better utilised onsite through water recycling.

2.0 Introduction

Utility costs in Australia are a substantial cost of doing business of an Australian meat processing business, as depicted in Table 1 below. The recent Cost to Operate report noted that utility costs are approximately 6% of total costs excluding cattle purchases and are significantly higher than some of the other countries that the processor compete with on the export market.

Table 1: Operating cost structure summary, beef processors, Australia, United States, Brazil and Argentina, 2015-16

Cost category	Australia		United States ¹		Brazil		Argentina	
	Cost per head (AU\$)	As % of total costs (excl. livestock purchases)	Cost per head (AU\$)	As % of total costs (excl. livestock purchases)	Cost per head (AU\$)	As % of total costs (excl. livestock purchases)	Cost per head (AU\$)	As % of total costs (excl. livestock purchases)
Labour-related costs	\$210.54	58.4%	\$129.46	44.6%	\$75.63	43.9%	\$88.31	42.9%
Utilities-related costs	\$21.62	6.0%	\$12.26	4.2%	\$19.93	11.6%	\$13.05	6.3%
Certification-related costs	\$7.29	2.0%	\$1.49	0.5%	\$0.52	0.3%	\$2.28	1.1%
Total (excl. livestock costs)	\$360.62	100.0%	\$290.15	100.0%	\$172.29	100.0%	\$205.96	100.0%
<i>Cost per kg HSCW</i>	<i>\$1.22</i>		<i>\$0.80</i>		<i>\$0.70</i>		<i>\$0.92</i>	

¹ The certification/audit costs for the United States refer only to those subject to government regulation. Unregulated (external) certification costs are, however, included in total costs.

Australian processors need to review, monitor, and implement changes to reduce their cost of utilities to remain competitive on the global market. By installing a system to capture water usage at the site, processor management will have the tools to target areas for improvement.

The project purchased and installed meters on critical incoming services and discharge points, where they are currently missing. Insights gathered from the project will both inform the processor (and AMPC) as to the various ways to reduce (wastage) and optimise the use (scheduling) of water services across the site. This project may lead to further expansion of monitoring services at the processor.

3.0 Project Objectives

The objective is to:

- Install digital meters on all critical water service incoming and discharge points with reporting back to a single location.
- Insights developed that identify leakage/waste, schedule changes and future distribution investments required by both processor and AMPC core R&D activities.
- Obtain data to inform environmental performance reporting for the red meat processing sector as part of AMPC Environmental Performance Review and Industry Sustainability Frameworks.

4.0 Methodology

The processor installed a system to capture and monitor water usage at the site. Water meters have been purchased and installed on critical incoming services. Initial reporting capabilities and tools have been developed to target areas. The management team has been able to identify areas for improvement with initial focus on four areas including:

1. Kill floor supervision to make sure sterilisers/table is shut off between breaks and after production
2. Project to reduce tripe umbrella wash use
3. Review cleaner usage and report
4. Review yards usage and report

4.1 Water Access

All water at the site is obtained from 2 bores which pump into two tanks (Tank 3 & 4). Bore 1 pumps into tank 4 which supplies the hot water process, spray chill and reclaim water, and bore 2 pumps into tank 3 which supplies the potable-water process. Tank 3 and 4 can be balanced in the scenario that water is required for any reason.

4.2 Water Meters

A total of 30 water meters have been installed at the plant including 17 meters in the hot water line, spray chiller and reclaim, and 13 meters across the cold-water line.

4.2.1 Piping and instrumentation

A water meter architecture diagram (8.1 Appendix 1: P&ID Diagram) has been developed by external provider as no piping and instrument diagram (P&ID) was able to be located at the site. The architecture design includes a diagram for both the hot and cold-water services and includes the process equipment and meters installed.

4.2.2 Calculations and assumptions

Bore 1 – Tank 4

Once the water is extracted from bore 1 and in tank 4 (water metered to understand the amount extracted from the bore), the water goes through a water softener system. The softened water goes into tank 1 and the softener back wash water (filter cleanse) goes into tank 2 – reclaim water. The water from bore 1 can be utilised 3 ways including hot water production, spray chilling or reclaimed water.

Hot water

The hot water system includes an individual return loop for the kill floor (includes offal) and boning room. This return loop allows water to go through the boiler to ensure hot water is at required temperatures. Water meters have been installed before the staging tank to understand the total hot water and before the boiler (8.1 Appendix 1: P&ID Diagram) to understand the production usage. An assumption has been made that hot water production usage is the outgoing water from the staging tank less the kill floor and boning room water return water (+/- 0.32%).

Spray Chiller

Water from tank 1 (softened water) supplies the spray chill tank and the water is treated with chlorine. A water meter has been installed after the spray chill tank to understand the usage of spray chilling system into chillers 1,2,3,4.

Reclaim Water (Remainder Backwash)

The softener backwash water is unmetered and therefore the below calculation is utilised to measure the remainder backwash water.

$$\text{Reclaim water} = \text{Total water from Bore 1} - (\text{Staging Tank Meter} + \text{Spray Chill})$$

Bore 2 – Tank 3

Water extracted from bore 2 (metered) goes into tank 3 and is treated with chlorine. Total amount of outflow water from tank 3 (potable) is also metered.

Calculations of incoming water against outgoing water

The total amount of water utilised is verified by the total metered from bore 1 & 2 is compared to the utilised water on the plant including the hot water, spray chill, backwash, cold water and ante cold 50/50%.

Ante rooms

There is one meter utilised for multiple anterooms which includes all 40°C water across the site (boning room, slaughter floor and offal room). The water usage is allocated to 50% hot water production usage and 50% cold water usage.

Wash Down (Hot and cold water)

A calculation-based assumption is made for wash down water in each area. It is assumed that all water remaining in each area from the total is wash down / steriliser water.

4.2 Management Meeting

Weekly meetings between the plant and management teams are held to review the water reports. These meetings are also utilised to discuss and implement identified opportunities for projects, report on engineering adjustments, and maintain team accountability. Table 2 identifies the key dates of the management meetings during each milestone. Intensive monitoring commenced on the 31st of October 2021 with focus on data insights from the 24th of November 2021.

Table 2: Management Review Meeting Dates

MS 3	MS 4	MS 5	MS 6
24/11/21	12/01/22	06/04/22	
03/12/21	19/01/22	13/04/22	
08/12/21	26/01/22	20/04/22	
15/12/21	02/02/22	27/04/22	
22/12/21	09/02/22	04/05/22	

29/12/21	16/02/22	11/05/22
	23/02/22	18/05/22
	02/03/22	25/05/22
	09/03/22	01/06/22
	16/03/22	08/06/22
	23/03/22	15/06/22
	30/03/22	22/06/22
		29/06/22

4.3 Intensive Monitoring - Reports

4.3.1 Management Report

A weekly management report (8.2 Appendix 2: Weekly Report Example) is generated by an external provider from the on-plant SCADA system showing the current and previous weeks water usage. This report provides the ability to identify any changes from the previous week. The management report is broken down into four main water meters () and then plant area for both total hot water (

Table 4) and total potable water (

Table 5).

Table 3: Total plant water usage broken down by area

Total Plant Water Usage areas	Water Meter
Water Plant	Remainder Backwash
Chillers	Spray Chill
Production Hot Water	Total Hot Water
Production Cold Water	Total Potable Water

Table 4: Total hot water usage broken down by plant area

	Offal	Kill Floor	Boning Room
Water Meter	Tripe – Peeler	Carcase Wash 1	Hock Processing Room
	Tripe – Refiner	Carcase Wash 2	Anterooms
	Steriliser & Wash Down	Evisceration Table Steriliser	
		Wash Down & Knife Sterilisers	

Table 5: Total Potable Water Usage broken down by plant area

	Offal	Kill Floor	Yards	Plant	Refrigeration Plant	Wash Down
Water Meter	Tripe – Peeler	Hock Mixer	Final Live wash	Amenities	Condensing Tower	Wash Down
	Tripe – Refiner	Evisceration Clean	Troughs	Anterooms		
	Offal – Trommel Wash	Evisceration Cool				
	Umbrella					

4.3.2 Individual area Report

Weekly individual area reports broken down by daily usage are generated by an external provider (8.3 Appendix 3: Individual Area Report Example (Spray Chill)). These reports identify the amount of water utilised during production and after hours for each meter and provides daily graphs (8.3 Appendix 3: Individual Area Report Example (Spray Chill)). This allows further investigation into each day if required.

Table 6: Individual area reports

Individual Area Reports		
Amenities Cold Water	Condensing Tower	Anterooms – Hot Water
Boning Room – Hot Water	Carcase Wash 1 & 2	Production & Potable Water
Refiner Hot & Cold Water	Spray Chilling	Umbrella
Evisceration Hot & Cold Water	Final Live Wash & Troughs	Hock Room Hot & Cold Water
Kill Floor Total	Offal Trommel, steriliser & wash down	Peeler Hot & Cold Water
Yard wash reclaim	Bore 1 & 2	

4.4 Benchmarking

4.4.1 Initial Benchmarking

Initial benchmarking was developed in February 2022 based on the weekly management report and implemented in April 2022. The benchmarks (total and litres/head) were developed from an average of 4 weeks data. Benchmarks were then utilised in the management teams weekly reports.

4.4.2 Follow-on Benchmarking

With more data, water benchmarking targets have been reviewed and updated in August 2022 to reflect the decreased water usage over time.

5.0 Project Outcomes

The requirements for milestone 6 have been achieved.

5.1 Installation of Water Meters

Installation of water meters has allowed the plant and management team an understanding of water usage on site with what is coming in from the bores vs. going out for each individual area and process in production. Furthermore, the installation of water meters has allowed the management team to utilise the data for water modelling for another facility which has allowed the company to make data driven decisions for the company’s trade waste agreement and decrease the peak forecast by about 30% for incoming water.

5.2 Identification of Opportunities

Installation of water meters has provided the team the opportunity to identify key opportunities to target throughout the project. Key opportunities identified for water usage reduction during the project were umbrella wash, wash down, utilisation of backwash water and the carcass wash.

The umbrella wash was one key opportunity identified utilising over 400,000L of water per week on average. The process utilised a lever tap which allowed the operator to utilise unlimited amount of water to complete the process. An air valve with a button has been installed which releases a fixed amount of water to perform the task. Water usage has since reduced significantly from the initial data. An increase in water usage was identified, and further investigation identified that the operator would hit the button multiple times to release more water. A control board was installed to limit the time that the valve would open for; thus restricting the amount of water released. The opportunity to understand and identify water usage with the umbrella has seen the water usage reduce to 110,000L per week on average (Figure 1) – a 72.5% decrease in total water usage for this process.

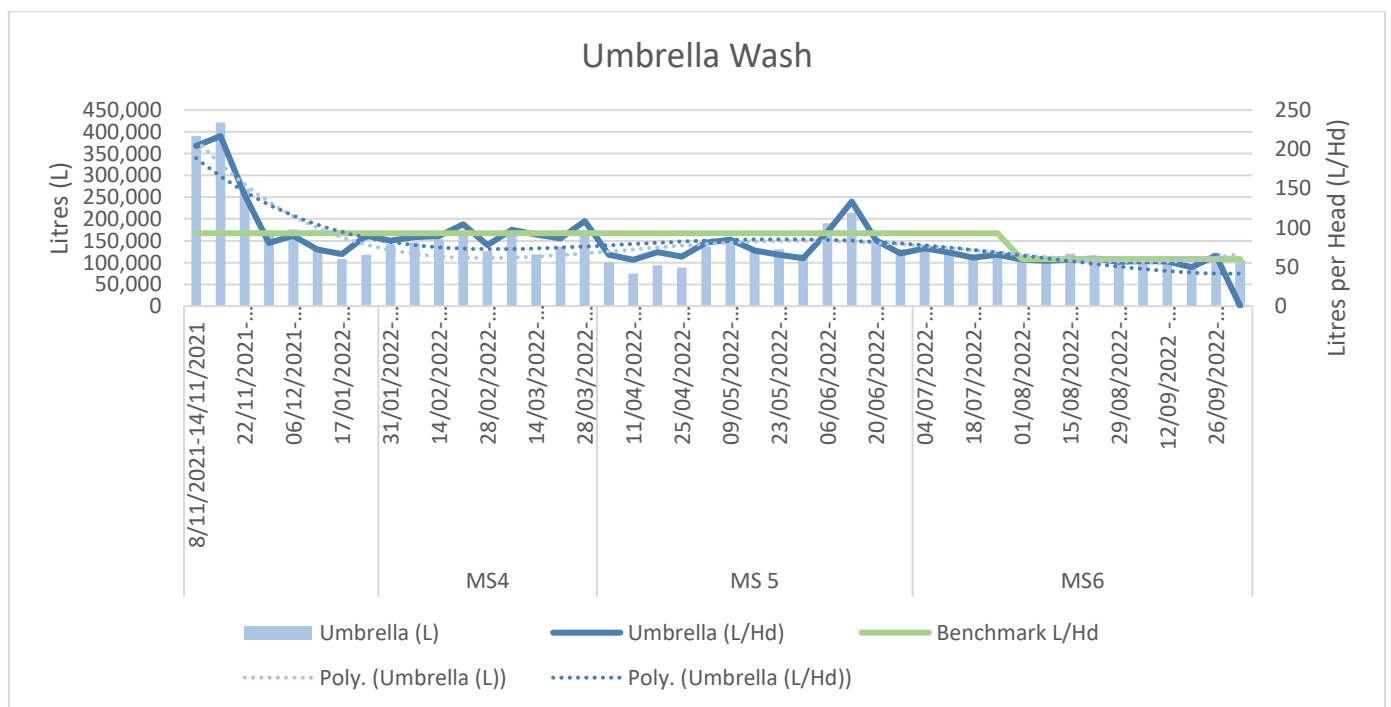


Figure 1: Umbrella wash water usage MS 3 – MS 6

The wash down usage was another key opportunity identified by management. The wash down usage was broken up into 3 meters including the hot water offal – steriliser & washdown, hot water kill floor – steriliser and washdown and the cold-water wash down. The piping infrastructure at the plant made it a challenge to be able to split the washdown from the sterilisers. Furthermore, the sterilisers on site are continuous flow which limits the opportunity to target water usage for wash down or sterilisers. As a result, overall water usage for the steriliser and wash down remained consistent with little reduction observed (Figure 2, Figure 3, Figure 4) over the milestones for the various wash down and steriliser areas.

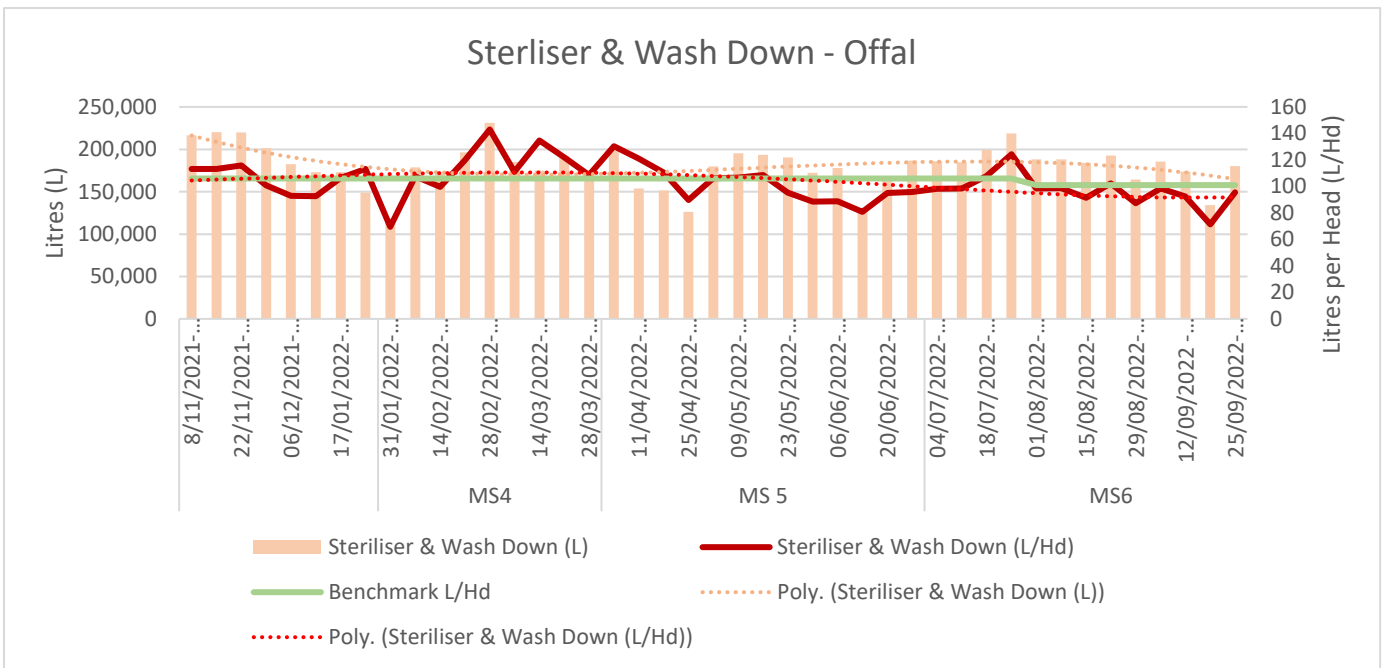


Figure 2: Offal Hot Water Usage – Steriliser and Wash Down MS3 – MS6

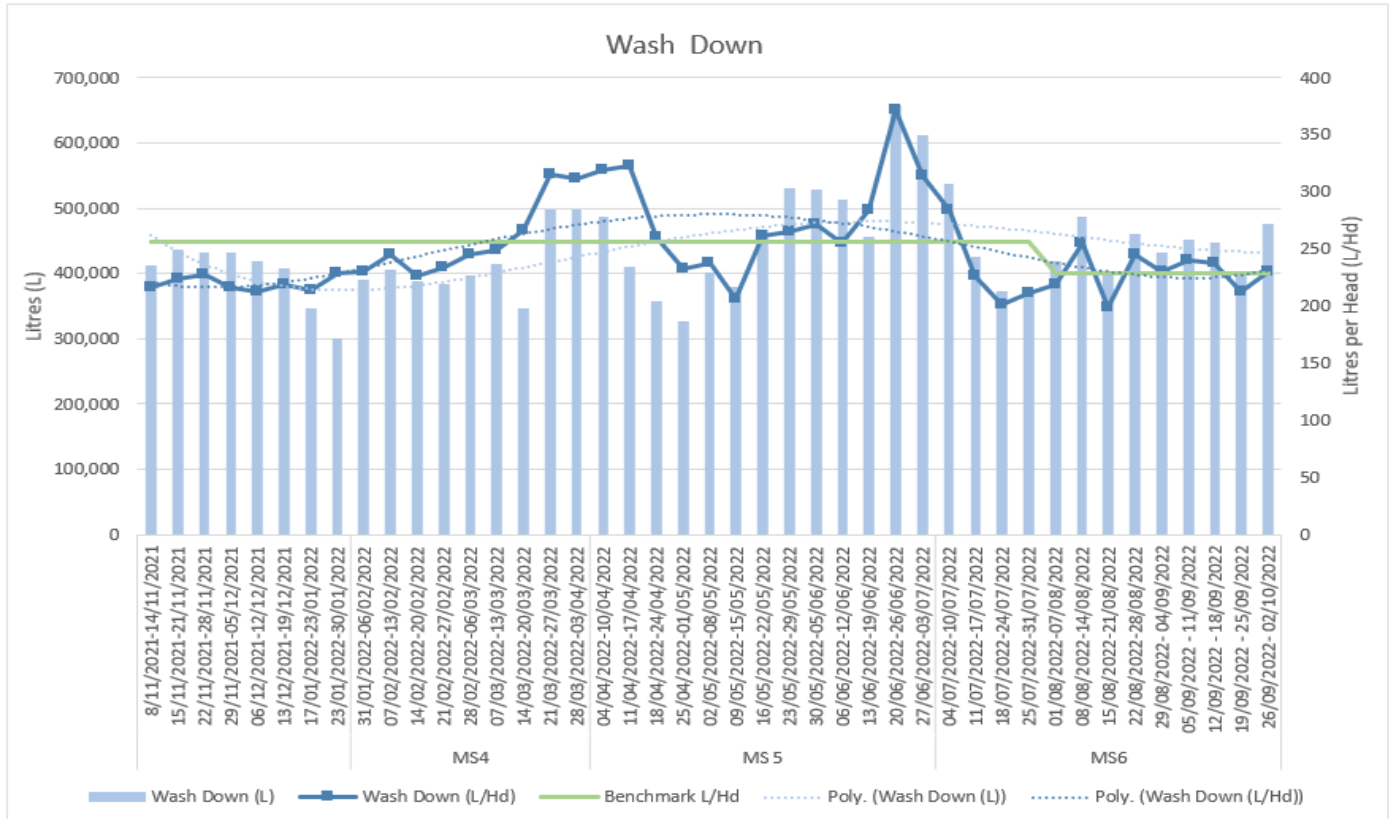


Figure 4: Cold Water Wash Down Water Usage MS 3 – MS 6

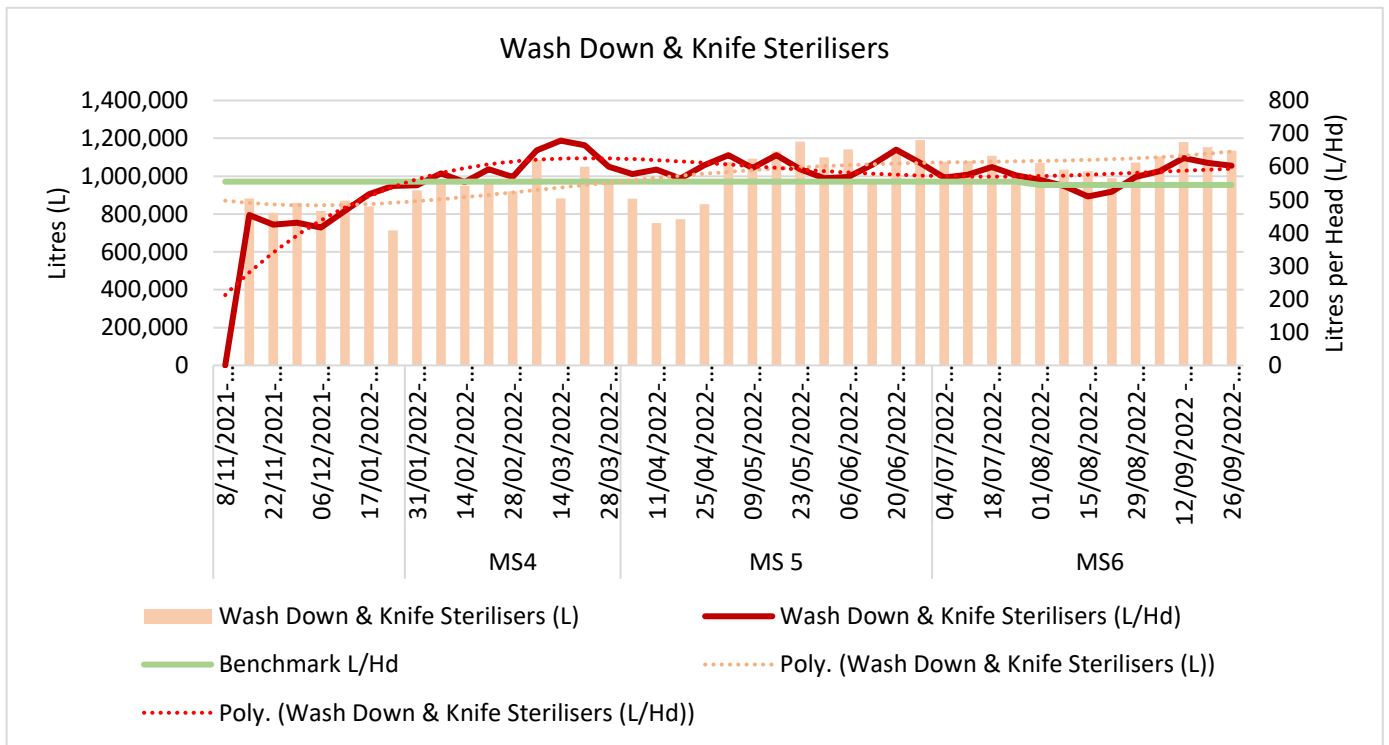


Figure 3: Kill Floor Hot Water Wash Down & Knife Steriliser Usage MS 3 – MS 6

Since the commencement of the project, the backwash water has been captured (tank 2) and utilised for the pre-wash of the cattle and washing the yards. Before the project, the water utilised would have been potable water. This has significantly reduced the amount of discharge water going to the treatment process and therefore the overall amount of water the plant is required to discharge. Figure 5 indicates shows that there is approximately 490,000L of remainder backwash water captured each week.

