CONTAMINATED WATER RETENTION

Jalco Household & Fabric Care

227-303 Woodpark Road, Smithfield, N.S.W, 2164

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REVIEW

Name	*Office*
Peter Moore	ZOIC Environmental Pty Ltd

Executive Summary

Jalco is Australia's premier supplier of outsourced manufacturing and filling for the non-food, fast-moving consumer goods sector. Jalco operates a manufacturing facility for the production of laundry and household cleaning products. This manufacturing facility is located at 227-303 Woodpark Road, Smithfield, New South Wales, 2164.

The Jalco manufacturing facility undertakes the blending, granulating and packaging of household consumer goods. These household consumer goods are manufactured using bulk raw materials. These materials include bulk materials that are stored in tanks and bulk raw materials received in large packages.

The NSW Environmental Protection Agency issued a prevention notice (Prevention Notice Number 1574572) to Jalco. This preventative notice included the demonstration of the retainment of contaminated water from a fire event in the outdoor storage of hazardous liquid chemicals.

The scope of the study is to quantify the water retention required for outside areas where the storage of hazardous liquid chemicals is undertaken. The methodology used in this study resulted in the clarification of the following areas:

1. Identify water contributors to the wastewater system;
2. Review the performance of the wastewater system;
3. Quantification of the rainwater/stormwater quantities.

A water balance was undertaken for collection of rainwater/stormwater. This water balance for rainwater/stormwater revealed that the collection of the rainwater/stormwater contributed 30% of the trade waste flow from the site. Process effluent generated from the cleaning of vessels, washing out lines, cleaning production area and raw material wastage contributed 70% of the trade waste flow from the site.

The wastewater treatment plant was found to be performing to Sydney Water requirements. The technology used in the wastewater treatment plant is appropriate for the treatment of the process effluent. The wastewater treatment plant is operated on a shift basis with a peak throughput of 100,000 litres per day.

A fire event involving the storage of hazardous liquid chemicals in outdoor (unroofed) areas would result in the generation of a quantity of contaminated water. The water would be contaminated by the release of chemicals and by the by-products of a fire in the storage area. The contaminated water quantity would be increased by rainfall during or shortly after the hazardous event.

The storage of hazardous chemicals in outdoor, unroofed and unbunded area was reviewed, and different strategies investigated. These strategies included:

- Increased retention of water on site to reduce the risk of contaminated water leaving the site by the use of tanks or similar;
- Diversion of roof areas from the site collection of stormwater and increase retention on site;
- Bunding of the entirety of the site to increase retention on site; and
- Relocation of hazardous materials, bunding a section of the site and increased water retention capacity.

It is recommended that Jalco undertake one (1) of the following actions:

1. Increase the water retention capacity using tanks, bunding and changes to stormwater management to allow for the storage of hazardous liquid chemicals on the present hardstand area; or
2. Remove hazardous liquid chemicals from the hardstand areas.

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1 Introduction

Jalco is Australia's premier supplier of outsourced manufacturing and filling for the non-food, Fast Moving Consumer Goods (FMCG) sector. Jalco operates a manufacturing facility for the production of laundry and household cleaning products. This manufacturing facility is located at 227-303 Woodpark Road, Smithfield, New South Wales (N.S.W.), 2164.

The Jalco manufacturing facility undertakes the blending, granulating and packaging of household consumer goods. These household consumer goods produced by Jalco include:

- Laundry detergent powder and liquid;
- Bleach;
- Window cleaner;
- Floor cleaners;
- Multipurpose cleaners;
- Bathroom Cleaners;
- Cleaners;
- Toilet cleaners; and
- Dishwashing liquid and dishwashing powder.

1.1 Background

On 3 January 2019, the NSW Environment Protection Agency (EPA) inspected the facility located at 227-303 Woodpark Road, Smithfield New South Wales, 2164. The EPA made the following observations.

- Potentially hazardous chemicals were stored outdoors and were observed to be leaking;
- Secondary containment systems were both incomplete and inadequate;
- Inadequate house-keeping has led to an accumulation of debris and contamination within the stormwater system;
- It was not clear to EPA officers that the stormwater isolation valve, located at on the south-western driveway was in the open or closed position;
- One of the two pumps situated in the water treatment plant was emitting a repetitive, high pitch tone indicative of mechanical failure; and
- Stagnant water was pooling around the Dissolved Air Floatation wastewater treatment system.

The EPA issued a prevention notice (Prevention Notice Number 1574572). This prevention notice included the following preventative action to be taken:

> ***d) demonstrate by way of calculation, that the secondary containment system, including the water treatment plant, is of sound and sufficient capacity. Calculations must reference the stormwater catchment area, water treatment system capacity and water treatment rate.***
>
> ***Note: the effective volume of the secondary contaminant system must be able to contain 25% of the total volume of the individual containers located within the outdoor storage area, plus a freeboard allowance for both rainwater and firewater.***
>
> ***When calculating the freeboard allowance, the licensee must ensure that the secondary containment system can adequately manage the rainwater volume associated with a (1 in 20-year, 24-hour storm event) or 95th percentile, 5-day rainfall depth (mm) as defined in Managing urban stormwater – soil and construction (Volume 1), 2004, 4th edition.***

1.2 Scope of Works

The scope of the study is to enable Jalco to manage the process effluent, rainwater and stormwater flows at the site and determines water retention requirements. Water retention is required for the storage of hazardous liquid chemicals in outside areas.

The study has two (2) parts. The first part of the scope is to undertake a quantified review of the water flows within the site. This quantification of flows is used in the second part of the study in determining the water retention and treatment requirements for the storage of hazardous liquid chemicals in outside areas.

This approach enables reviews to be undertaken for the following:

1. Identify contributors to the process effluent;
2. Identify potential process effluent reductions;
3. Review the performance of the wastewater plant;
4. Identify the possible options for the re-use of water.
5. Quantification of the rainwater/stormwater quantities.

2 Methodology

The methodology used in this study is undertaken in two (2) parts. The first part of the methodology is the mapping and quantification of water throughout the site. There are two (2) pathways mapped. These pathways are:

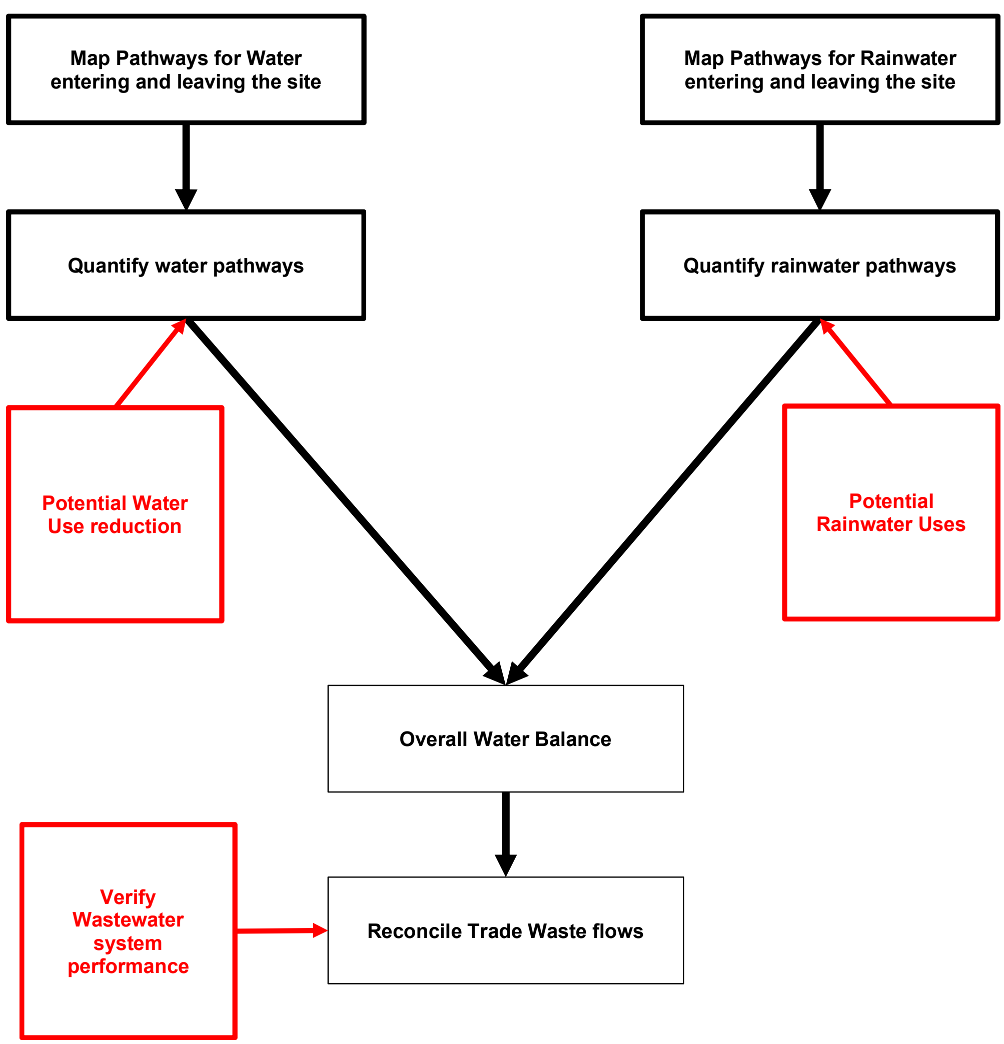
1. Water entering the site as town water. This is used in amenities and in the manufacturing process; and
2. Water entering the site from a rainfall.

The mapping of these pathways is quantified using available data and approximations. This produces an overall water balance that is reconciled against the trade waste flows.

In the process of undertaking the mapping and quantification opportunities for improvement. These include:

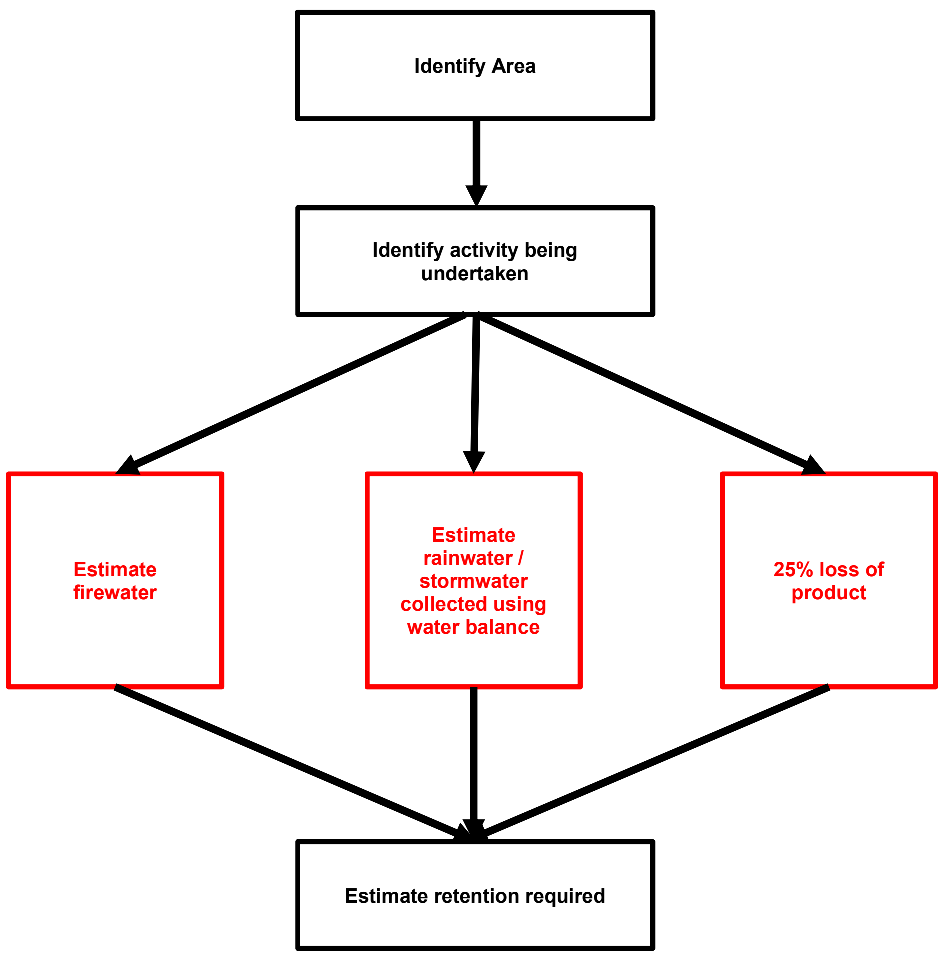
- Identify potential water reduction demands for town water;
- Identify reductions and uses for stormwater; and
- Examination of the wastewater treatment plant.

Figure 2.1 Methodology for Water Balance



The second part of the methodology is the estimation of the retention requirements for potential hazardous events. The particular event of interest is a fire or loss of containment in outdoor storage of hazardous liquid chemicals. The work provided in the first part of this methodology is used to quantify flows and retention requirements. The methodology used for the second part is described in Figure 2.2.

Figure 2.2 Methodology for Water Retention



3 Site Details

3.1 Site Location

Jalco operates a manufacturing facility for the production of laundry and household cleaning products. This manufacturing facility is located at 227-303 Woodpark Road, Smithfield N.S.W., 2164. The site location is shown in Figure 3.1 and Figure 3.2.

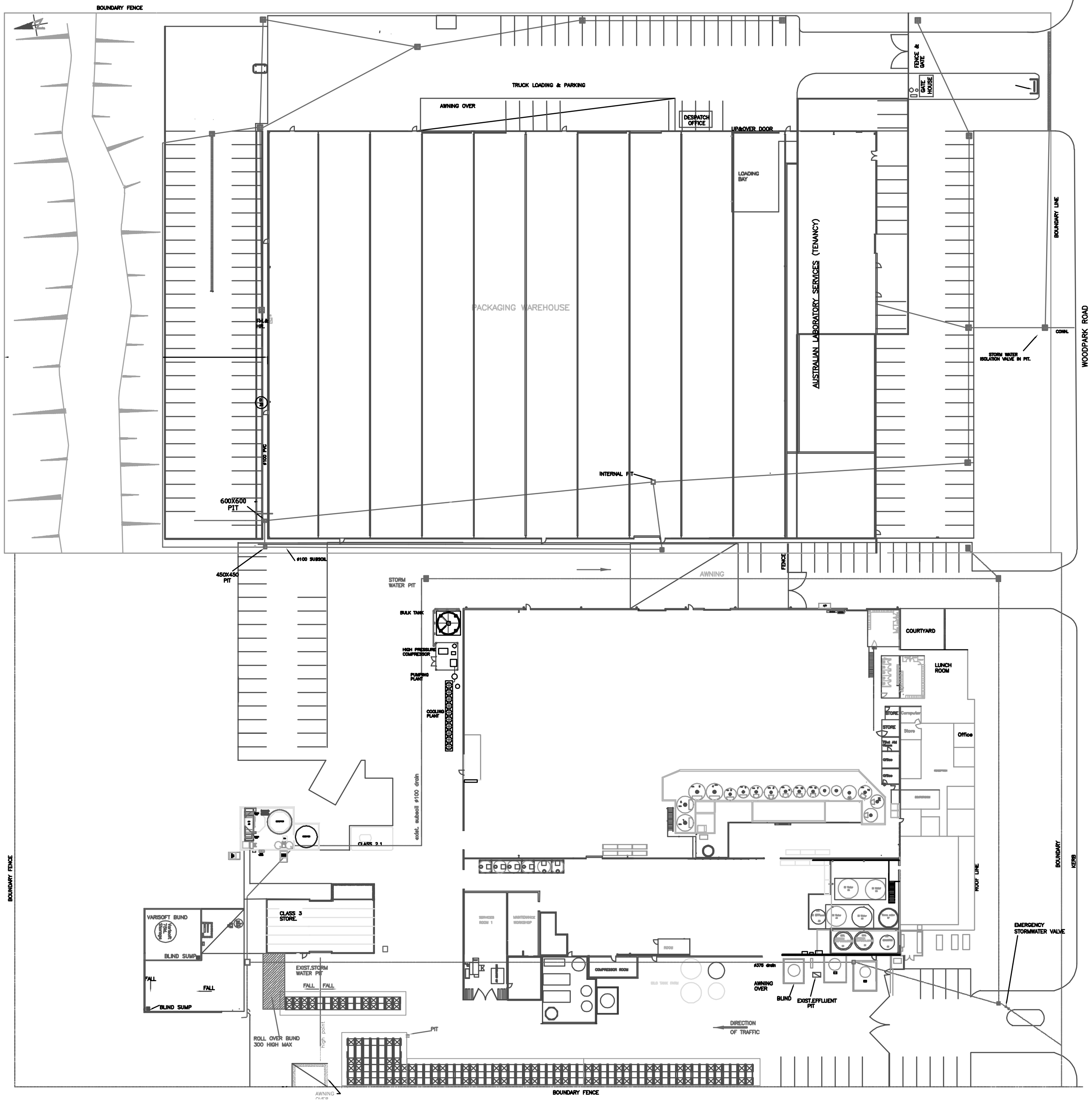
Figure 3.1 Location

Figure 3.2 Aerial View

3.2 Site Layout

The layout of the site is shown in Figure 3.3.

Figure 3.3 Site Layout



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4 Water Balance

The water balance for the site is an application of a material balance used in process engineering. A material balance equation simply states that the total material in any system is always conserved. That is described by the statement below.

Total material in = Total material out + Total material accumulated in the system

The water balance is described by the following statement:

Total water in = Total water out + Retained on site

The balance is conducted for 12 months, and the water retained on-site is negligible. The water balance statement can be written as;

Total water in = Total water out

4.1 Mapping

The mapping of water flows involves identification of water entering into the site and leaving the site. This mapping can then be quantified.

4.1.1 Water In

The water into the site was identified as being:

- Towns water; and
- Rainwater.

Rainwater is not stored or used in the processing. The rainwater is examined in section 6.

4.1.2 Water Out

The water exiting the site has been divided into two (2). The first use of water is in amenities provided for personnel working at the site. The second is the industrial use of water for production.

The use of water for amenities provides a pathway for water to leave the site. These sources of amenities use include:

- Use in toilets and urinals;
- Use in shower facilities provided for personnel;
- Use in Laboratories;
- Use for general cleaning in dishwasher, sinks and general cleaning; and
- Provision of drinking water; and
- Provision of water for use in landscaping

The amenities water leaving the site is undertaken by two (2) pathways. The first pathways is in the sewer, which includes toilets, urinals, showers, laboratories and general cleaning. Drinking water and landscaping leave the site with personnel and by evaporation and environment.

The second use of water is in the production process. This use of water includes;

- Water in the manufactured product;
- Water used for vessel and pipe cleaning;
- Water used for cleaning production areas;
- Boiler blowdown; and
- Water used in the regeneration of the deionised water vessels.

Water used in the production process can exit the site by two (2) pathways. The first pathway in the manufactured product. The second pathway is by the wastewater treatment plant. The contributors to the process effluent system include the water used for vessel and pipe cleaning, cleaning of production areas, boiler blowdown, and water used in regeneration.

The mapping of the water in and water out is of the site is combined with the quantification and is presented in section 4.2. and Figure 4.2.

4.2 Quantification

In section 4.1, the mapping of water in and water out of the site was undertaken. In this section, quantification of the amount of water for each stream is undertaken.

4.2.1 Water Audit

Metered Inputs and Outputs.

A water audit was undertaken to identify metered water into the site and metered water exiting the site. The following quantities were identified;

1. Metered flow of water into the site. The two (2) year average being 72,899,500 litres of water;
2. Metered flow via sewerage (excluding trade waste) from the site. The two (2) year average being 5,610,000 litres;
3. Metered flow of trade waste from the site. The two (2) year average being 20,548,500 litres;

4.3 Water Balance

A water balance was conducted for the site. The results of this water balance can be found in Figure 4.2.

4.3.1 Water Balance Findings

The water balance found the following results:

1. There are 72,899,500 litres of water used on the site in a year;
2. 53,125,000 litres of the water leave the site in the manufactured products;
3. The cleaning and purging of vessel and washing down generates 10,614, 311 litres per year; and
4. Amenities use 5,770,600 litres per year.

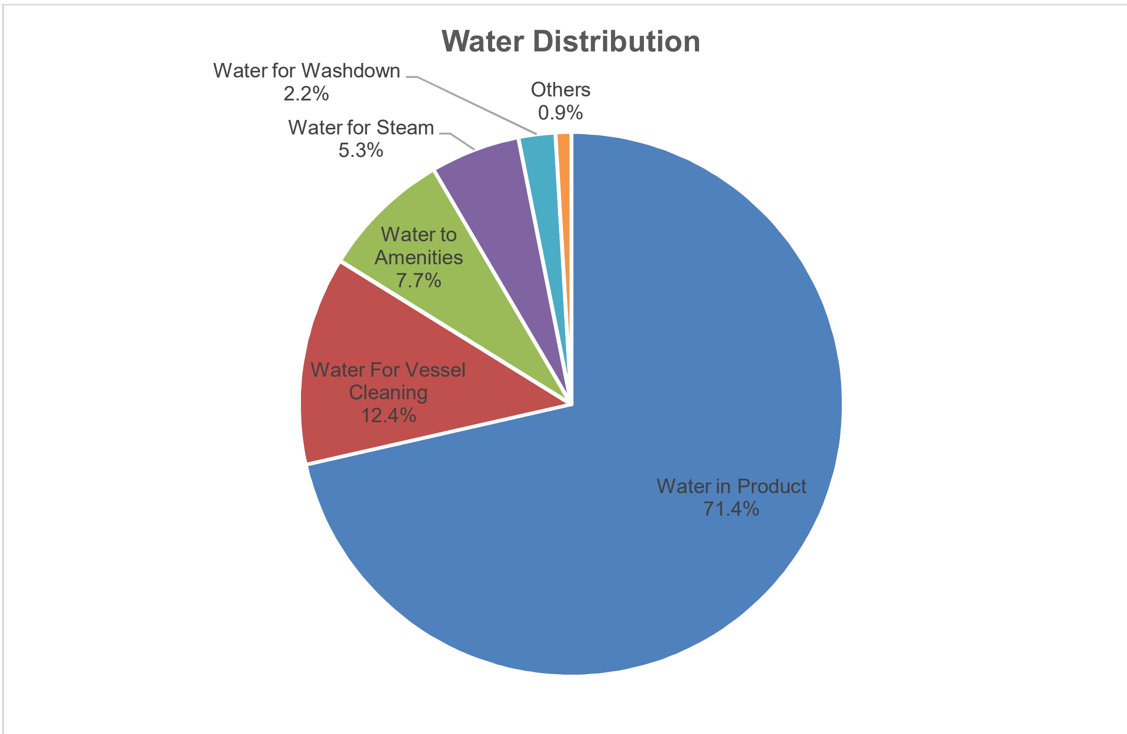
The cleaning and purging are required for the batch manufacturing process. Between each batch, the pipes and vessels must be cleaned to minimise cross-contamination between products. This batching results in contaminated water that flows to the wastewater plant.

Jalco operates five (5) days per week on a 24-hour basis. It produces 250 tonnes of product each production day. If a batch size of 10 tonnes is assumed, then 28 washouts occur in one day and approximately 7,000 washouts per year. This means that 1,288 litres of water are used for each batch changeover. This represents 12.9% of the batch size assumed. The potential reduction in the cleaning water is examined in section 5.2.

Towns water use is shown in Figure 4.1. Figure 4.1 reveals that water is predominately distributed to three (3) primary uses. These uses are:

- Amenities for personnel and laboratories using approximately 7.7% of the water supplied to the site;
- Water leaving the site in manufactured products. This accounted for 71.4% of the water; and
- Water used in production for cleaning. This accounted for 12.4% of the water

Figure 4.1 Water Distribution

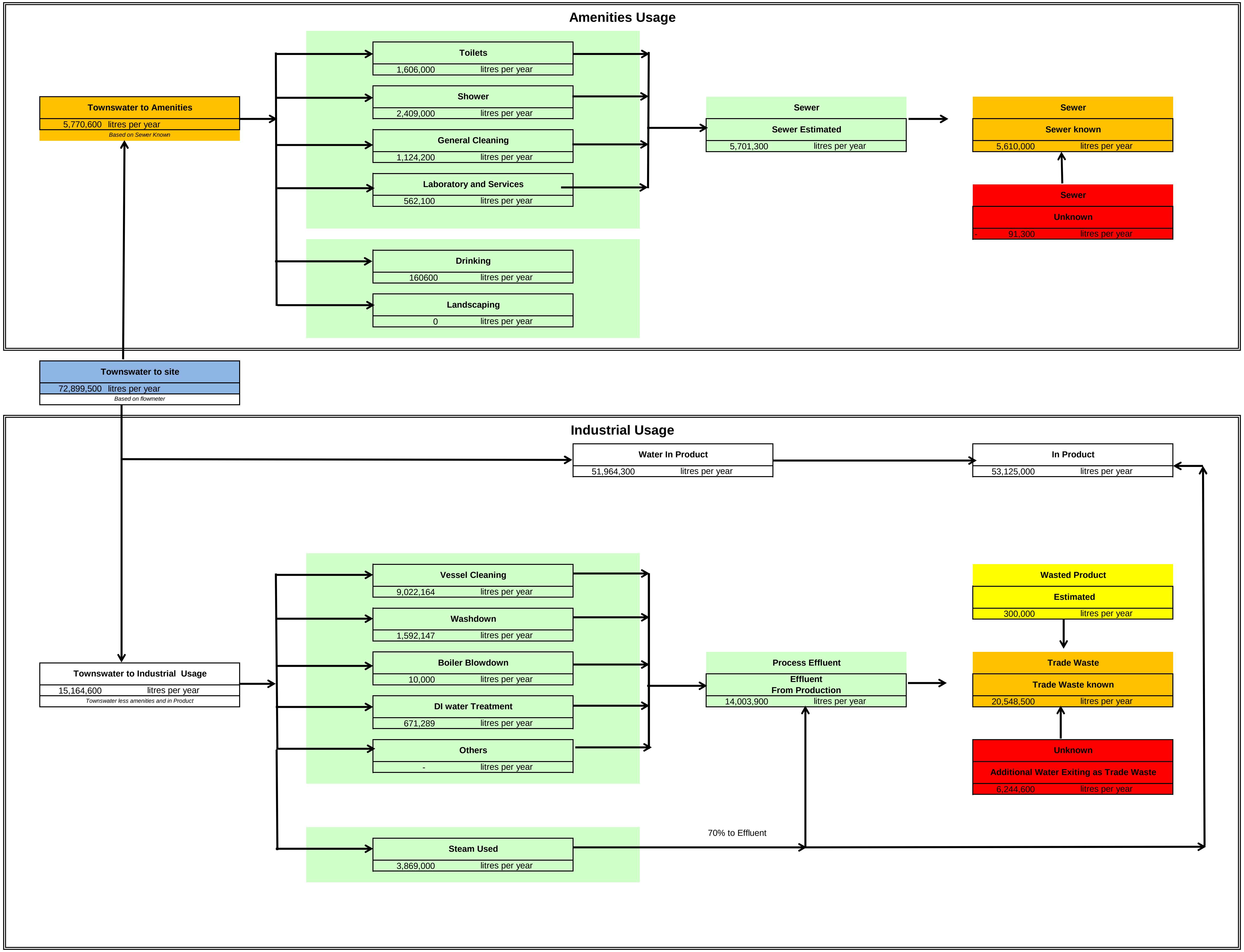


The water balance around amenities had a discrepancy of less than 2% and was considered a reasonable accounting of water flows. Individual water flows may have been over or underestimated and other users not identified.

The wastewater system is unbalanced with an unaccounted component of 30%. This unaccounted flow can be attributed to the rainwater /stormwater collection that is implemented at the site. This will be examined in section 6 and section 7

Figure 4.2 Water Mapping and Quantification

Water Balance - Jalco Smithfield



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5 Production Water

In this section, the use of water at the site has been examined.

5.1 Water Used in Production

Water used in production is used in the following:

1. As a component in the manufactured product;
2. Used for vessel and pipe cleaning;
3. Used for cleaning production areas;
4. As boiler blowdown;
5. Used in the regeneration of the deionised water vessels; and
6. Steam.

The water balance undertaken in section 4 has been used quantified the distribution of water throughout the site. The water distributed. The largest industrial use of water is in the product. 77.4% of towns water is used in the final product. The other industrial use of water is shown in Figure 5.1.

Figure 5.1 Water Used in Production

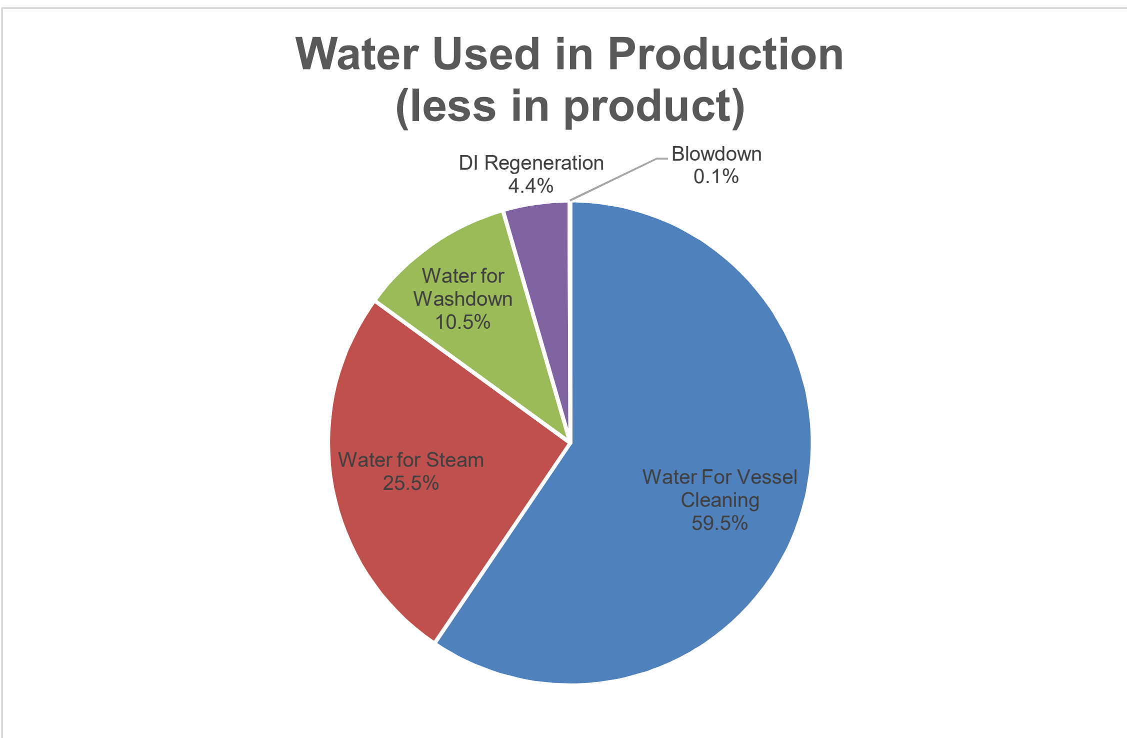


Figure 5.1. reveals that water used in vessel cleaning is the largest production use of water. The site operates a batch manufacturing process. The batch process requires the pipelines and vessels to be cleaned and purged to ensure there is no cross-contamination of the finished product. This cleaning and purging are a function of the number of batch changes. The number of batch changes being a result of demand, supply availability of raw materials, preparation equipment and finished product storage.

Cleaning, washdowns, water from steam and other sources is combined in a stream known as process effluent. Process effluent is sent for treatment at the dissolved air flotation treatment plant. After treatment, the process effluent is known as trade waste and exits the site as sewerage.

5.2 Process Effluent Reduction

This section examines potential methods for the reduction of the quantity of process effluent.

5.2.1 Fixed Purge Amounts

The requirement to purge and clean vessels and lines is a function of the batch operations undertaken. The amount required to clean and purge can be standardised and reproduced. This may be product-specific or generic. Installation of flow metering and automatic valves allows fixed volumes to be used for cleaning. This can be combined clean in place (CIP) nozzles for the cleaning of vessels. This standardisation would require trial and error to determine the optimum operating points.

The standardisation of purging and cleaning would result in a reduction in the total volume needed for purging and cleaning. The secondary effect would be a reduction in the process effluent quantities. Towns water and process effluent are both costs of production, and their reduction would reduce operating costs.

5.2.2 Re-use of Cleaning Water

The purging and cleaning of pipelines and vessels results in a gradient of contamination of the fluid being released from the line or vessel. The initial fluid is heavily contaminated with the product and is suitable for trade waste disposal. As the purging and cleaning proceeds the level of contamination decreases. After the cleaning cycle, the fluid has a low contamination level.

The use of a final proportion of the cleaning liquid as the first part of the cleaning for the next cycle is extensively used in the industry. This would require the collection of a set volume of the final rinse and distribution back as the first part of the next clean. The system requires storage of liquid, pumping and distribution.

This counter-current use of cleaning fluid can result in a reduction in water used and trade waste generated. It would be anticipated that 20% of the final rinse could be reused to start the next cycle. A reduction of 1.8 million litres of water could be anticipated for cleaning with a similar reduction in process effluent.

6 Rainwater / Stormwater

Rainwater and stormwater are generated on the site from a rain event. The rainwater refers to water that is drained off from a roof and stormwater is water that drains of a land area. The site has several areas where water can run-off after a rain event. These areas include:

- Roofed Buildings;
- Concreted areas, referred to in this study as hardstands. These hardstand areas are used for unloading of raw materials; loading of finished goods, storage of materials, car parking and general site movements;
- Landscaped Area, in a rain event, will generate run-off water. The proportion of this runoff water assumed at 30%. The bulk of the rain being absorbed into the soil.

6.1 Rainwater Collection and Mapping

There are two (2) collection pathways for rainwater and stormwater on the site. The first pathway is the collection of rainwater and stormwater from roofs, hardstands and landscaped area into the stormwater system and the discharge from the site. The second pathway is the collection of rainwater/stormwater from roofs, hardstands and landscaped area into a pit that is pumped back to be treated as wastewater. These are shown in Figure 6.1

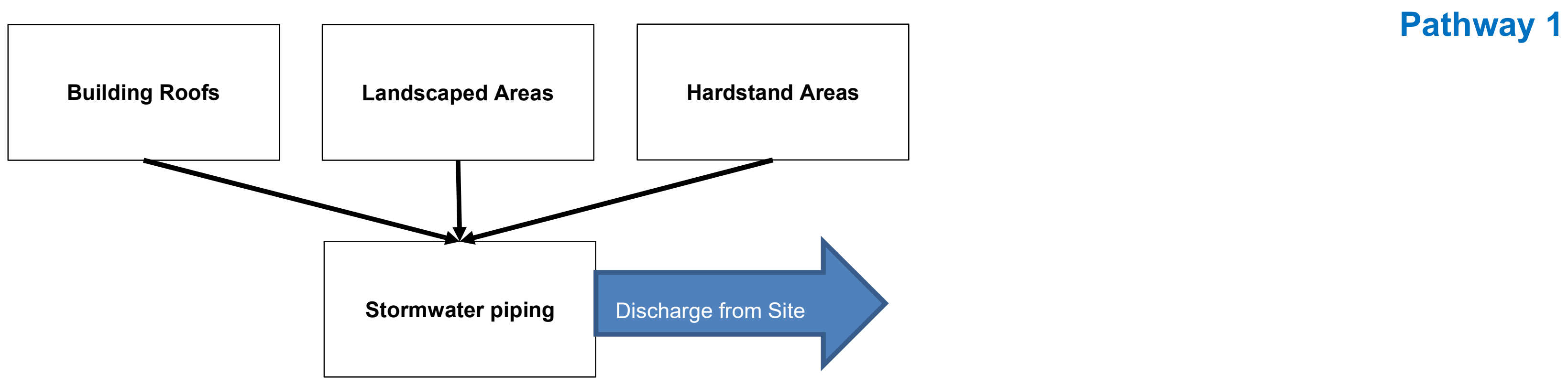
These pathways are mapped and shown in Figure 6.3. The site has been divided into several roofs, hardstands and landscaped areas. The rainwater/stormwater collected in each of these areas are combined and follow three (3) courses from the site. The area description, size, activity that is undertaken and course from the site is shown in Table 6.1.

A figure of 902mm rainfall recorded at Prospect Reservoir for the period 1st June 2018 till 31st May 2019 is used for the annualised water balance. The rainfall figures are shown in Appendix C.

Mapping and quantification are shown in Figure 6.3. Figure 6.3 reveals the following results. These results are:

- Pit No.3 collected 4,683,184 litres of water for the period 1st June 2018 till 31st May 2019.
- Rainwater/stormwater collected and sent to the wastewater plant calculates as 5,511,220 litres of water;
- From section 4.3, the unknown component of water entering the wastewater plant was 6,244,600 litres. The rainwater/stormwater entering this system represents 88.3% of this unknown water entering the wastewater plant. Given the variables and assumptions used, rainwater is the unknown flow into the wastewater plant.

Figure 6.1 Stormwater/Rainwater Collection Pathways



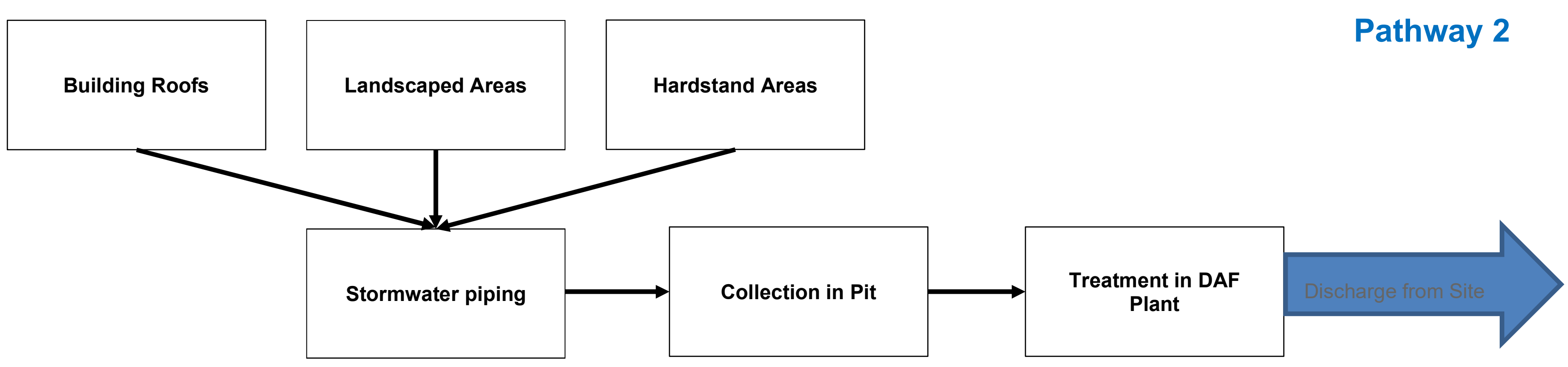
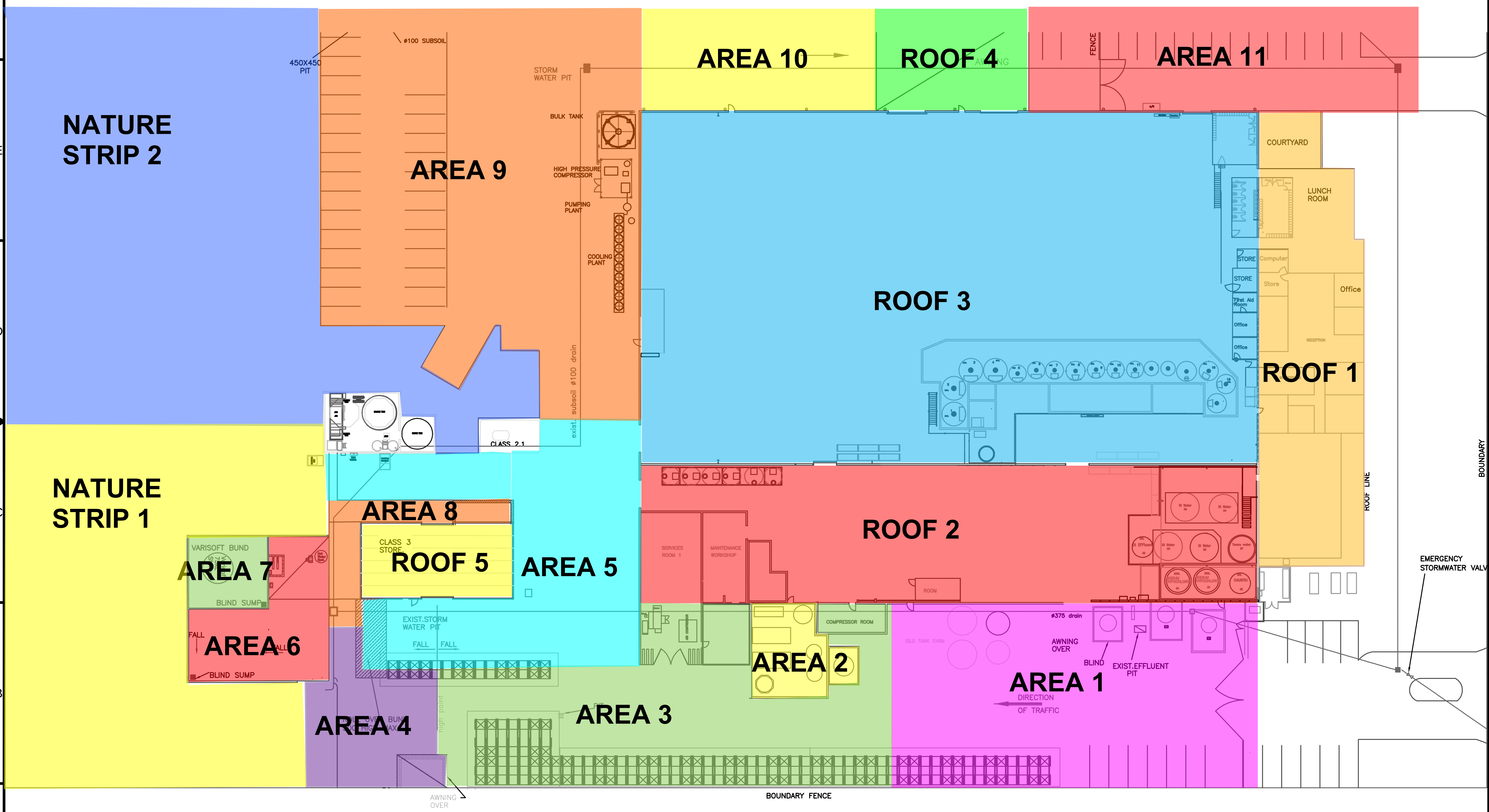


Figure 6.2 Designated Areas of Rainwater/Stormwater Collection



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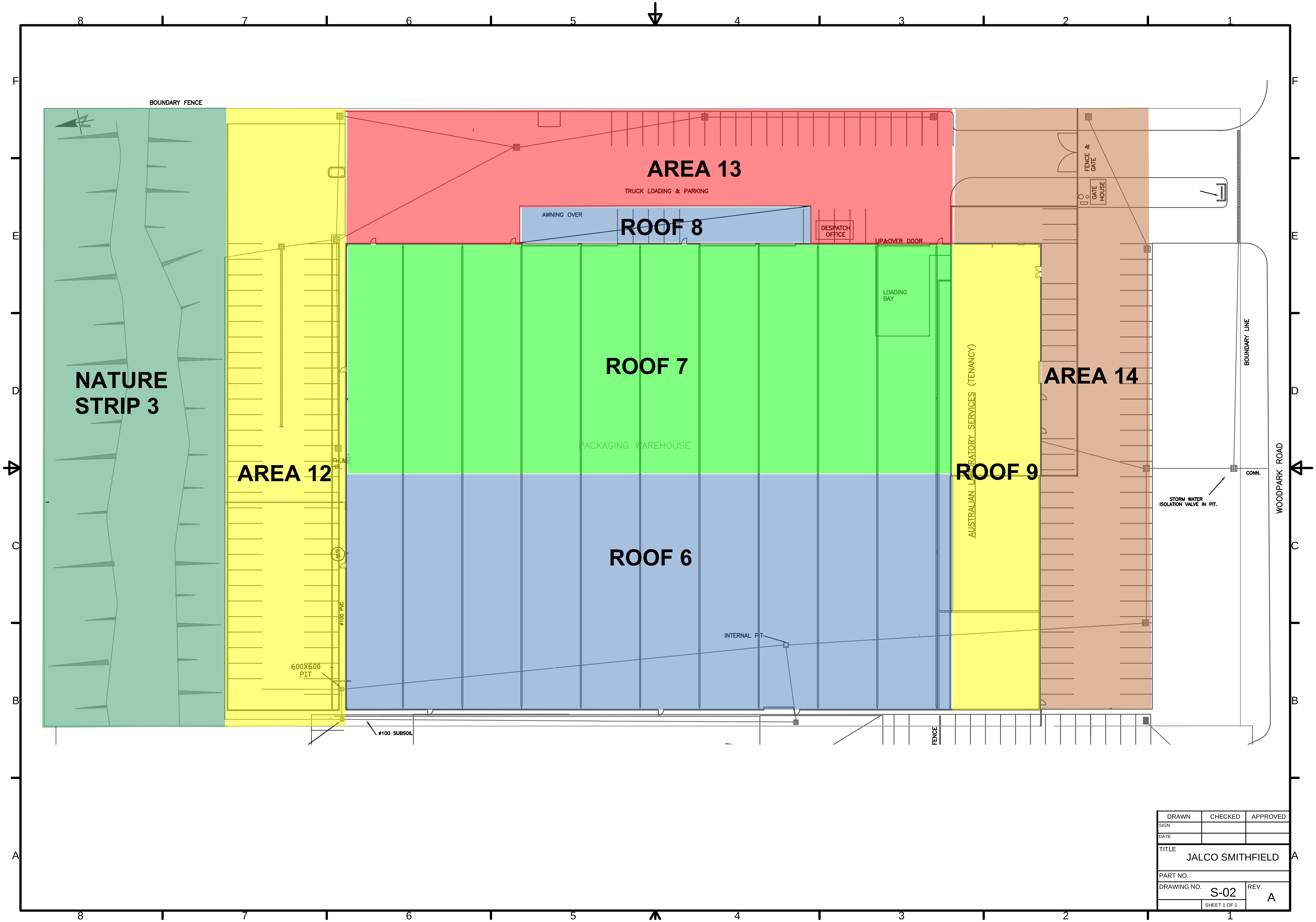