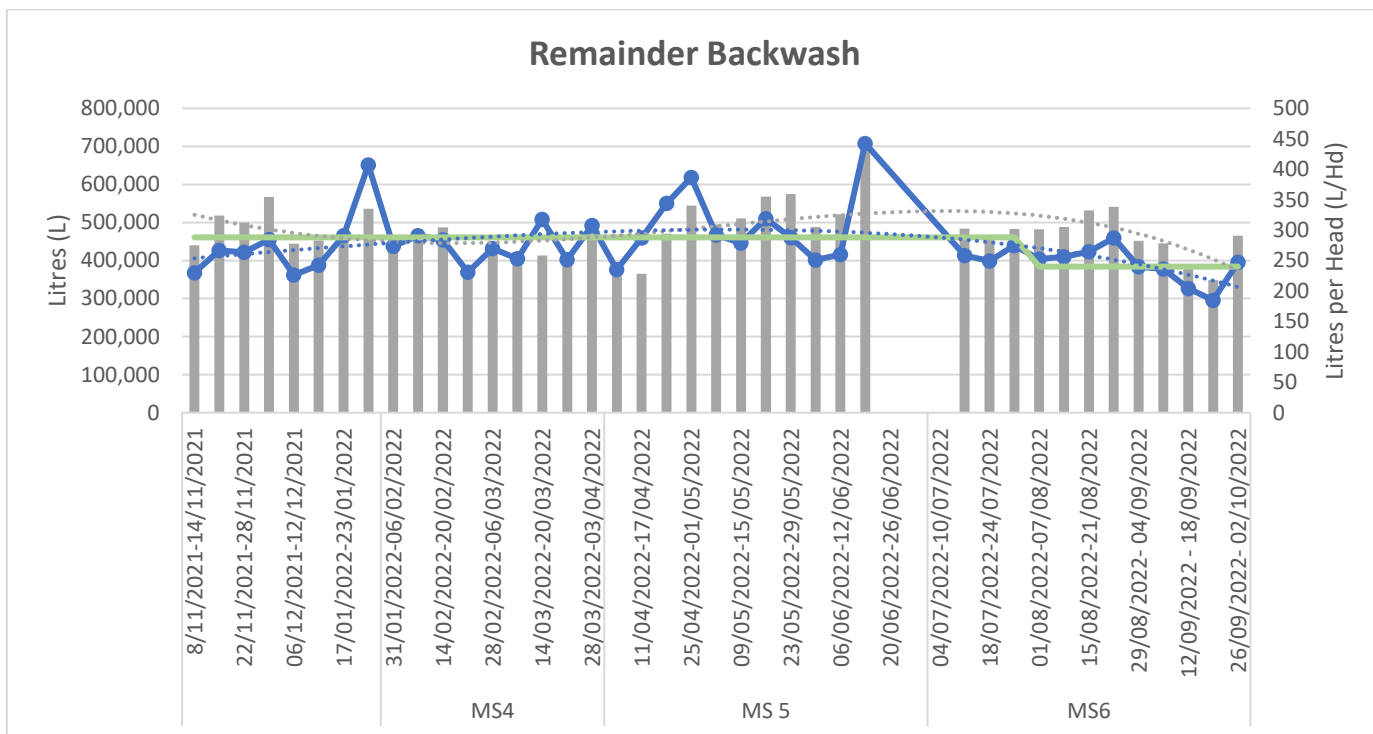


Figure 5: Remainder Backwash Water Usage MS 3 – MS 6

The carcass wash water usage was identified by management as another target opportunity. The carcass wash time was decreased to 10 seconds per body which allowed the water usage reduce to approximately 107,000L per week from 160,000L on average per week (Figure 6).

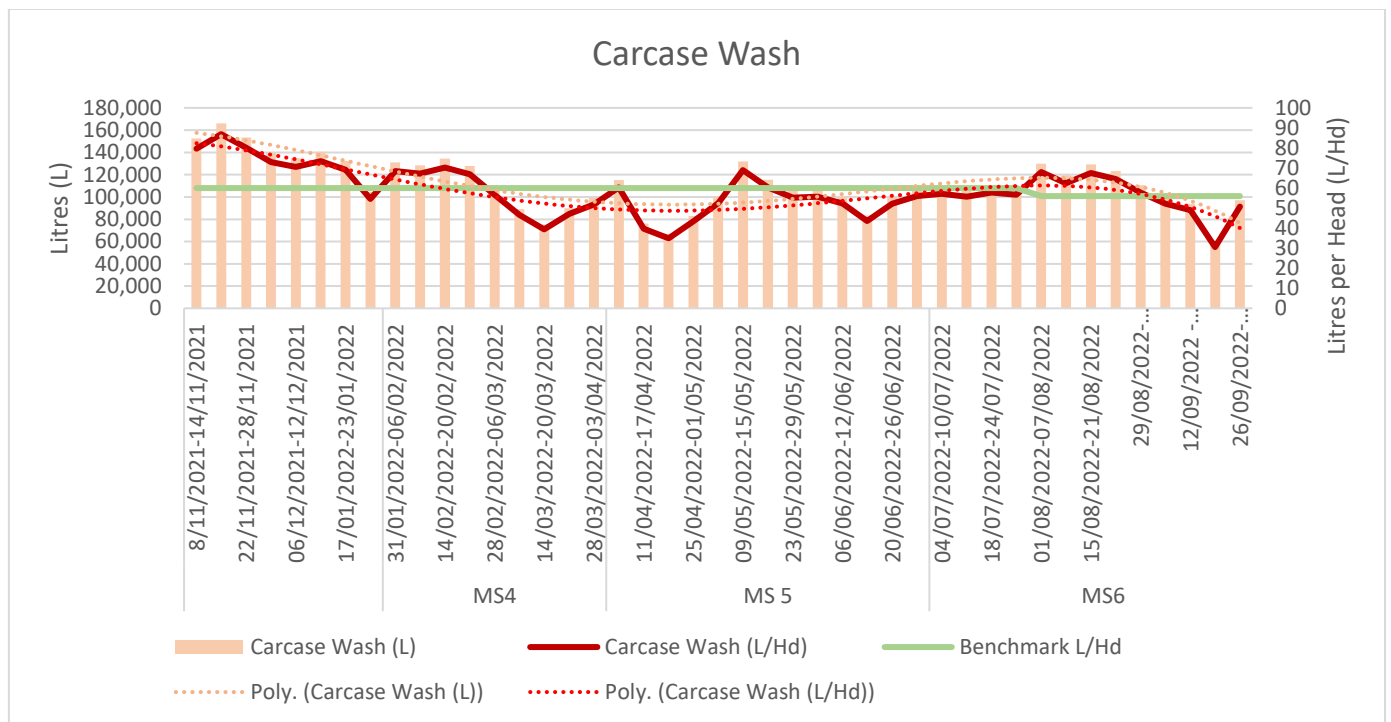


Figure 6: Carcase Wash Water Usage MS 3 – MS 6

5.3 Dashboards and Data Driven Decisions/Opportunities

A series of dashboards have been developed by an external service provider in Salesforce. The dashboard was designed to provide insights into the overall water usage at the site. The data is automatically extracted from the SCADA system each night to update the dashboards. Data driven decisions have allowed for additional planning and ways to recycle and utilise water at other sites.

5.4 Reduction in overall water usage

At the initiation of the project, the plant was utilising approximately 4,800,000 litres of water per week. Figure 7 shows the average plant consumption per quarter over the duration of the project. There has been an average total plant consumption reduction by 10-15% over the project. The potable water has had the largest reduction over the project. Figure 8 illustrates a reduction in the amount of water utilised per head for the total plant consumption, remainder backwash, hot water, and potable water.

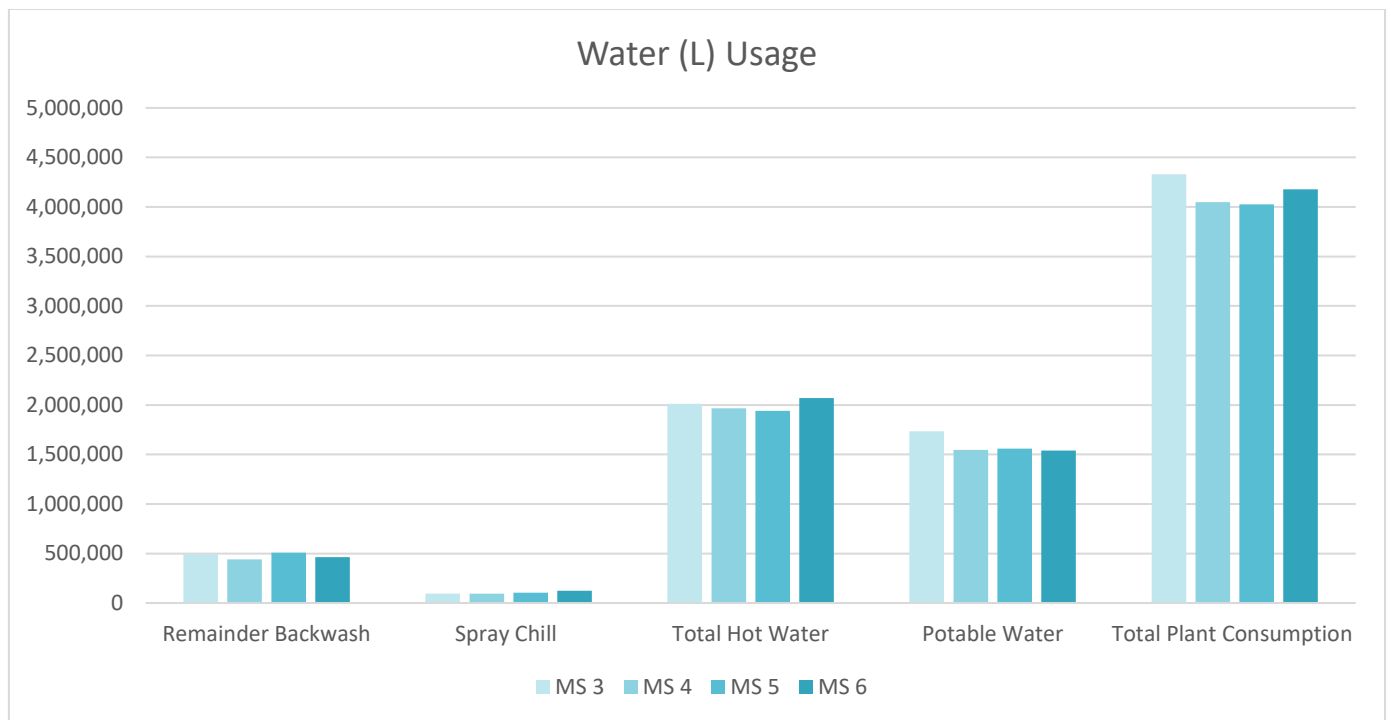


Figure 7: Total Water Usage across MS 3 – MS 6

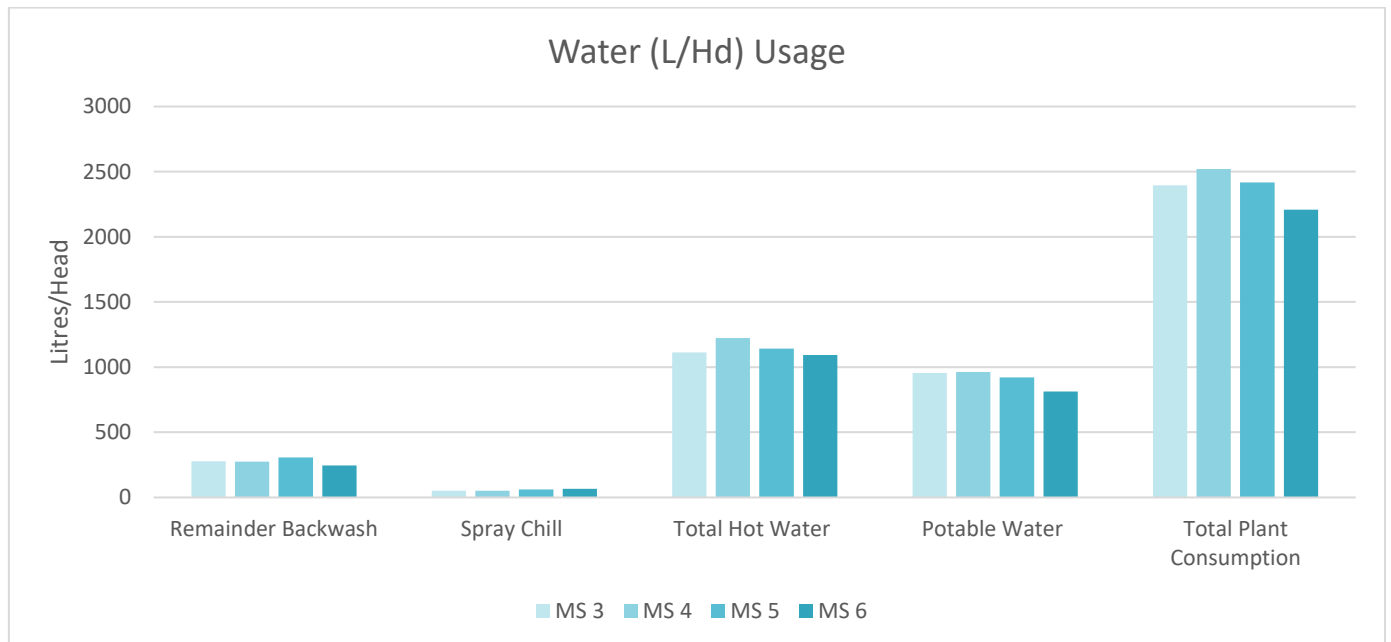


Figure 8: Total Water Usage (L/Hd) across MS 3 – MS 6

6.0 Discussion

6.1 Total Hot Water Usage

The total overall hot water usage has increased on average by 2.8% or 57,545 across MS3 (2,011,563L), MS 4 (1,965,837L), MS 5 (1,940,039L) and MS 6 (2,069,108). The maximum weekly water usage was observed in MS 3 (2,350,260L) and minimum was observed in MS5 (1,534,760L). However, the average litres per head has decreased across milestone 3 (1112 L/Hd), milestone 4 (1223 L/Hd), milestone 5 (1142 L/Hd) and milestone 6 (1093 L/Hd) respectively, illustrating that the increase in total water usage observed is due to increased processing numbers (Figure 9).

Milestone 6 had the highest total hot water usage over the project and had the lowest water usage for litres per head, indicating that water efficiencies have been monitored.

The total hot water usage includes usage from the following areas: offal room, kill floor, hock room, anterooms (40C water) and boning room. A decline has been observed in all areas except for the kill floor.

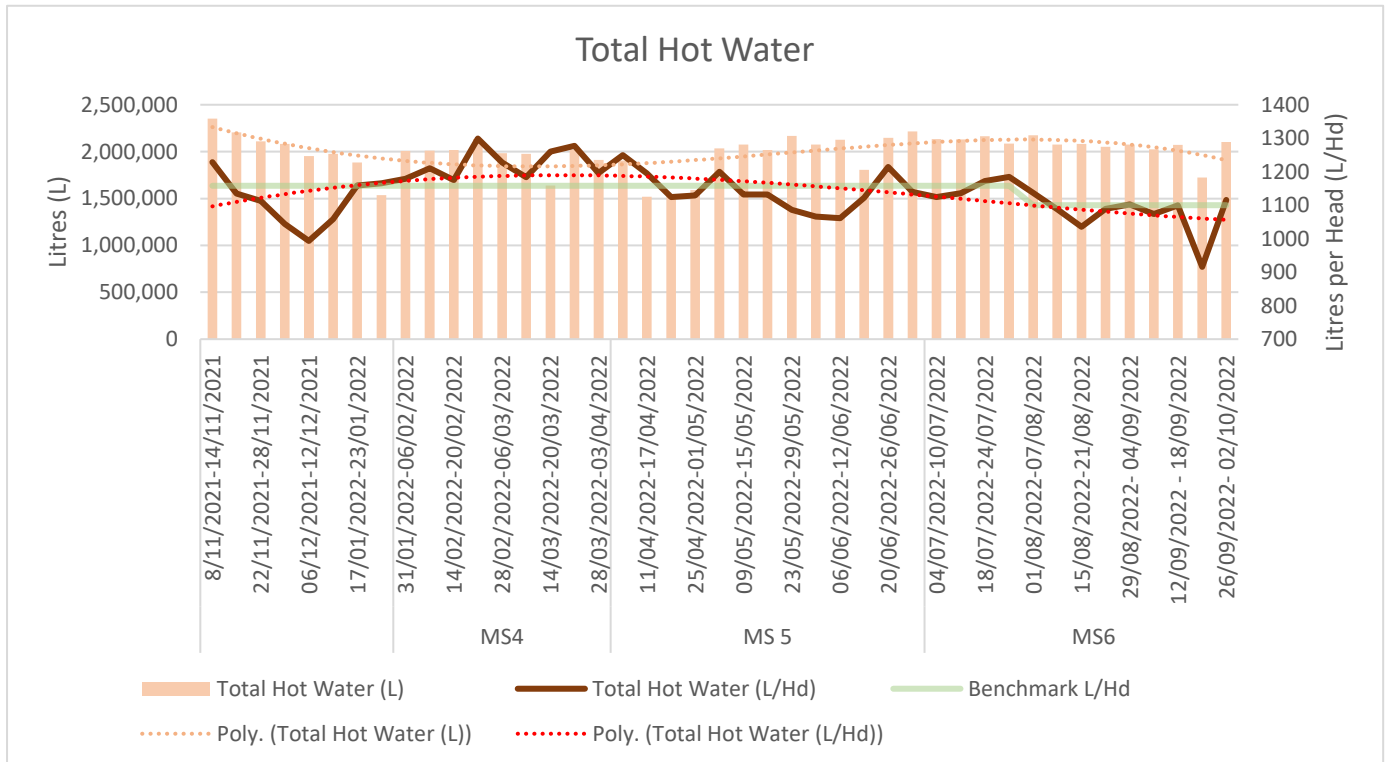


Figure 9: Total Hot Water Usage MS 3 – MS 6

6.1.1 Total Offal Room Hot Water Usage

The total offal hot water usage varied across MS3 (336,934L), MS 4 (320,574L), MS 5 (309,428L) and MS 6 (323,766). However, water usage for litres per head declined over the project and was lowest in MS6 (172 L/Hd) and was highest in MS4 (200 L/Hd).

Figure 10 illustrates the water usage for the tripe peeler, tripe refiner and offal room steriliser & wash down.

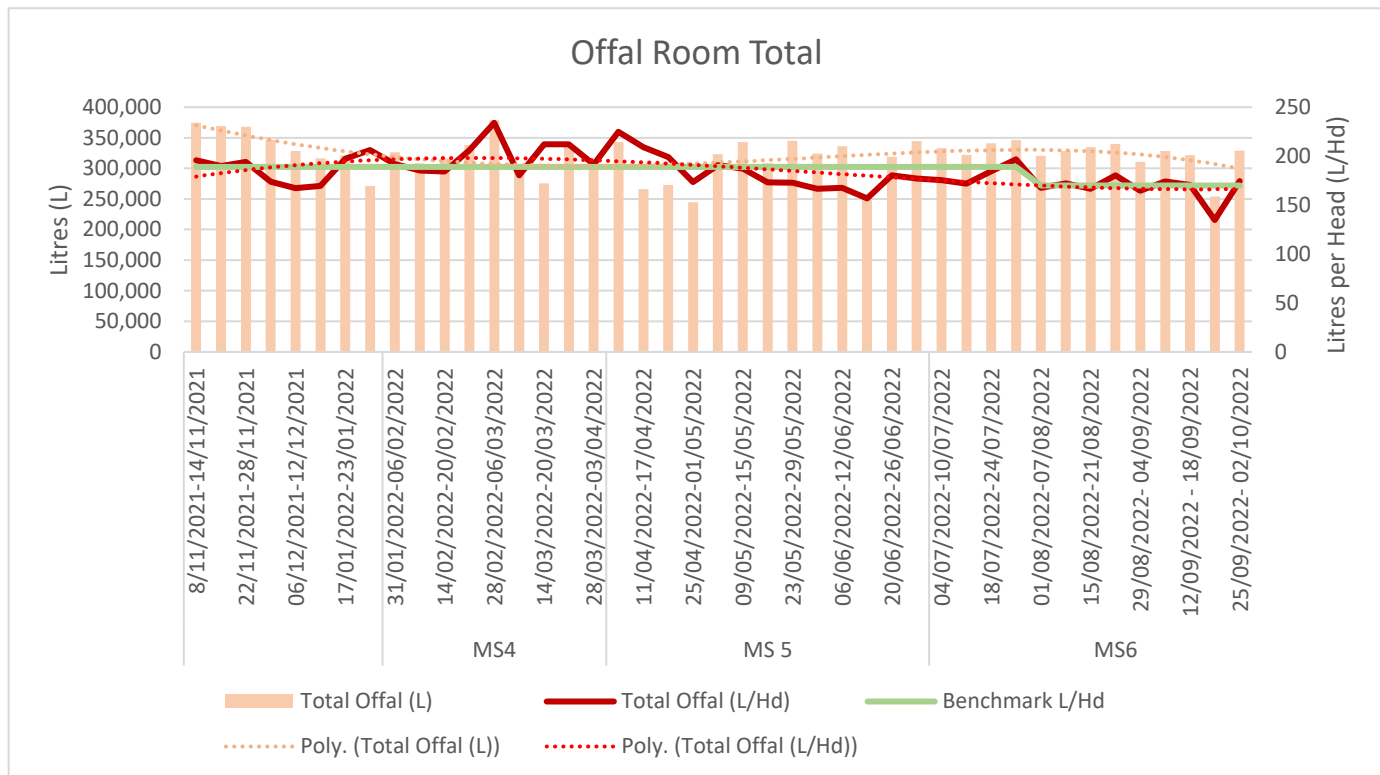


Figure 10: Total Offal Room Water Usage MS 3 – MS 6

6.1.2 Total Kill floor Hot Water Usage

The total kill floor hot water usage has increased across MS3 (1,106,258 L), MS 4 (1,180,467 L), MS 5 (1,209,485 L) and MS6 (1,287,404L). The maximum weekly water usage was observed in MS 3 (1,394,925L) and minimum observed in MS5 (898,815L).

The average litres per head varied across milestone 3 (615L/Hd), milestone 4 (735 L/Hd), milestone 5 (710 L/Hd) and milestone 6 (683 L/Hd) respectively. The maximum (784 L/Hd) litres per head was observed in MS4 and minimum (536L/Hd) observed in MS3.

Figure 11 illustrates the water usage for the carcass wash, evisceration table steriliser and wash down & knife steriliser.

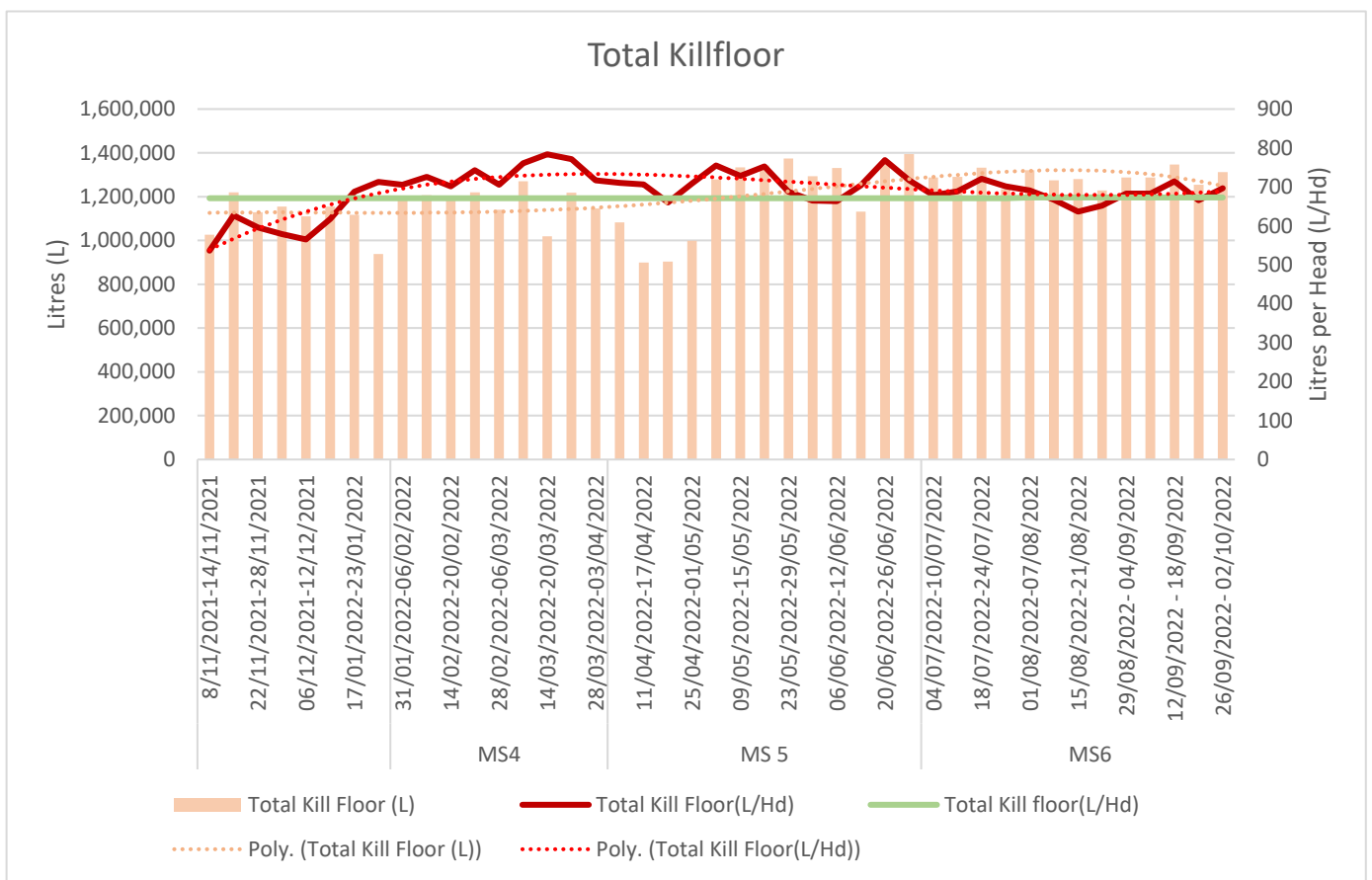


Figure 11: Total Kill floor water usage (MS 3- MS 6)

6.1.3 Total Hock Processing Hot Water Usage

The hock processing room is only intermittently used and therefore the data that has been collected is not reflective of the total water used in the area.