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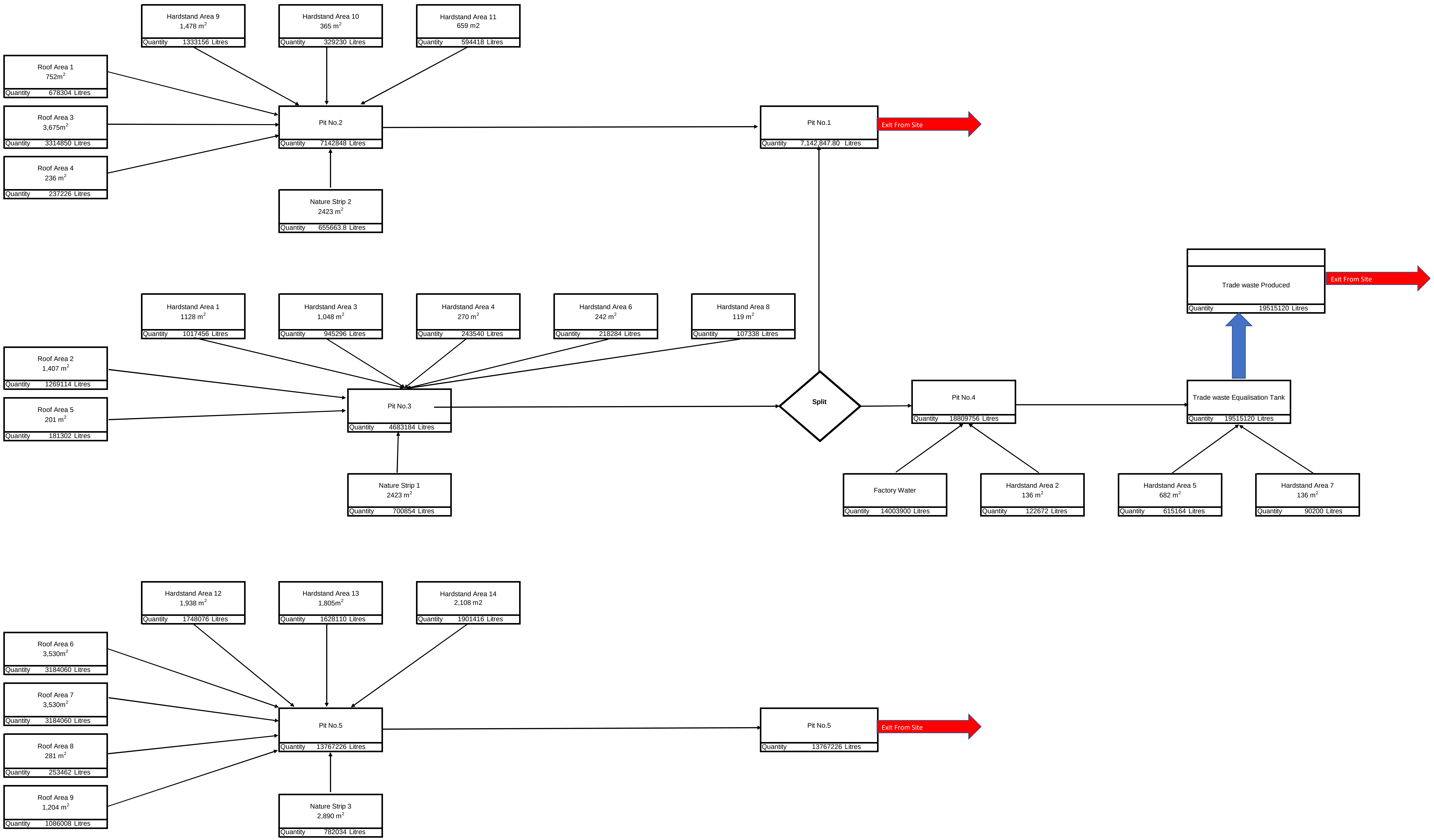
Table 6.1 Rainwater/Stormwater Areas

Label	Area (m^2)	Function	Water Goes to
Roof Area 1	752	Roof	Pit 2
Roof Area 2	1,407	Roof	Pit 3
Roof Area 3	3,675	Roof	Pit 2
Roof Area 4	236	Roof	Pit 2
Roof Area 5	201	Roof	Pit 3
Roof Area 6	3530	Roof	Pit 5
Roof Area 7	3530	Roof	Pit 5
Roof Area 8	281	Roof	Pit 5
Roof Area 9	1204	Roof	Pit 5
Hardstand Area 1	1128	Unloading / Storage	Pit 3
Hardstand Area 2	136	Storage	Pit 4
Hardstand Area 3	1048	Unloading / Storage	Pit 3
Hardstand Area 4	270	Storage	Pit 3
Hardstand Area 5	682	Storage	Tank
Hardstand Area 6	242	Storage	Pit 3
Hardstand Area 7	100	Storage	Tank
Hardstand Area 8	119	Storage	Pit 3
Hardstand Area 9	1478	Carpark	Pit 2
Hardstand Area 10	365	Traffic	Pit 2
Hardstand Area 11	659	Traffic	Pit 2
Hardstand Area 12	1938	Carpark	Pit 5
Hardstand Area 13	1805	Loading	Pit 5
Hardstand Area 14	2108	Carpark	Pit 5
Nature Strip 1	2590	Landscaped Area	Pit 3
Nature Strip 2	2423	Landscaped Area	Pit 2
Nature Strip 3	2890	Landscaped Area	Pit 5

Figure 6.3 Stormwater/Rainwater Mapping and Quantification

Jalco Smithfield
Stormwater Management

Event	Annual
Duration	1 year
Rainfall	902 mm



6.2 Rainwater Harvesting

Rainwater harvesting is the process of collecting rainwater from an impervious surface and directing it to a location where it shall be used or stored for later use. The site has several areas that could be used to collect rainwater.

Rainwater can be collected from the roofs of the buildings located on the site. This water could be used for irrigation of landscaped area or used to supplement the towns water supply. Rainwater is also collected from hardstand areas. These hardstand areas are used for various activities, including:

- Parking of cars;
- Unloading Deliveries of raw materials;
- Loading of finished products; and
- Storage of bulk chemicals.

These hardstand areas are likely to have a level of contamination present at the beginning of the rain event. Contaminants such as oil and grease from vehicles; chemical spills and others would be present and make the first amount of this run-off unsuitable for re-use. After a period of time, these contaminants are flushed away, and the water quality would improve, making the water suitable for re-use.

7 Trade Waste

The wastewater system is used to treat process effluent from the manufacturing plant and treat rainwater/stormwater collected. This section examines the characteristics of the trade waste, the performance of the wastewater plant, and the effect of rain on throughput.

7.1 Characteristics of Trade Waste

The characteristics of the trade waste released from the Jalco site are shown in Table 7.3. The wastewater plant treats the following:

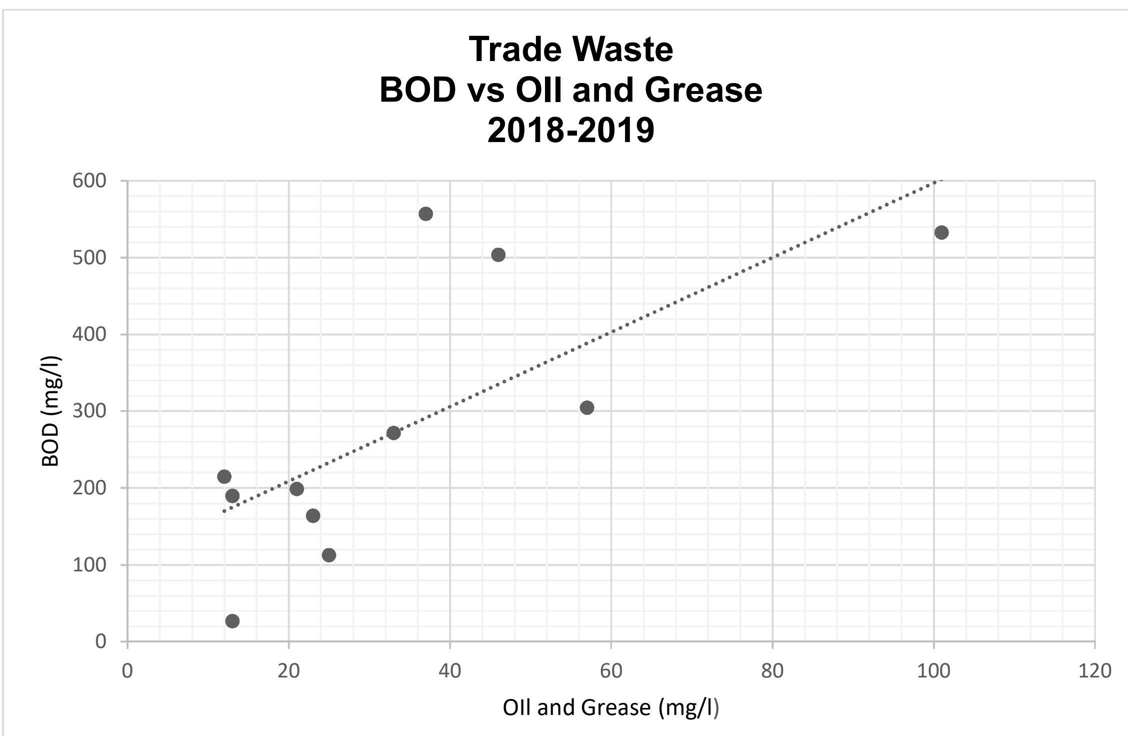
1. Dissolved Solids;
2. Suspended Solids;
3. Oil and Grease; and
4. Biological Oxygen Demand (BOD)

Dissolved solids in trade waste purposes are not worthwhile to remove. Dissolved solids removal requires technologies such as ion exchange and concentration (e.g. reverse Osmosis). These technologies are expensive in both capital and operation. They are targeted at reusing the water from the waste stream. This is not the operational target for the site and dissolved solid removal would not form part of a wastewater plant.

Suspended solids are small solid particles that do not dissolve in water. Suspended solids are a feature of the wastewater plant. Suspended solids can be treated by Dissolved Air Flotation (DAF).

There is a relationship between grease and oil and BOD. The oils and greases undergo biological action which consumes oxygen. The oil and grease versus BOD are plotted in Figure 7.1. This figure reveals that higher oil and grease levels typically result in higher BOD results. The removal of oil and grease can be achieved by various technologies, including DAF, and plate separators.

Figure 7.1 Oil and Grease versus BOD



7.2 Wastewater Plant

The wastewater plant at the site comprises a DAF system. There is an equalisation plant for pH control, flocculants mixing tanks and reaction tanks. The key separation process is the DAF unit. Given the characteristics of the trade waste as revealed in section 7.1, DAF is an appropriate technology for the treatment of the wastewater at Jalco.

7.3 Plant Performance

7.3.1 Flowrates of Trade Waste

The flow rate has the following limitations placed on it by Sydney Water. These limitations were:

1. Flow rate peak of up to 3 litres per second (that is no more than 256,000 litres per day);
2. An average daily flow rate of no more than 50, 000 litres per day

The flowrate of trade waste from the site had the following results shown in Table 7.1. The daily flowrates of trade waste from the site are shown in Figure 7.2.

Table 7.1 Trade Waste Flowrates

Parameter	Result
Total for 12 months (1/06/2018-31/05/2019)	18,590 kilolitres
Daily Flow Average (for the year)	50.93 Kilolitres per day
Peak	152 Kilolitres per day
Number of Days Not operating	72
Average for operating days	63 Kilolitres

The operation of the wastewater plant is on a shift basis. The plant is not operated every day of the week as the operations can occur over five (5) days per week. The expected throughput per shift is between 30-33 kilolitres. The results are shown in Table 7.1. and are consistent with a two (2) shift operation of the plant in the period June 2018-May 2019.

The plant throughput is not maximised, and extra capacity is available. The amount of buffer storage must be suitable to meet peak water waste generated on the site.

7.3.2 Treatment for Sydney Water Key Parameters.

The treatment of the wastewater at Jalco is undertaken to ensure the quality of the trade waste meets the requirements of Sydney Water discharge parameters. In section 7.1, the key characteristics of the trade waste were examined. The DAF separation process is appropriate for the treatment of the suspended solids and the oil and grease. The appropriateness of the treatment is highlighted by Jalco meeting and exceeding the key parameters of the trade waste licence agreement.

7.4 Effect of Rainwater

In section 4.2, a water balance was conducted. This water balance was revealed that trade waste flow had an unknown component. This unknown water flow has been identified as rainwater.

Rainwater is collected throughout the site, as described in section 6. The collection of this rainwater is dependent on the function of the area. For example, outside storage areas are collected and pumped to the wastewater plant system and roofs, in general, are discharged to stormwater.

In Figure 7.3, the average rainfall for 6 days has been plotted with the cumulative sum of trade waste with the average trade waste. The cumulative sum will become higher when the trade waste flow rate is above the average trade waste flow and move down when the flow rate is below the average trade waste flow.

Figure 7.3 reveals a relationship between rainfall and the trade waste flow. In periods where rainfall is experienced the trade waste flow is above the average and where little or no rain is experienced the trade waste drop below average trade waste flows.

Two (2) periods were selected for further examination. These periods were:

1. 27/07/18-27/08/18 as a representative dry period with little rain; and
2. 5/10/18-2/11/18 as a representative rainy period.

The results are presented in Table 7.2

Table 7.2 Effect of Rainwater on Trade Waste Flows

Dates	Amount of Rainfall	No. Days in Period	Average Trade waste Flow (megalitres per day)
27/07/18-27/08/18	Low	32	42.8
5/10/18-2/11/18	High	29	74.8

Table 7.2 reveals that trade waste flow increases by 74% for a rainy period. These results are consistent with the water balance in section 4.2, where the average daily flow of process effluent produced by the manufacturing process was evaluated at 38.36 megalitres per day.

The increase in the trade waste flow highlighted in Table 7.2 is consistent with the results found in section 6. Rainwater/stormwater is collected and released from the site using the wastewater system.

Figure 7.2 Trade Waste Flows at Jalco

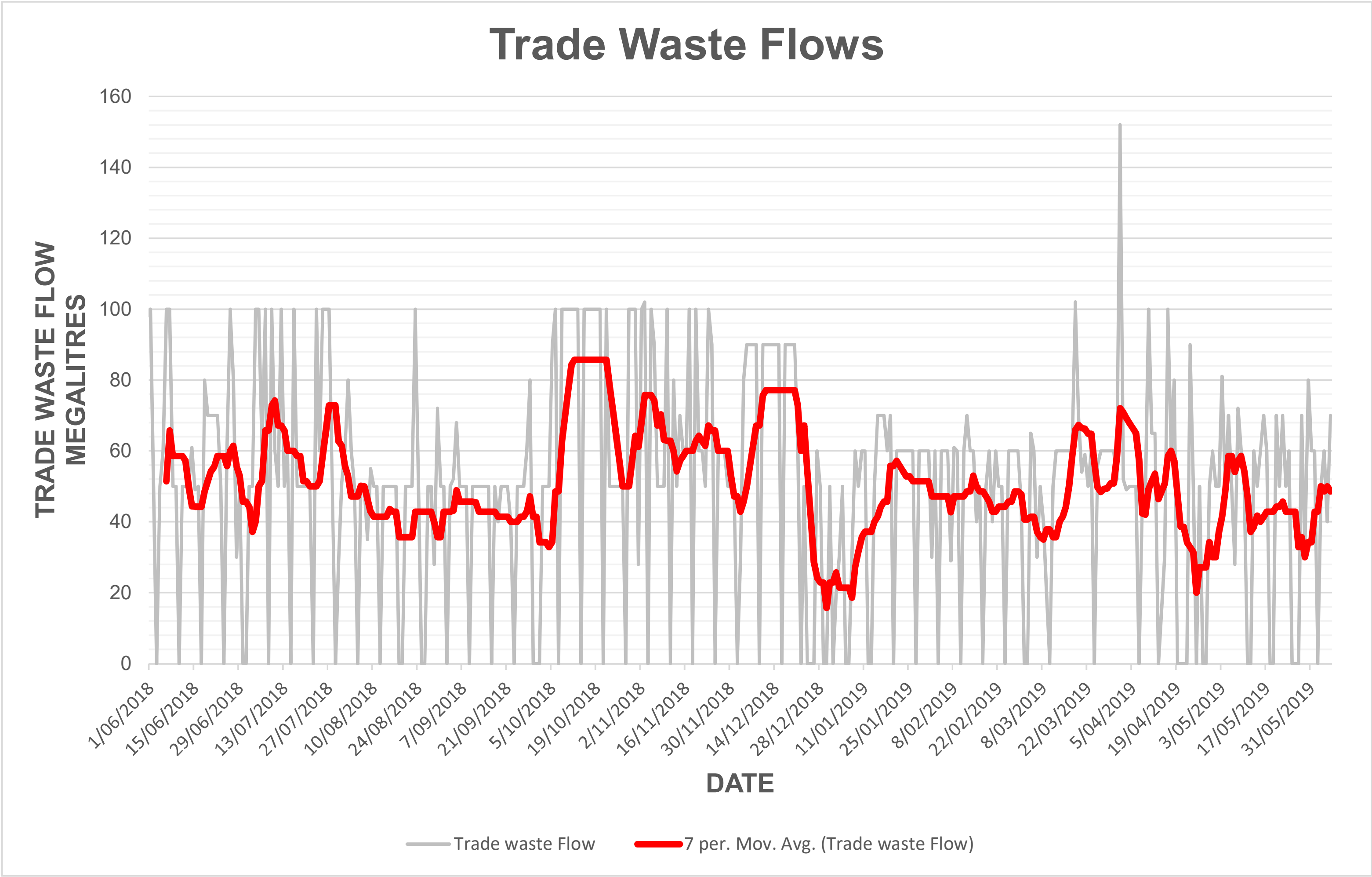
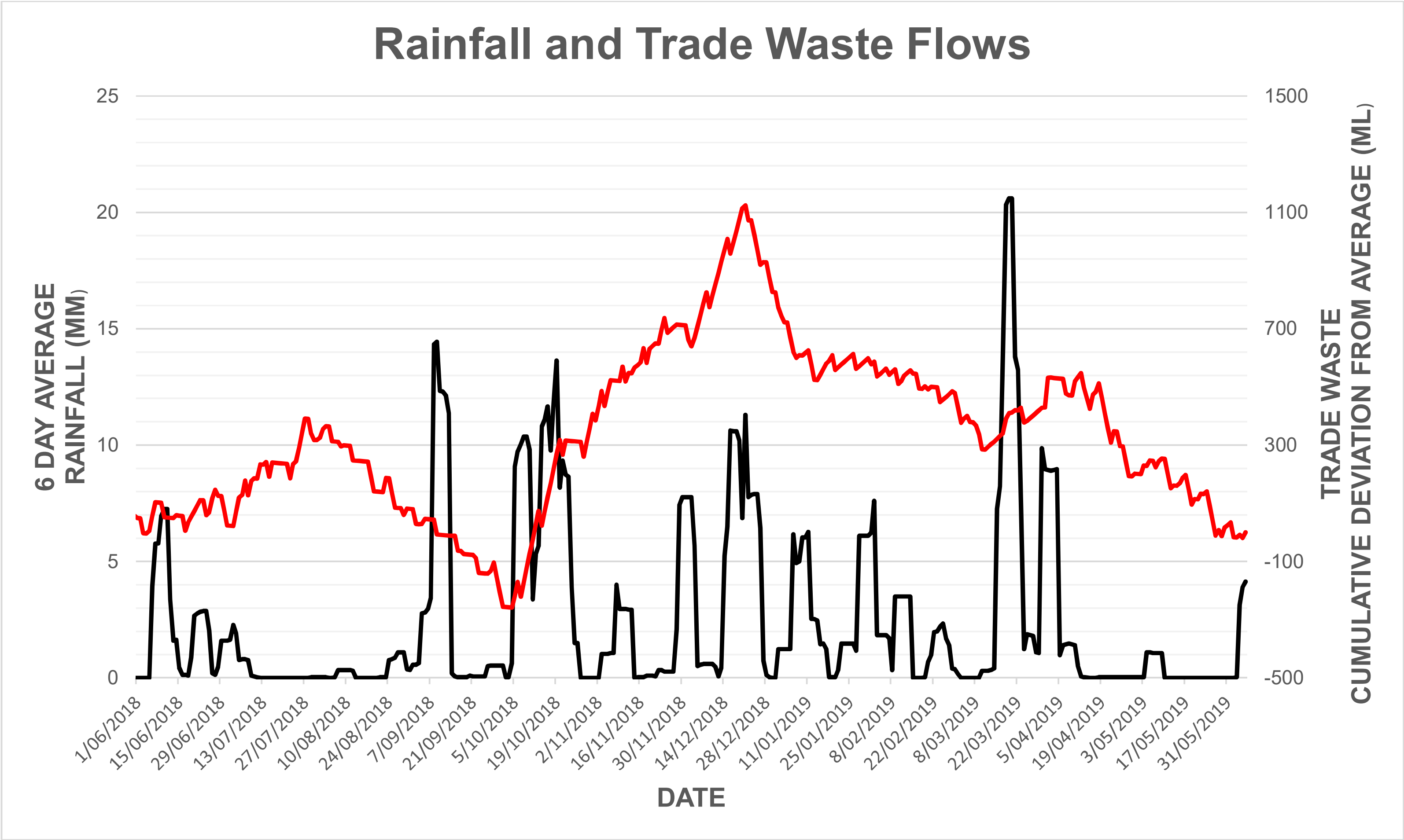


Table 7.3 Trade Waste Quality Results at Jalco

Start Date	Finish Date	Flowrate	TDS	SS	SO4	Oil	BOD	pH		Rain (mm)	
		Ml	mg/l	mg/l	mg/l	mg/l	mg/l	Before	After	Before	During
26/04/2018	27/04/2018	28	5590	50	702	13	27	7.5	7.7	0	0.4
27/05/2018	28/05/2018	30	6420	8	390	37	557	7.9	8.1	0	0
30/07/2018	31/07/2018	30	31000	49	2600	25	113	8.6	8.8	0	0
29/08/2018	30/08/2018	28	5440	256	657	33	272	7.9	8.1	0	0
1/10/2018	2/10/2018	28	7200	15	589	57	305	8.1	8.3	0	0
30/10/2018	31/10/2018	28	5740	13	1590	21	199	8.8	9	0	0
3/12/2018	4/12/2018	30	3630	16	572	12	215	8.7	8.9	0	0
7/01/2019	8/01/2019	31	4870	16	1060	13	190	8.6	8.8	0	0.4
28/02/2019	1/03/2019	29	6120	26	588	23	164	8.7	8.8	0	0
25/03/2019	26/03/2019	30	4530	66	963	101	533	7.7	7.9	5.6	0.2
15/04/2019	16/04/2019	29	4820	20	584	46	504	8.2	8.4	0	0

Figure 7.3 Rainfall and Trade Waste Generated at Jalco.



8 Contaminated Water Retention

In the previous section, a water balance and a rainwater /stormwater balance were conducted. These balances revealed the relationship between water coming into the site, and water leaving the site. These balances were found to be consistent with known flows and balanced with the trade waste flow. These balances provide a basis to examine contaminated water retention and treatment to minimise the impacts on the surrounding environment.

8.1 Potential Solutions

This section examines the potential solutions to meet the requirement under the NSW EPA to minimise the risks of contaminated water reaching waterways.

8.1.1 Secondary Containment

Secondary containment refers to any means used to contain liquid leaks or spills if the primary container (liquid storage container) or transfer mechanism fails. Secondary containment areas prevent liquids from escaping to the environment. Secondary containment can include:

- A containment bund. Bunds are impermeable, raised barriers forming the perimeter of secondary containment areas (for example, walls, speed humps, guttering, curbing, flexible rubber barriers constructed with robust, impermeable, UV and chemical resistant material or lined with such material).
- Encasement. These are storage containers with built-in (integral) secondary containment (for example, encasing plastic pipes that carry liquid within a larger pipe which drains to a collection sump, placing drums inside larger, sealed plastic drums during transport by forklift).
- Grading. Grading of sealed surface areas to form a contained area, either as part of a building or an external structure.

For hazardous materials in drums and plastic IBCs are stored in outdoor areas, the EPA guidelines suggest that:

> *The effective volume of the secondary contaminant system must be able to contain 25% of total volume of the individual containers located within the outdoor storage area, plus a freeboard allowance for both rainwater and firewater.*
>
> *When calculating the freeboard allowance ensure that the secondary containment system can adequately manage the rainwater volume associated with a (1 in 20-year, 24-hour storm event) or 95th percentile, 5-day rainfall depth (mm) as defined in Managing urban stormwater – soil and construction (Volume 1), 2004, 4th edition.*

8.1.2 First Flush

First flush systems are used to prevent pollutants that have accumulated on outdoor surfaces from entering the stormwater system during rain events. Areas that can benefit from using a first flush system are motor vehicle courtyards, exposed surfaces at a chemical manufacturing plant, exposed surfaces at a dye works and others These systems work on the principle that most contaminants will be mobilised by the rainwater and transported to the stormwater system during the initial stages of any rain event The system diverts water from the first flush for each rain event into storage, allowing for the testing, treatment and disposal of the contaminated water.

While a first flush system is likely to improve the quality of rainwater leaving a site, it will not guarantee that all water leaving the site will be free from contamination.

8.2 Outside Storage of Liquid Hazardous Chemicals

The outside storage of hazardous chemicals is presently undertaken at the site. A cursory audit was conducted in July 2019. This audit is used as the basis for establishing the present requirement for contaminated water retention.

8.2.1 Quantity and Location

The audit revealed that hazardous liquid chemicals were being stored on hardstand areas. The quantities and types of storage are shown in Table 8.1 and shown in Figure 8.1.

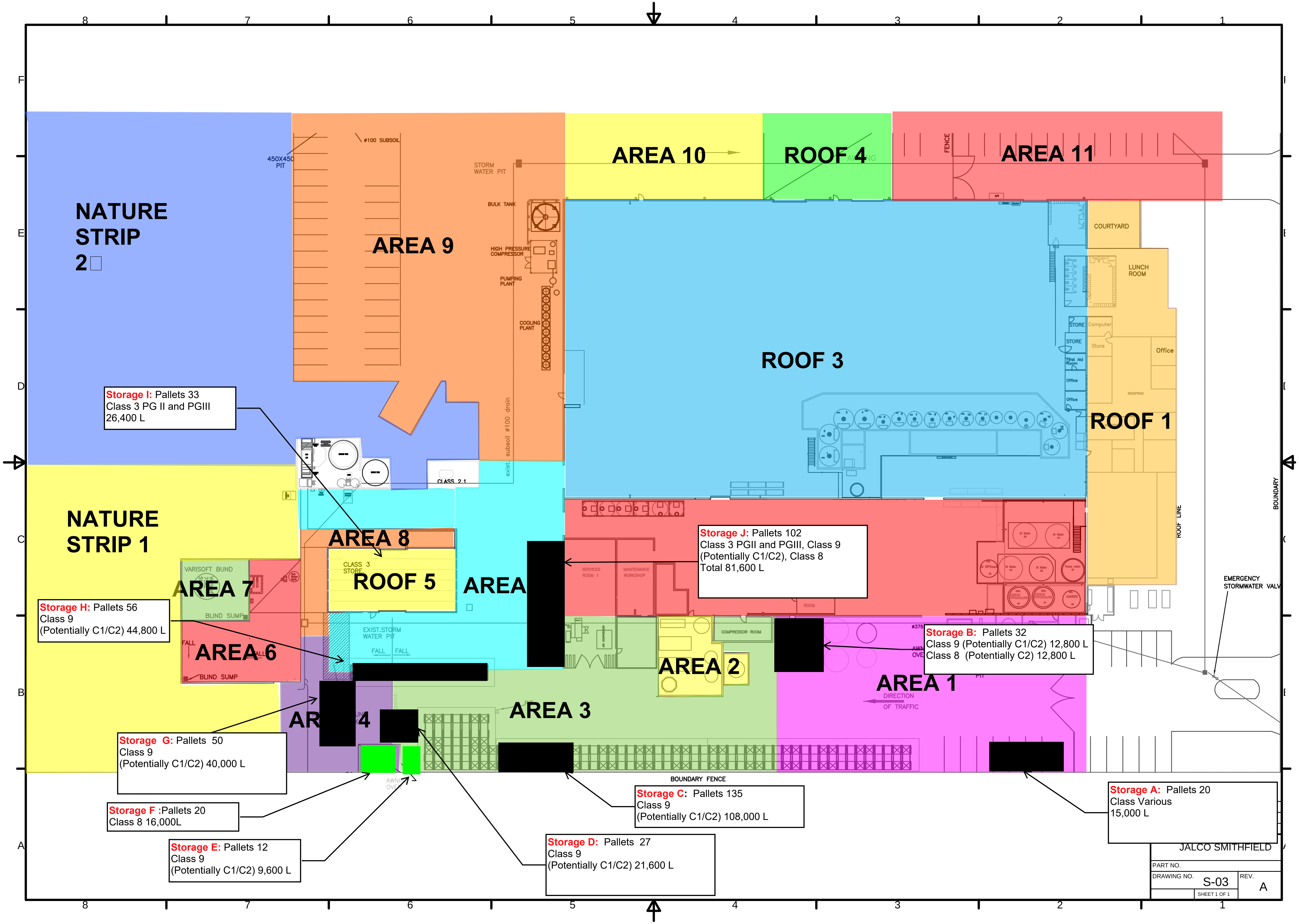
Table 8.1 Quantity and Type, Hazardous Liquid Chemicals Stored Outside

Storage Area	Pallets	Liquid Quantity[1]	Typical Materials in Area	Comments
A	20	15,000	Various DG Class 9, DG Class 8 Waste Material	Potential for the material to be a combustible liquid type C1 or C2
B	32	25,600	DG Class 9, DG Class 8	Potential for the material to be a combustible liquid type C1 or C2
C	135	108,000	DG Class 9,	Potential for the material to be a combustible liquid type C1 or C2
D	27	21,600	DG Class 9,	Potential for the material to be a combustible liquid type C1 or C2
E	12	9,600	DG Class 9,	Potential for the material to be a combustible liquid type C1 or C2
F	20	16,000	DG Class 8	
G	50	40,000	DG Class 9,	Potential for the material to be a combustible liquid type C1 or C2
H	56	44,800	DG Class 9,	Potential for the material to be a combustible liquid type C1 or C2
I	33	26,400	Class 3PII and Class 3 PGIII	Flammable Material
J	102	81,600	Class 3PII Class 3 PGIII Class 8 Class 9	Potential for the material to be a combustible liquid type C1 or C2

The outside storage of hazardous liquid chemicals totals 388,600 litres. The type of liquid is dominated by Dangerous Good Class 9. Class 9 are miscellaneous dangerous goods which during transport present a danger or hazard not covered by other eight (8) dangerous goods classes. At Jalco the class 9 materials are predominately environmentally hazardous substances. A large proportion of the material is organic chemicals. These organic chemicals are potentially combustible liquids. Combustible liquids are defined by AS 1940 by flashpoint. They contribute to fire events as the combustible liquid will burn.

[1] *The volume is approximated as 800 litres per pallet. This is an approximation that could over-estimate the liquid quantity*

Figure 8.1 Hazardous Liquid Chemical Storage, Outside.



NATURE STRIP 2
AREA 9
AREA 10
ROOF 4
AREA 11
ROOF 3
ROOF 1
COURTYARD
LUNCH ROOM
Office
STORE
450X450 PIT
ø100 SUBSOIL
STORM WATER PIT
BULK TANK
HIGH PRESSURE COMPRESSOR
PUMPING PLANT
COOLING PLANT
exist. subsoil ø100 drain
FENCE
Storage I: Pallets 33
Class 3 PG II and PGIII
26,400 L
NATURE STRIP 1
AREA 8
CLASS 3 STORE
ROOF 5
AREA
VARISOFT BUND
AREA 7
BLIND SUMP
AREA 6
FALL
EXIST.STORM WATER PIT
CLASS 2.1
Storage H: Pallets 56
Class 9
(Potentially C1/C2) 44,800 L
Storage J: Pallets 102
Class 3 PGII and PGIII, Class 9
(Potentially C1/C2), Class 8
Total 81,600 L
SERVICES ROOM 1
MAINTENANCE WORKSHOP
ROOM
COMPRESSOR ROOM
AREA 2
Storage B: Pallets 32
Class 9 (Potentially C1/C2) 12,800 L
Class 8 (Potentially C2) 12,800 L
AREA 1
DIRECTION OF TRAFFIC
AREA 3
AR 4
EMERGENCY STORMWATER VALV
ROOF LINE
BOUNDARY
Storage G: Pallets 50
Class 9
(Potentially C1/C2) 40,000 L
BOUNDARY FENCE
Storage F :Pallets 20
Class 8 16,000L
Storage C: Pallets 135
Class 9
(Potentially C1/C2) 108,000 L
Storage A: Pallets 20
Class Various
15,000 L
Storage E: Pallets 12
Class 9
(Potentially C1/C2) 9,600 L
Storage D: Pallets 27
Class 9
(Potentially C1/C2) 21,600 L
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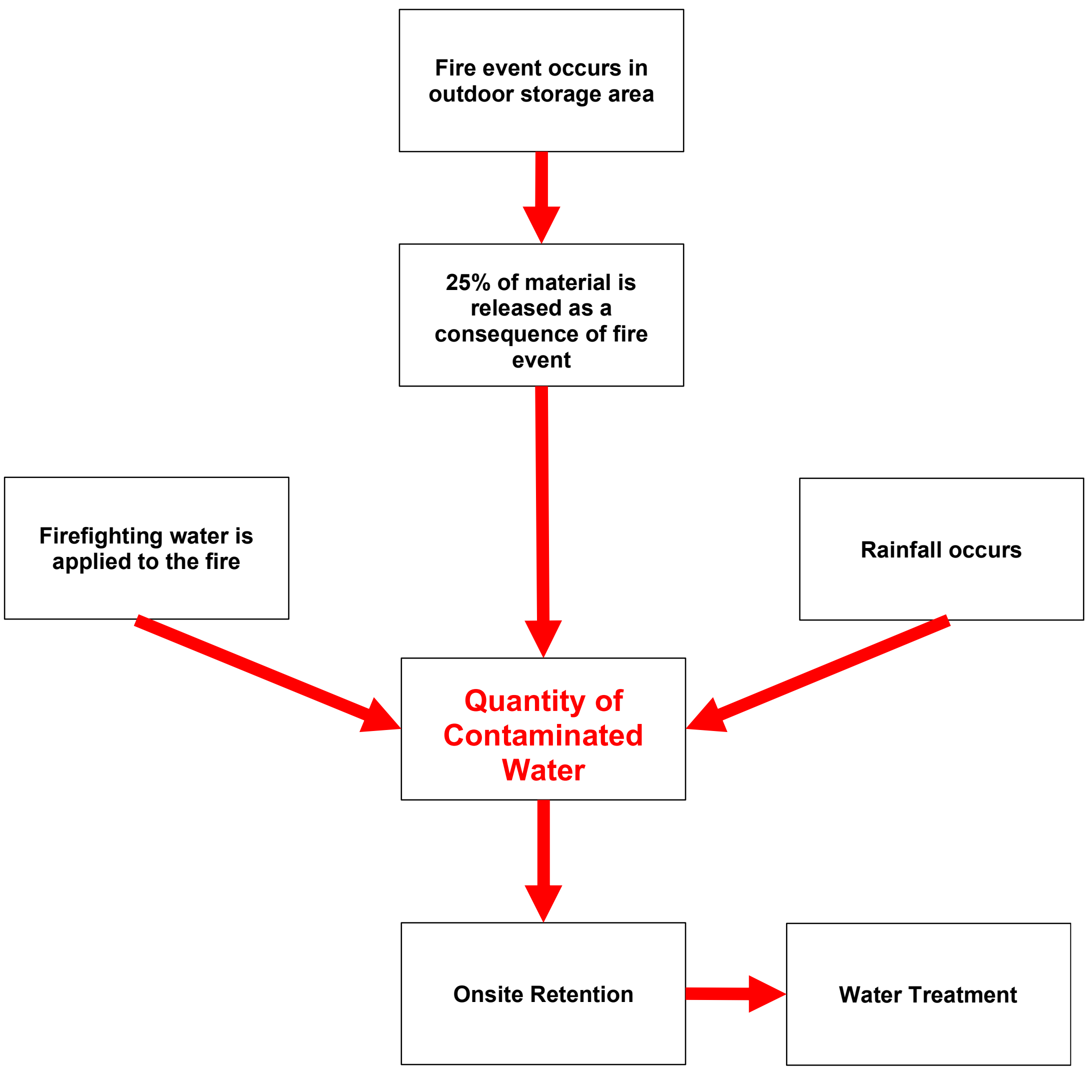
8.2.2 Contaminated Water Quantities and Retention (Outdoor Storage)

This section contains an estimation of the quantity of contaminated water generated by a fire event in the outdoor storage of hazardous liquid chemicals. The section evaluates the level of retention required to prevent the escape of contaminated water into the surrounding environment.

8.2.2.1 <u>Quantification of Contaminated Water</u>

The quantification of contaminated water is shown in Figure 8.2. The scenario considered is a fire event within the outdoor storage of hazardous liquid chemicals. A fire event occurs, and firefighting water is applied to reduce the consequence of the fire event. The amount of firefighting water required is a function of the quantity of material stored and the type of material stored. The material type can be combustible or non-combustible. Materials that are combustible would require a greater volume of firefighting water to control and mitigate. This fire event generates a quantity of contaminated water. The amount of contaminated water is increased when a rain event occurs around the same time as the fire event. This scenario is the basis for estimation of the quantity of contaminated water and is consistent with the NSW EPA guidelines issued as part of the improvement notice.

Figure 8.2 Quantification of Contaminated water



8.2.2.2 *Quantities of Contaminated Water*

In section 8.2.2.1, the method for quantifying of contaminated water was presented. This method is used to evaluate the quantity of contaminated water potentially generated. The calculations are presented in Appendix G.

The estimation of the contaminated water has the following key features:

- The materials being stored contain combustible liquids, and a significant quantity of firefighting water is likely to be applied;
- Storage area D, Storage area E, Storage area F, Storage area G and Storage area H are located adjacent to each other, and in a fire, the storage is considered as one (1) storage area;
- The rainfall is evaluated for 2 hourly intervals, as shown in Appendix D. This rainfall approximation results in a large rainfall occurring directly after the fire event. This is a conservative approximation of the rainfall that would result in a 5 day, 74.1mm rainfall event.
- The stormwater system is combined with rainwater being accumulated from the following areas;
    - Hardstand Area 1;
    - Hardstand Area 3
    - Hardstand Area 4;
    - Hardstand Area 5;
    - Hardstand Area 8;
    - Roof 2;
    - Roof 5

This common stormwater system results in a large volume of contaminated water being required to be retained and treated.

The quantity of material released, firewater used to control and extinguish the fire, and the amount of rainwater/stormwater are presented in Table 8.2. The estimation of firefighting water is based on the size of the potential release. The estimation of the quantity of firefighting water is found in Appendix F.

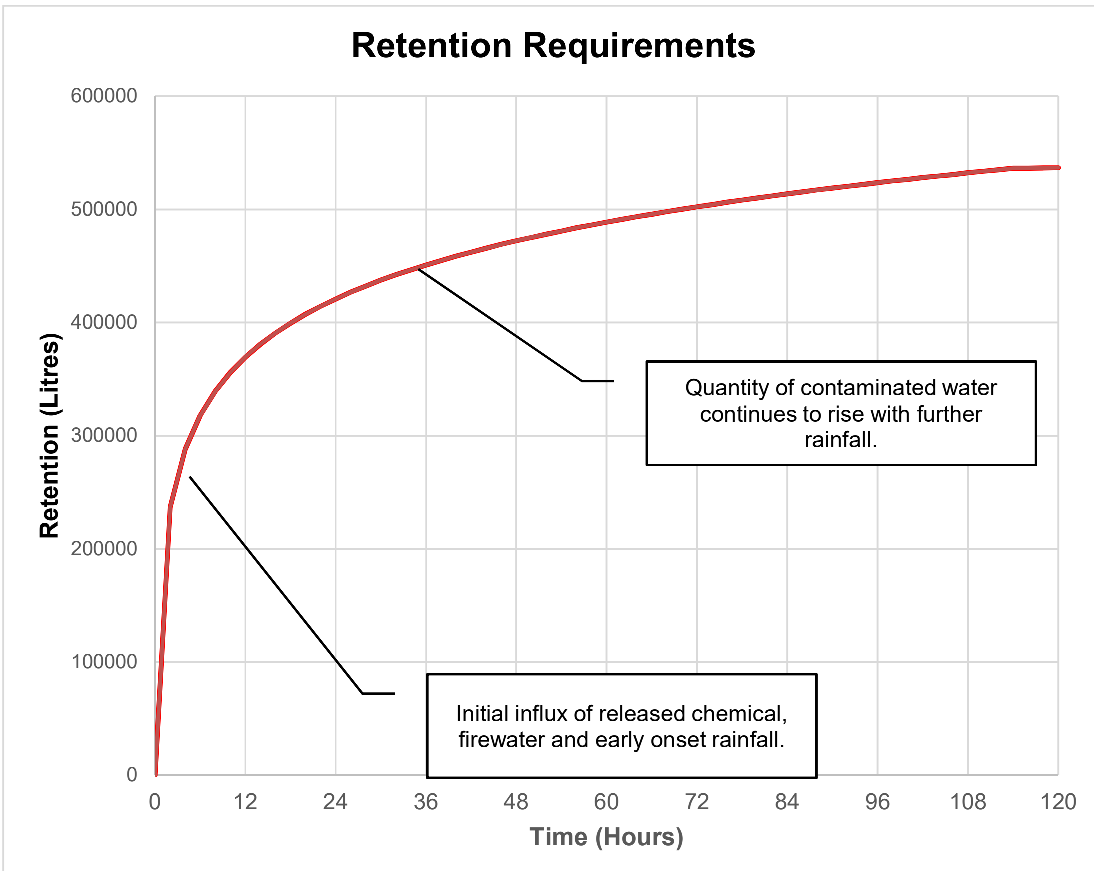
Table 8.2 Contaminated Water Retainment for Outside Hazardous Chemical

Storage Area	25% Released	Firefighting Water	Rainwater/Stormwater collected in Area	Quantity of Contaminated Water
	Litres	Litres	Litres	Litres
A	3,750	18,000	359,756	381,506
B	6,400	36,000	359,756	402,156
C	27,000	108,000	359,756	494,756
D+E+F+G+H	33,000	144,000	359,756	536,756
J	20,400	72,000	359,756	452,156

As Table 8.2 reveals, a retention quantity of 536,756 litres would be required without the use of any other mitigating factors.

The quantity of contaminated water generated is shown in Figure 8.3. The results shown in Figure 8.3 are the results for storage area (D+E+F+G+H). This combined storage area represents the largest quantity of hazardous liquid chemicals stored outside, has the largest release of chemicals, and requires the largest application of firefighting water. Figure 8.3 reveals that there is an initial rapid influx of contaminated water. This is the combination of the hazardous liquid chemical being released, the application of firefighting water and the addition of rainfall. The retention quantity continues to rise over time with additional rainfall.

Figure 8.3 Contaminated Water Quantifies (Storage Area D+E+F+G+H)



8.2.2.3 *Effect of Wastewater Treatment*

The quantity of contaminated water required to be stored with wastewater treatment are shown in Table 8.3

Table 8.3 Retention for Outside Hazardous Chemical Storage (with Wastewater Treatment)

Storage Area	25% Released	Firefighting Water	Peak Quantity of Retention	Comments
	Litres	Litres	Litres	
A	3,750	18,000	210,942	
B	6,400	36,000	231,592	
C	27,000	108,000	324,192	
D+E+F+G+H	33,000	144,000	366,192	Storage Areas have been combined with proximity.
J	20,400	72,000	281,592	

Table 8.3 reveals that retention of 366, 192 litres of contaminated water would be required. This storage of contaminated water can take the form of bunds, grading and storage tanks. The available retention is examined in section 8.2.2.4. The largest retention corresponds to the fire event with the largest storage quantity.

The characteristic contaminated water curve is shown in Figure 8.4. The peak storage requirement occurs within 24 hours of a fire event. The likely composition of the contaminated water from the fire event in storage is shown in Figure 8.5. Figure 8.5 reveals that rainwater/stormwater is the largest component of the contaminated water required for retention.

Figure 8.4 Contaminated Water Retention (with Treatment Plant Operational)

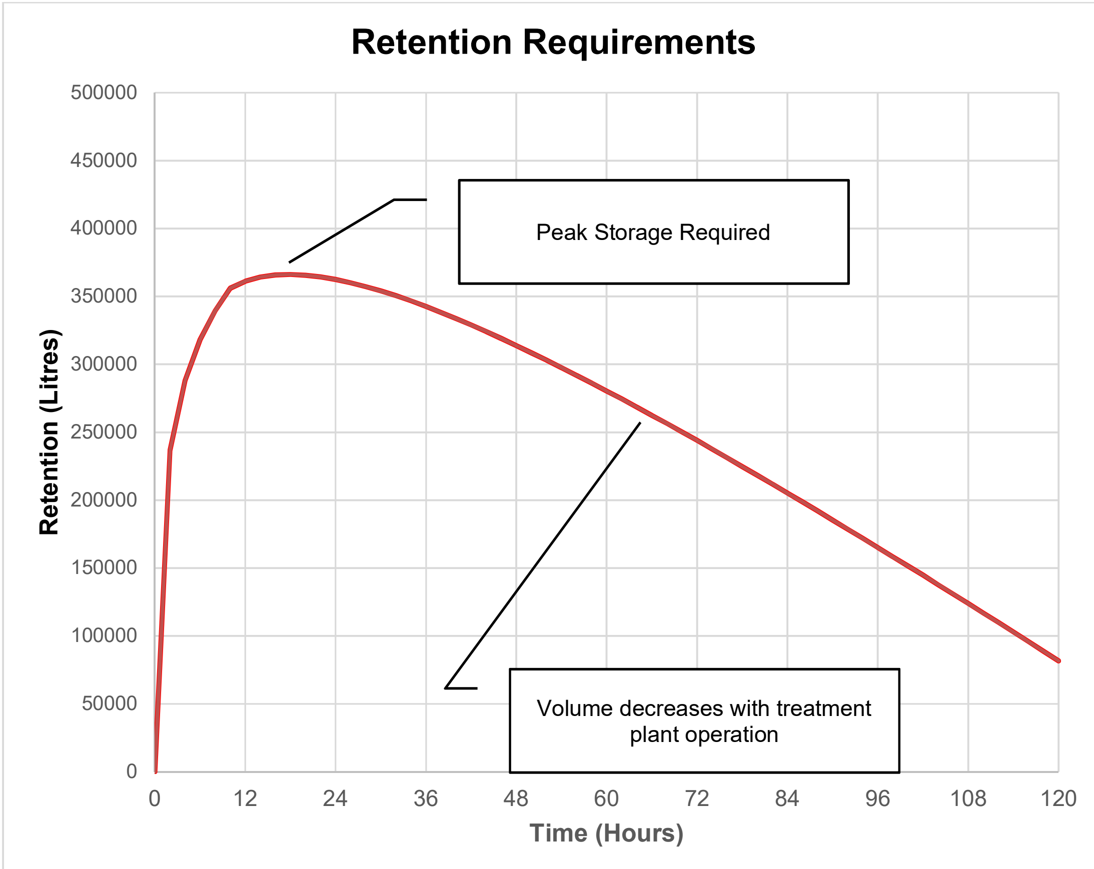
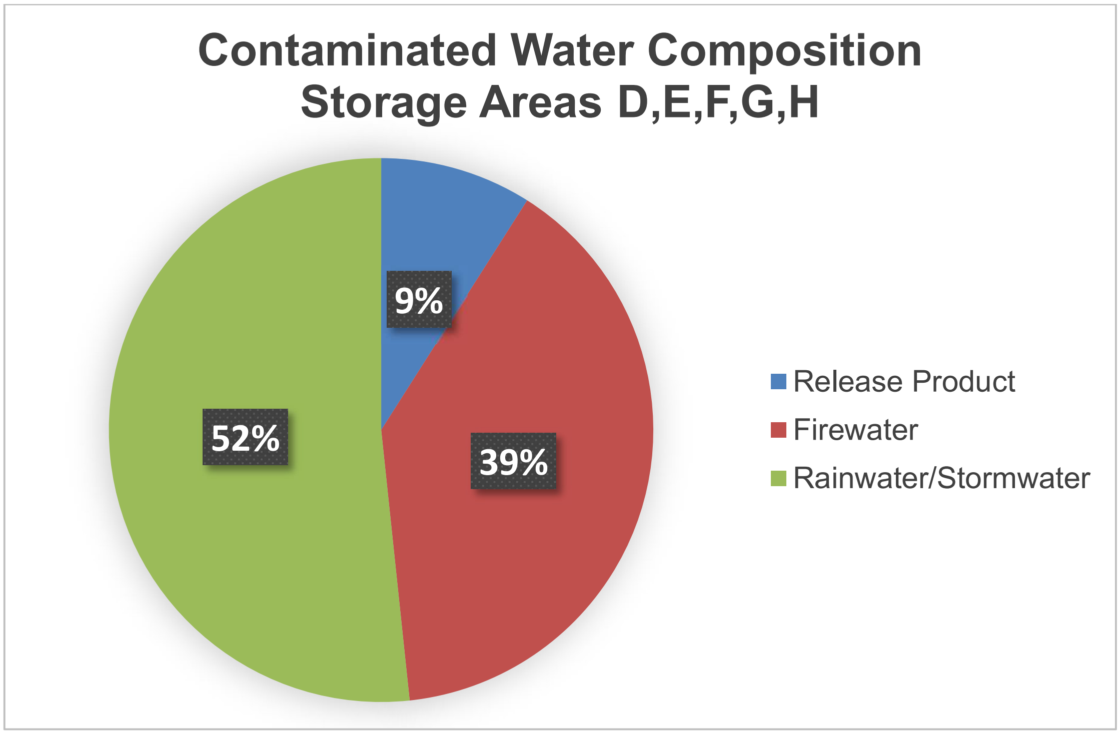