6.1.4 Anterooms (40C) Hot Water Usage

The Anterooms usage has reduced across MS3 (104,793L), MS 4 (80,279L), MS 5 (75,969L) and MS 6 (82,274). Figure 12 shows a similar trend for the litres per head with a decline across MS 3 (58L/Hd), MS 4 (50L/Hd), MS 5 (45L/Hd) and MS 6 (44L/Hd) (Figure 12).

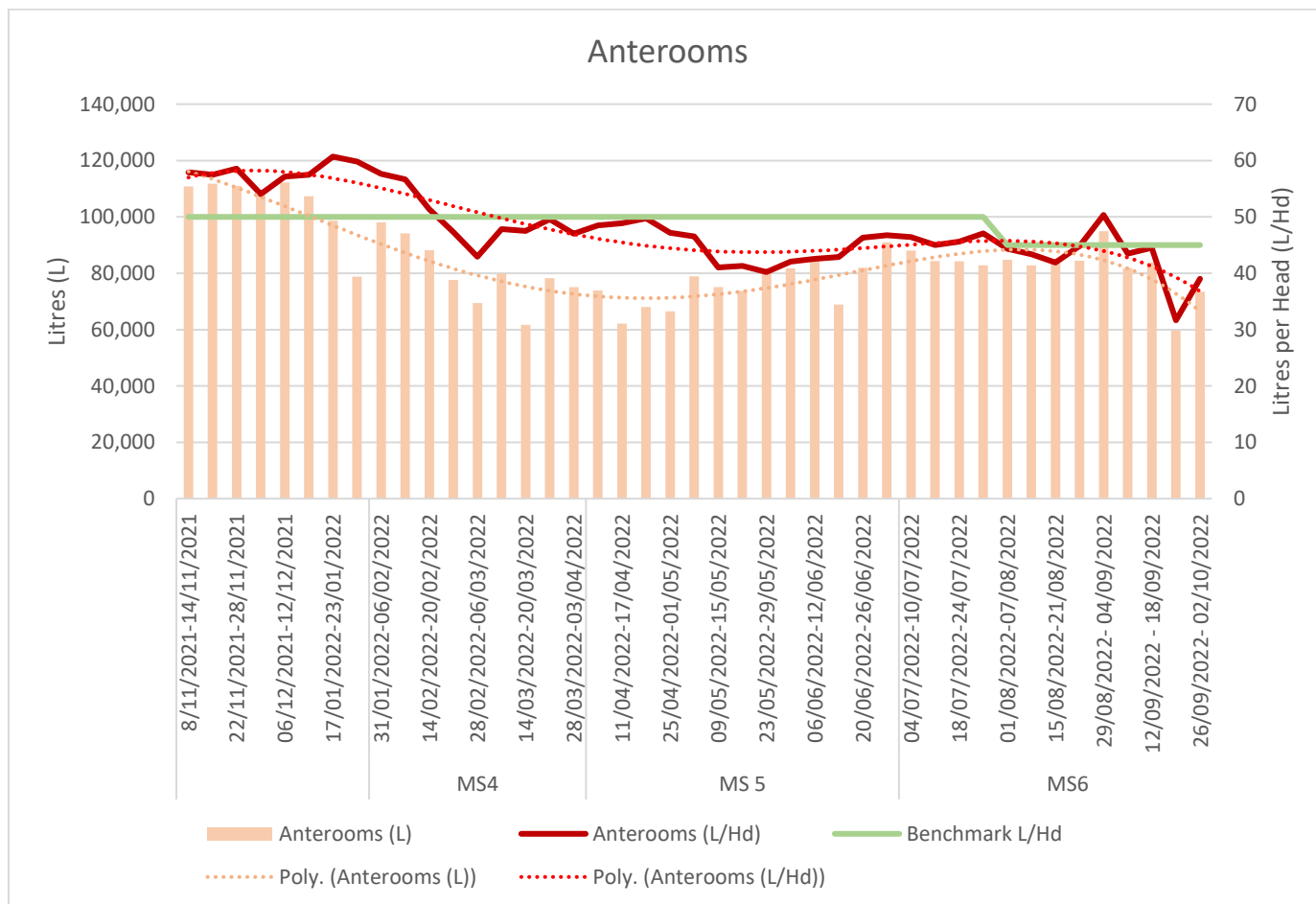


Figure 12: Total 40C Hot Water Usage (MS3 – MS 6)

6.1.5 Total Boning Room Hot Water Usage

The total boning room hot water usage reduced across MS3 (421,069L), MS 4 (383,986L), MS 5 (332,115L) and increased in MS 6 (364,531). Similarly, the water usage per head decreased over the duration of the project. Figure 13 shows the water usage for litres per head was highest in MS 4 and lowest in MS 6.

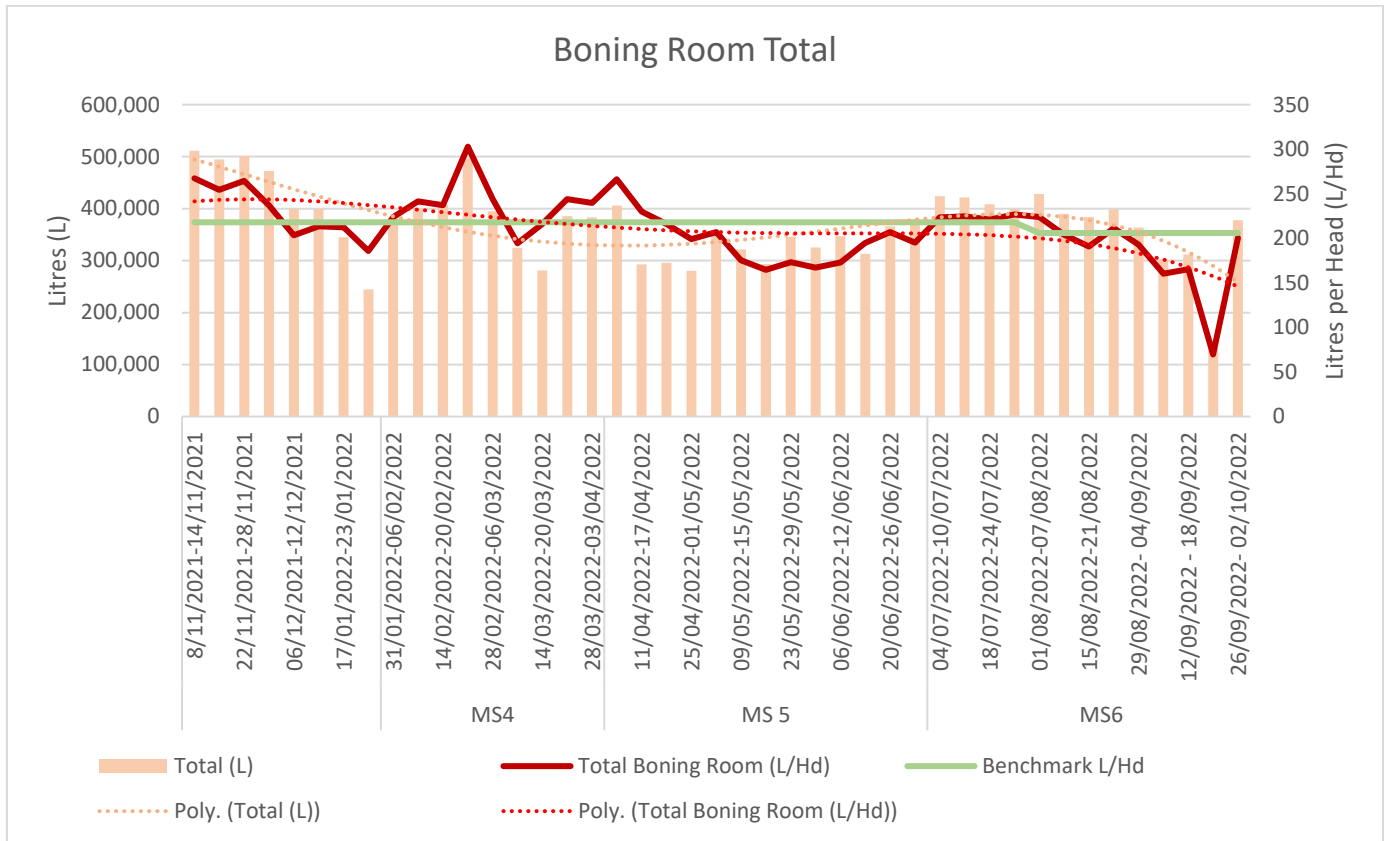


Figure 13: Total Boning Room Hot Water Usage (MS3 – MS6)

6.2 Total Potable Water Usage

The total overall potable water usage has reduced by approximately 11% across MS3 (1,732,269L), MS 4 (1,545,661L), MS 5 (1,558,104L) and MS 6 (1,540,195L). The maximum weekly water usage was observed in MS 3 (2,012,200L) and minimum observed in MS 6 (1,333,750L).

The average litres per head has decreased across milestone 3 (956 L/Hd), milestone 4 (963 L/Hd), milestone 5 (920 L/Hd) and milestone 6 (817 L/Hd). The maximum (963 L/Hd) litres per head was observed in MS4 and minimum (817L/Hd) observed in MS 6. Figure 14 shows an increase in the litres per head in those specific weeks where kill volumes decreased, and total water usage remained high.

Figure 14 illustrates the water usage from the following areas: offal room, hock processing room, kill floor, yards, plant, condensing tower and wash down.

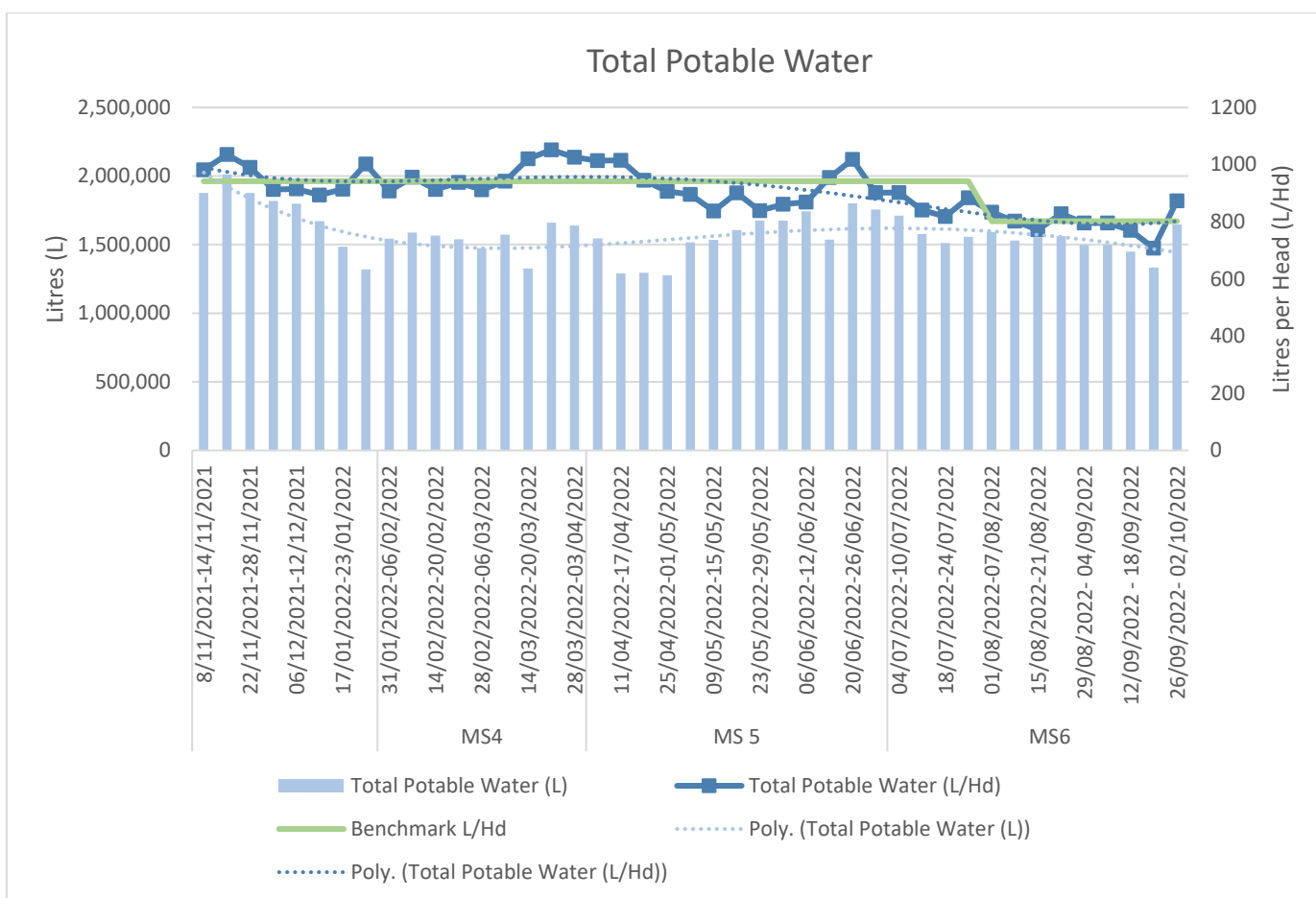


Figure 14: Total Potable Water Usage (MS3 – MS6)

6.2.1 Total Offal Room Potable Water Usage

A decline in total offal potable water usage across MS3 (654,164L), MS 4 (507,484L), MS 5 (482,013L) and MS 6 (475,260L) has been observed. Overall water usage for litres per head has also declined over MS3 (359 L/Hd), MS 4 (315 L/Hd), MS 5 (284 L/Hd) and MS 6 (252 L/Hd).

Figure 15 illustrates the water usage for the tripe peeler, tripe refiner, trommel wash and umbrella wash. The umbrella wash has seen the largest weekly reduction in water by 59L/Hd.

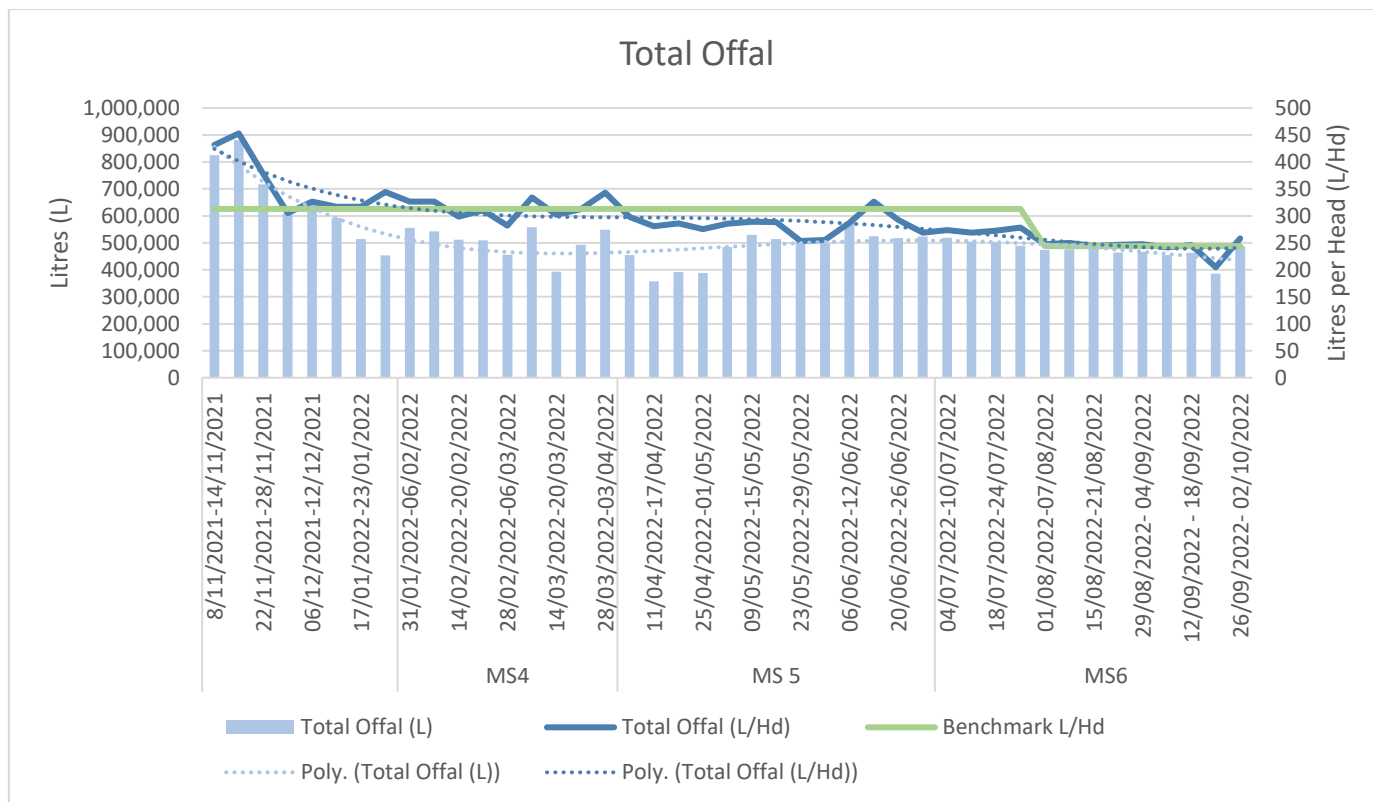


Figure 15: Total Offal Room Potable Water Usage (MS3 – MS6)

6.2.2 Total Hock Processing Potable Water Usage

The hock processing room is only intermittently used and therefore the data that has been collected is not reflective of the total water used in the area.

6.2.3 Total Kill floor Potable Water Usage

A increase in total kill floor potable water usage across MS3 (41,544L), MS 4 (41,363L), MS 5 (122,210L) and MS 6 (130,886L) has been observed. Overall water usage for litres per head has also increased over MS3 (23 L/Hd), MS 4 (26 L/Hd), MS 5 (71 L/Hd) and MS 6 (70L/Hd).

Figure 16 illustrates the water usage for the hock mixer, evisceration clean and evisceration cool. It was identified on the 14/03/22 that the equation was incorrect, utilising the data from the evisceration cool. An adjustment was made which reflects the data in Figure 16. However, the evisceration clean total water usage and litres per head has increased throughout MS 5 and MS 6.

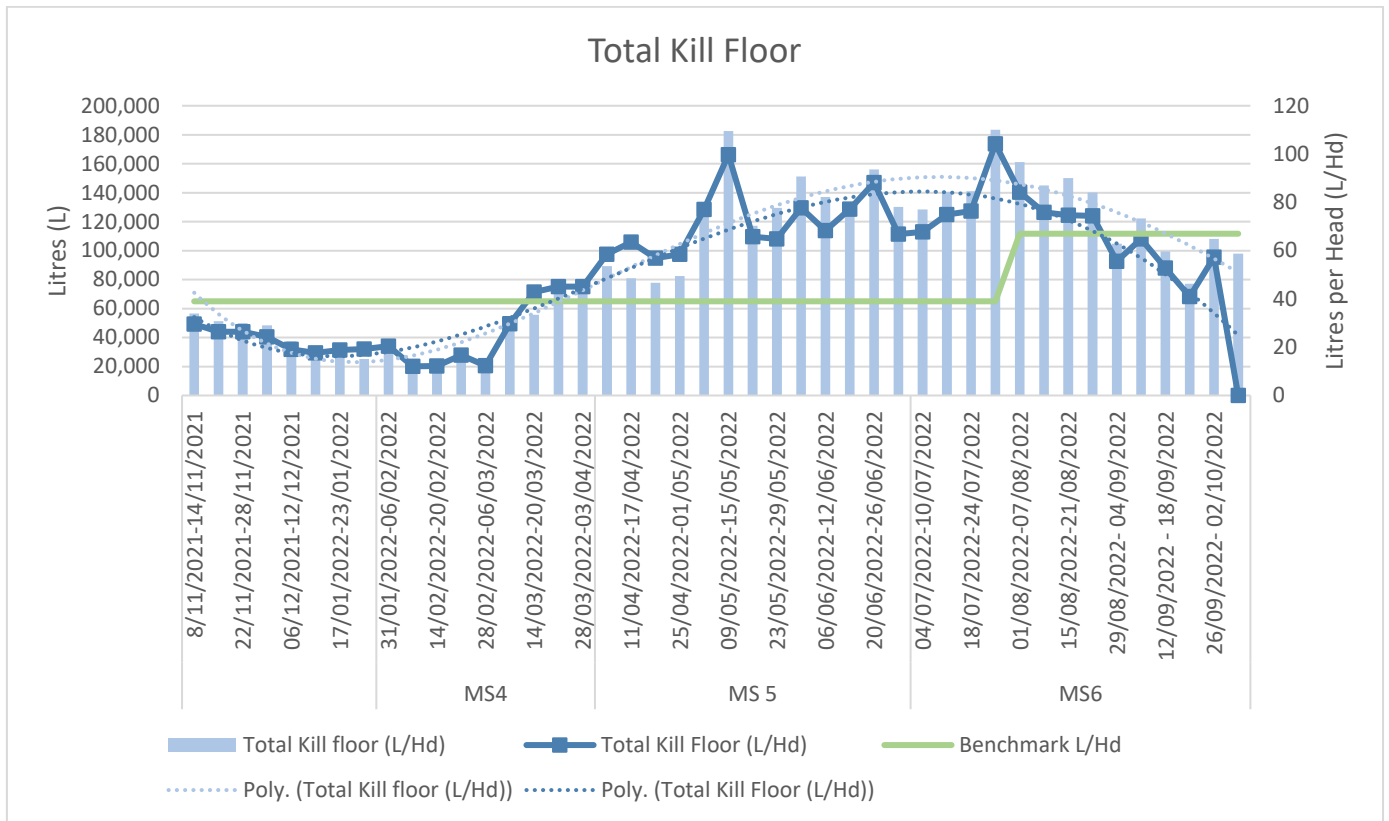


Figure 16: Total Kill floor Potable Water Usage (MS 3 – MS 6)

6.2.4 Total Yards Potable Water Usage

An increase in total yards potable water usage across MS3 (135,862L), MS 4 (119,020L), MS 5 (118,710L) and MS 6 (150,432L) has been observed. Overall water usage for litres per head has also increase over MS3 (76 L/Hd), MS 4 (74 L/Hd), MS 5 (70 L/Hd) and MS 6 (80 L/Hd). This is largely driven by an increase final livewash usage.

Figure 17 illustrates the water usage for the final livewash and troughs. Both the final live wash and troughs water usage have decline for overall usage and litres per head. A significant decline in MS 5 was observed for the water usage of the troughs indicating that cattle are drinking less over the cooler periods of winter.

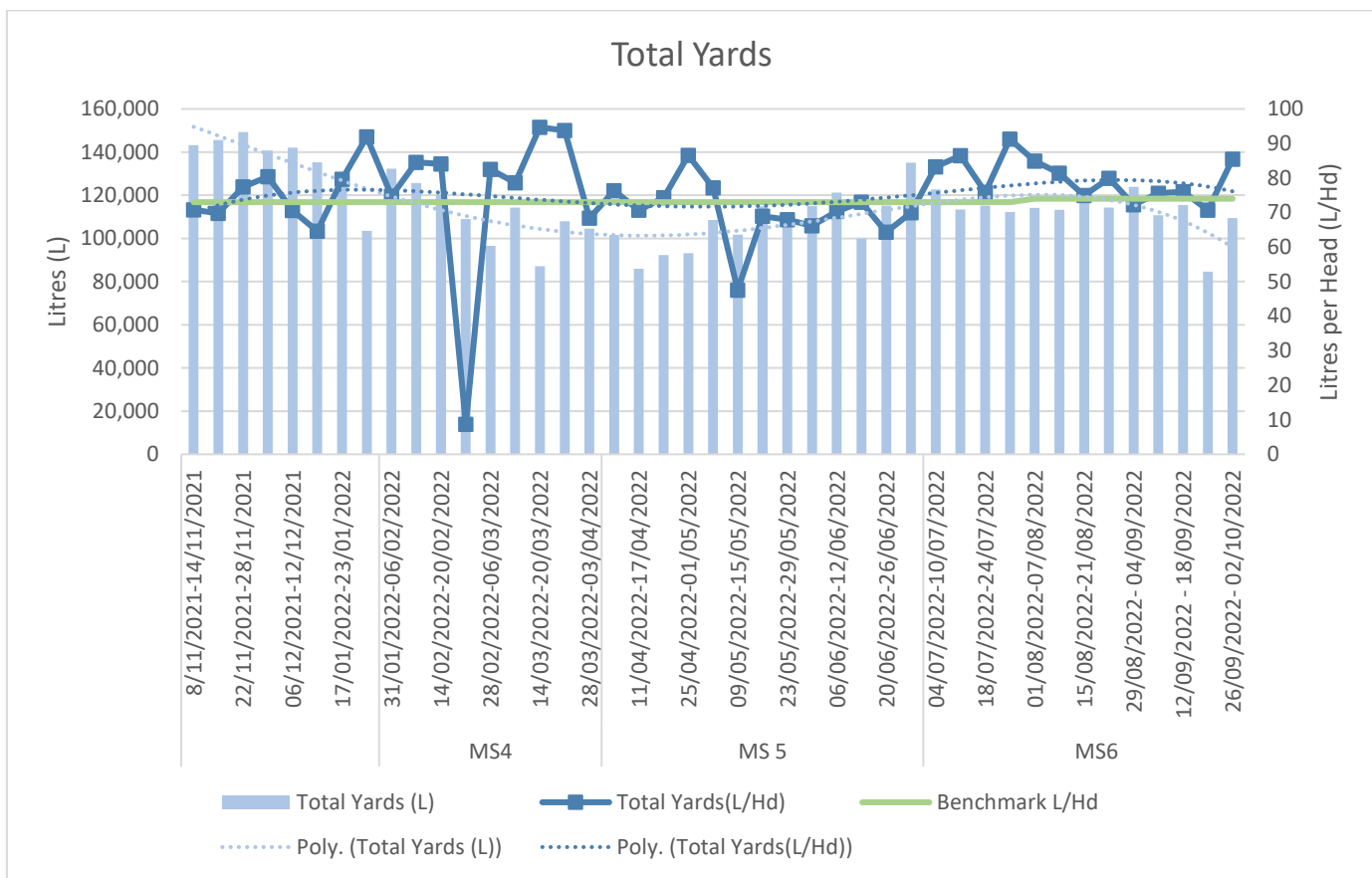


Figure 17: Total Yards Potable Water Usage (MS 3 – MS 6)

6.2.5 Total Plant Water Usage

A decline in total yards potable water usage across MS3 (135,862L), MS 4 (110,874L) and MS 5 (107,320L) with a slight increase in MS 6 (112,737L) has been observed. However, the overall water usage for litres per head has continued to decline over MS3 (75 L/Hd), MS 4 (69 L/Hd), MS 5 (63 L/Hd) and MS 6 (60 L/Hd).