Figure 8.5 Contaminated Water Storage Composition



8.2.2.4 *Presently Available Containment*

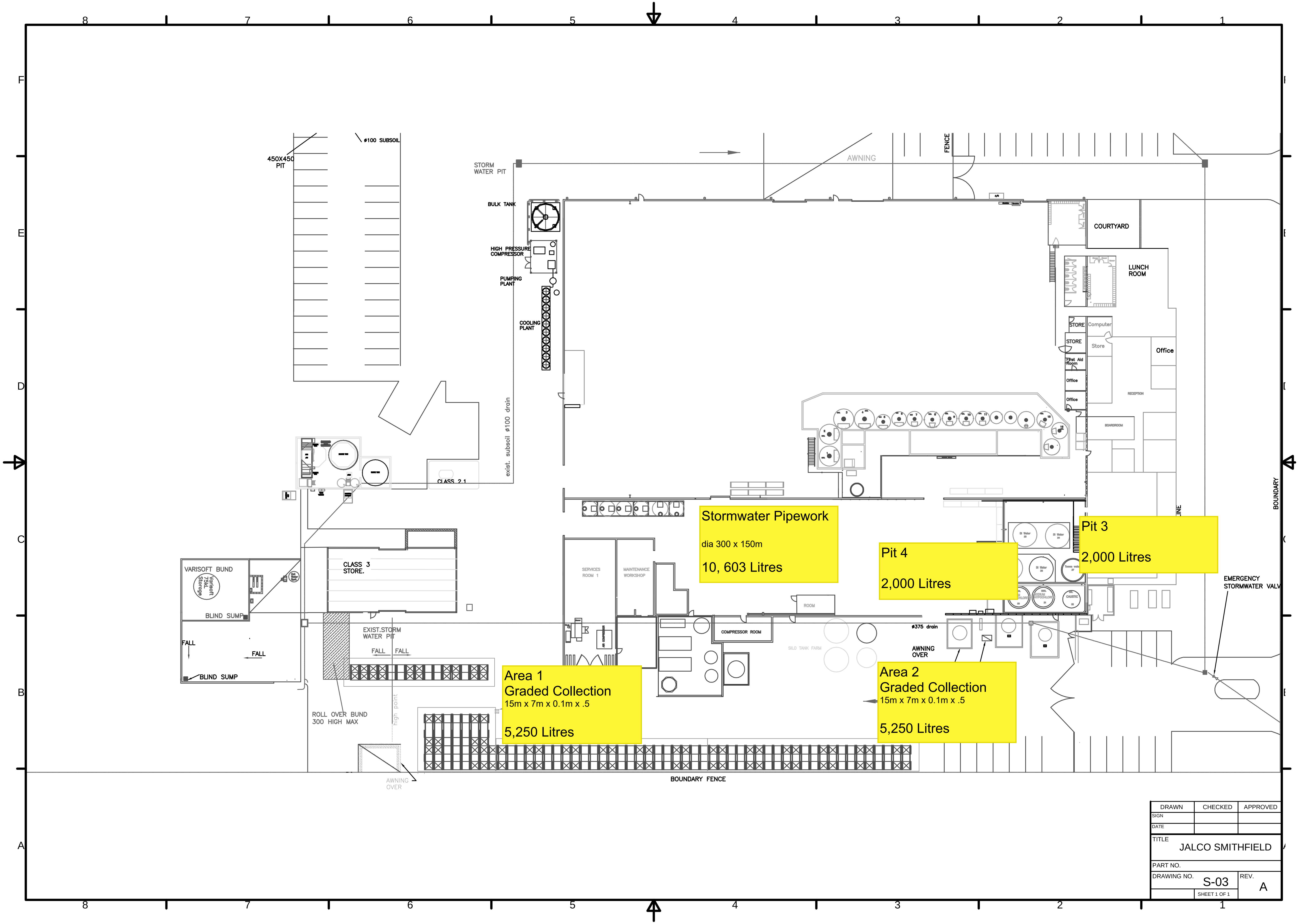
In previous sections, the quantity of retention required for the outside storage of hazardous chemicals has been evaluated. The Jalco site has areas where containment of water could occur. These are described in Table 8.4 and shown in Figure 8.6

Table 8.4 Containment Area

Containment Type	Area	Capacity
Graded Area	Handstand Area 1	5,250 litres
Graded Area	Handstand Area 3	5,250 litres
In Stormwater Pipes	Stormwater Pipework	10,603 litres
Pit 3	Collection pit stormwater	2,000 litres
Pit 4	Collection Pit	2,000 litres

Table 8.4 reveals a potential storage capacity of 25,103 litres. Supplementary capacity is available in the wastewater overflow tank which has a capacity of 20,000 litres. The resultant capacity for the site is 45,103 litres. This capacity is equivalent to an 8.5mm rain event occurring after the fire event. The onsite retention capacity is below the contaminated water retention requirements examined in the previous sections.

Figure 8.6 Containment Areas



450X450 PIT
ø100 SUBSOIL
STORM WATER PIT
AWNING
FENCE
BULK TANK
HIGH PRESSURE COMPRESSOR
PUMPING PLANT
COOLING PLANT
exist. subsoil ø100 drain
CLASS 2.1
COURTYARD
LUNCH ROOM
STORE
Computer
STORE
Store
First Aid Room
Office
Office
Office
Office
RECEPTION
BOARDROOM
BOUNDARY
Stormwater Pipework
dia 300 x 150m
10, 603 Litres
Pit 3
2,000 Litres
Pit 4
2,000 Litres
EMERGENCY STORMWATER VALVE
VARISOFT BUND
Varisoft 75kL Storage
BLIND SUMP
FALL
FALL
BLIND SUMP
CLASS 3 STORE.
SERVICES ROOM 1
MAINTENANCE WORKSHOP
ROOM
EXIST.STORM WATER PIT
FALL
FALL
COMPRESSOR ROOM
SILO TANK FARM
ø375 drain
AWNING OVER
Area 1
Graded Collection
15m x 7m x 0.1m x .5
5,250 Litres
Area 2
Graded Collection
15m x 7m x 0.1m x .5
5,250 Litres
ROLL OVER BUND 300 HIGH MAX
high point
AWNING OVER
BOUNDARY FENCE
DRAWN
CHECKED
APPROVED
SIGN
DATE
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8.3 Contaminated Water Retention Reduction

The reduction of contaminated water from a fire event in the outdoor storage of hazardous liquid chemicals is examined in this section. The potential reduction in contaminated water retention is applied to a fire event in outside storage where storage areas D,E,F,G and H are involved as this event requires the largest retention volume.

The quantity of contaminated water to be retained is described by the following expression:

$$\textbf{Quantity of Contaminated Water} = \text{function}\left(\begin{array}{c}\textbf{Quantity of Material} \\ \textbf{Type of Material,} \\ \textbf{Area Available for Rain Collection}\end{array}\right)$$

8.3.1 Diversion of Roof 2 Rainwater

The roof No.2 presently drains into the stormwater system that connects the hardstand areas where hazardous liquid chemicals are stored. The diversion of this roof's rainwater to tanks for landscaping or piping for separate release to stormwater will reduce the required contaminated water retention. This calculation is shown in Appendix G. Initially, a fire event in storage Areas, D, E, F, G and H requires retention of 366,192 litres. With the roof No.5 not included in the catchment, 313,592 litres of retention are required for the event. A reduction of 14.3% of water retention is achieved.

This reduction in the collection area will impact on the trade waste throughput based on the calculations in section 6 with an annualised rainfall of 902mm the trade waste flow would reduce from 19,515 m^3 to 18,246 m^3. This is a reduction of 6.5% in annual trade waste flows.

8.3.2 Relocation of Hazardous Liquid Chemicals and Area Isolations

The removal of hazardous liquid chemicals from outside storage areas will impact on the total contaminated water retention. The scenario considered is:

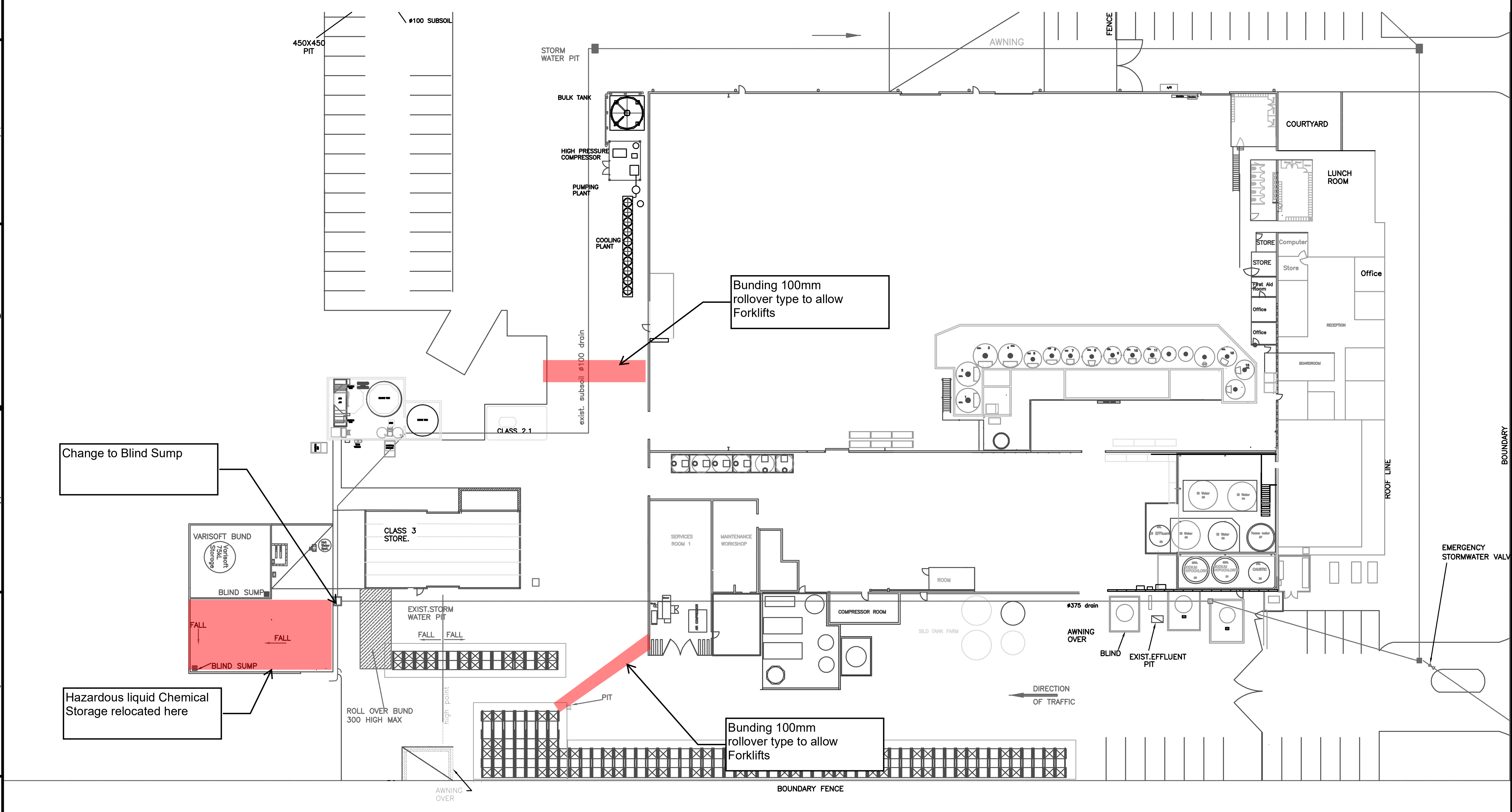
- Storages A, B and C are relocated to Area 6 and surrounds;
- 100mm rises are provided to isolate Handstand Area 4 and Area 5 from other hardstand areas;
- The stormwater pit located at the corner of Area 6 becomes a blind sump; and
- Hardstand Area 1 and hardstand area 3 are used for unloading of materials and are considered as a first flush. The first 15mm are sent for retention with the remainder being discharged to stormwater.

This concept is shown in Figure 8.7. The results are presented Appendix G. Changing storage areas, and isolation of the hazardous liquid chemicals reduce the retention required to 312,198 litres, a reduction of 14.7%.

The combined effect of the diversion of roof No.2 and the changes to storage practices could reduce the on-site retention to 287,313 litres, a reduction of 21.5%

In the scenario developed the requirements for the storage in terms of separation of hazardous goods has not been examined and may render the solution unfeasible.

Figure 8.7 Storage Area Changes



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8.3.3 Site Containment

In section 8.3.2, the relocation of the hazardous liquid chemicals to one (1) location was considered. Containment was made in that area, with other hardstand areas being treated as first flush and roofs being discharged directly to stormwater. Alternatively, the areas where hazardous liquid chemicals are stored can be treated as a capture area with bunding and rollovers being used to prevent material from leaving the site. The largest containment capacity required is presently 366,192 litres. The available bunding area is 3,247 square metres. The bunding would be needed to be 112.7 mm high around the area to contain contaminated water. The area considered is shown in Figure 8.8.

8.3.4 Firefighting

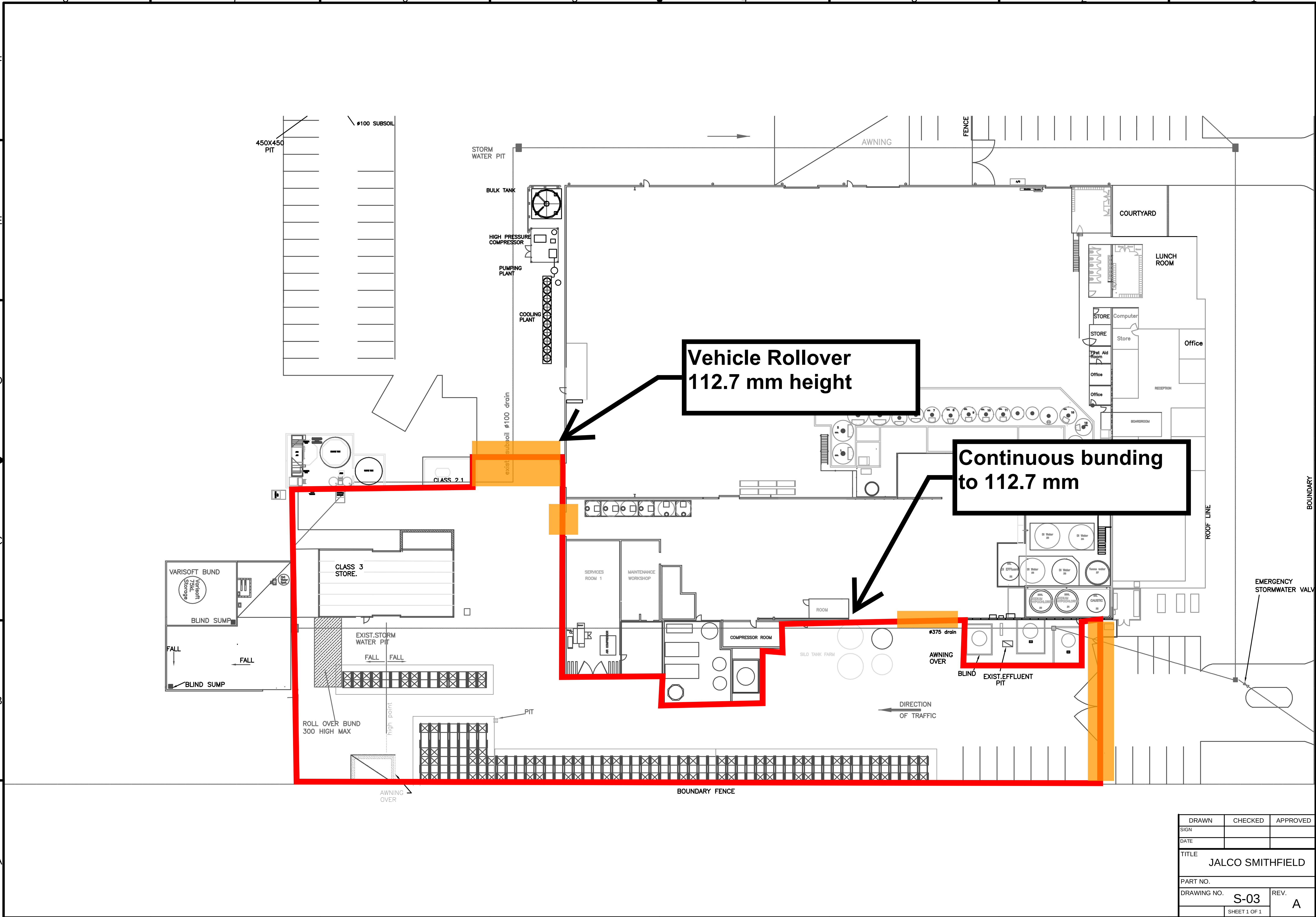
The hazardous liquid chemicals have been identified as being potentially combustible liquids. Combustible liquids provide fuel to the fire event and require large volumes of firefighting water to control and extinguish the fire. The use of foams can significantly reduce the volume of firefighting water required. It could be expected that foam application could reduce the volume of water generated by 50%.

A change in the application of firefighting to a foam could result in a reduction of contaminated water retention to 292,192 litres a reduction of 20.2%.

8.3.5 Hazardous Liquid Chemical Quantities

Raw material management would require a reduction in raw materials on-site, with the bulk of the raw products (in drums and IBCs) to be undertaken off-site. In effect the raw materials in drums and IBCs being received “just in time” with storage not required on the hardstand. This methodology significantly changes the contaminated water retention requirements. The quantity of retention being reduced to 15mm of the rainfall as a “first flush” system. This would require retention of approximately 48,706 litres. Fire events from outdoor storage of hazardous liquid chemicals are no longer considered in the evaluation of contaminated water retention requirements.

Figure 8.8 Site Bunding



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9 Conclusions

9.1 Water Balance

A water balance was conducted for water flows throughout the site. It was found that the significant use of water was in the final product. The second notable use of water was to clean and purge lines and vessels to prevent cross-contamination and for general cleaning of the production area. The water used for cleaning in the production area (process effluent), contributing 70% of the trade waste.

A reduction in cleaning water both for general cleaning and for purging would decrease the process effluent flows. Three (3) potential solutions include:

1. Use of fixed purge amounts to optimise the cleaning water used;
2. Clean in place (CIP) installation to reduce the requirement for manual cleaning; and
3. Counter current cleaning where the last wash portion of the previous wash-down is used as the first part of the next wash-down.

9.2 Rainwater / Stormwater Balance

The water balance revealed a proportion of the trade waste was not from cleaning and purging in the production area. A rainwater/stormwater balance was conducted to identifying the area and pathways that rainwater/stormwater took to exit the site. The rainwater/stormwater collected and sent for treatment at the DAF plant was found to be 30% of trade waste. The rainwater/stormwater balance was used in estimating contaminated water requirements for the outdoor storage of hazardous liquid chemicals.

9.3 Wastewater Treatment Plant

The wastewater treatment plant comprises an equalisation tank for pH control and a DAF unit. The water quality produced by the plant was found to meet the quality parameters established by Sydney Water. The wastewater plant, given the quality performance results, is appropriate for the characteristics of the trade waste produced.

The wastewater plant can process up to 100 m^3 per day of trade waste. At present, 70% of the trade waste comes from cleaning associated with production and 30% from the collection of rainwater/stormwater. The flowrate rate of the treatment plant was found to increase corresponding to any rainfall event.

9.4 Contaminated Water Retention

The storage of hazardous liquid chemicals on hardstands located outside was examined. A cursory audit was undertaken to establish the quantity of hazardous liquid chemicals outside and the location of these chemicals. The maximum retention of contaminated water was found to be 366,192 litres. It was found that 52% of the contaminated water retainment requirements was rainwater/ stormwater.

The following changes were found to reduce the required retention of contaminated water. These included:

- Diversion of rainwater collected on roofs from stormwater collected on hardstands;
- Changes to storage locations, extra bunding and isolation of hardstand areas from a common stormwater system;
- Total site bunding; and
- Use of foam firefighting system

The storage of hazardous liquid chemicals on hardstands located outside will require retention quantities higher than those available at the site at present.

Appendix A Water Balance Assumptions

A.1 Assumptions

The following is estimated using data supplied by Jalco.

1. Flow to toilets and Urinals evaluated at 1,606,000 litres per year. This is based on 220 people, using twice per day at 10 litres per use. For estimation 365 days is used;
2. Flow to showers evaluated at 2,409,000 litres per year. This is based on 165 people, using one per day at 40 litres per use. For estimation 365 days is used;
3. General cleaning estimated at 1.124,200 litres per year. This is based on 165 people, using one per day at 40 litres per use. For estimation 365 days is used;
4. Laboratory and service estimated at 562,100 litres per year. This is based on 50% of the general cleaning;
5. Drinking water estimated at 160,600 litres per year. This is based on 220 people, drinking 2 litres per day. For estimation 365 days is used;
6. Water in the product estimated at 51,964,300 per year. This is 85% of 285 tonnes daily production for 250 days.
7. Boiler blowdown estimated at 10,000 litres. This is based on 50 litres per day, 2 units over 100 days;
8. DI water used in regeneration is 1% of the town's water metered less water evaluated to amenities;
9. Steam produced estimated at 3,869, 000 litres per year. This is based on 14,600 litres at 250 days with 15% overhead.
10. Vessel cleaning estimated to be 9,022,164 litres per year. This is based on 85% of towns water not to amenities or in a product less water to boiler blowdown, DI regeneration and steam production;
11. Washdown cleaning estimated to be 1,593,147 litres per year. This is based on 15% of towns water not to amenities or in a product less water to boiler blowdown, DI regeneration and steam production;
12. Wasted product estimated to be 300,000 litres per year. This is based on 4% of a 30,000-litre trade waste flow. This could include raw materials and finished products.