Figure 18 illustrates the water usage for the amenities and anterooms. The amenities have increased water usage overtime which reflects the increase personnel onsite. The anterooms have decreased over time for the total usage and litres per head.

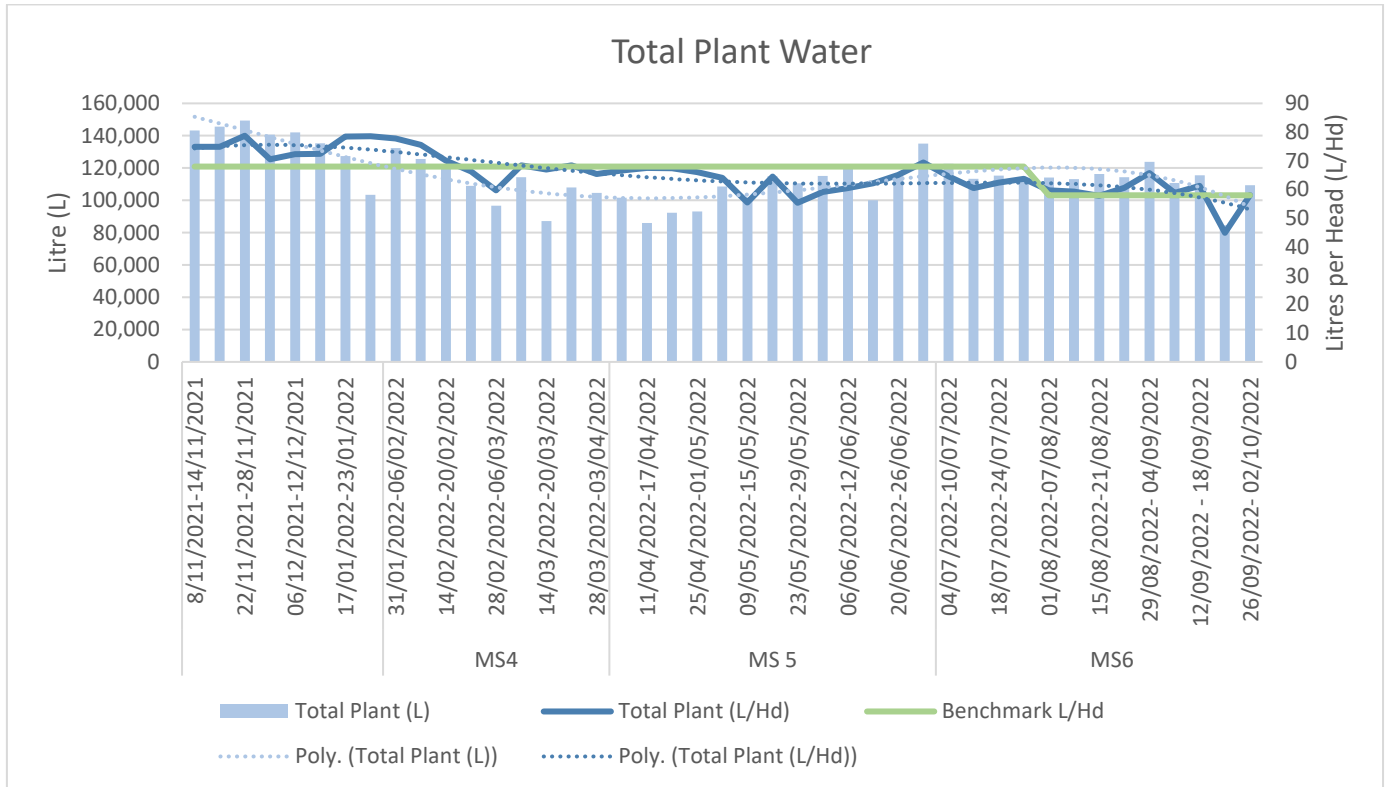


Figure 18: Total Plant Water Usage (MS 3 – MS 6)

6.2.6 Condensing Tower Water Usage

A decline in total yards potable water usage across MS3 (365,101L), MS 4 (338,826L), MS 5 (254,947L) and MS 6 (233,605L) has been observed. Similarly, the overall water usage for litres per head has also decreased over MS3 (203 L/Hd), MS 4 (212 L/Hd), MS 5 (153 L/Hd) and MS 6 (124 L/Hd) (Figure 19).

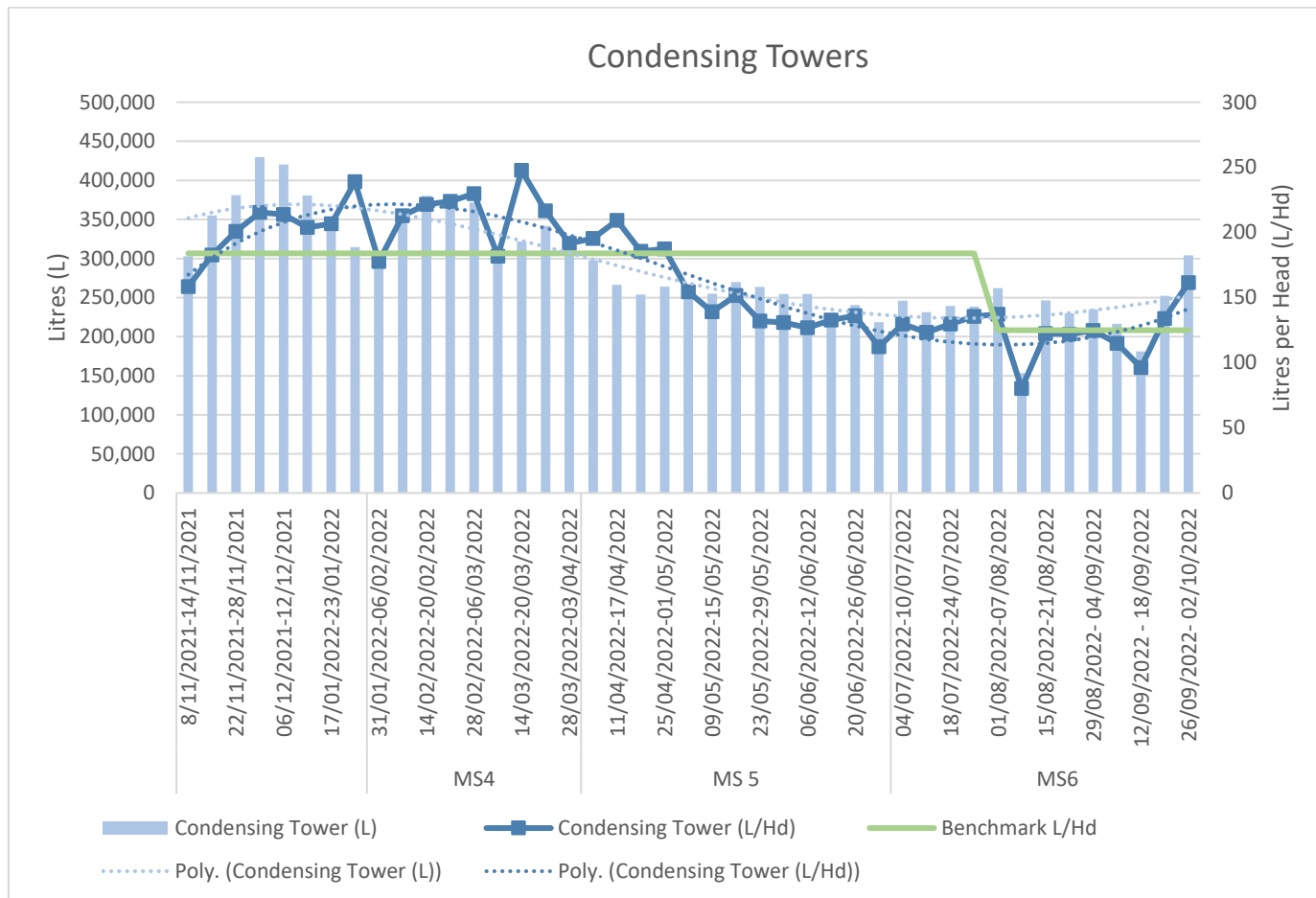


Figure 19: Condensing Tower Water Usage (MS 3 – MS 6)

6.2.7 Total Wash Down Potable Water Usage

A increased in total wash down potable usage across MS3 (398,672L), MS 4 (413,865L), MS 5 (471,383L) and MS 6 (437,266L) has been observed. Overall water usage for litres per head has also increased over MS3 (220 L/Hd), MS 4 (258 L/Hd), MS 5 (277 L/Hd) and MS 6 (232 L/Hd) (Figure 20).

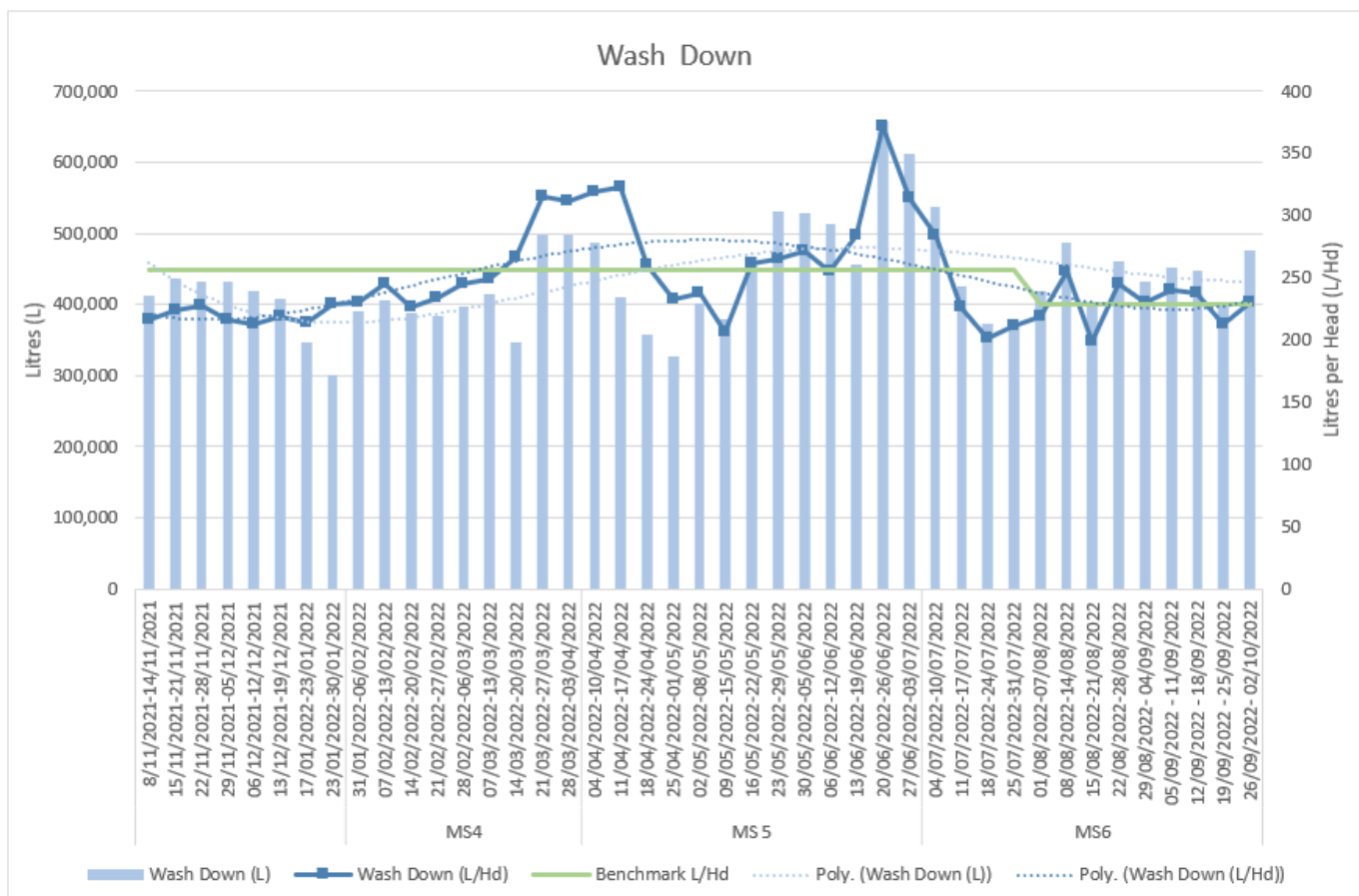


Figure 20: Total Wash down Potable Water Usage (MS 3 – MS 6)

6.4 Remainder Backwash Water Usage

A decline in remainder backwash water usage across MS3 (491,309L), MS 4 (441,697L), MS 5 (509,733L) and MS 6 (463,854L) has been observed. Overall water usage for litres per head has also increased over MS3 (276 L/Hd), MS 4 (275 L/Hd), MS 5 (308 L/Hd) and MS 6 (246 L/Hd). An increase in total usage and litres per head observed in MS5 (Figure 21) has been influenced by the tank cleaning process on 13/06/2022, which resulted on the 2 weeks of faulty readings from the meter.

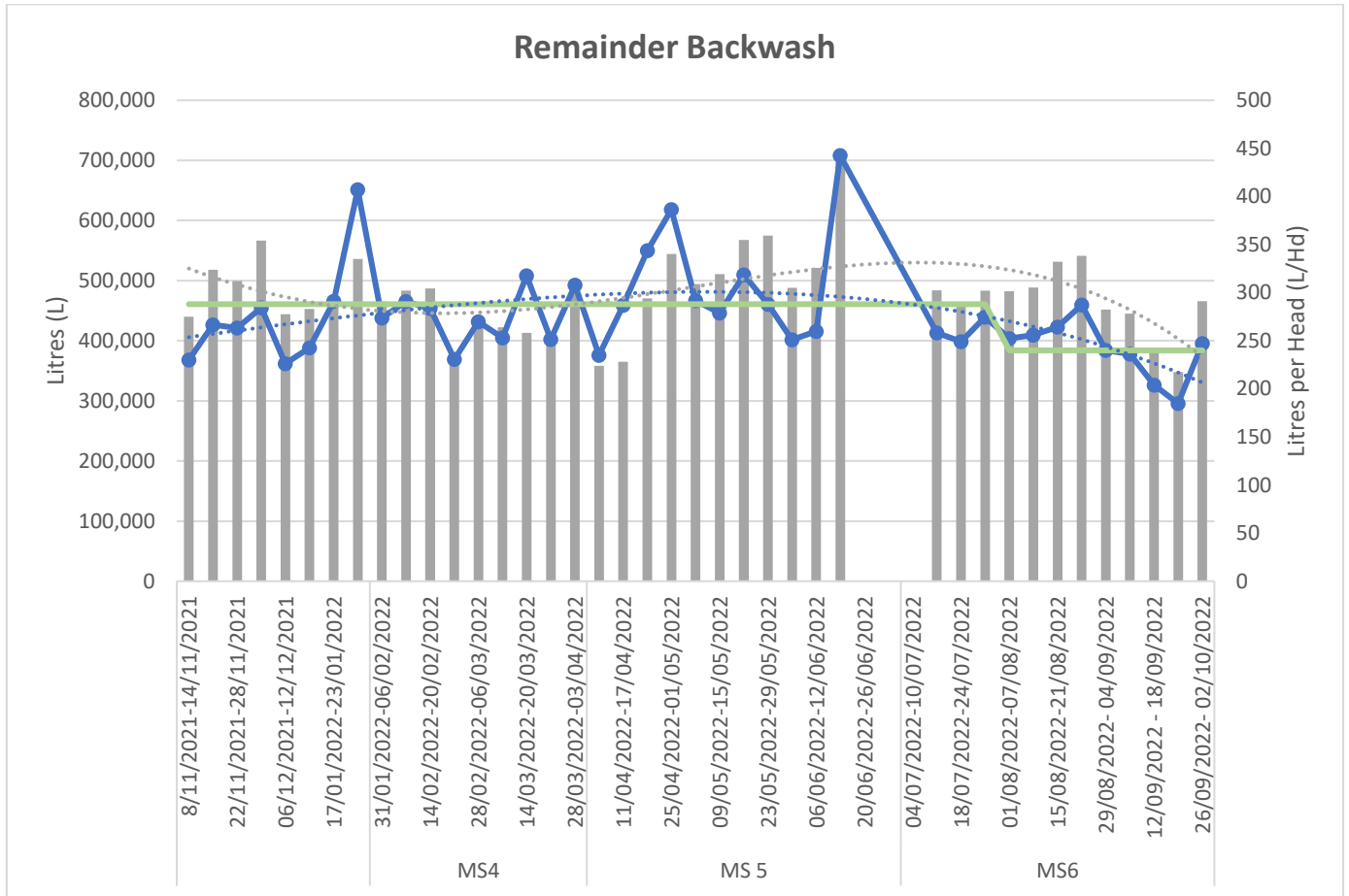


Figure 21: Remainder Backwash Water Usage (MS 3- MS 6)

6.5 Total Spray Chill Water Usage

A increase in remainder spray chill water usage across MS3 (93,656L), MS 4 (93,613L), MS 5 (105,746L) and MS 6 (125,015L) has been observed. Overall water usage for litres per head has also increased over MS3 (52 L/Hd), MS 4 (52 L/Hd), MS 5 (62 L/Hd) and MS 6 (66 L/Hd) (Figure 22).

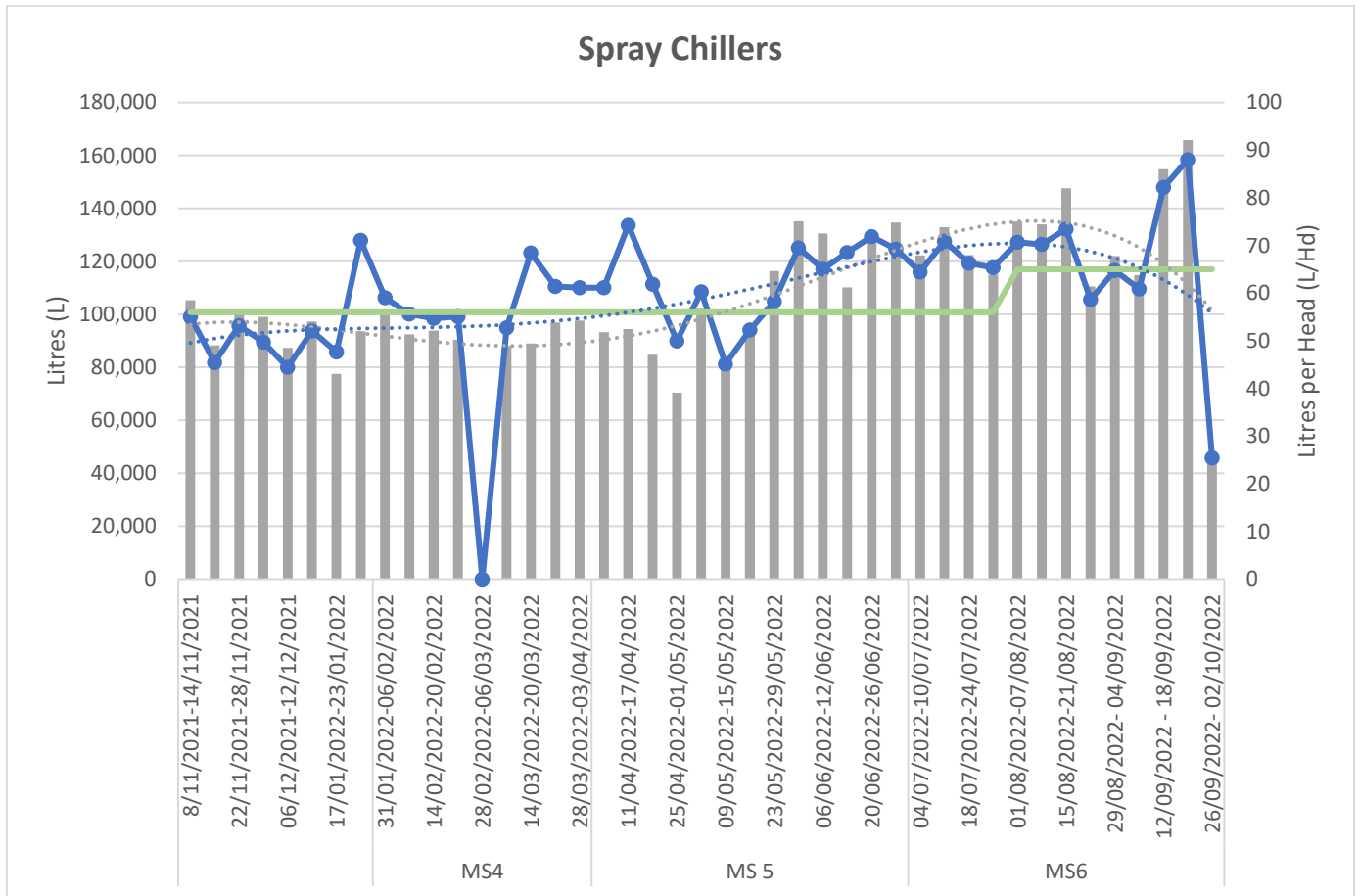


Figure 22: Total Spray Chill Water Usage (MS 3 – MS 6)

7.0 Conclusions / Recommendations

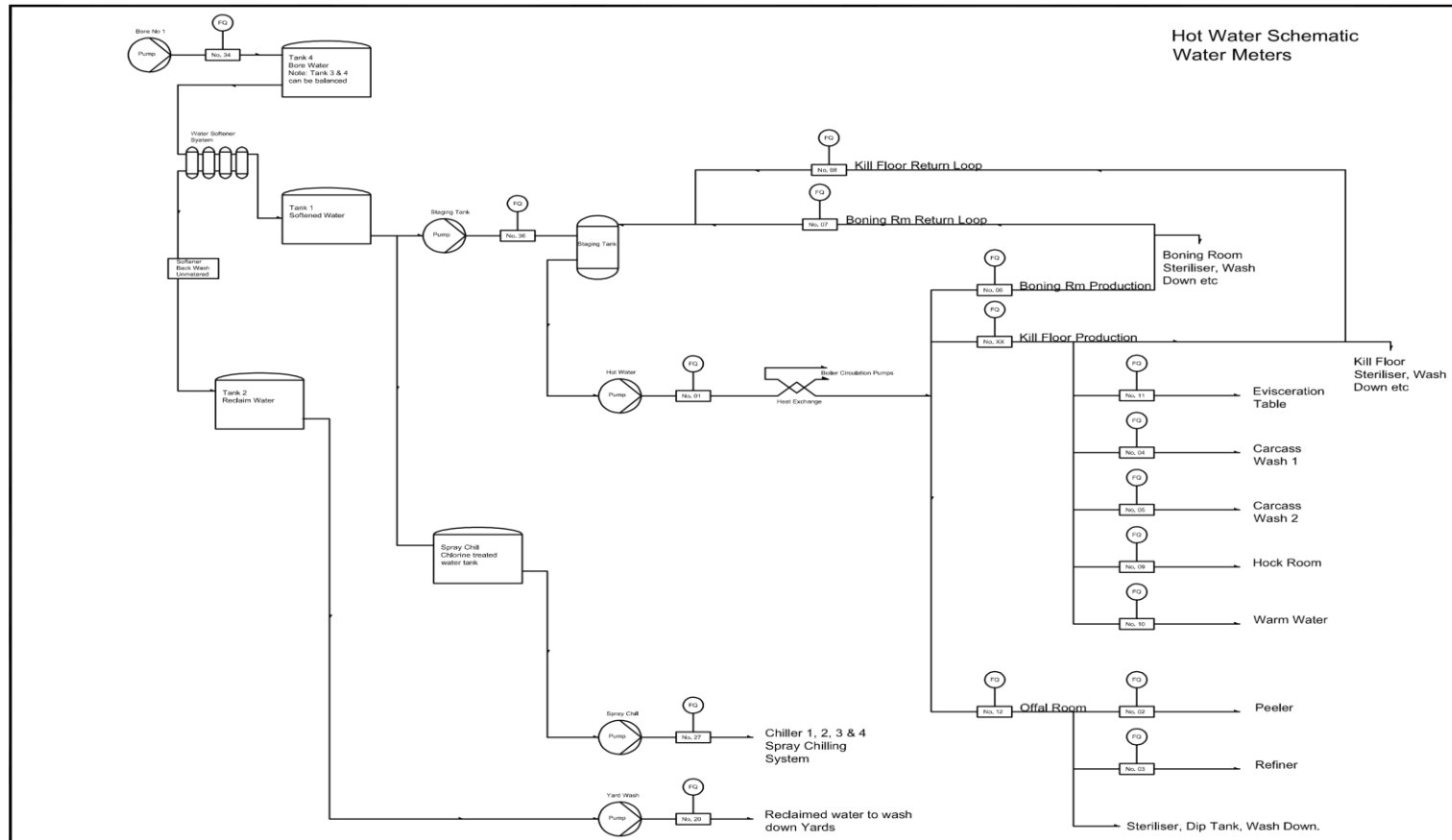
Milestone 6 was successfully achieved including:

- Intensive monitoring and insights development
- Weekly management review meetings with explanation of any changes made
- Quarterly results and outputs

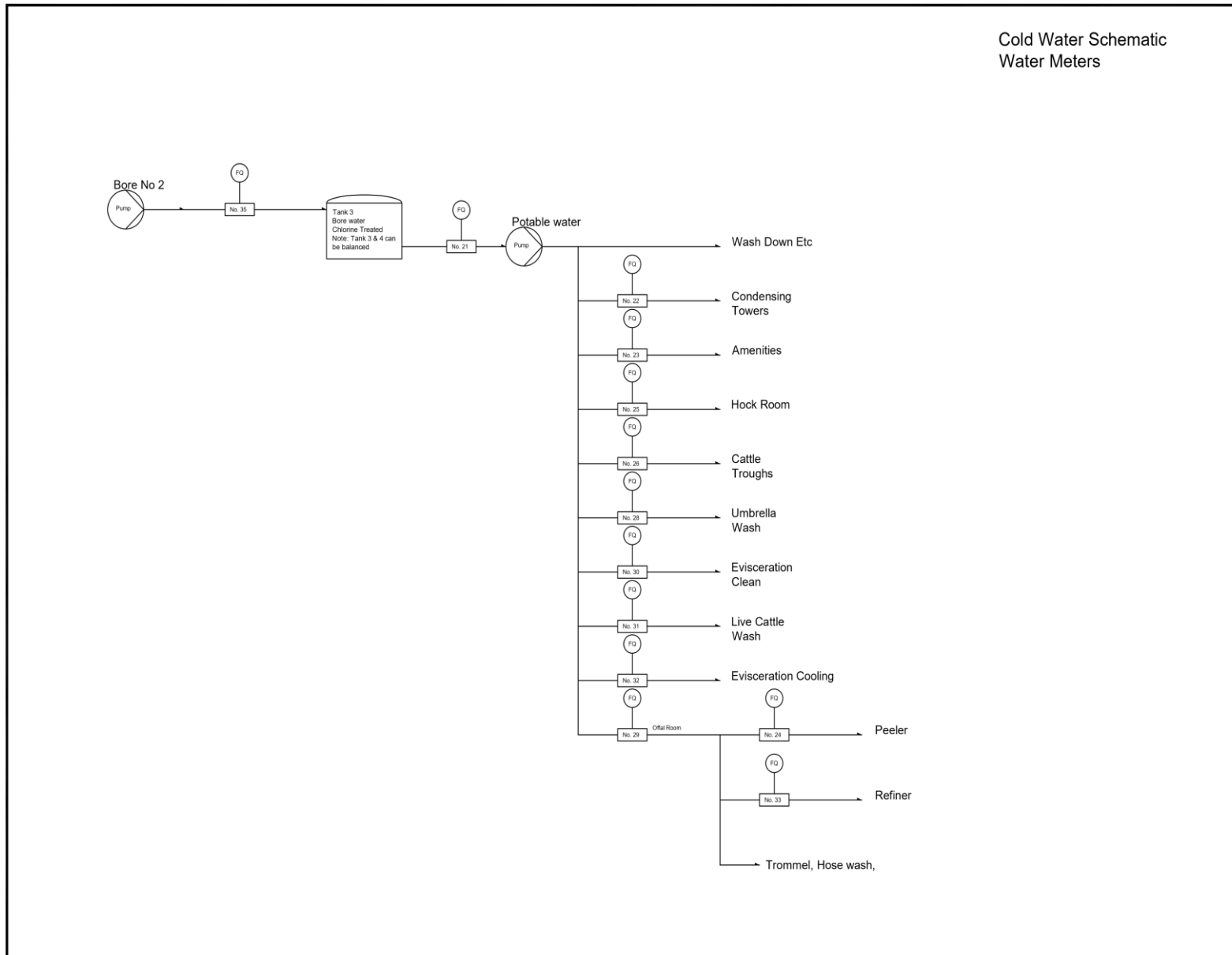
Learnings from this project have been taken into consideration with future designs and opportunities in the company. Furthermore, there is opportunity to further understand how water can be better utilised onsite through water recycling.

8.0 Appendices

8.1 Appendix 1: P&ID Diagram



Cold Water Schematic
Water Meters



8.2 Appendix 2: Weekly Report Example

Management Report

Start date: 21/2/2022 12:00 AM

End date: 27/2/2022 11:59 PM

Total Plant Consumption (L): <N/A>wp.weekvol_bore2@

Location	Water Meter	Hot Water Volume This Week (L)	Hot Water Volume Last Week (L)	Water Saving Implementation
Offal	Tripe - Peeler	56,290	57,305	
Offal	Tripe - Refiner	85,590	87,680	
Offal	Steriliser & Wash Down	196,550	171,125	
Offal	Total	338,430	316,110	
Kill Floor	Carcass Wash 1	89,850	104,190	
Kill Floor	Carcass Wash 2	38,060	30,290	
Kill Floor	Evisceration Table Steriliser	118,340	119,590	
Kill Floor	Wash Down & Knife Sterilisers	973,085	949,655	
Kill Floor	Total	1,219,335	1,203,725	
Hock Processing Room	Hock Processing Room	360	1,250	
Plant	Anterooms	77,645	88,135	
Boning Room	Total	497,380	407,035	
Production Total	Total Hot Water	2,133,150	2,016,255	

Location	Water Meter	Potable Water Volume This Week (L)	Potable Water Volume Last Week (L)	Water Saving Implementation
Offal	Tripe - Peeler	65,055	93,380	
Offal	Tripe - Refiner	128,585	129,425	
Offal	Offal - Trommel Wash	144,440	136,275	
Offal	Umbrella	171,340	152,970	
Offal	Total	509,420	512,050	
Hock Processing Room	Hock Mixer	55	0	
Kill Floor	Evisceration Clean	7,030	960	
Kill Floor	Evisceration Cool	20,500	20,040	
Kill Floor	Total	27,530	21,000	
Yards	Final Livewash	121,310	127,310	
Yards	Troughs	20,970	16,940	
Yards	Total	142,280	144,250	
Plant	Amenities	31,290	32,240	
Plant	Anterooms	77,645	88,135	
Plant	Total	108,935	120,375	
Refrigeration Plant	Condensing Tower	367,530	380,280	
Wash Down	Wash Down	384,200	387,945	
Production Total	Total Potable Water	1,539,950	1,565,900	

Location	Water Meter	Water Volume This Week (L)	Water Volume Last Week (L)	Water Saving Implementation
Water Plant	Remainder Backwash	378,950	487,045	
Chillers	Spray Chill	90,450	93,900	
Production Hot Water Total	Total Hot Water	2,133,150	2,016,255	
Production Cold Water Total	Potable Water	1,539,950	1,565,900	
Plant	Total Plant Consumption	4,142,500	4,163,100	

Location	Gas Meter	LPG Volume This Week (L)	LPG Volume Last Week (L)	LPG Saving Implementation
Plant	Total Plant Consumption	12,277	11,600	

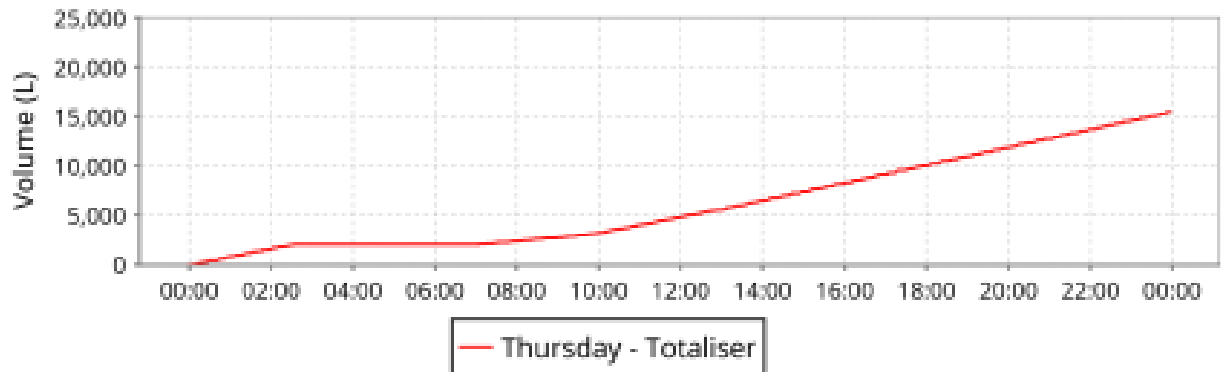
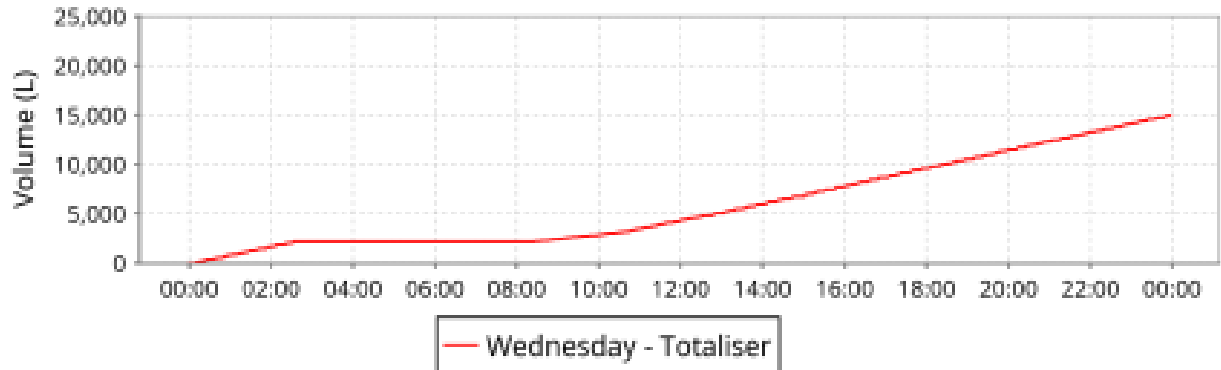
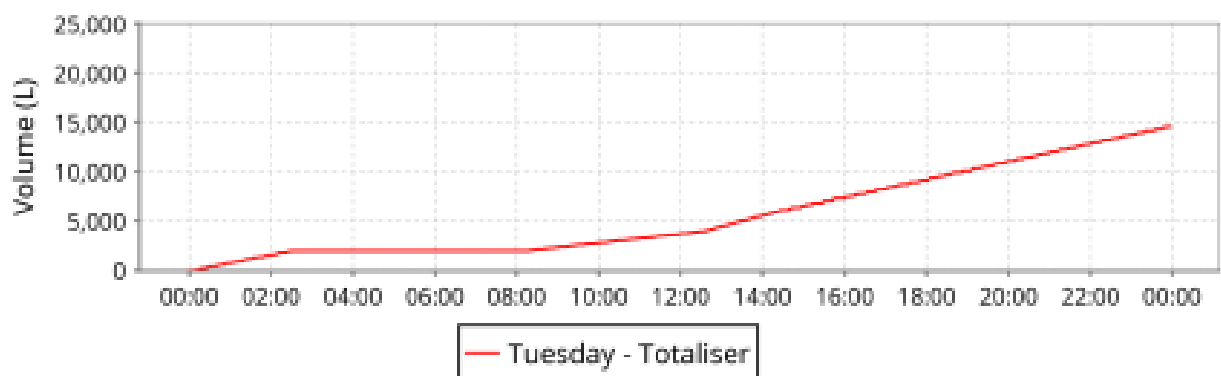
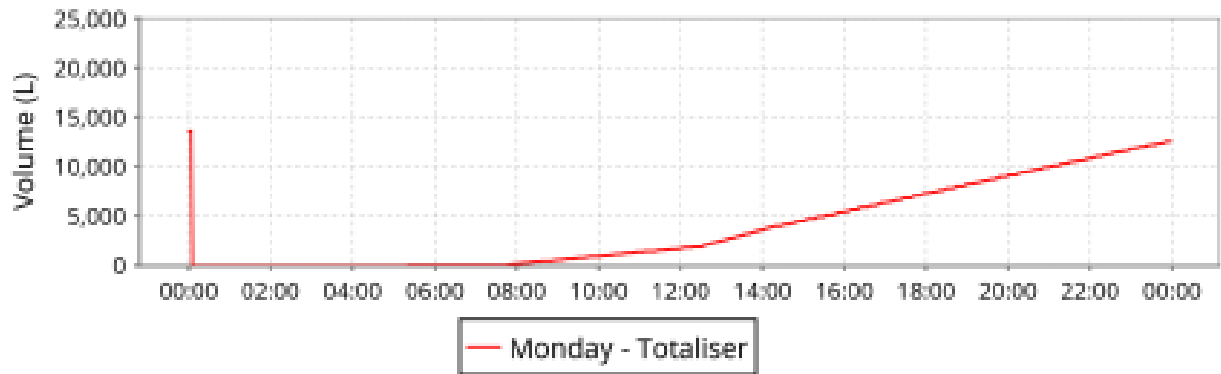
8.3 Appendix 3: Individual Area Report Example (Spray Chill)

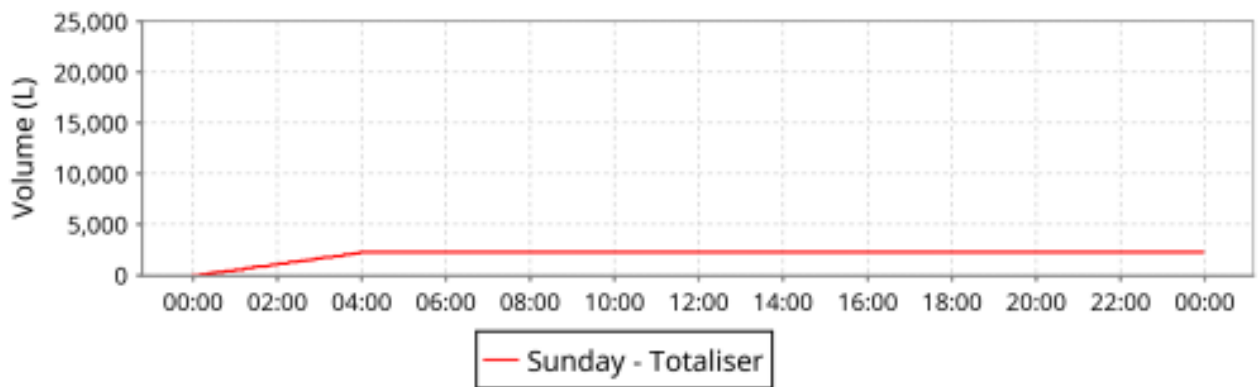
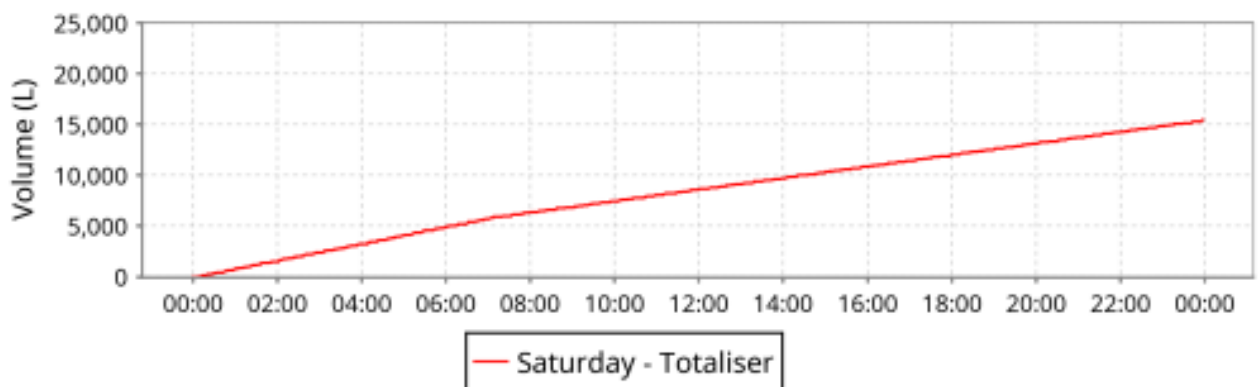
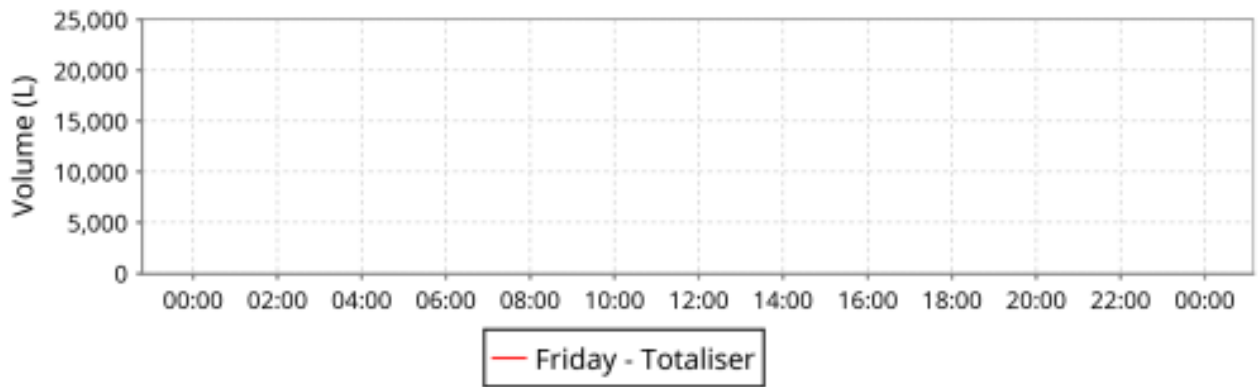
Spray Chill Cold Water

Start date: 21/2/2022 12:00 AM

End date: 27/2/2022 11:59 PM

Day	Daily Total (L)	Weekly Total (L)
Monday	17,130	17,130
Tuesday	15,170	32,300
Wednesday	16,880	49,180
Thursday	17,540	66,720
Friday	18,860	85,580
Saturday	5	85,585
Sunday	5	85,590





8.4 Appendix 4: Total water Usage (L) summary across MS3 – MS6

Total Water Usage (L)			MS 3				MS 4				MS 5				MS 6							
		(n)	Mean	Max.	Min.	SD	(n)	Mean	Max.	Min.	SD	(n)	Mean	Max.	Min.	SD	(n)	Mean	Max.	Min.	SD	
Total Hot Water	Offal	Tripe - Peeler	8	54,527	59,840	49,015	3,726	9	49,629	57,305	35,320	7,683	13	54,915	65,000	35,450	8,914	13	56,802	60,410	47,625	3,830
	Offal	Tripe - Refiner	8	90,525	97,840	73,565	6,911	9	82,905	90,340	61,300	8,070	13	83,429	93,925	67,515	8,742	13	78,386	90,535	8,250	20,876
	Offal	Steriliser & Wash Down	8	191,882	220,100	148,950	24,829	9	180,263	231,200	118,180	27,978	13	171,084	198,725	126,310	23,199	13	183,065	218,590	134,255	18,610
	Offal	Total	8	336,934	374,280	271,530	32,607	9	320,574	378,495	275,710	27,230	13	309,428	344,875	244,430	35,810	13	323,766	346,395	253,845	22,245
	Killfloor	Carcase Wash 1	8	102,946	122,860	83,430	12,242	9	79,569	104,190	54,170	17,525	13	61,655	74,550	36,180	11,084	13	71,972	92,960	30,210	14,928
	Killfloor	Carcase Wash 2	8	37,568	46,250	21,040	8,535	9	29,730	38,060	21,080	4,935	13	37,716	60,590	24,560	10,748	13	35,408	53,620	26,760	6,690
	Killfloor	Evisceration Table Steriliser	8	138,158	175,240	12,630	50,131	9	103,466	143,370	61,140	23,614	13	87,225	109,860	63,640	14,997	13	99,953	124,490	42,500	22,940
	Killfloor	Wash Down & Knife Sterilisers	7	827,476	883,420	713,360	53,168	9	967,702	1,085,320	882,540	59,933	13	1,022,888	1,190,235	752,085	151,114	13	1,080,070	1,180,150	989,475	53,997
	Killfloor	Total	8	1,106,258	1,219,260	938,690	81,089	9	1,180,467	1,269,950	1,018,930	67,837	13	1,209,485	1,394,925	898,815	175,468	13	1,287,404	1,346,950	1,228,725	33,837
	Hook Pr	Hook Processing Room	4	3,075	10,555	0	4,333	9	587	1,250	270	319	13	13,042	48,490	185	16,393	13	11,134	26,630	25	9,947
	Plant	Anterooms	8	104,793	112,225	78,810	10,647	9	80,279	98,025	61,745	10,895	13	75,969	90,990	62,180	7,907	13	82,274	94,860	59,640	7,886
	Boning F	Total	8	421,069	511,270	244,880	86,889	9	383,986	497,380	281,015	55,739	13	332,115	406,150	280,640	36,460	13	364,531	428,065	131,310	77,152
	Product	Total Hot Water	8	2,011,563	2,350,260	1,534,760	227,944	9	1,965,837	2,133,150	1,637,615	128,252	13	1,940,039	2,217,010	1,519,665	237,936	13	2,069,108	2,173,660	1,725,425	107,515
	Total Potable Water	Offal	Tripe - Peeler	8	114,278	129,130	82,065	14,900	9	99,369	146,950	58,855	28,001	13	92,499	138,945	69,945	16,501	13	89,046	93,845	72,620
Offal		Tripe - Refiner	8	132,961	138,655	110,870	8,501	9	121,517	134,305	88,180	13,108	13	105,104	145,935	0	48,708	13	132,796	143,100	110,815	7,183
Offal		Offal - Trommel Wash	8	184,468	199,615	142,565	17,692	9	138,917	163,005	109,445	13,645	13	152,796	258,215	115,090	37,422	13	138,449	163,310	108,995	14,270
Offal		Umbrella	8	222,458	421,810	107,590	116,175	9	147,681	173,060	118,590	18,123	13	131,614	214,600	74,990	38,027	13	114,965	140,220	93,430	10,914
Offal		Total	8	654,164	880,540	453,580	137,083	9	507,484	557,700	393,090	51,320	13	482,013	576,560	357,520	62,722	13	475,260	519,180	385,860	31,505
Hook Pr		Hook Mixer	8	953	7,620	0	2,520	9	6	55	0	17	13	15,414	47,425	0	15,272	13	10,402	43,960	0	12,002
Killfloor		Evisceration Clean	8	17,201	27,800	1,230	8,918	4	49,588	71,950	13,470	22,450	13	102,297	131,060	75,380	18,033	13	112,978	140,770	55,230	25,329
Killfloor		Evisceration Cool	7	23,449	28,750	16,000	3,849	8	20,600	48,790	6,940	12,073	11	7,115	10,180	3,300	1,958	13	7,505	9,830	2,840	2,082
Killfloor		Total	8	41,544	56,550	25,260	10,684	9	41,363	72,160	19,990	20,192	13	122,210	182,615	77,870	30,915	13	130,886	183,350	77,195	27,261
Yards		Final Livewash	8	118,121	138,330	87,980	15,582	9	115,504	127,310	95,140	9,718	13	107,859	132,180	79,590	16,314	13	141,148	154,840	124,810	9,734
Yards		Troughs	8	17,853	33,040	9,000	6,712	9	17,738	31,620	7,750	6,241	13	10,851	26,770	5,990	5,173	13	9,284	14,890	5,690	2,030
Yards		Total	8	135,974	160,210	120,610	12,333	9	119,020	148,010	14,280	38,646	13	118,710	141,140	87,140	16,425	13	150,432	162,310	133,120	9,989
Plant		Amenities	8	26,769	33,860	3,890	9,094	9	30,596	34,450	25,330	2,867	13	31,351	44,150	23,700	5,962	13	30,462	35,940	25,010	2,640
Plant		Anterooms	8	104,793	112,225	78,810	10,647	9	80,279	98,025	61,745	10,895	13	75,969	90,990	62,180	7,907	13	82,274	94,860	59,640	7,886
Plant		Total	8	135,862	149,280	103,480	13,741	9	110,874	132,325	87,075	13,334	13	107,320	135,140	85,880	12,908	13	112,737	123,860	84,650	9,021
Refriger.		Condensing Tower	8	365,101	429,810	303,090	43,370	9	338,826	380,270	302,290	29,346	13	254,947	297,890	213,530	20,864	13	233,605	304,170	153,360	35,068
Wash Dc		Wash Down	8	398,672	436,210	301,790	45,299	9	413,965	498,145	346,215	48,471	13	471,383	658,315	327,905	93,895	13	437,266	537,875	371,420	45,457
Product		Total Potable Water	8	1,732,269	2,012,200	1,319,850	214,252	9	1,545,661	1,660,450	1,327,100	93,015	13	1,558,104	1,801,350	1,277,400	172,208	13	1,540,185	1,712,100	1,333,750	88,006
Water Pl	Remainder Backwash	8	491,309	566,790	439,940	43,481	9	441,697	491,910	378,950	39,502	11	509,733	711,550	358,085	93,332	12	463,854	541,285	348,125	52,051	
Chillers	Spray Chill	8	93,656	105,300	77,500	8,363	8	93,613	100,400	88,050	4,152	13	105,746	135,150	70,450	20,729	13	125,015	165,800	47,900	27,308	
Product	Total Hot Water	8	2,011,563	2,350,260	1,534,760	227,944	9	1,965,837	2,133,150	1,637,615	128,252	13	1,940,039	2,217,010	1,519,665	237,936	13	2,069,108	2,173,660	1,725,425	107,515	
Product	Potable Water	8	1,732,269	2,012,200	1,319,850	214,252	9	1,545,661	1,660,450	1,327,100	93,015	13	1,558,104	1,801,350	1,277,400	172,208	13	1,540,185	1,712,100	1,333,750	88,006	
Plant	Total Plant Consumption	8	4,328,763	4,824,000	3,483,900	428,340	9	4,047,056	4,176,600	3,466,500	213,031	11	4,024,873	4,535,300	3,270,000	431,129	12	4,178,733	4,383,900	3,573,100	204,070	

8.5 Appendix 5: Total Water Usage (L/Hd) summary across MS3 – MS6

L/Hd		MS 3					MS 4				MS 5				MS 6							
		(n)	Mean	Max.	Min.	SD	(n)	Mean	Max.	Min.	SD	(n)	Mean	Max.	Min.	SD	(n)	Mean	Max.	Min.	SD	
Total Hot Water	Offal	8	30	37	26	4	9	31	36	21	4	13	32	38	20	4	13	30	32	25	2	
	Offal	8	50	56	47	3	9	51	56	47	3	13	49	57	45	4	13	42	47	4	11	
	Offal	8	106	116	93	9	9	113	143	69	20	13	101	130	81	14	13	97	124	71	11	
	Offal	8	187	206	167	14	9	200	234	181	17	13	183	225	157	18	13	172	197	135	13	
	Killfloor	8	73	87	55	9	9	57	70	39	11	13	52	69	35	9	13	56	68	31	9	
	Killfloor	2	20	22	18	2	0	#DIV/0!	0	0	#DIV/0!	0	#DIV/0!	0	0	#DIV/0!	8	24	64	15	15	
	Killfloor	8	77	92	7	27	9	64	84	47	11	13	51	61	43	7	13	53	66	23	12	
	Killfloor	8	407	542	0	159	9	604	679	544	47	13	600	651	564	27	13	573	626	510	32	
	Killfloor	8	615	713	536	56	9	735	784	701	29	13	710	769	660	34	13	683	721	636	23	
	Hock Pr	4	2	5	0	2	9	0	1	0	0	13	7	25	0	9	13	6	14	0	5	
	Plant	8	58	61	54	2	9	50	58	43	4	13	45	50	40	3	13	44	50	32	4	
	Boning f	8	230	267	186	28	9	238	303	194	28	13	198	266	165	28	13	193	227	70	41	
	Product	8	1112	1229	993	71	9	1223	1299	1175	43	13	1142	1250	1061	55	13	1098	1185	916	65	
	Total Potable Water	Offal	8	63	67	58	3	9	62	88	36	16	13	54	78	49	7	13	47	50	39	3
		Offal	8	74	84	67	6	9	75	83	68	5	13	60	82	0	26	13	70	73	59	3
Offal		8	102	108	95	4	9	86	96	79	5	13	92	152	69	28	13	74	90	58	9	
Offal		8	120	217	66	57	9	92	108	78	9	13	77	133	59	19	13	61	74	50	6	
Offal		8	359	453	305	53	9	315	343	282	18	13	284	326	253	18	13	252	278	205	18	
Hock Pr		2	2	4	0	2	1	0	0	0	0	12	9	26	0	8	11	7	25	0	7	
Killfloor		8	9	15	1	4	4	33	45	8	15	13	60	74	53	7	13	60	74	29	13	
Killfloor		7	13	15	11	1	8	13	29	4	7	11	4	6	2	1	13	4	5	2	1	
Killfloor		8	23	30	18	4	9	26	45	12	14	13	71	100	57	12	13	70	104	41	15	
Yards		8	65	69	55	5	9	72	79	60	5	13	64	69	43	7	13	75	85	66	6	
Yards		8	10	25	5	6	9	11	20	5	4	13	7	19	3	4	13	5	8	3	1	
Yards		8	76	92	65	8	9	74	95	9	25	13	70	87	48	9	13	80	91	71	6	
Plant		8	15	19	2	5	9	19	21	17	1	13	18	23	15	2	13	16	19	13	1	
Plant		8	58	61	54	2	9	50	58	43	4	13	45	50	40	3	13	44	50	32	4	
Plant		8	75	79	71	3	9	69	78	60	5	13	63	69	55	4	13	60	66	45	5	
Refriger	8	203	239	158	22	9	212	248	178	22	13	153	209	112	30	13	124	161	80	19		
Wash Dc	8	220	229	213	6	9	258	315	226	32	13	277	372	207	43	13	232	284	198	23		
Product	8	956	1035	894	49	9	963	1052	907	52	13	920	1018	838	62	13	817	903	708	51		
Total Plant Consumption	Water Pl	8	276	407	226	54	9	275	318	231	26	11	308	443	235	59	12	246	287	185	27	
	Chillers	8	52	71	44	8	9	52	68	0	19	13	62	74	45	9	13	66	88	25	14	
	Product	8	1112	1229	993	71	9	1223	1299	1175	43	13	1142	1250	1061	55	13	1098	1185	916	65	
	Product	8	956	1035	894	49	9	963	1052	907	52	13	920	1018	838	62	13	817	903	708	51	
	Plant	8	2396	2645	2179	142	9	2520	2667	2419	89	11	2417	2588	2248	125	12	2219	2409	1897	121	

8.6 Appendix 6: Original Report

Management Report

Start date: 10/31/2021 11:59 PM

End date: 11/7/2021 11:59 PM

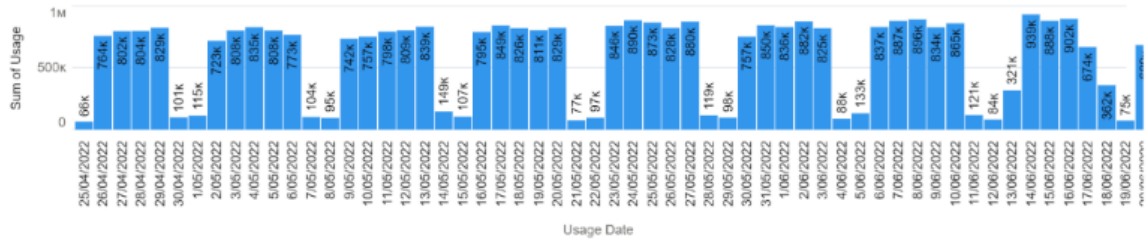
Total Plant Consumption (L): 3,936,700

Location	Water Meter	Hot Water Volume (L)	Meter % Total Hot Water	Room % Total Hot Water
Offal	Tripe - Peeler	44,885	2.5	-
Offal	Tripe - Refiner	77,610	4.3	-
Offal	Steriliser & Wash Down	151,055	8.4	-
Offal	Total	273,550	-	15.1
Kill Floor	Carcass Wash 1	86,380	4.8	-
Kill Floor	Carcass Wash 2	33,540	1.9	-
Kill Floor	Evisceration Table Steriliser	128,240	7.1	-
Kill Floor	Total	248,160	-	13.7
Hock Processing Room	Hock Processing Room	0	0	0
Plant	Anterooms	87,695	9.7	9.7
Kill Floor Wash Down	Wash Down (Un-metered)	679,374	37.6	37.6
Boning Room	Total	428,550	23.7	23.7
Production Total	Total Hot Water	1,806,845	100	100

Location	Water Meter	Chlorine Water Volume (L)	Meter % Total Chlorine Water	Room % Total Chlorine Water
Offal	Tripe - Peeler	93,140	5.9	-
Offal	Tripe - Refiner	112,305	7.2	-
Offal	Offal - Miscellaneous	151,665	9.7	-
Offal	Umbrella	296,620	18.9	-
Offal	Total	653,730	-	41.7
Hock Processing Room	Hock Mixer	0	0	0
Kill Floor	Evisceration Clean	20,160	1.3	-
Kill Floor	Evisceration Cool	20,600	1.3	-
Kill Floor	Total	40,760	-	2.6
Yards	Final Livewash	92,510	5.9	-
Yards	Troughs	19,300	1.2	-
Yards	Total	111,810	-	7.1
Plant	Amenities	23,390	1.5	-
Plant	Anterooms	87,695	5.6	-
Plant	Total	111,085	-	7.1
Refrigeration Plant	Condensing Tower	299,310	19.1	19.1
Un-metered	Un-metered	350,605	22.4	22.4
Production Total	Total Chlorine Water	1,566,950	100	100

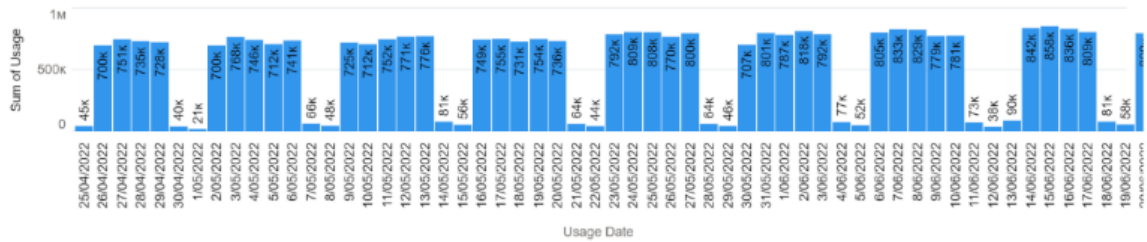
8.7 Appendix 7: Salesforces Dashboard (Overall Water Usage)

G Total Bore Extraction L30D



Extraction is absolute consumption and is the best measure for overall trend analysis.
[View Report \(G Total Bore Extraction L30D\)](#)

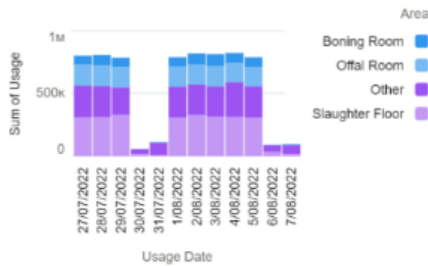
G Total Production Usage L30D



This should equal the Scada Total Production Management Report
[View Report \(G Total Production Usage L30D\)](#)

G Water Usage by Area L30D

Total Usage in a 24 hour period



[View Report \(G Water Usage by Area L30D\)](#)

G Water Day Usage by Area L30D

Usage between 4.00am and 4.00pm



[View Report \(G Water Usage by Area L30D\)](#)

G Water Night Usage by Area L30D

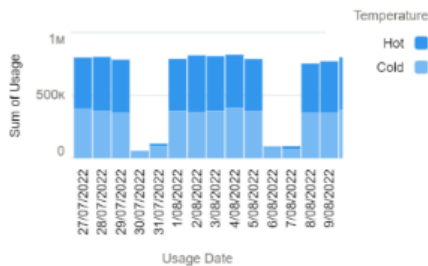
Usage between 4.00pm and 4.00am



[View Report \(G Water Usage by Area L30D\)](#)

G Water Usage by Temperature L30D

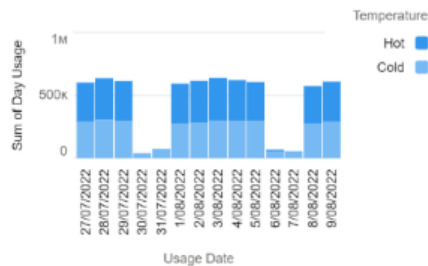
Total Usage in a 24 hour period



[View Report \(G Water Usage by Area L30D\)](#)

G Water Day Usage by Temperature L30D

Usage between 4.00am and 4.00pm



[View Report \(G Water Usage by Area L30D\)](#)

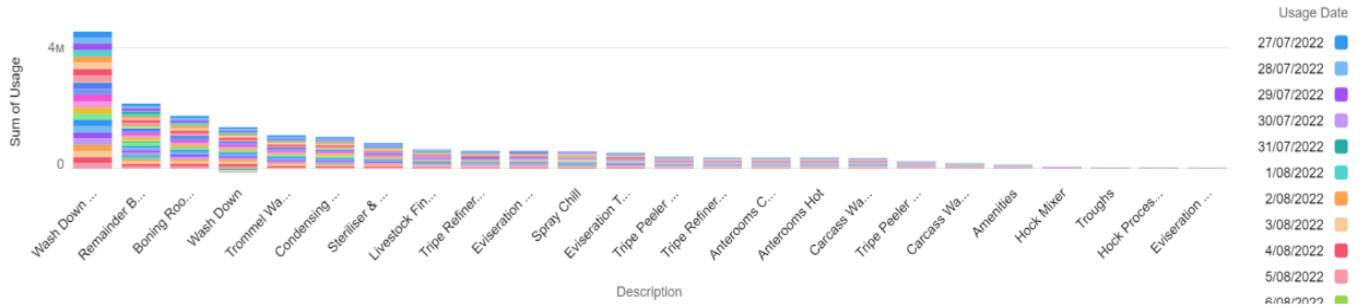
G Water Night Usage by Temperature L30D

Usage between 4.00pm and 4.00am



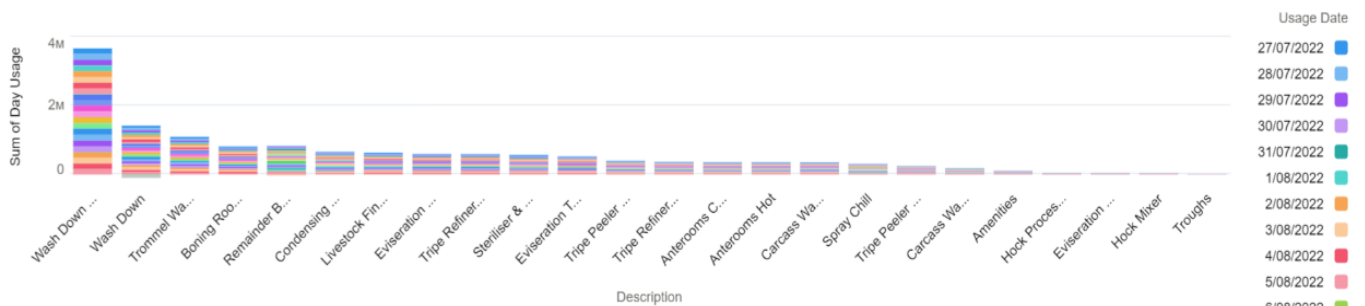
[View Report \(G Water Usage by Area L30D\)](#)

G Water Usage by TAG L30D



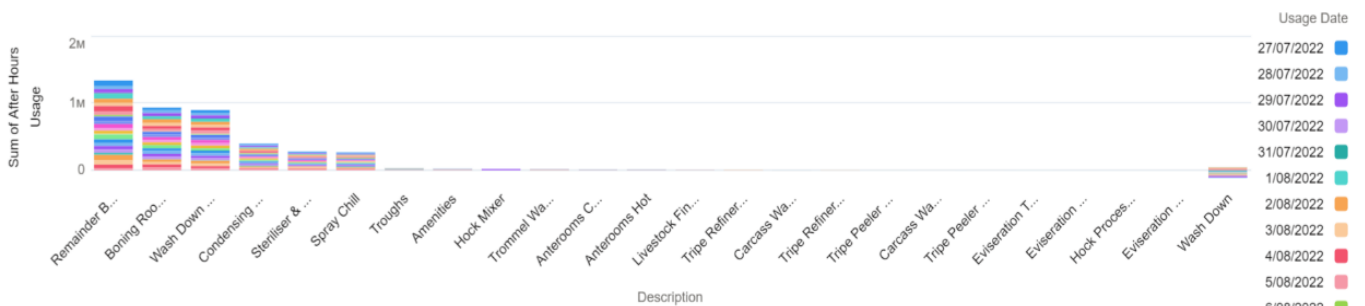
[View Report \(G Water Usage by TAG L30D\)](#)

G Water Day Usage by TAG/Description L30D



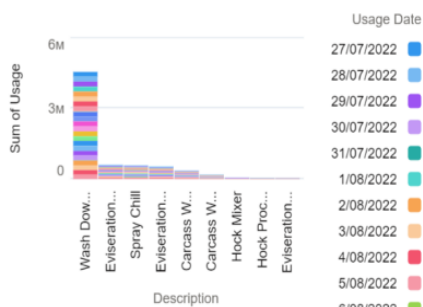
[View Report \(G Water Usage by TAG L30D\)](#)

G Water Night Usage by TAG/Description L30D



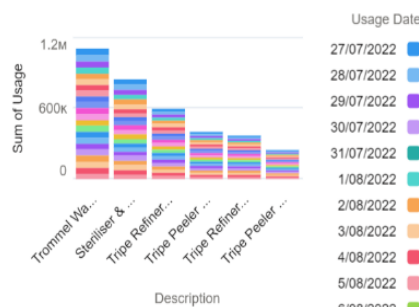
[View Report \(G Water Usage by TAG L30D\)](#)

G Water Slaughter Floor Usage by TAGL30D



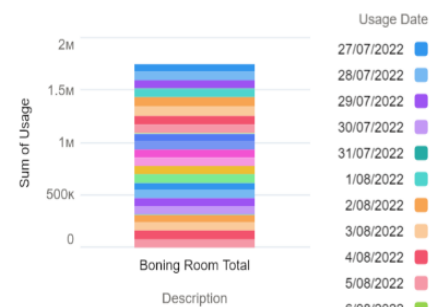
[View Report \(G Water Slaughter Floor Usage by TAGL30D\)](#)

G Water Offal Room Usage by TAG L30D



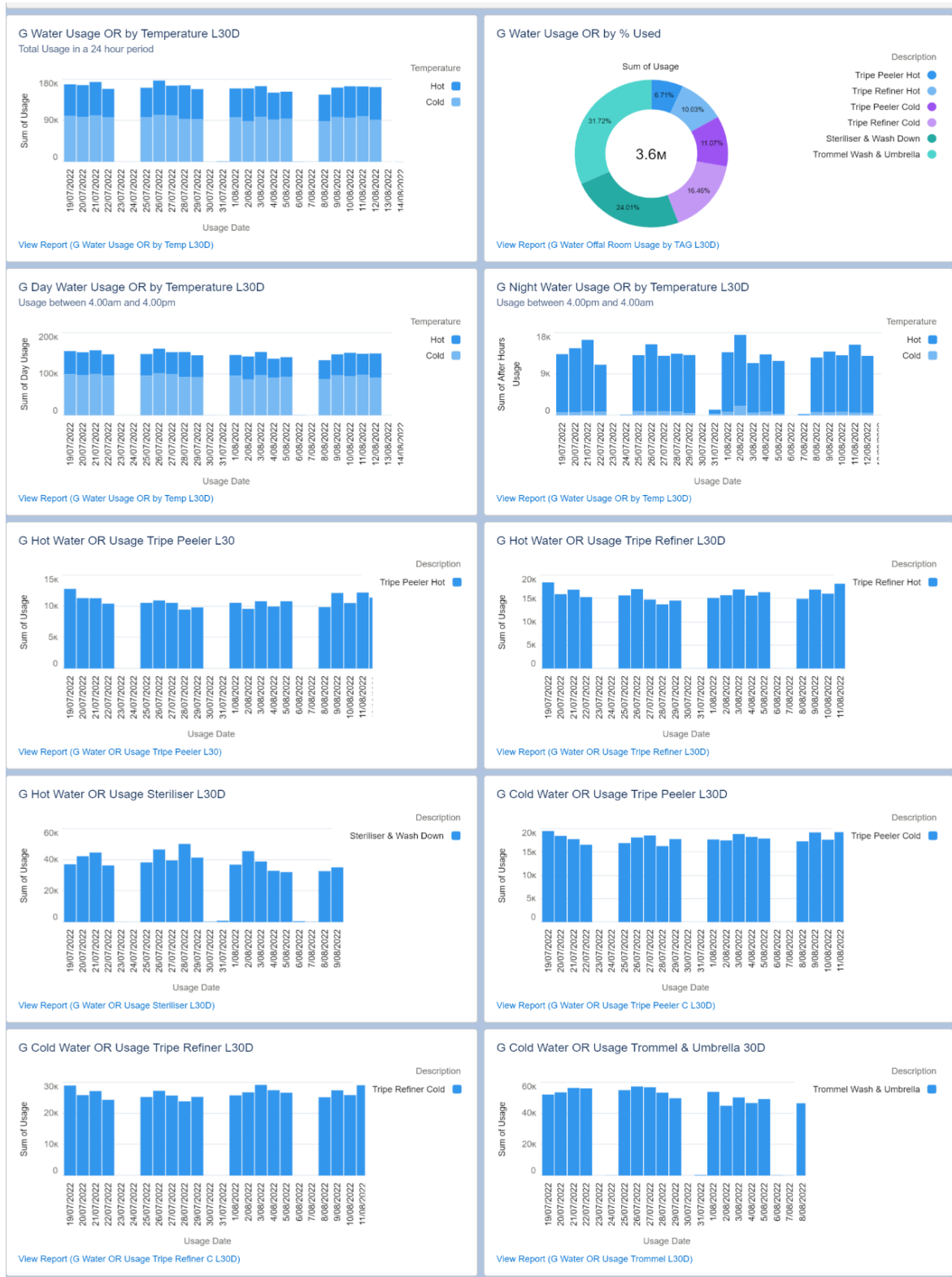
[View Report \(G Water Offal Room Usage by TAG L30D\)](#)

G Water Boning Room Usage by TAG L30D



[View Report \(G Water Boning Room Usage by TAG L30D\)](#)

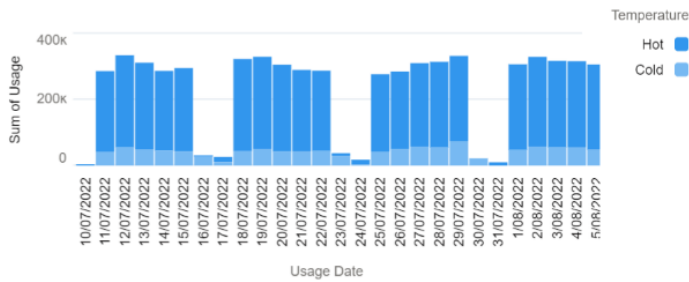
8.8 Appendix 8: Salesforce Dashboard (Offal Room)



8.9 Appendix 9: Salesforce Dashboard (Slaughter Floor)

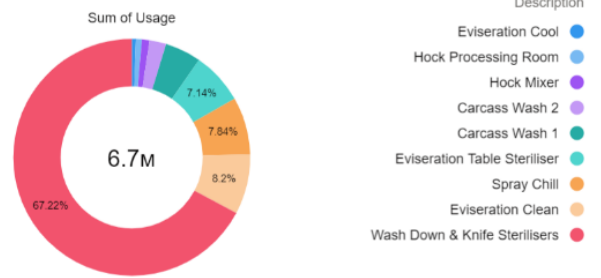
G Water Usage SF by Temperature L30D

Total Usage in a 24 hour period



[View Report \(G Water Usage SF by Temp L30D\)](#)

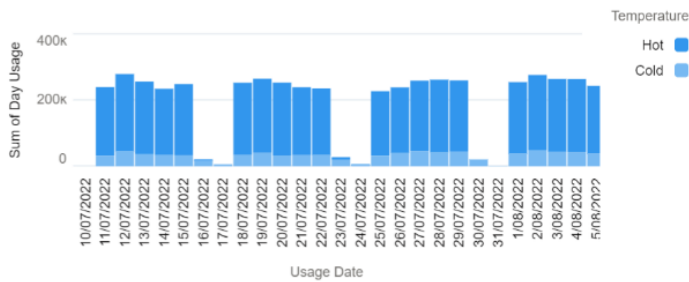
G Water Usage SF by % Used



[View Report \(G Water Slaughter Floor Usage by TAGL30D\)](#)

G Water Day Usage SF by Temperature L30D

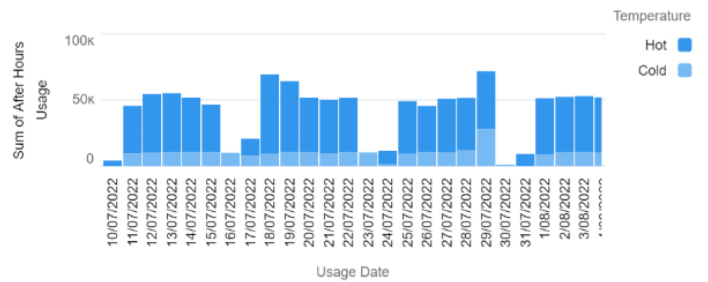
Usage between 4.00am and 4.00pm



[View Report \(G Water Usage SF by Temp L30D\)](#)

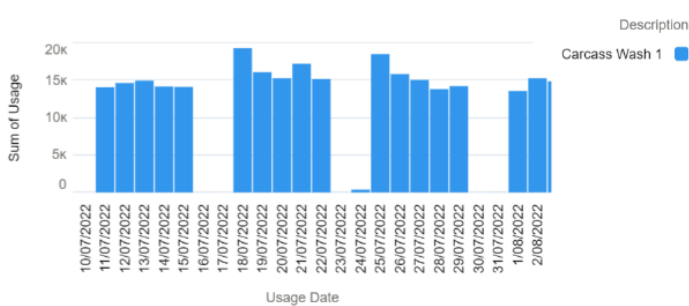
G Water Night Usage SF by Temperature L30D