Appendix B Water Audit

Water Audit

Project Number		19004	
Date		23rd May 2019	
Company		Jalco - Smithfield	
Location		Woodpark Road	
File Reference		19004-202 (R1)	

Water Input to Site			
Primary Water Source		Sydney Water	
Secondary Water Source		N/A	
Water Usage (Billed) last 12 Months 9mths + 3 estimated	2019	74,036,000	litres / year
Water Usage (Billed) previous 12-24 Months (07/17 - 06/18)	2018	71,763,000	litres / year
Water Usage (Billed) previous 25-36 Months (07/16 - 06/17)	2017	50,159,000	litres / year
Water Meter 1 Reading			litres
Water Meter 1 Location		Front door to office	
Water Meter 2 Reading			litres
Water Meter 2 Location			
Water Meter 3 Reading			litres
Water Meter 3 Location			

Water output From Site			
Trade waste metered last 12 Months (6mths + 6 estimated)		20,058,000	litres / year
Trade waste metered previous 12-24 Months (07/17 - -6/18)		21,039,000	litres / year
Trade waste metered previous 24-36 Months (07/16 - 06/17)		14,672,000	litres / year
Sewer (excluding trade waste) metered last 12 Months		5,628,000	litres / year
Sewer (excluding trade waste) metered previous 12-24 Months		5,592,000	litres / year
Sewer (excluding trade waste) metered previous 24-36 Months		6,416,000	litres / year

Manufacturing Water Usage			
Water Added to Product (per annum) 250t x 250 days x 85%		53,125,000	litres / year
Water for Vessel Cleaning (per annum) 250 x 250 x 40%		15,200,000	litres / year
Water used for wash area downs (per annum)		inc	litres / year
Water used for cooling (per annum)		nil	litres / year
Water used in Cooling Towers (per annum)		nil	litres / year
Water used in Boilers (per annum) 14600lts x 250 + (14600 x 15% x 100)		3,869,000	litres / year

Water Audit

Project Number		19004
Date		23rd May 2019
Company		Jalco - Smithfield
Location		Woodpark Road
File Reference		19004-202 (R1)

Facility Water Usage			
Number of Employees per day		220	per day
Number of Toliets on Site		15	
Toilet flush water (per annum) 5 lts x 220 x 250days		275,000	litres / year
Urinals on Site		3	
Urinal flush water (per annum) 2lts x 3times x (220x30%) x 250days		99,000	litres / year
Sink on Site		14	
Sink water (per annum) 2lts x 440 x 250		220,000	litres / year
Shower on site		6	
Shower water (per annum) 9lts x 11 times x 250 days		24,750	litres / year
Dishwater on site		2	
Dishwasher water (per annum) 2 x 70lts x 250 days		35,000	litres / year
Drinking water per annum 2lts x 220 x 250 days		110,000	litres / year
Landscaping water usage (per annum)		nil	litres / year

Tradewaste Sources			
Water for Vessel Cleaning (per annum)		15,200,000	litres / year
Water used for wash area downs (per annum)		inc above	litres / year
Water from Once-through Cooling (per annum)		nil	litres / year
Water from Cooling Tower blowdown (per annum)		nil	litres / year
Water from Bolier Blowdown (per annum) 50lts x 2 units x 100 days		10,000	litres / year
Water from Air compressor Blowdown (per annum) 20lts x 250 days		5,000	litres / year
Spillage of Product (per annum)			litres / year

Appendix C Daily Rainfall

Table. C.1 Rainfall Data (last 12 Months)

	2018							2019					
	Jun	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
1st	0	0	0	1.8	0	0	0	7.4	0.8	**0**	0	0	0
2nd	0	0.2	0	1.6	0	0	0	0	8.2	0	0	0	0
3rd	0	4	0	0.4	0.2	6.2	0	0	2	0	0.2	0	0.2
4th	0	0.2	0	12.8	3.6	0	0	0	0	0	0.2	6.4	18.6
5th	0	0.2	0	0.2	50.6	0	1	0	0	0	5.2	0	4.6
6th	23.6	0.2	0.2	1	4	0.2	2.4	29.6	0	0	2.8	0	1.4
7th	11	0	1.8	4.6	1.8	0	0.2	**0**	0	0	0.2	0	
8th	0	0	0	67	2	17.6	0	**0.4**	0	0	0.2	0	
9th	7.2	0	0	1	0.2	0	0	6.2	21	0	0	0	
10th	1.8	0	0	0.2	0.2	0	0	0	0	1.8	0	0	
11th	0	0	0	0	12	0	0.2	1.4	0	0	0	0	
12th	0.2	0	0	0	15.6	0	0	7.2	0	0	0	0	
13th	0.4	0	0	0	4	0	2.4	0	0	0.2	0	0	
14th	0.2	0	0	0	32.8	0	28.8	0	0	0.4	0	0	
15th	0	0	0	0.2	2	0.2	7.6	0	0	41.2	**0**	0	
16th	0	0	0	0	3.6	0	24.8	0.2	0	7.6	**0**	0	
17th	0	0	0	0	0.6	0	0	0	0	34.8	0	0	
18th	0	0	0	0	28.4	0.4	0	0	0	37.8	0.2	0	

	2018							2019					
	Jun	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
19th	5	0	0	0	14.4	0	0	0	0.2	1.8	0	0	
20th	11	0	0	0.4	0	0	8.8	0	4	0.4	0	0	
21st	0.6	0	0.2	0	9	0	34.2	1.8	1.6	0.4	0	0	
22nd	0.4	0	0	0	0	1.6	3.6	7	6	4.2	0	0	
23rd	0.2	0	0	0	0	0	0.6	0	0.2	0.2	0	0	
24th	0	0	4.4	0	0	0	0.2	0	1.2	**0.4**	0.2	0	
25th	0	0	0.2	0	0	0	0	0	1	**5.6**	0	0	
26th	0	0	0.4	3	0	0	0	0	0	**0.2**	0	0	
27th	0.2	0	1.6	0.2	0	0	0	0	0	0.2	0	0	
28th	2.4	0	0	0	0	12.6	0	36.6	**0**	0	0	0	
29th	7	0.2	0	0	0	32	0	0		0	0	0	
30th	0	0	0	0	0	2	0	0		53.2	0.2	0	
31st		0	0		0		0	0		0.2		0	

Appendix D Rainfall Estimation

D.1 Rainfall Over Time

The rainfall used for the analysis is the 95th percentile for North Paramatta available in Managing Urban Stormwater – Soil and Construction (Volume 1), 2004, 4th edition. For a five-day rain event, the rainfall is 74.1 mm.

The quantity of rainfall is estimated over the 5-day period by using the exceedance per year (EY) extracted from the Bureau of Meteorology. The average of 6EY, 4EY, 3EY, 2EY, and 1EY was taken for 6, 12, 24, 48,72, 96 and 120 hours. The final result of 74.1mm after 5 days was then assigned for the average EY at 120 hours. Intervals before 120 hours were taken as the proportion. The results are shown in Figure. D.1

Figure. D.1 Rainfall (mm) against Time. (hours)

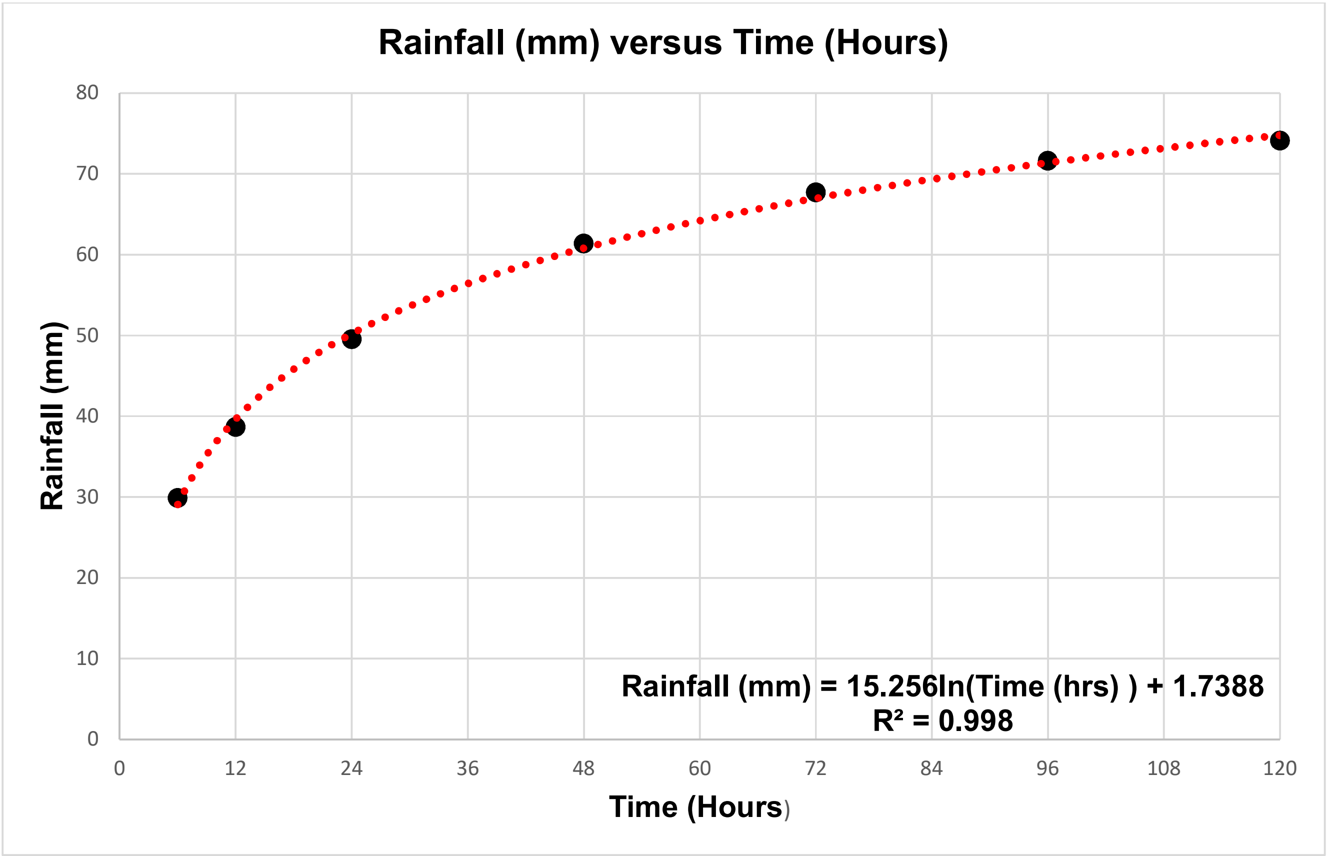


Table 6.3a 75th, 80th, 85th, 90th and 95th-percentile 2 and 5-day rainfall depths for 59 sites in New South Wales

Location	2-day rainfall depths (mm)					5-day rainfall depths (mm)				
	75th %ile	80th %ile	85th %ile	90th %ile	95th %ile	75th %ile	80th %ile	85th %ile	90th %ile	95th %ile
North Coast										
Coffs Harbour	18.3	23.6	31.8	44.4	70.8	33.6	42.7	55.8	74.9	117.6
Dorrigo	22.1	27.9	36.4	49.0	77.0	40.3	49.3	63.7	84.8	132.0
Grafton	14.0	17.8	22.9	31.2	48.9	23.3	29.0	37.2	50.1	75.4
Lismore	16.3	20.6	26.4	36.3	57.0	28.6	35.3	45.2	60.2	95.3
Port Macquarie	18.0	22.9	29.8	41.4	65.3	32.0	40.1	51.8	70.0	106.2
Taree	15.0	19.0	24.9	35.5	56.4	25.0	31.7	41.2	55.9	90.6
Tweed Heads	23.4	29.5	37.6	50.8	78.7	39.6	48.5	62.5	82.5	126.8
Central Coast/Hunter										
Cessnock	13.4	16.5	21.1	28.5	45.0	20.3	24.4	31.0	42.8	63.0
Gosford (Narara)	16.7	21.3	28.4	39.8	63.0	27.9	35.0	45.8	62.2	99.3
Nelson Bay	17.5	22.3	28.9	39.4	58.9	30.4	38.1	48.3	63.5	91.5
Newcastle	13.7	17.6	23.0	31.8	48.1	24.4	30.5	38.9	51.8	76.7
Scone	12.4	15.3	19.3	25.0	37.8	19.0	22.6	27.7	35.9	51.3
Wyong	16.8	20.8	26.9	37.2	58.8	26.8	33.8	43.2	58.7	90.1
Sydney/Blue Mountains										
Bankstown	11.4	14.5	19.6	27.0	42.0	19.4	24.4	31.5	42.6	66.6
Blacktown	12.0	15.0	20.3	28.0	43.6	19.0	24.6	32.2	43.2	70.8
Camden	13.6	16.8	21.6	29.2	44.8	20.2	25.1	32.0	43.4	66.3
Campbelltown	12.2	15.2	19.0	26.9	42.1	19.3	23.9	30.6	43.2	63.3
Hornsby	15.7	20.6	27.4	38.1	61.0	25.9	32.8	43.3	60.0	92.5
Katoomba	16.5	20.6	26.7	37.6	60.2	28.0	35.2	45.4	63.0	99.6
Lithgow	11.4	14.0	18.3	24.2	35.3	19.5	23.6	29.4	37.8	56.4
Liverpool	12.2	15.5	20.0	28.4	43.2	19.2	24.4	32.2	43.8	70.2
Mona Vale	19.0	23.6	29.2	38.7	62.0	29.0	35.2	44.0	61.2	92.0
Mosman	15.2	19.3	25.4	35.8	57.7	26.2	32.9	43.2	59.6	91.5
Parramatta North	11.7	15.2	20.6	28.2	45.5	20.3	25.8	33.1	45.8	74.1
Penrith	14.0	18.2	23.6	31.5	49.5	21.8	27.4	35.0	47.6	74.6
Richmond	10.2	13.5	18.0	24.9	39.2	17.5	22.4	29.5	39.7	61.4
Ryde	14.7	18.3	24.9	34.3	53.5	23.4	29.5	38.8	53.6	80.5
Springwood	15.5	20.1	25.9	35.0	55.6	25.2	31.4	40.4	55.0	84.1
Sutherland	15.0	18.8	24.9	34.8	55.0	23.4	29.7	38.9	54.6	85.1
Sydney 12.7		16.6	22.4	31.6	52.1	23.3	29.7	38.8	55.2	84.3
Wallacia	14.0	17.8	23.0	31.4	48.8	22.1	27.6	36.6	48.8	76.2
Wilberforce	11.4	14.9	19.8	27.7	46.4	19.8	24.6	33.2	46.7	69.4
Illawarra/South Coast										
Albion Park	16.5	21.1	27.9	39.1	67.4	25.2	31.8	41.9	59.8	101.2
Batemans Bay	13.7	17.8	24.1	34.2	54.9	22.1	28.0	37.4	52.4	84.4
Bega	12.6	16.1	21.3	30.5	51.1	19.5	24.6	32.5	46.2	77.2
Cooma	7.6	9.8	13.0	17.8	27.2	12.5	15.8	20.0	25.8	39.1
Helensburgh	23.1	28.7	38.1	53.0	81.3	35.6	45.0	57.4	78.2	124.6
Kiama	14.7	19.1	24.9	35.5	57.2	25.5	32.2	42.1	58.3	90.7
Kangaroo Valley	16.8	21.4	29.2	41.7	70.6	26.8	34.2	45.7	67.0	115.6
Mittagong	14.7	18.3	23.4	31.8	49.1	22.9	28.0	36.2	49.0	75.2
Robertson	15.8	20.3	27.9	38.2	67.3	28.4	36.0	46.1	67.3	113.0
Wollongong	13.8	18.0	24.8	36.6	61.3	25.4	33.0	43.5	60.8	95.6
Northern Tablelands and Northwestern Slopes										
Armidale	12.4	15.2	19.3	25.0	35.3	19.8	24.1	29.2	37.4	52.9
Gunnedah	14.2	17.3	21.3	27.7	39.2	20.0	24.1	30.2	38.4	53.0
Tamworth	15.2	18.3	22.2	27.7	39.6	21.6	25.2	30.8	39.2	54.2
Tenterfield	18.8	22.3	26.7	33.8	46.0	26.7	31.4	38.1	47.4	63.3
Central Tablelands and Central Western Slopes										
Bathurst	10.7	13.2	16.5	21.4	30.4	16.8	20.6	24.9	31.4	43.7
Cowra	12.0	14.7	18.0	22.9	32.8	18.1	21.6	26.1	32.5	44.9
Dubbo	12.7	16.0	20.2	26.1	36.0	18.8	22.8	28.4	35.6	50.7
Southern Tablelands and Southwestern Slopes										
Albury	11.8	14.4	17.4	22.4	31.6	20.0	23.7	28.4	35.2	45.2
Goulburn	7.8	10.0	13.2	18.0	27.4	14.2	17.8	22.2	28.6	40.8
Jindabyne	11.9	14.2	17.3	22.6	33.4	17.3	20.6	24.9	32.0	46.8
Queanbeyan	12.7	15.2	18.8	24.2	34.3	18.0	21.3	25.8	33.0	45.1
Wagga	9.2	11.4	14.4	19.3	27.6	15.6	18.8	23.4	29.4	40.2
Northwestern, Southwestern and Far Western Plains										
Bourke	11.7	14.6	18.3	24.8	35.6	15.3	19.0	23.9	30.9	44.5
Broken Hill	7.1	9.1	12.0	16.8	25.9	9.7	12.2	16.2	21.6	33.0
Griffith	9.5	11.7	14.0	18.5	26.2	13.8	16.4	20.6	25.4	34.6
Moree	12.6	15.8	19.3	25.1	36.8	18.0	21.9	26.8	36.3	51.4
Nyngan	12.2	15.2	19.1	25.6	37.3	16.5	20.4	25.8	33.8	47.8

Appendix E Trade Waste Data

Table. E.1 Trade Waste Data (last 12 Months)

	2018							2019				
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1st	100	0	60	50	0	28	50	0	30	45	152	50
2nd	50	50	80	0	50	100	0	20	60	0	52	50
3rd	0	50	60	50	50	102	30	30	0	0	49	81
4th	50	100	50	52	50	0	80	50	60	65	50	49
5th	60	100	0	68	90	100	90	0	60	60	50	70
6th	100	60	50	50	100	90	90	0	60	30	50	50
7th	100	100	50	50	0	50	90	30	29	50	0	28
8th	50	0	35	50	100	50	90	60	61	40	45	72
9th	50	100	55	0	100	50	0	50	60	20	50	60
10th	0	60	50	50	100	100	90	60	0	0	100	50
11th	50	50	50	50	100	0	90	60	60	50	65	0
12th	50	100	0	50	100	80	90	0	70	60	65	0
13th	50	50	50	50	100	50	90	0	60	60	0	60
14th	61	60	50	50	0	70	90	50	60	60	0	50
15th	49	0	50	50	100	60	90	70	40	60	30	60
16th	50	100	50	0	100	60	0	70	50	60	100	70
17th	0	50	50	50	100	100	90	70	0	60	60	60
18th	80	50	0	40	100	0	90	60	50	102	80	0

	2018							2019				
	Jun	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**
19th	70	50	0	50	100	100	90	70	60	69	0	0
20th	70	50	50	50	100	60	90	0	40	54	0	70
21st	70	50	50	50	0	60	60	60	60	59	0	50
22nd	70	0	50	40	100	50	0	60	50	50	0	70
23rd	50	100	100	0	50	100	50	60	50	60	90	50
24th	0	60	50	50	50	90	0	60	0	0	50	60
25th	60	100	0	50	50	0	0	60	60	56	0	0
26th	100	100	0	50	50	60	0	60	60	60	50	0
27th	80	100	50	60	50	60	60	0	60	60	0	0
28th	30	50	50	80	0	60	50	60	60	60	0	70
29th	50	0	28	0	100	50	0	60		60	50	30
30th	0	29	72	0	100	50	0	60		60	60	80
31st		51	50		100		50	60		52		60

Appendix F Estimation of Firefighting Water

F.1 Estimation of Firefighting Water

The estimation of the firefighting water effects the quantity of contaminated water produced in a hazardous incident. Firefighting water required is based on the quantity of material released and the type of material. The outside storage of hazardous liquid chemicals involves the storage of potentially combustible liquids. A combustible liquid requires more firefighting water than a non-combustible liquid. A combustible liquid contributes to the size and duration of a fire. The estimation of firefighting water is described in Table. F.1. The estimations are given in Table. F.1 assume a hydrant hose can deliver 600 litres per minute.

Table. F.1 Firefighting Water Used

Type of Material Involved	Size of Storage (litres)	Application Rate	Volume Firefighting Water Produced (litres)
Combustible Liquids	0-20,000	One (1) hydrant hose for 30 minutes	18,000
Combustible Liquids	20,000-40,000	One (1) hydrant hose for 60 minutes	36,000
Combustible Liquids	40,000-60,000	One (1) hydrant hose for 120 minutes	72,000
Combustible Liquids	60,000-80,000	Two (2) hydrant hose for 60 minutes	72,000
Combustible Liquids	80,000-120,000	Two (2) hydrant hose for 90 minutes	108,000
Combustible Liquids	120,000-160,000	Two (2) hydrant hose for 120 minutes	144,000
Combustible Liquids	>160,000	As required	

Appendix G Estimation of Contaminated Water

G.1 Estimation of Contaminated Water

This section contains the calculation of the contaminated water generated after a fire event in the outdoor storage of hazardous liquid chemicals. The following assumptions have been used in the calculation. These assumptions include:

- The rainfall is based on 2 hourly estimates calculated in Appendix D;
- Wastewater plant does not operate for 12 hours after the initial incident. Early operation of the wastewater plant will reduce the required retention of contaminated water;
- The wastewater plant operates at 100 m^3/day. Higher rates may be possible from the wastewater plant. Higher rates are not considered in the modelling undertaken.