Usage between 4.00pm and 4.00am



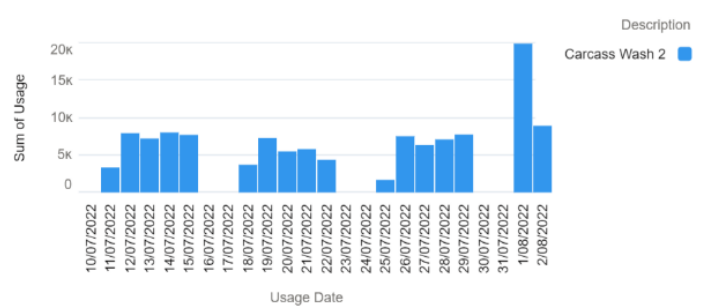
[View Report \(G Water Usage SF by Temp L30D\)](#)

G Hot Water SF Usage Carcass Wash 1 L30D



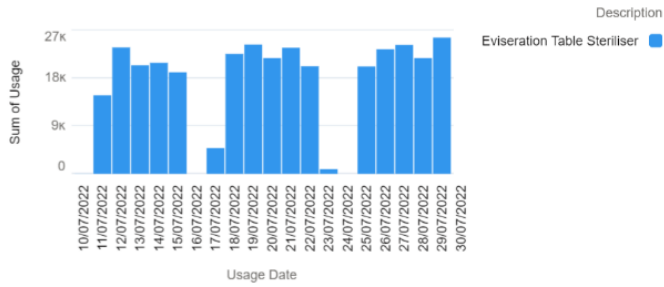
[View Report \(G Water SF Usage Carcass Wash 1 L30D\)](#)

G Hot Water SF Usage Carcass Wash 2 L30D



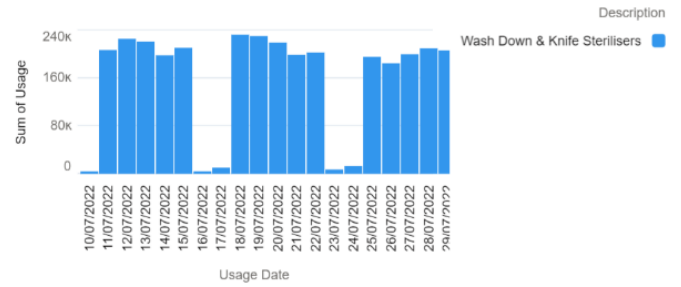
[View Report \(G Water SF Usage Carcass Wash 2 L30D\)](#)

G Hot Water SF Usage Evis Steril L30D



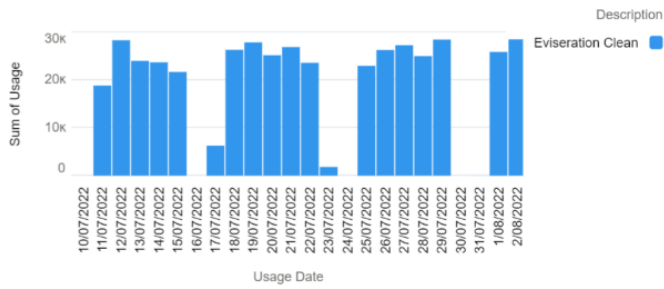
[View Report \(G Water SF Usage Evis Steril L30D\)](#)

G Hot Water SF Usage Wash Down L30



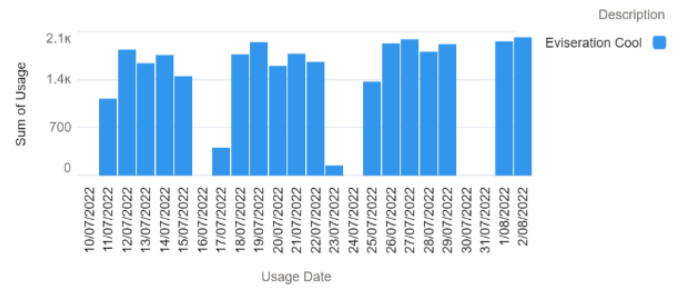
[View Report \(G Water SF Usage Wash Down L30\)](#)

G Cold Water SF Usage Envis Clean L30



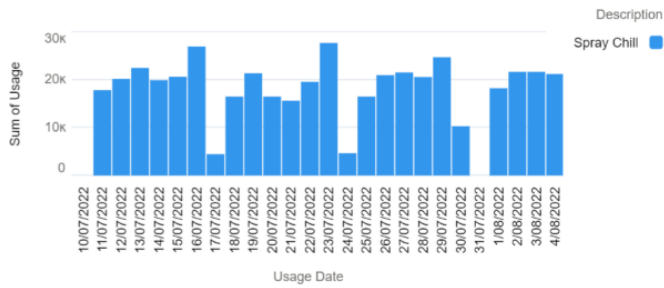
[View Report \(G Water SF Usage Envis Clean L30\)](#)

G Cold Water SF Usage Envis Cool L30



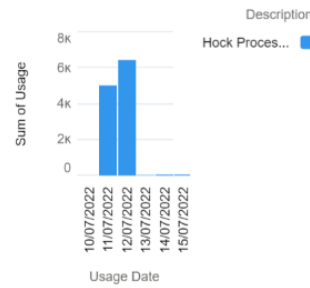
[View Report \(G Water SF Usage Envis Cool L30\)](#)

G Cold Water SF Usage Spray Chill L30D



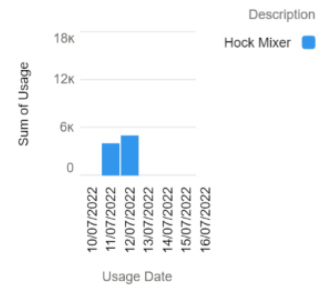
[View Report \(G Water SF Usage Spray Chill L30D\)](#)

G Hot Water SF Usage Hock L30



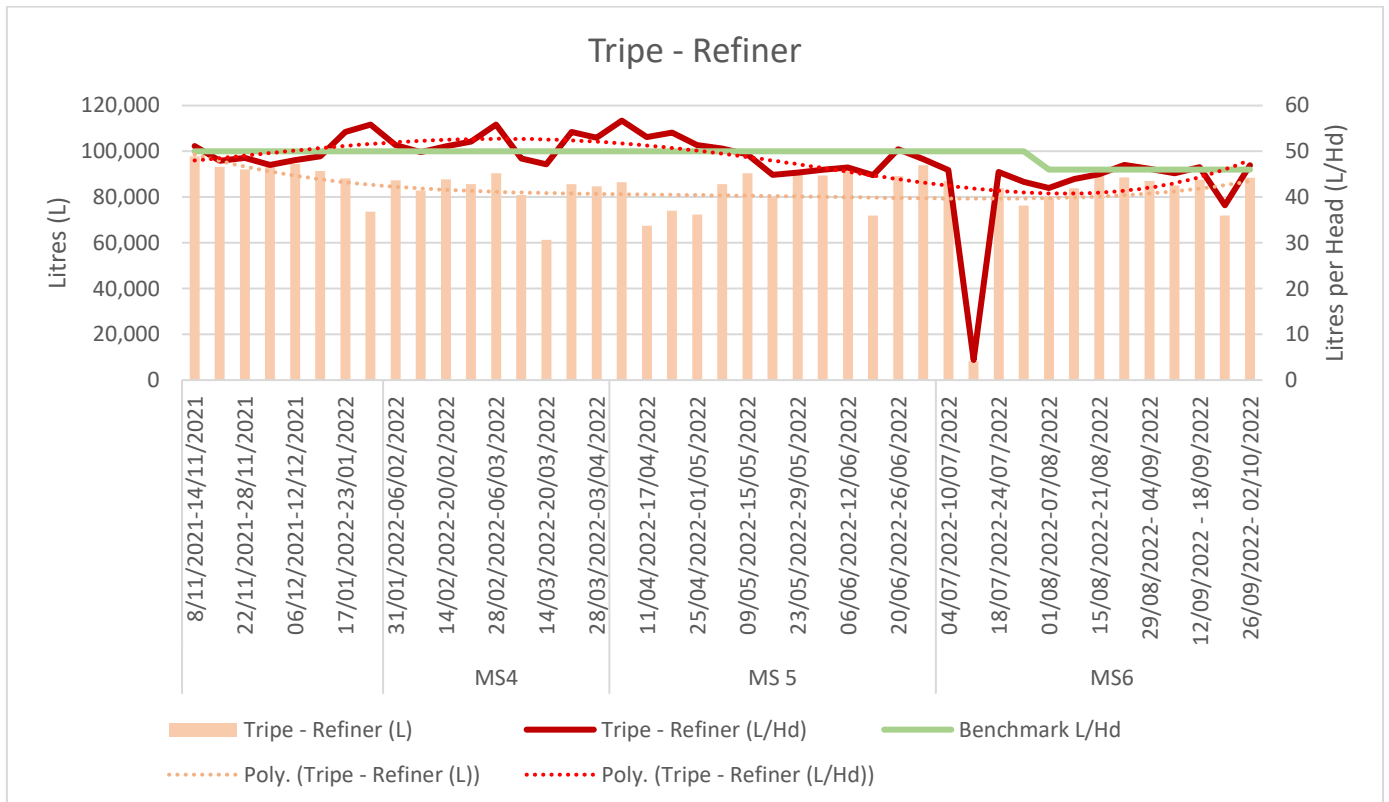
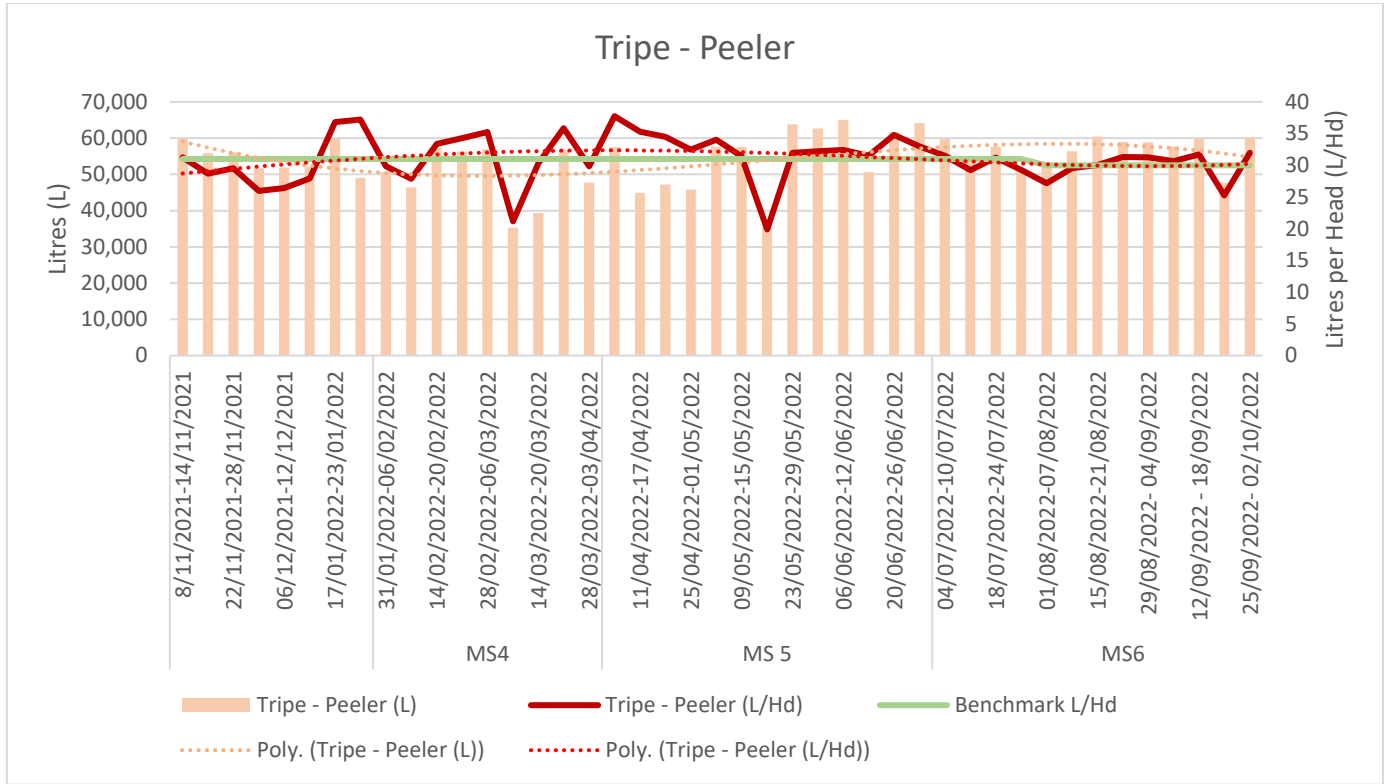
[View Report \(G Water SF Usage Hock L30\)](#)

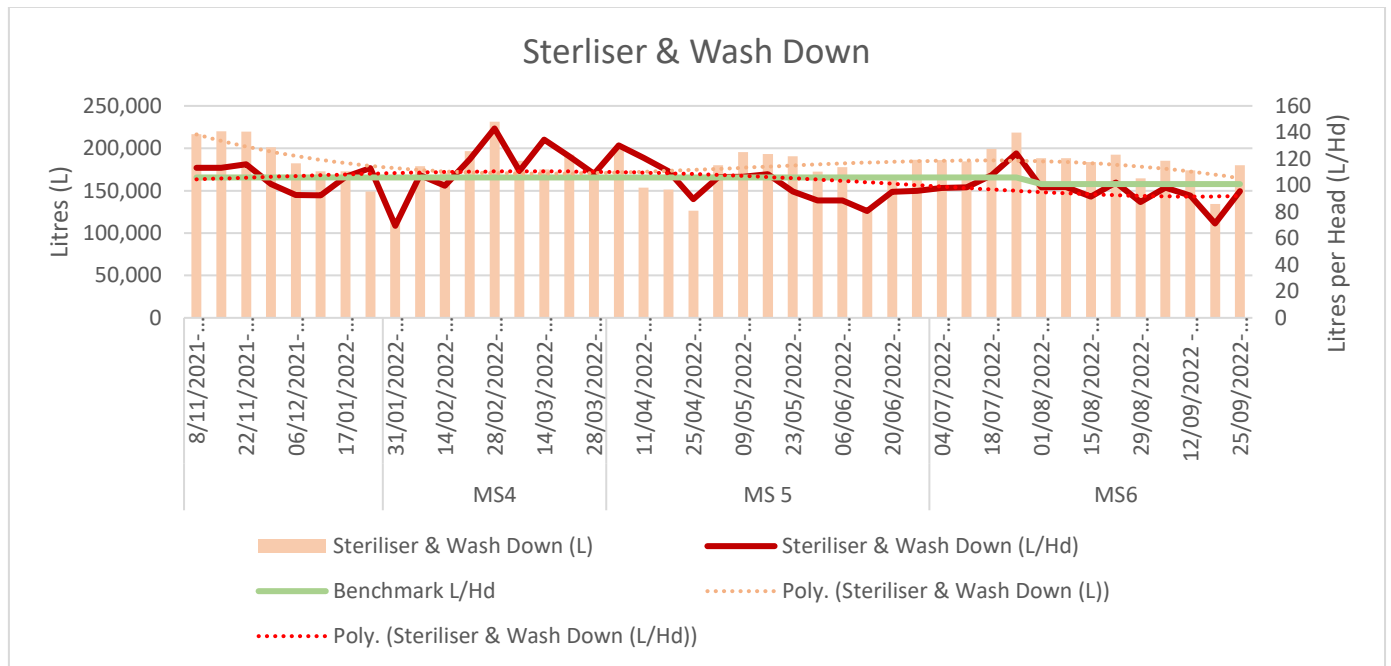
G Cold Water SF Usage Hock Cold



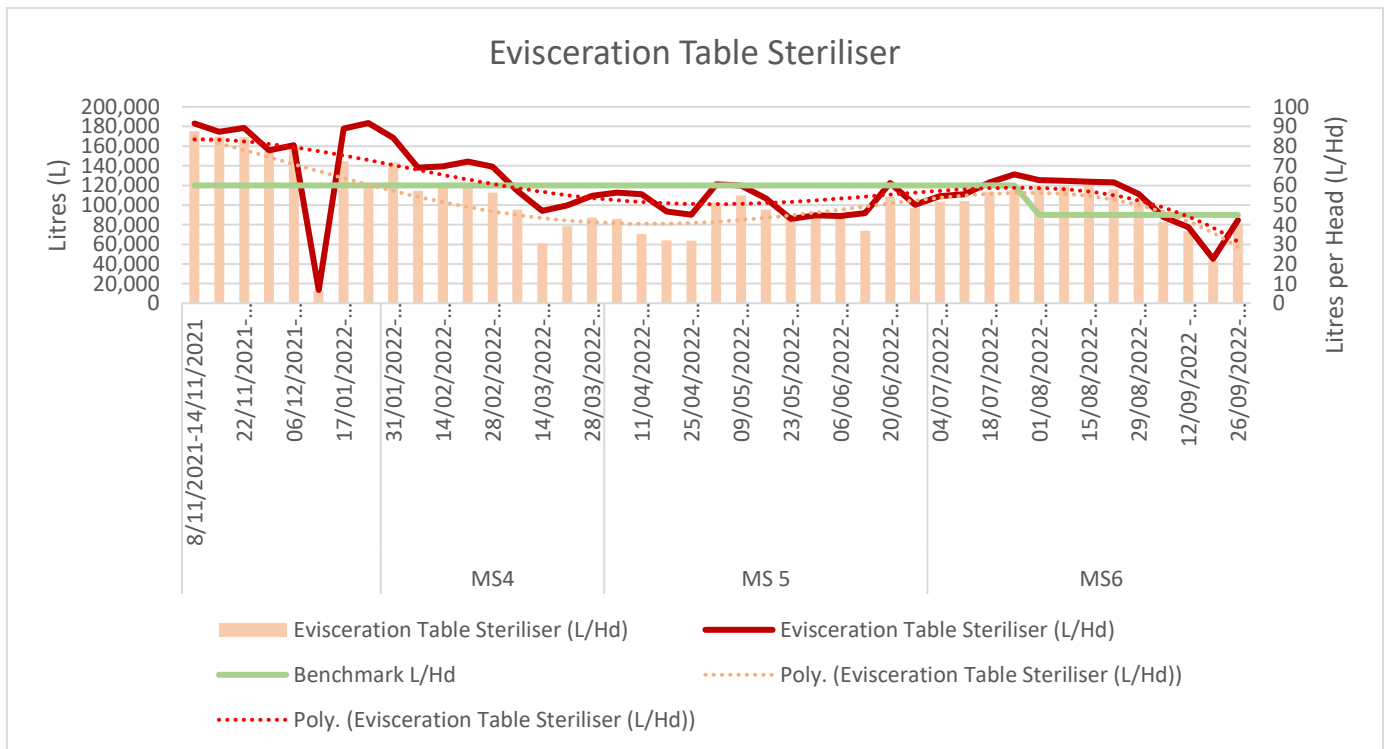
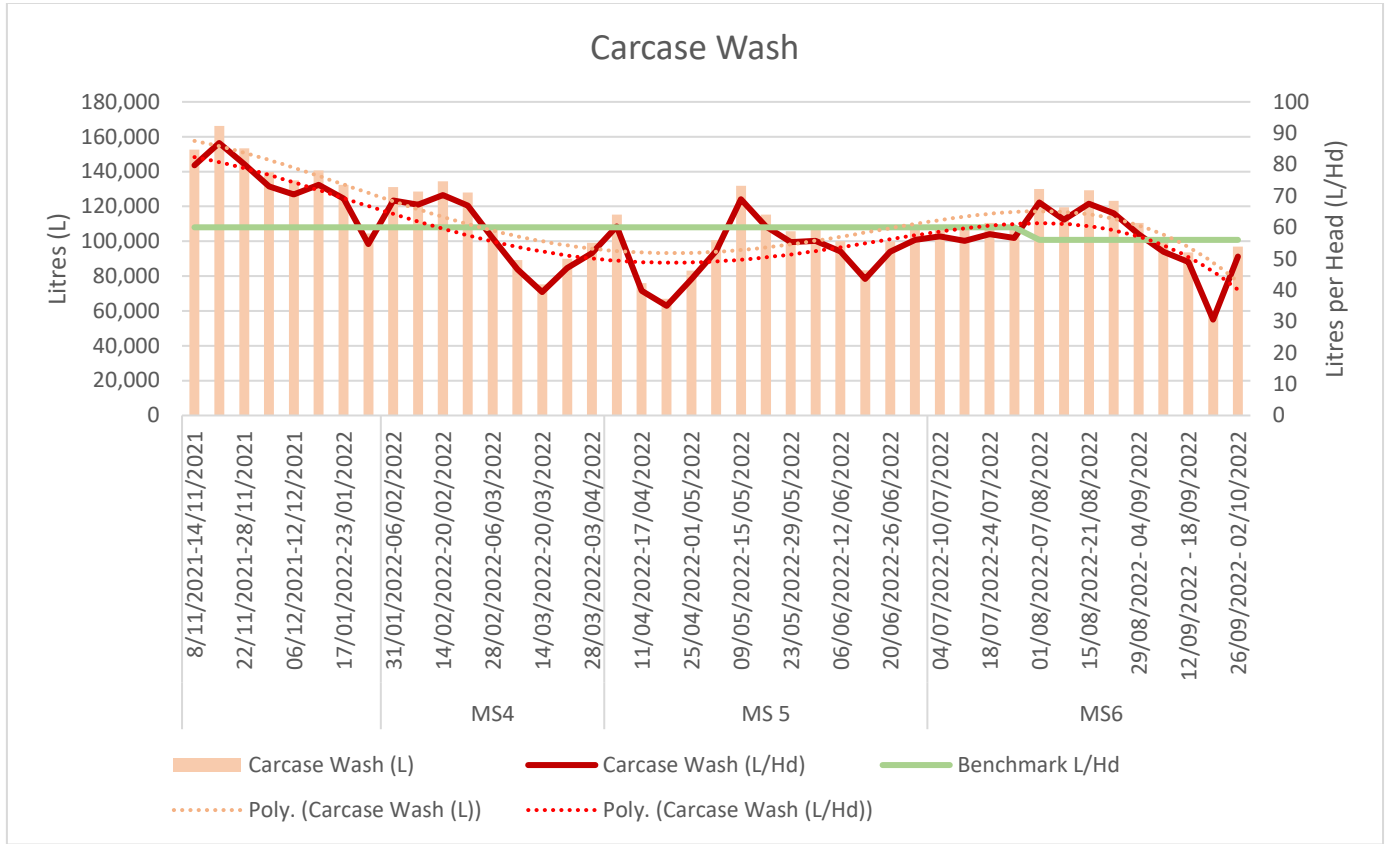
[View Report \(G Water SF Usage Hock Cold L30D\)](#)

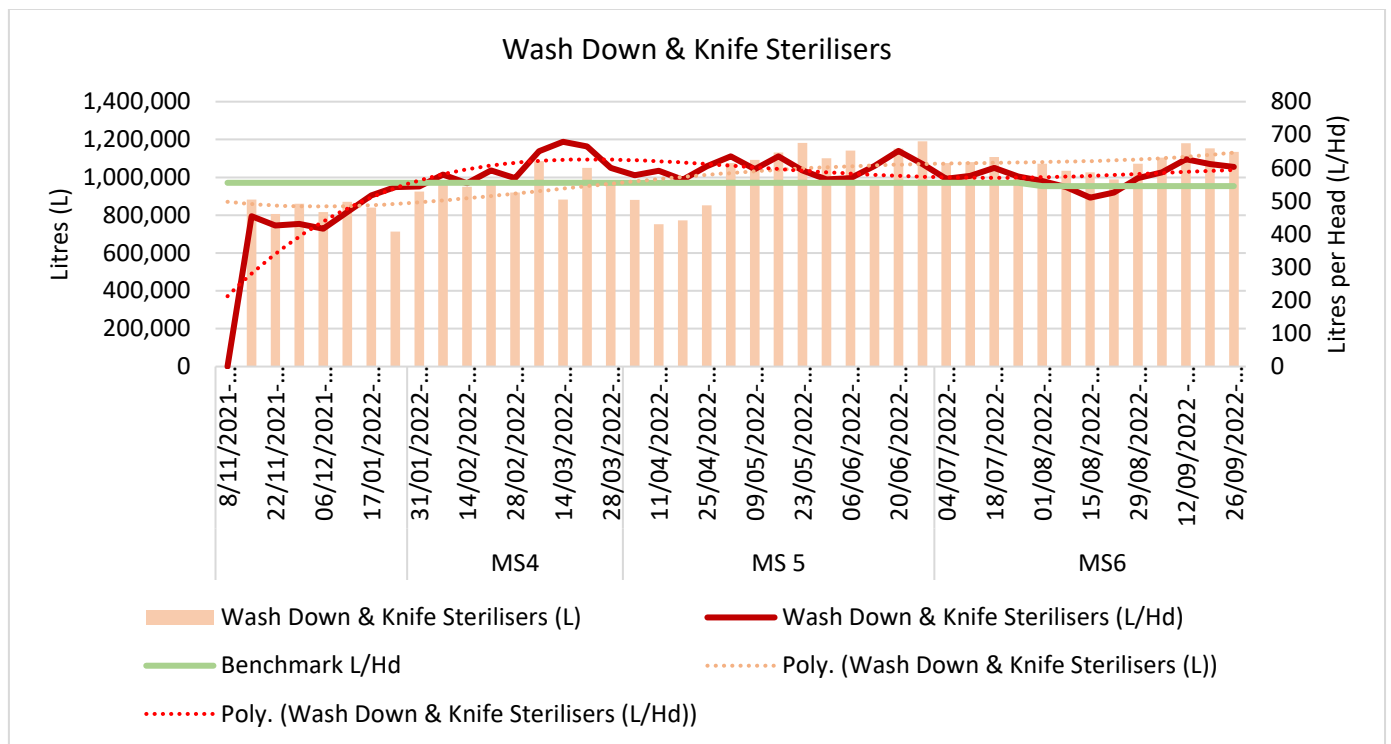
8.10 Appendix 10: Offal Room Hot Water Usage Areas