Secondary Containment
Fire Storage D+E+F+G+H

Scenario		Storage D+E+F+G+H Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 4
Event		Fire
File Reference		19004-364

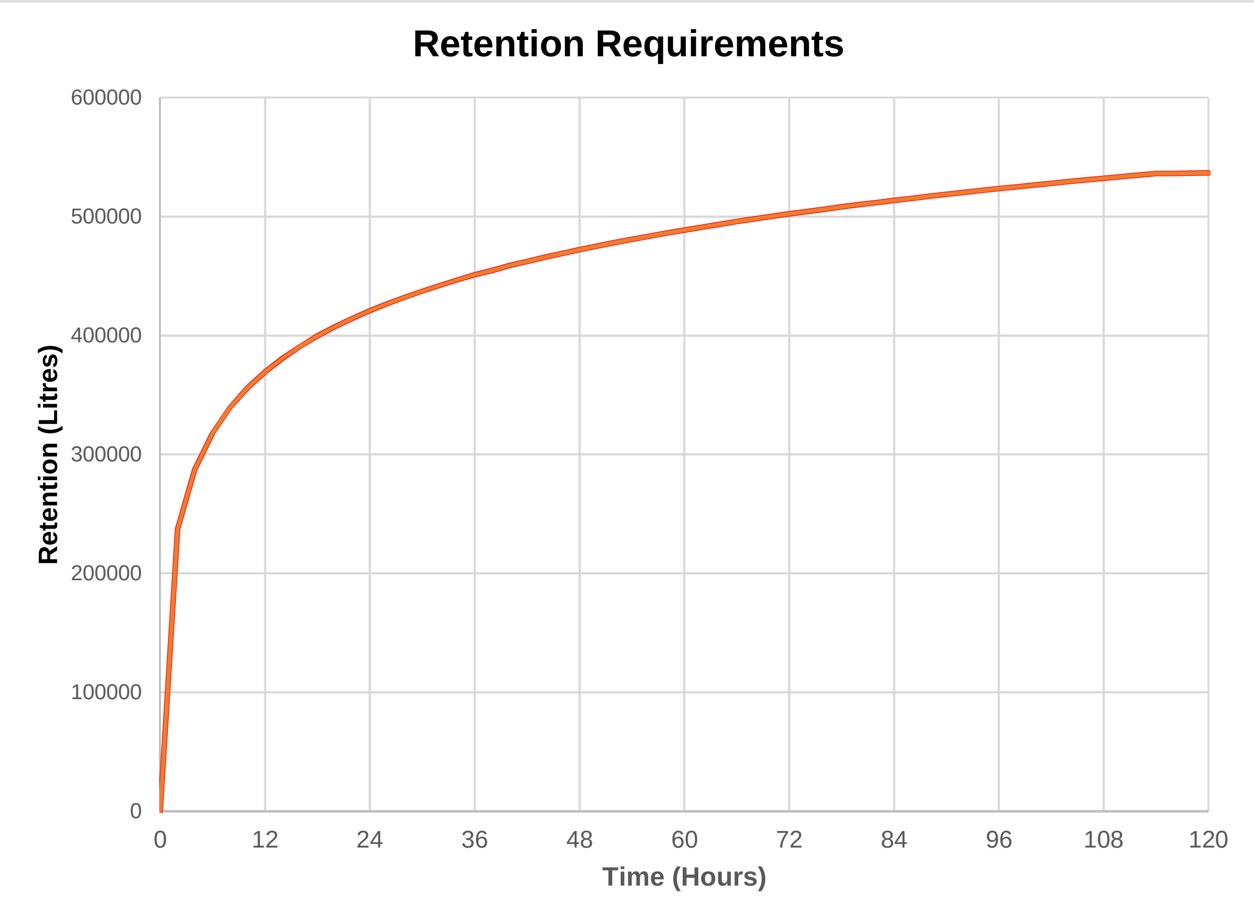
Material Being Stored			
Material Being Stored		Class 9	
		Class 8	
Volume of Materials being stored	**1**	21600	Litres
	2	9600	Litres
	3	16000	Litres
	4	40000	Litres
	5	44800	Litres
25% of Volume Release	**A**	33000	Litres
Firefighting Water			
Basis: 2 Hydrants @ 600 litres per minute for 120 minutes			
Firefighting Water	**B**	144000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1	**1**	1128	m^2
Hardstand Area 3	**2**	1048	m^2
Hardstand Area 4	**3**	270	m^2
Hardstand Area 5	**4**	682	m^2
Hardstand Area 8	**5**	119	m^2
Roof 2	**6**	1407	m^2
Roof 5	**7**	201	m^2
Total Surface Area	**C**	4855	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		536756	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		536756	Litres
Area Required for Bunding 100mm		5368	m^2

Secondary Containment
Fire Storage D+E+F+G+H

Scenario		Storage D+E+F+G+H Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 4
Event		Fire
File Reference		19004-364



Comments
The scenario considered is a fire in storage area D+E+F+G+H and around Hardstand Area 4.
Storage areas are close together and fire propagation likelihood is high. Areas are combined
Interconnection between hardstand areas by stormwater.
Area 2, Area 6 and Area 7 are bunded areas and are assumed not to be pumped out after the event.
Tradewaste System is not operated to reduce the quantity of retention
Situation July 2019

Secondary Containment
Fire Storage A

Scenario		Storage A Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 1
Event		Fire
File Reference		19004-301

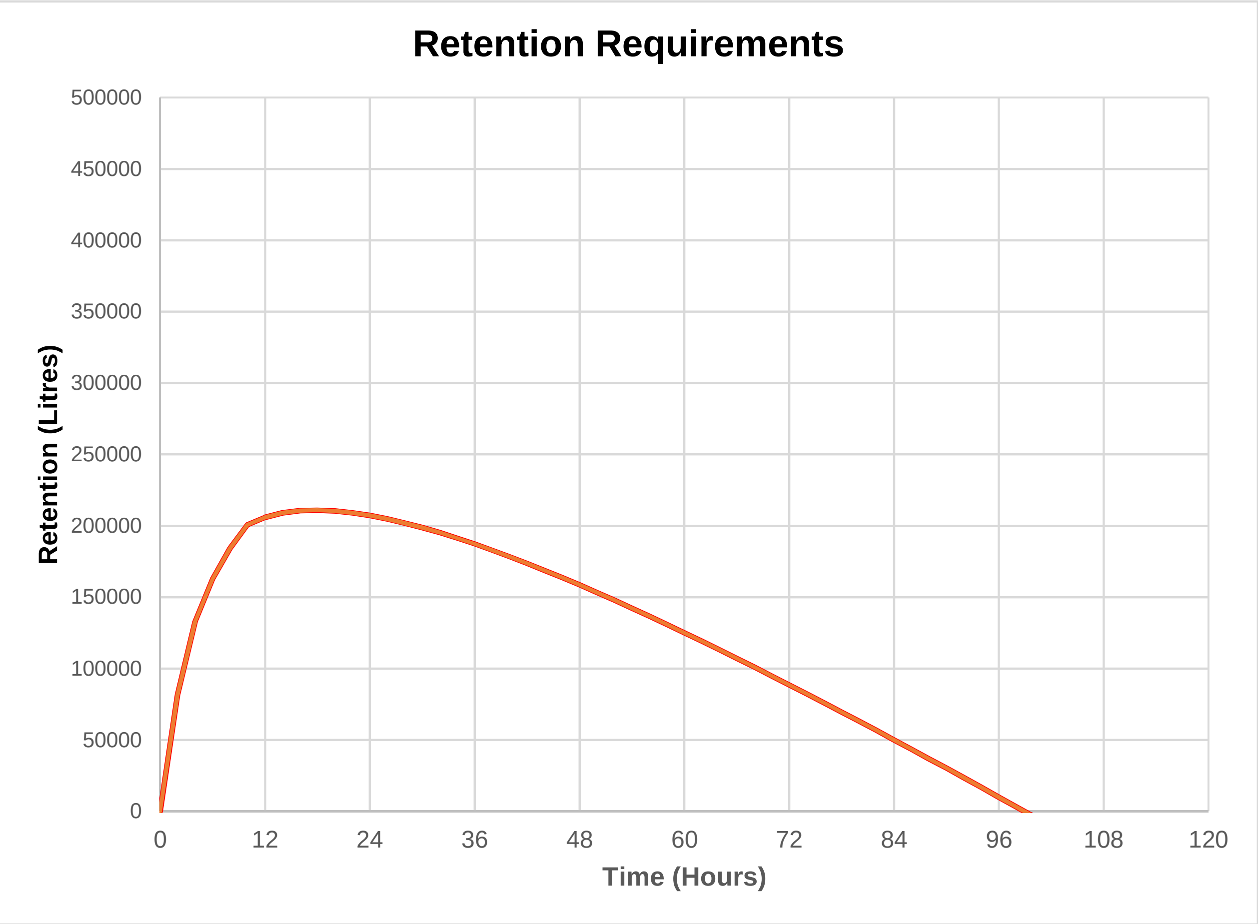
Material Being Stored			
Material Being Stored		Class 9	
Volume of Materials being stored	**1**	15000	Litres
	2		Litres
	3		Litres
	4		Litres
	5		Litres
25% of Volume Release	**A**	3750	Litres
Firefighting Water			
Basis: 1 Hydrants @ 600 litres per minute for 30 minutes			
Firefighting Water	**B**	18000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1	**1**	1128	m^2
Hardstand Area 3	**2**	1048	m^2
Hardstand Area 4	**3**	270	m^2
Hardstand Area 5	**4**	682	m^2
Hardstand Area 8	**5**	119	m^2
Roof 2	**6**	1407	m^2
Roof 5	**7**	201	m^2
Total Surface Area	**C**	4855	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		210942	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		214692	Litres
Area Required for Bunding 100mm		2109	m^2

Secondary Containment
Fire Storage A

Scenario		Storage A Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 1
Event		Fire
File Reference		19004-301



Comments
The scenario considered is a fire in Storage A and around Hardstand Area 1.
Interconnection between hardstand areas by stormwater.
Area 2, Area 6 and Area 7 are bunded areas and are assumed not to be pumped out after the event.
Trade Waste System is operated
Situation July 2019

Secondary Containment
Fire Storage B

Scenario		Storage B Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 1
Event		Fire
File Reference		19004-302

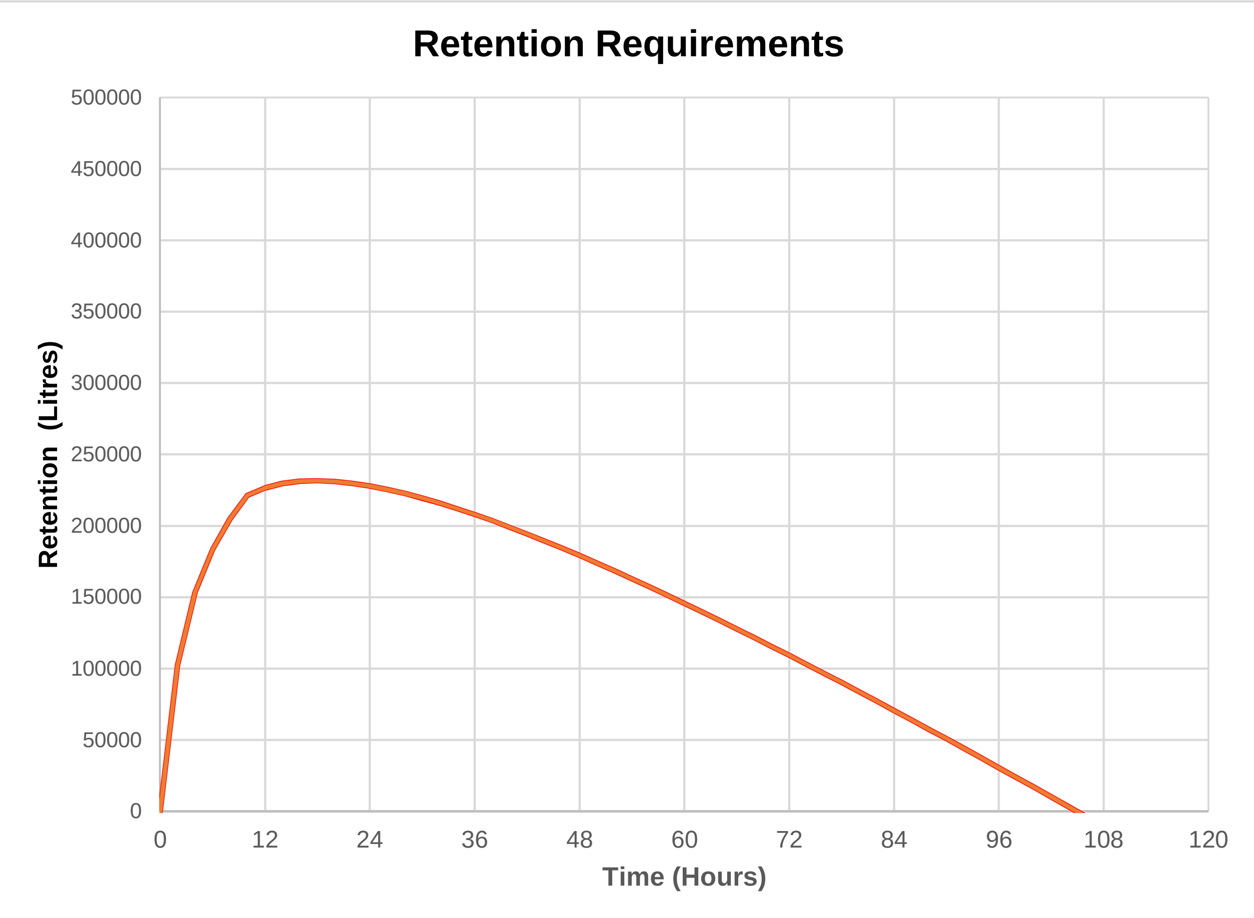
Material Being Stored			
Material Being Stored		Class 9	
		Class 8	
Volume of Materials being stored	**1**	12800	Litres
	2	12800	Litres
	3		Litres
	4		Litres
	5		Litres
25% of Volume Release	**A**	6400	Litres
Firefighting Water			
Basis: 1 Hydrants @ 600 litres per minute for 60 minutes			
Firefighting Water	**B**	36000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1	**1**	1128	m^2
Hardstand Area 3	**2**	1048	m^2
Hardstand Area 4	**3**	270	m^2
Hardstand Area 5	**4**	682	m^2
Hardstand Area 8	**5**	119	m^2
Roof 2	**6**	1407	m^2
Roof 5	**7**	201	m^2
Total Surface Area	**C**	4855	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		231592	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		235342	Litres
Area Required for Bunding 100mm		2316	m^2

Secondary Containment
Fire Storage B

Scenario		Storage B Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 1
Event		Fire
File Reference		19004-302



Comments
The scenario considered is a fire in Storage B and around Hardstand Area 1.
Interconnection between hardstand areas by stormwater.
Area 2, Area 6 and Area 7 are bunded areas and are assumed not to be pumped out after the event.
Trade Waste System is operated
Situation July 2019

Secondary Containment
Fire Storage C

MM
MOORE MANAGEMENT

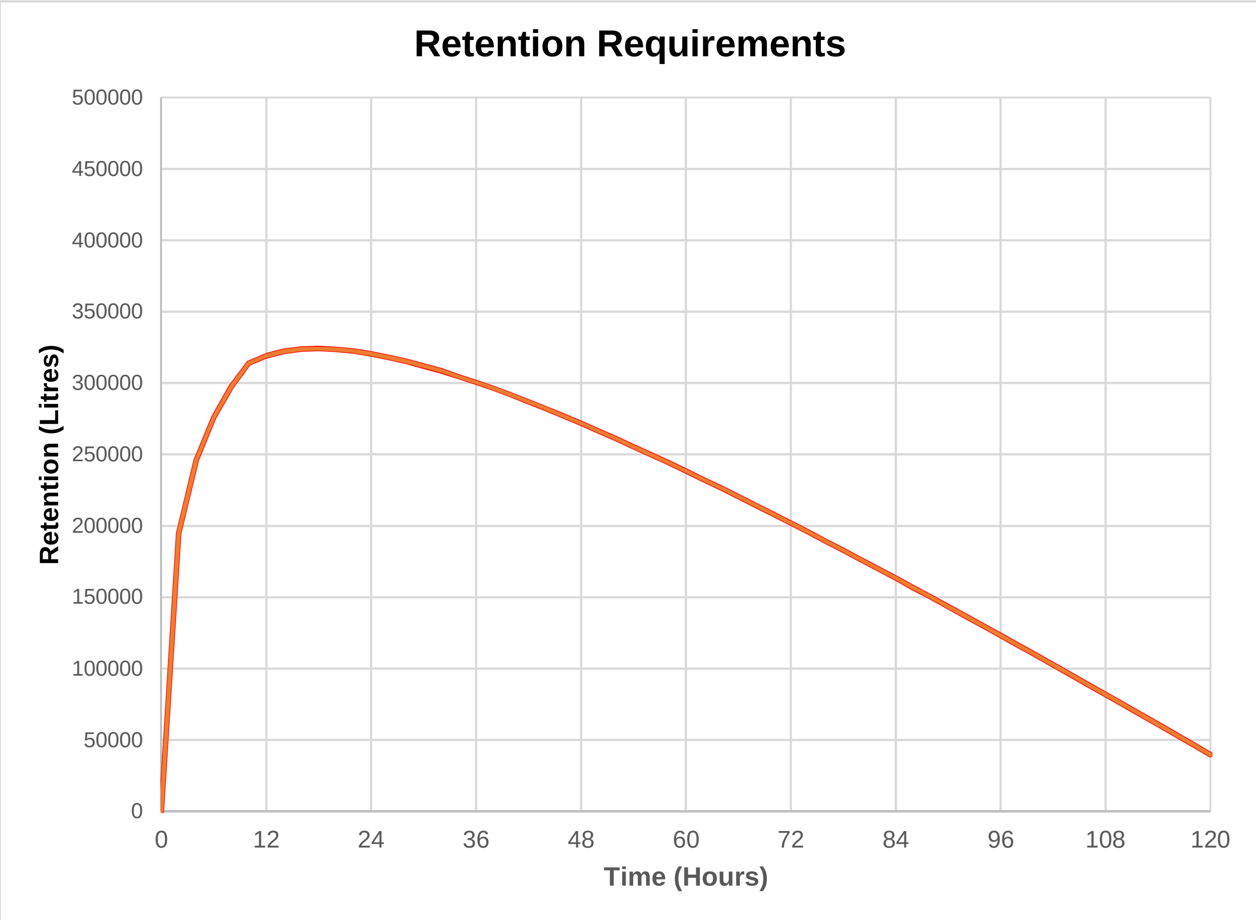
Scenario		Storage C Fire	
Location		Jalco Smithfield	
Storage Area		Hardstand Area 3	
Event		Fire	
File Reference		19004-303	
Material Being Stored			
Material Being Stored		Class 9	
Volume of Materials being stored	**1**	108000	Litres
	2		Litres
	3		Litres
	4		Litres
	5		Litres
25% of Volume Release	**A**	27000	Litres
Firefighting Water			
Basis: 2 Hydrants @ 600 litres per minute for 90 minutes			
Firefighting Water	**B**	108000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1	**1**	1128	m^2
Hardstand Area 3	**2**	1048	m^2
Hardstand Area 4	**3**	270	m^2
Hardstand Area 5	**4**	682	m^2
Hardstand Area 8	**5**	119	m^2
Roof 2	**6**	1407	m^2
Roof 5	**7**	201	m^2
Total Surface Area	**C**	4855	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		324192	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		327942	Litres
Area Required for Bunding 100mm		3242	m^2

Secondary Containment
Fire Storage C

Scenario		Storage C Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 3
Event		Fire
File Reference		19004-303



Comments
The scenario considered is a fire in Storage C and around Hardstand Area 3.
Interconnection between hardstand areas by stormwater.
Area 2, Area 6 and Area 7 are bunded areas and are assumed not to be pumped out after the event.
Tradewaste System is operated
Situation July 2019

Secondary Containment
Fire Storage D+E+F+G+H

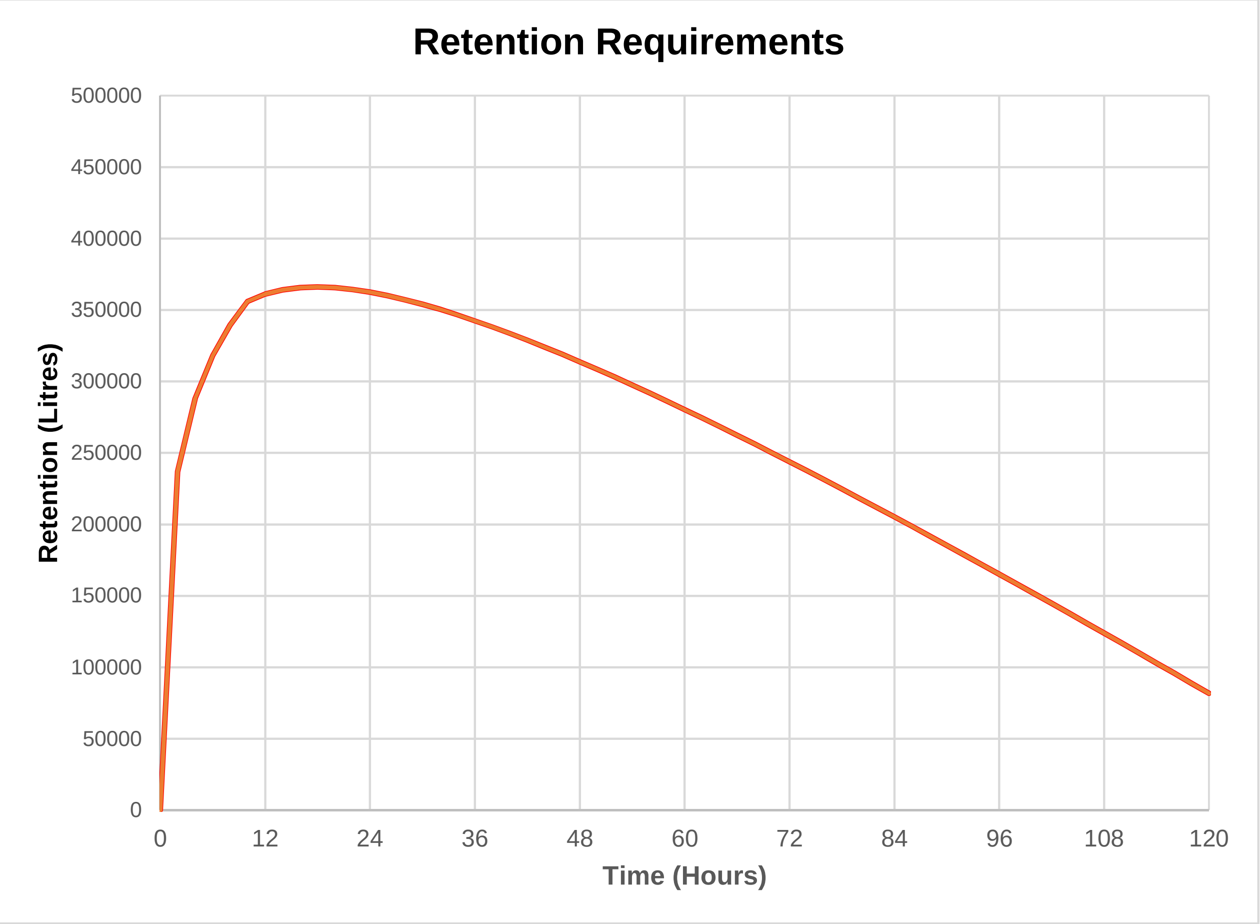
Scenario		Storage D+E+F+G+H Fire	
Location		Jalco Smithfield	
Storage Area		Hardstand Area 4	
Event		Fire	
File Reference		19004-304	
Material Being Stored			
Material Being Stored		Class 9	
		Class 8	
Volume of Materials being stored	**1**	21600	Litres
	2	9600	Litres
	3	16000	Litres
	4	40000	Litres
	5	44800	Litres
25% of Volume Release	**A**	33000	Litres
Firefighting Water			
Basis: 2 Hydrants @ 600 litres per minute for 120 minutes			
Firefighting Water	**B**	144000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1	**1**	1128	m^2
Hardstand Area 3	**2**	1048	m^2
Hardstand Area 4	**3**	270	m^2
Hardstand Area 5	**4**	682	m^2
Hardstand Area 8	**5**	119	m^2
Roof 2	**6**	1407	m^2
Roof 5	**7**	201	m^2
Total Surface Area	**C**	4855	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		366192	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		369942	Litres
Area Required for Bunding 100mm		3662	m^2

Secondary Containment
Fire Storage D+E+F+G+H

Scenario		Storage D+E+F+G+H Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 4
Event		Fire
File Reference		19004-304



Comments
The scenario considered is a fire in Storage D+E+F+G+H and around Hardstand Area 4.
Storage Areas are close together and fire propagation likelihood is high. Areas combined
Interconnection between hardstand areas by stormwater.
Area 2, Area 6 and Area 7 are bunded areas and are assumed not to be pumped out after the event.
Trade Waste System is operated
Situation July 2019

Secondary Containment
Fire Storage J

Scenario		Storage J Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 5
Event		Fire
File Reference		19004-305

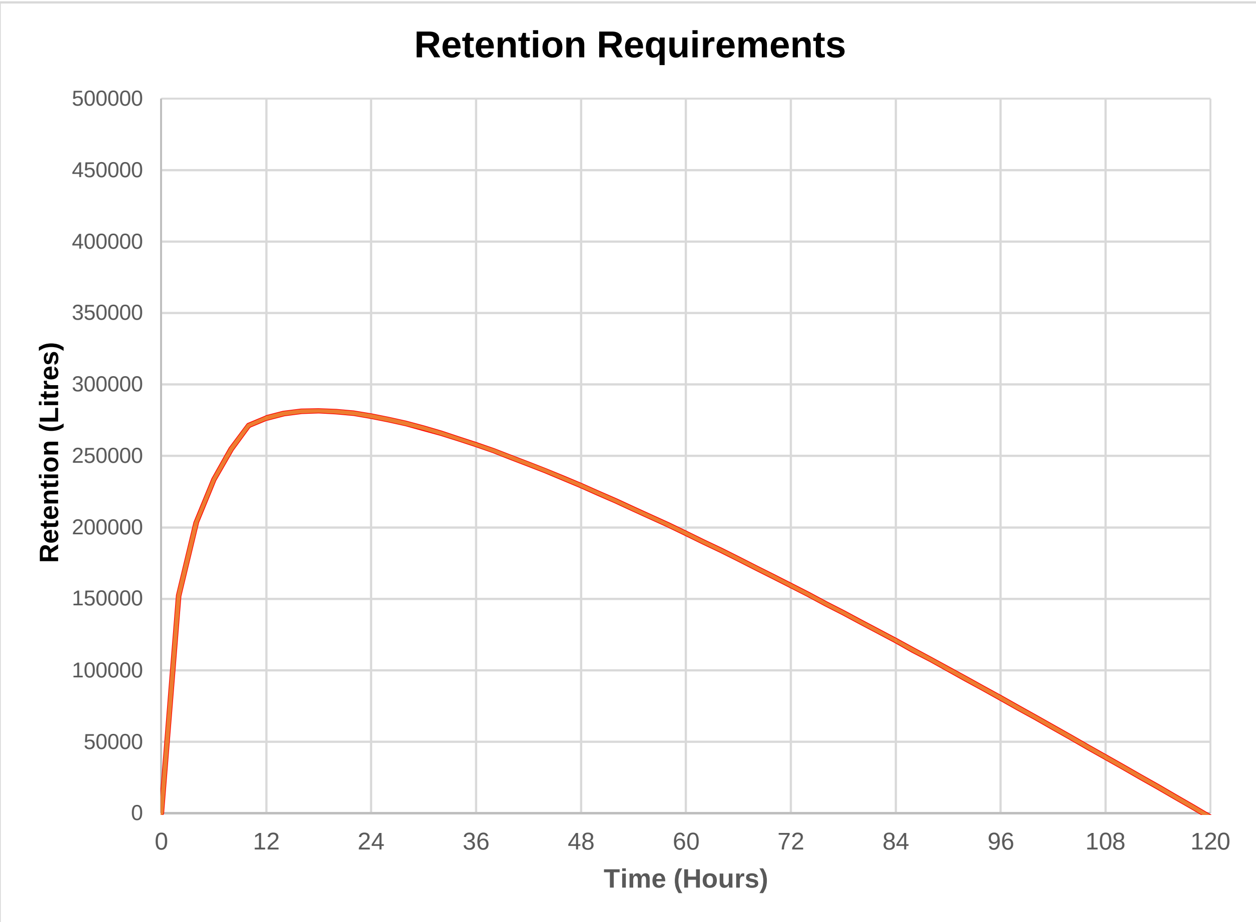
Material Being Stored			
Material Being Stored		Class 8, Class 9	
		Class 3	
Volume of Materials being stored	**1**	81600	Litres
	2		Litres
	3		Litres
	4		Litres
	5		Litres
25% of Volume Release	**A**	20400	Litres
Firefighting Water			
Basis: 2 Hydrants @ 600 litres per minute for 60 minutes			
Firefighting Water	**B**	72000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1	**1**	1128	m^2
Hardstand Area 3	**2**	1048	m^2
Hardstand Area 4	**3**	270	m^2
Hardstand Area 5	**4**	682	m^2
Hardstand Area 8	**5**	119	m^2
Roof 2	**6**	1407	m^2
Roof 5	**7**	201	m^2
Total Surface Area	**C**	4855	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		281592	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		285342	Litres
Area Required for Bunding 100mm		2816	m^2