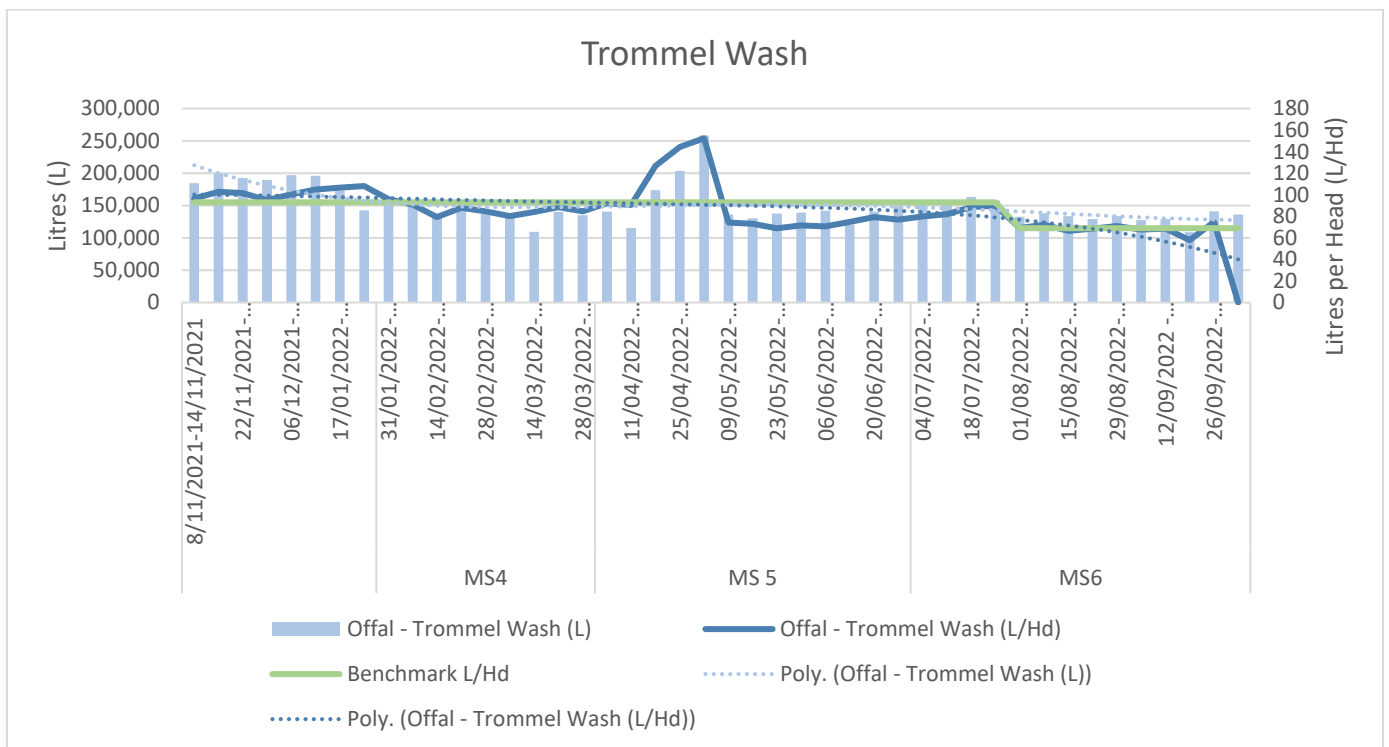
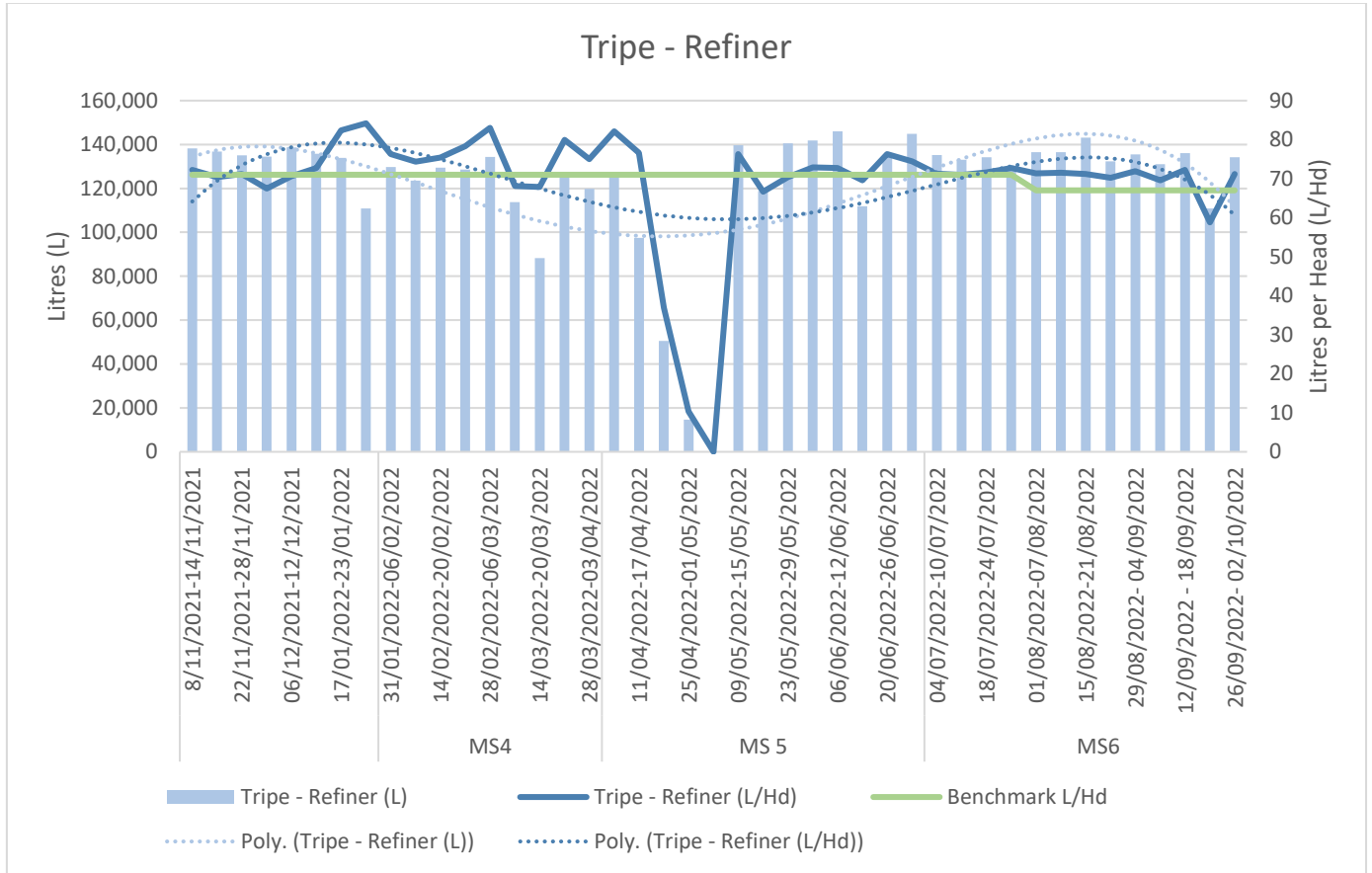


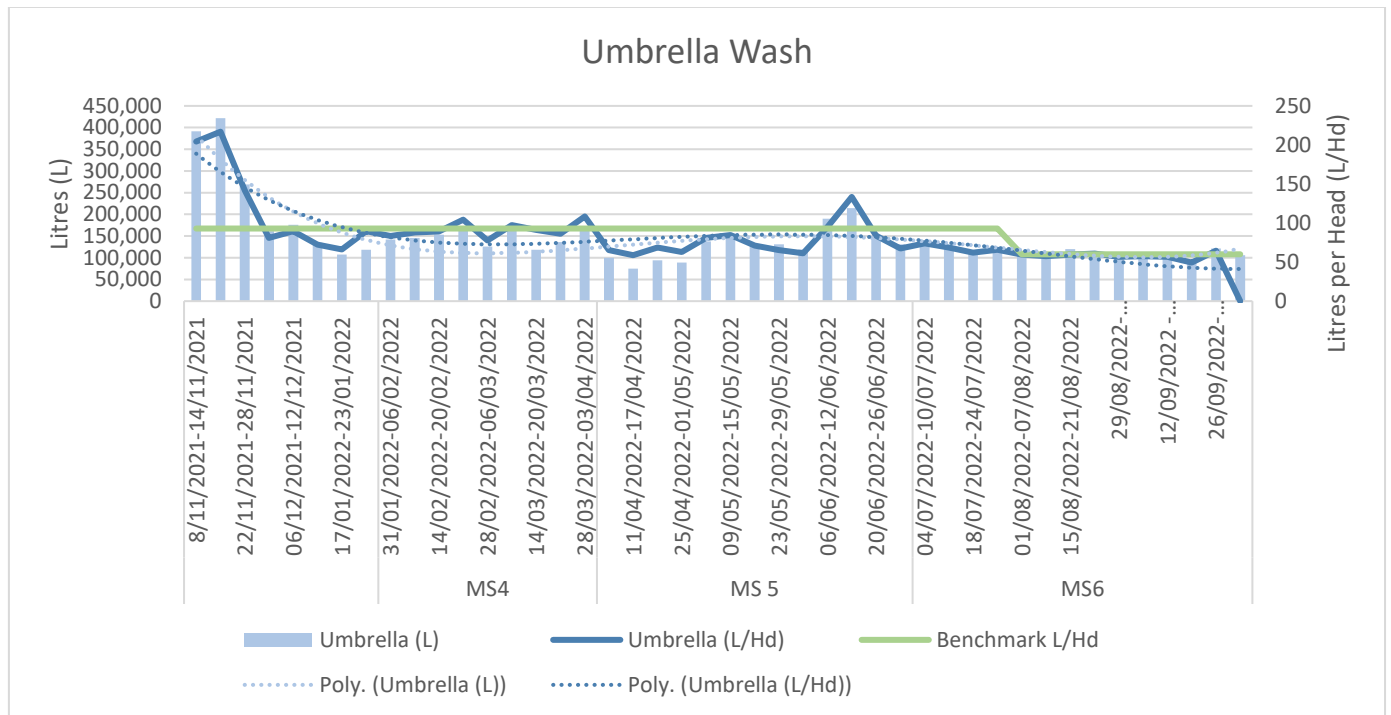
8.11 Appendix 11: Kill Floor Hot Water Usage Areas



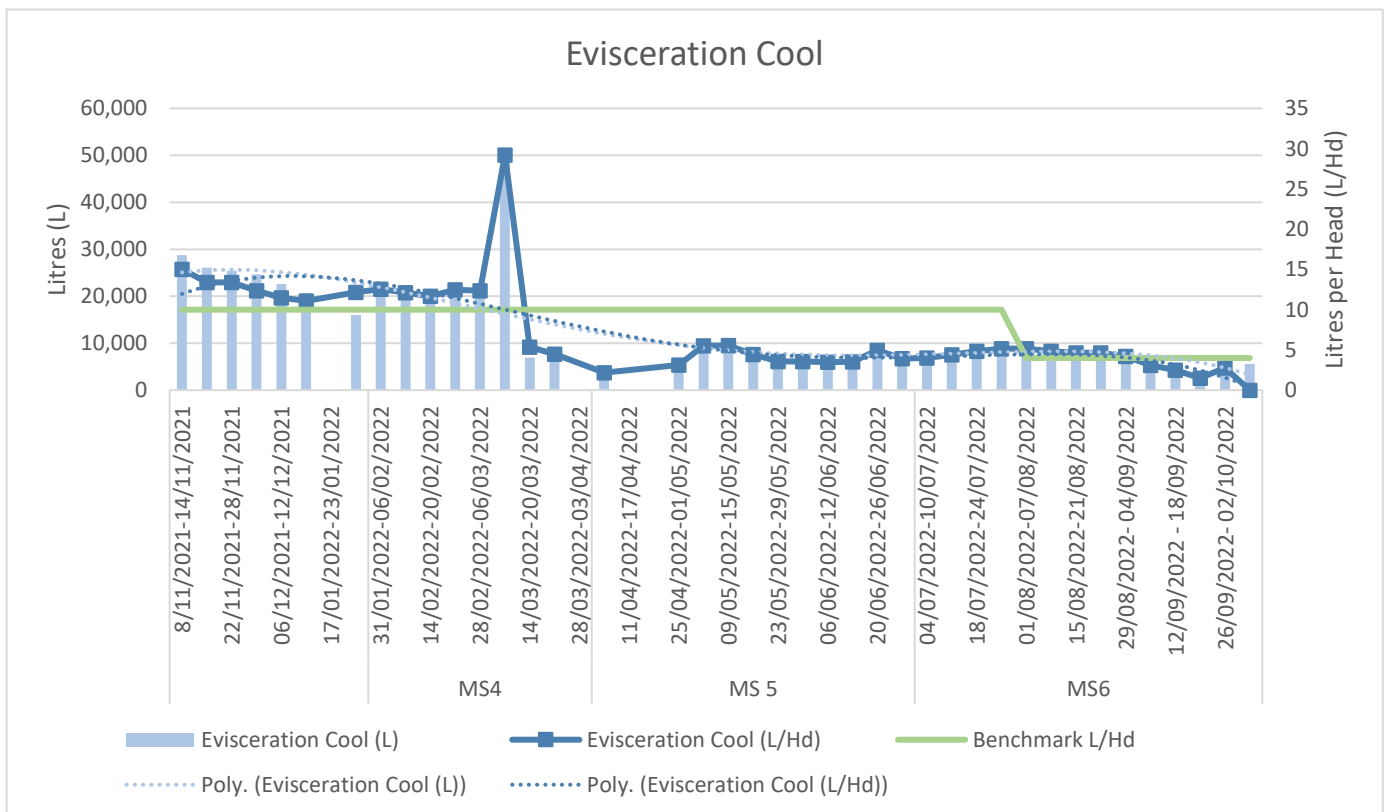
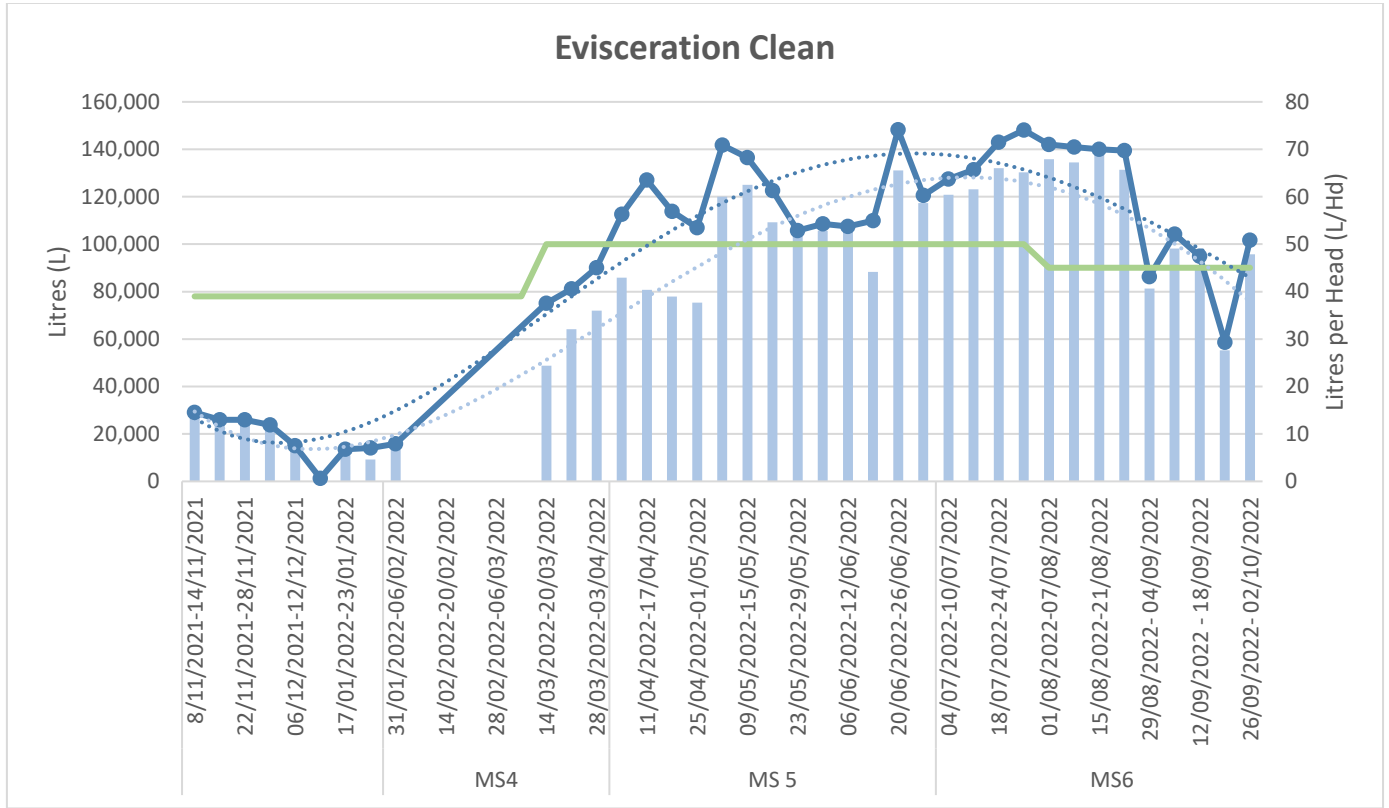


8.12 Appendix 12: Offal Room Potable Water Usage Areas

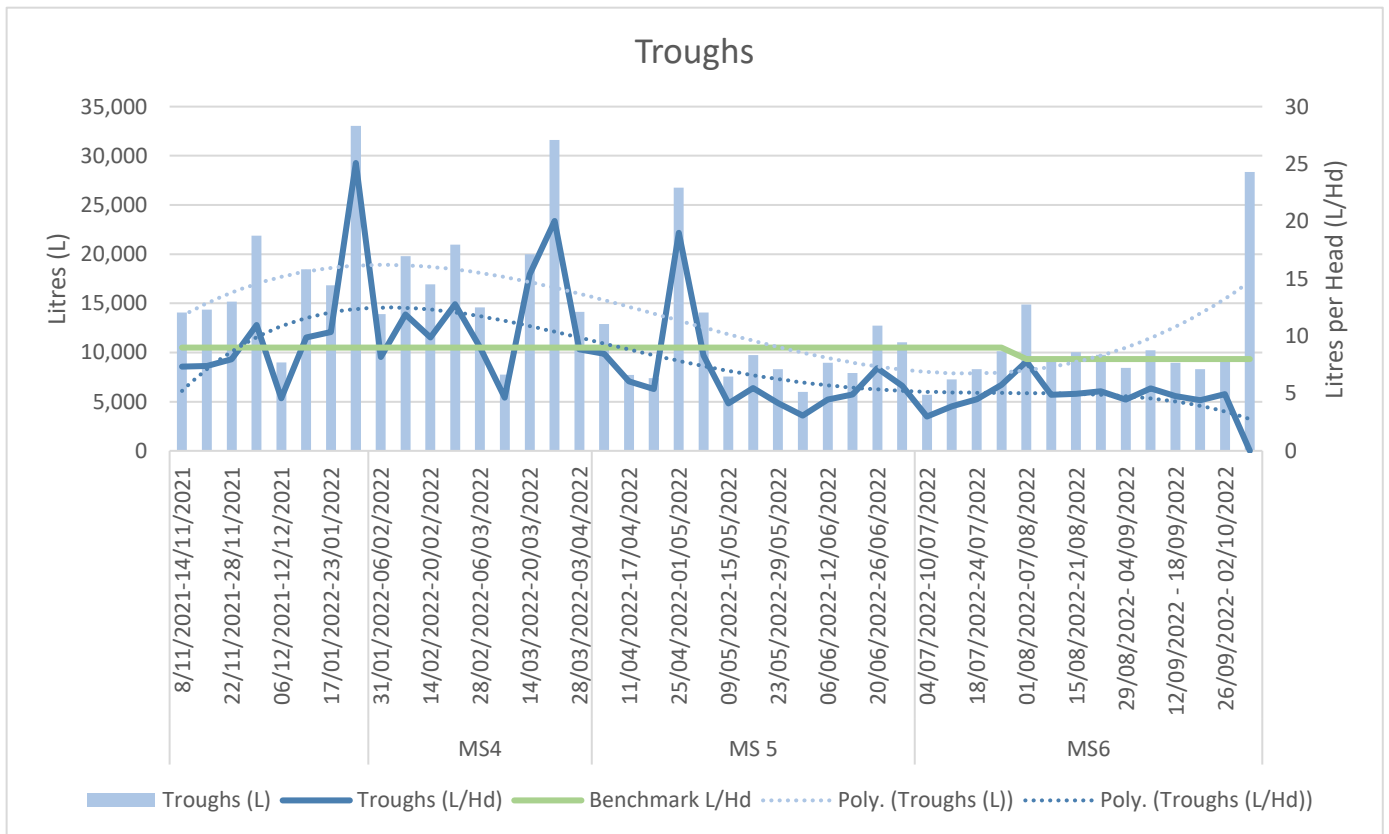
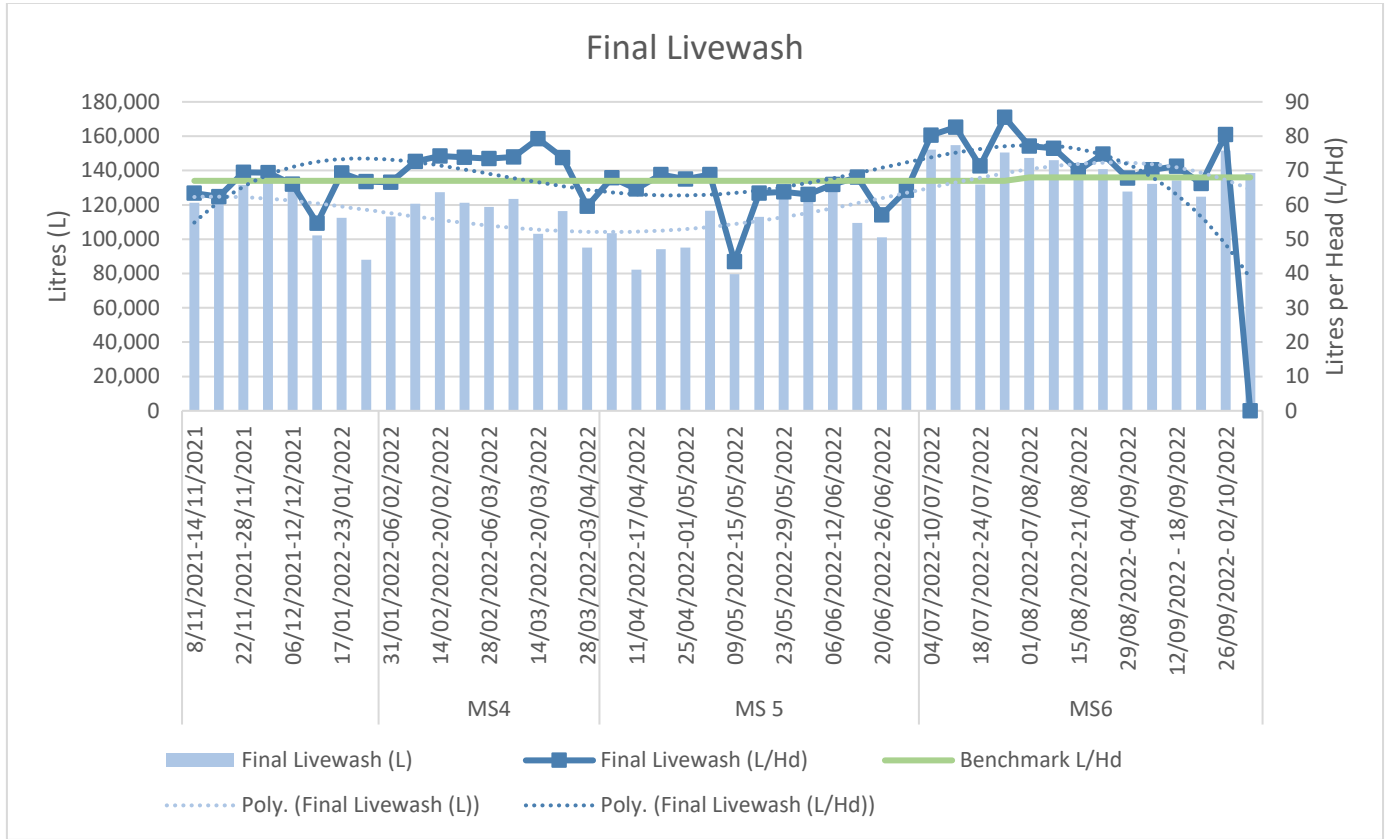




8.13 Appendix 13: Slaughter Floor Potable Water Usage Areas



8.14 Appendix 14: Yards Potable Water Usage Areas



8.15 Appendix 15: Plant Potable Water Usage Areas