Secondary Containment
Fire Storage J

Scenario		Storage J Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 5
Event		Fire
File Reference		19004-305



Comments
The scenario considered is a fire in Storage J and around Hardstand Area 5.
Interconnection between hardstand areas by stormwater.
Area 2, Area 6 and Area 7 are bunded areas and are assumed not to be pumped out after the event.
Trade Waste System is operated
Situation July 2019

Secondary Containment
Fire Storage D+E+F+G+H

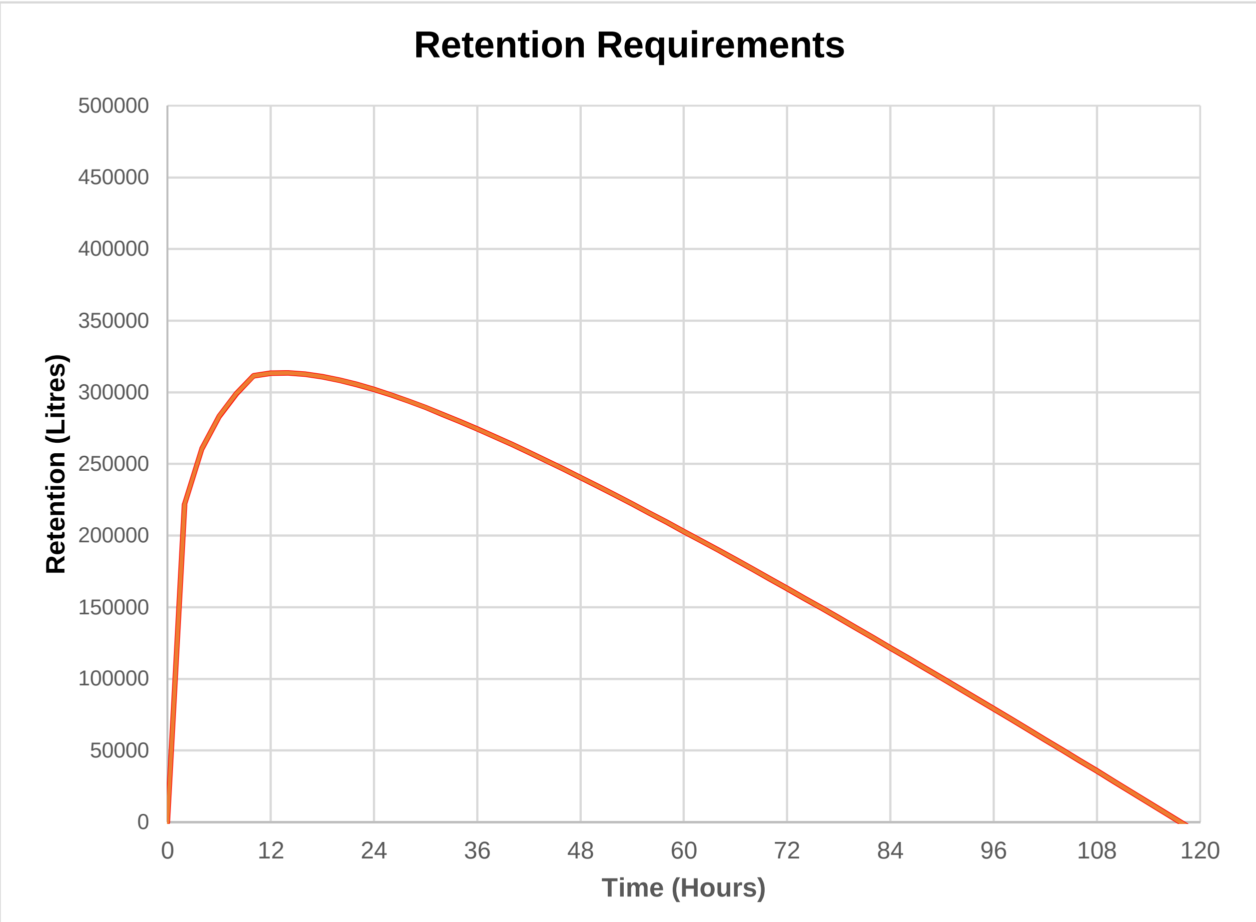
Scenario		Storage D+E+F+G+H Fire	
Location		Jalco Smithfield	
Storage Area		Hardstand Area 4	
Event		Fire	
File Reference		19004-314	
Material Being Stored			
Material Being Stored		Class 9	
		Class 8	
Volume of Materials being stored	**1**	21600	Litres
	2	9600	Litres
	3	16000	Litres
	4	40000	Litres
	5	44800	Litres
25% of Volume Release	**A**	33000	Litres
Firefighting Water			
Basis: 2 Hydrants @ 600 litres per minute for 120 minutes			
Firefighting Water	**B**	144000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1	**1**	1128	m^2
Hardstand Area 3	**2**	1048	m^2
Hardstand Area 4	**3**	270	m^2
Hardstand Area 5	**4**	682	m^2
Hardstand Area 8	**5**	119	m^2
Roof 5	**6**	201	m^2
	7	201	m^2
Total Surface Area	**C**	3649	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		313592	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		317342	Litres
Area Required for Bunding 100mm		3136	m^2

Secondary Containment
Fire Storage D+E+F+G+H

Scenario		Storage D+E+F+G+H Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 4
Event		Fire
File Reference		19004-314



Comments
The scenario considered is a fire in storage area D+E+F+G+H and around Hardstand Area 4.
Storage areas are close together and fire propagation likelihood is high. Areas are combined
Interconnection between hardstand areas by stormwater.
Area 2, Area 6 and Area 7 are bunded areas and are assumed not to be pumped out after the event.
Trade Waste System is operated
Roof No.2 is separately diverted to stormwater or is stored for allocation elsewhere.
Situation July 2019

Secondary Containment
Fire Storage D+E+F+G+H

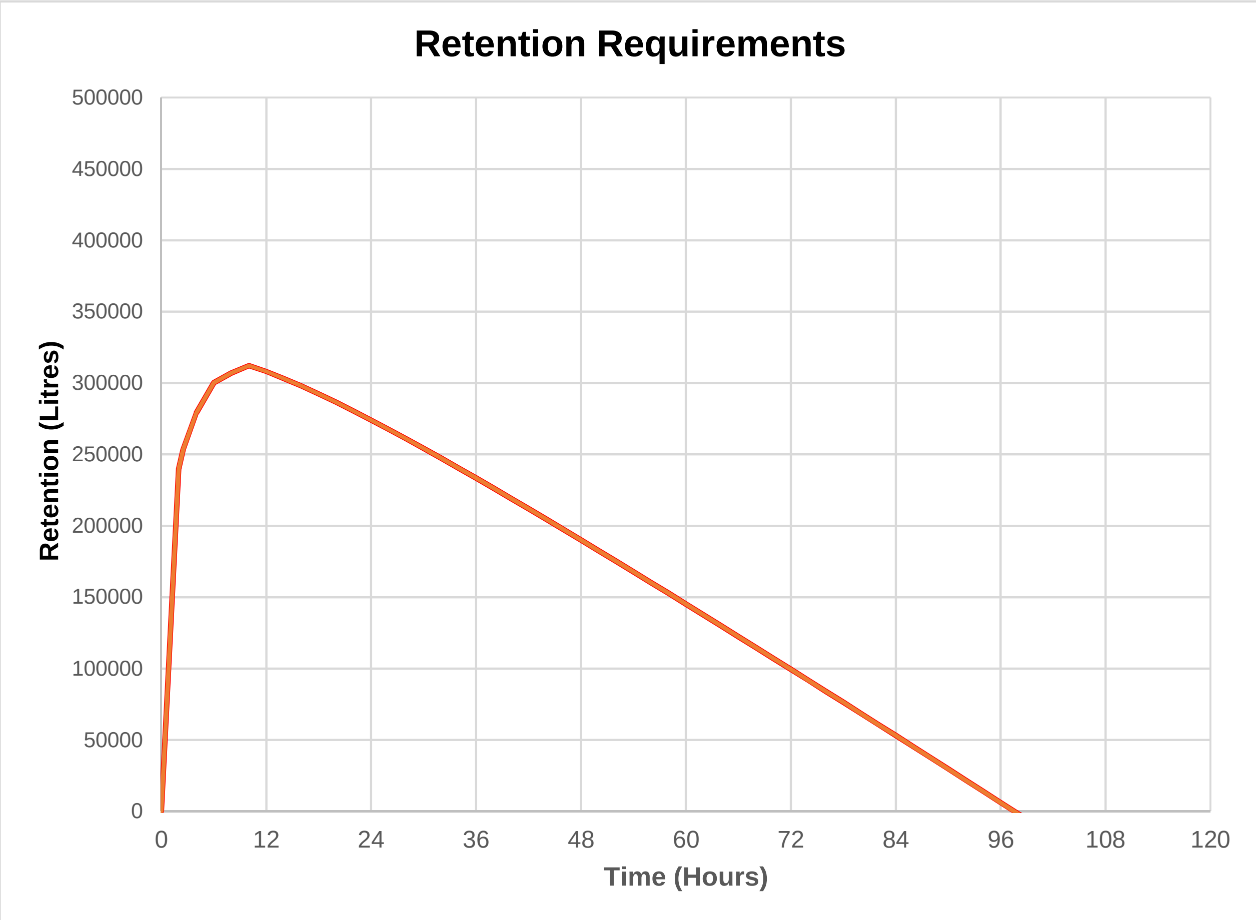
Scenario		Storage D+E+F+G+H Fire	
Location		Jalco Smithfield	
Storage Area		Hardstand Area 4	
Event		Fire	
File Reference		19004-324	
Material Being Stored			
Material Being Stored		Class 9	
		Class 8	
Volume of Materials being stored	**1**	21600	Litres
	2	9600	Litres
	3	16000	Litres
	4	40000	Litres
	5	44800	Litres
25% of Volume Release	**A**	33000	Litres
Firefighting Water			
Basis: 2 Hydrants @ 600 litres per minute for 120 minutes			
Firefighting Water	**B**	144000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1 + Hardstand Area 3 + Roof 2	**1**	3583	m^2
Hardstand Area 4	**2**	270	m^2
Hardstand Area 5	**3**	682	m^2
Hardstand Area 6	**4**	242	m^2
Hardstand Area 8	**5**	119	m^2
	6		m^2
Roof 5	**7**	201	m^2
Total Surface Area (less item 1)	**C**	1514	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		312198	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		312198	Litres
Area Required for Bunding 100mm		3122	m^2

Secondary Containment
Fire Storage D+E+F+G+H

Scenario		Storage D+E+F+G+H Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 4
Event		Fire
File Reference		19004-324



Comments
The scenario considered is a fire in Storage D+E+F+G+H and around Hardstand Area 4.
Storage Areas are close together and fire propagation likelihood is high. Areas combined
Isolated Area. Hardstand Area 1 and Hardstand Area 3 First 15mm only. Roof 2 first 15mm
Area 6 Included
Area 2, Area 7 are bunded areas and are assumed not to be pumped out after the event.
Situation July 2019

Secondary Containment
Fire Storage D+E+F+G+H

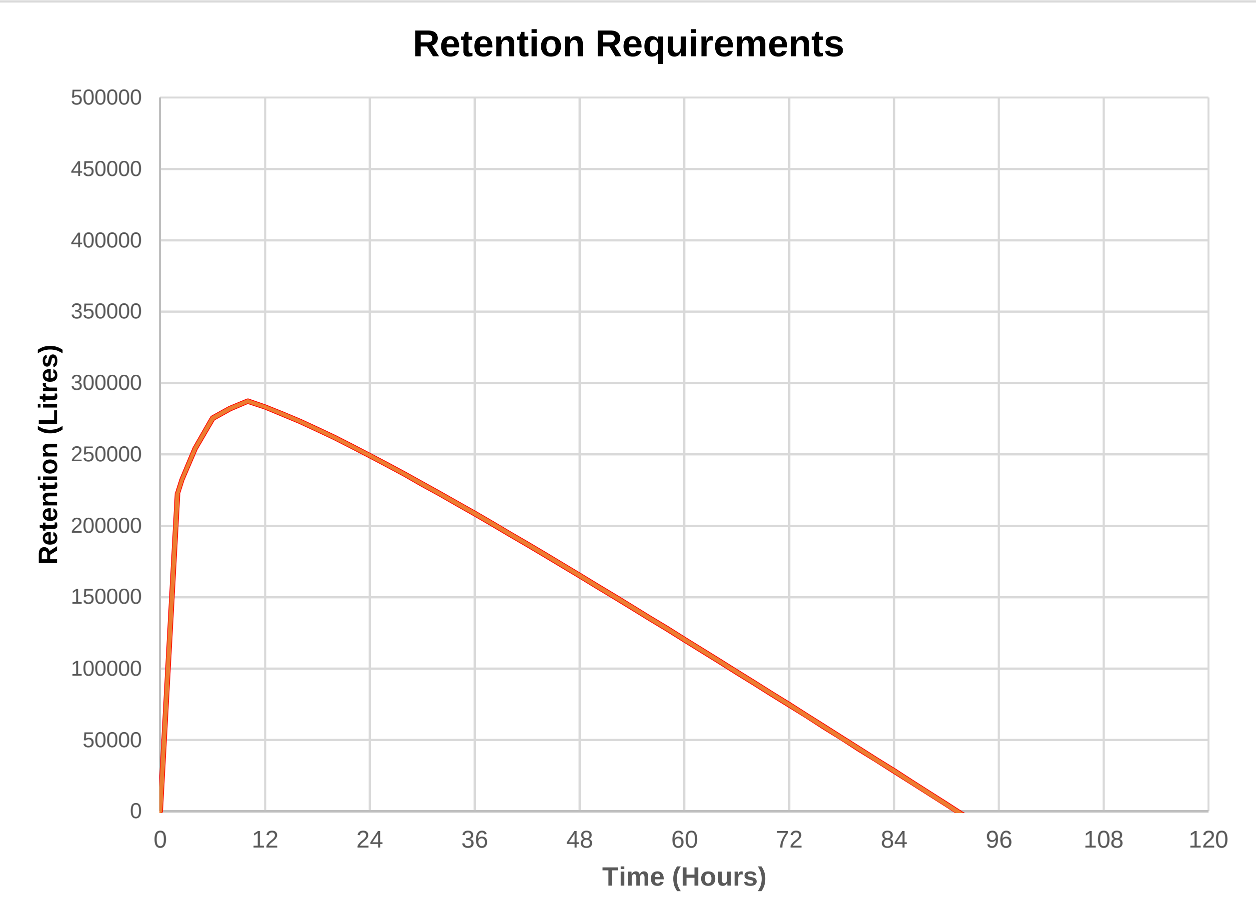
Scenario		Storage D+E+F+G+H Fire	
Location		Jalco Smithfield	
Storage Area		Hardstand Area 4	
Event		Fire	
File Reference		19004-334	
Material Being Stored			
Material Being Stored		Class 9	
		Class 8	
Volume of Materials being stored	**1**	21600	Litres
	2	9600	Litres
	3	16000	Litres
	4	40000	Litres
	5	44800	Litres
25% of Volume Release	**A**	33000	Litres
Firefighting Water			
Basis: 2 Hydrants @ 600 litres per minute for 120 minutes			
Firefighting Water	**B**	144000	Litres

Areas Involved in Contaminated Water			
Hardstand Area 1 + Hardstand Area 3	**1**	2176	m^2
Hardstand Area 4	**2**	270	m^2
Hardstand Area 5	**3**	682	m^2
Hardstand Area 6	**4**	242	m^2
Hardstand Area 8	**5**	119	m^2
	6		m^2
Roof 5	**7**	201	m^2
Total Surface Area (less item 1)	**C**	1514	m^2

Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		287313	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		287313	Litres
Area Required for Bunding 100mm		2873	m^2

Secondary Containment
Fire Storage D+E+F+G+H

Scenario		Storage D+E+F+G+H Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 4
Event		Fire
File Reference		19004-334



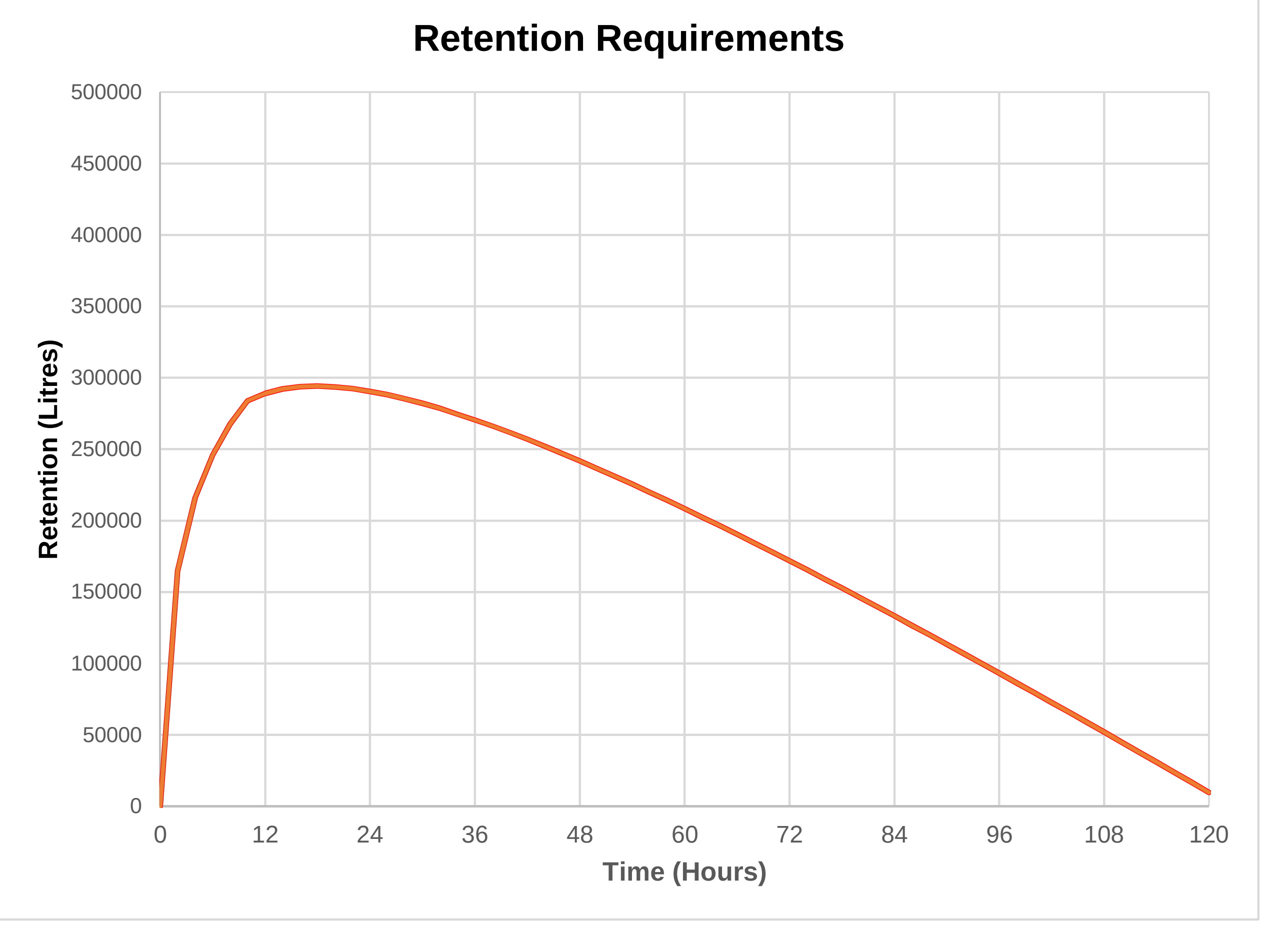
Comments
The scenario considered is a fire in storage area D+E+F+G+H and around Hardstand Area 4.
Storage areas are close together and fire propagation likelihood is high. Areas are combined
Isolated Area. Area 1 and Area 3 First 15mm only Area 6 included
Roof 5 has been separately discharged from the site.
Area 2, Area 7 are bunded areas and are assumed not to be pumped out after the event.
Situation July 2019

Secondary Containment
Fire Storage D+E+F+G+H

Scenario		Storage D+E+F+G+H Fire	
Location		Jalco Smithfield	
Storage Area		Hardstand Area 4	
Event		Fire	
File Reference		19004-354	
Material Being Stored			
Material Being Stored		Class 9	
		Class 8	
Volume of Materials being stored	**1**	21600	Litres
	2	9600	Litres
	3	16000	Litres
	4	40000	Litres
	5	44800	Litres
25% of Volume Release	**A**	33000	Litres
Firefighting Water			
Foam @ 50% original			
Firefighting Water	**B**	72000	Litres
Areas Involved in Contaminated Water			
Hardstand Area 1	**1**	1128	m^2
Hardstand Area 3	**2**	1048	m^2
Hardstand Area 4	**3**	270	m^2
Hardstand Area 5	**4**	682	m^2
Hardstand Area 8	**5**	119	m^2
Roof 2	**6**	1407	m^2
Roof 5	**7**	201	m^2
Total Surface Area	**C**	4855	m^2
Volumetric Requirements			
Maximum Volume of Storage Required (production ceased)		294192	Litres
Maximum Volume of Storage Required (production Restarted 12hrs)		297942	Litres
Area Required for Bunding 100mm		2942	m^2

Secondary Containment
Fire Storage D+E+F+G+H

Scenario		Storage D+E+F+G+H Fire
Location		Jalco Smithfield
Storage Area		Hardstand Area 4
Event		Fire
File Reference		19004-354



Comments
The scenario considered is a fire in storage area D+E+F+G+H and around Hardstand Area 4.
Storage areas are close together and fire propagation likelihood is high. Areas are combined
Interconnection between hardstand areas by stormwater.
Area 2, Area 6 and Area 7 are bunded areas and are assumed not to be pumped out after the event.
Foam is used as the fire fighting media reducing the water volume for firefighting.
Situation July 2019

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