Containment Assessment

Lotus Lightweight Structures, Wellingborough
Presented to Group Lotus

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Delta-Simons Project No. 19-0118.01

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Report Details

Client	Group Lotus
Report Title	Containment Assessment
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Project No.	19-0118.01
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1.0 Introduction

1.1 Appointment

Delta-Simons Environmental Consultants Limited ("Delta-Simons") was instructed by Group Lotus (the "Client") to carry out a review of containment systems for bulk storage and process vessels at the Lotus Lightweight Structures anodising facility at Sywell Road, Wellingborough, NN8 6XX (the "Site") in support of their Part A(1) Environmental Permit Application.

1.2 Context and Purpose

The aim of this assessment is to consider the condition and suitability of the primary, secondary and tertiary containment (if required) for bulk storage and process vessels at the Site. This report is produced in line with the CIRIA guidance document *Containment systems for the prevention of pollution – Secondary, tertiary and other measures for industrial and commercial premises*, *2014*.

1.3 Scope of Works

The scope of works undertaken for this assessment was:

- Site visit to review and verify building features, plant, documentation and operational practices;
- Measure secondary containment provision, dimensions and capacities;
- Review construction methods for secondary containment;
- Review emergency response procedures and inspect equipment for spill response; and
- Assess primary and secondary containment against the requirements of CIRIA C736.

1.4 Limitations

The standard limitations associated with this assessment are presented in Appendix B.

2.0 Site Information

2.1 General

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Site Location		Site Layout	
Co-ordinates	Highlighted area approximately at National Grid Reference 486083, 268850.	**Site Area**	Approximately 0.046Ha
		Floor Area (GIFA)	Approximately 370 m^2
Site Location	Lotus Lightweight Structures, Sywell Road, Wellingborough, NN8 6XX		
Current Site Use	The Site is currently occupied by one, high-bay production and warehouse building with attached, single-storey office building. The production building houses an anodising line and a racked warehouse.		
Site Visit	Marcus Reynolds and Gaston Senese from Delta-Simons conducted a Site visit to Lotus Lightweight Structures, Wellingborough on 20th October 2020. A series of Site photographs are presented within Section 4 of this Report.		

3.0 Site Risk Rating

The Site Risk Rating has been calculated according to the methodology in Section 2 of CIRIA C736.

There is an existing Site Condition Report which contains an environmental risk assessment following the Source-Pathway-Receptor model. This document has been submitted as part of the Environmental Permit Application.

3.1 Site Hazard Rating

3.1.1 Source Hazards

There are no liquid or solid substances used or stored at the Site in quantities over 5 litres which are classified as flammable. Minimal oil storage takes place at the Installation, in quantities required for facility maintenance. Oils are stored in the compressor house, on bunded pallets, in containers up to 25 litres. Therefore, the requirements of the Control of Pollution (Oil Storage) (England) Regulations 2001 are met even though they do not apply to containers below 200 litres or storage within a building.

Raw material consumption at the site is considered to be relatively low. Substances used at the etching line are typically dissolved in water prior to use to make up a larger quantity of solution.

All raw materials are stored on bunded pallets, including the salt tablets. The typical quantities held on site and the annual consumption are shown in the table below.

Raw material	Maximum amount present	Annual Consumption	Relevant data (including information from Safety Data Sheet)
Acetic Acid	125 litres	100 Litres	Stored as a liquid in original 25 litre plastic containers.
Hydrochloric Acid	60 litres	60 litres	Stored as a liquid in original 30 litre plastic containers.
Potassium Fluoride Anhydrous	1,050 litres	1,050 litres	White powder. Used to precipitate aluminium into the edge for to allow calculation of free sodium hydroxide and 3 aluminium
R-Additive	500 litres	500 litres	Sodium hydroxide based additive. Stored in 200 litre plastic drums.
R-Clene 121	800 litres	1,400 litres	Alkaline liquid cleaner classified as irritant. Stored as a liquid in 200 litre plastic drums.
R-Clene 735	600 litres	2,000 litres	Nitric acid (40-50%) and Hydrofluoric acid (3-7%), classified as corrosive and toxic under CLP. Stored as a liquid in 200 litre plastic drums.
R-Etch 535	2,000 litres	33,001 litres	Sodium hydroxide based liquid etchant. Classified as corrosive under CLP.
R-Seal Superior	600 litres	2,800 litres	Hot water sealing additive, not classified as hazardous under CLP. Stored as a liquid in 200 litre plastic drums.

Sulphuric Acid	3,000 litres	44,000 litres	40-50% sulphuric acid. Stored as a liquid in a 1,000 litre plastic IBC.
Salt Tablets	1,225 kg	1,225 kg	Solid salt tablets. Used for water treatment and stored in sacks.
Sanadol Deep Black	25 kg	25 kg	Aluminium blacking agent, raw material is a paste.
Sodium Hydroxide	5 litres	5 litres	Used in the lab for titration

Propane cylinders are currently stored in a gas cage in the yard, used to power the site forklift truck. Site personnel reported that a battery forklift truck is planned to replace the current propane truck and will result in the removal of compressed flammable gas cylinders from site.

Liquid substances stored and used on site have the potential to cause environmental harm if discharged into surface water systems or when contained in firewater.

Source Harm Index: Moderate

3.1.2 Pathways

The following information is relevant in assessing risk from pathways at the Site:

- All primary containment installations at the Site are situated on impermeable ground and within secondary containment. The ground surrounding these areas is also hard-surfaced, typically sloping towards a surface water drain.
- On-site effluent treatment system requires a pump to empty final effluent tank to the foul sewer. There is no natural route to the foul sewer from process tanks or equipment.
- There are no below-ground features such as services, ducts, pipelines, filled ground, tunnels, tanks or sumps. The only exception are the two 1m^3 concrete sumps beneath the plating line which are used for pumping to the effluent treatment plant.
- Drainage Survey – a CCTV drainage survey was undertaken by Dyno Rod in September 2019 of the entire site. This identified some areas which required repair and replacement due to silting and damage to the pipework. The recommended replacement works were completed in early 2020.
- Foul drainage – comprises sanitary wastewater from welfare and washing facilities. No entry points into the foul sewer system are present in process or storage areas of the site, except for the final treated effluent pumping point.
- No gravity drainage from bunds, no siphons or bund wall/floor penetrating pipework/valves. Pumps required to pump out.
- There are no known soakaways present on site. All roof drainage is routed to the municipal surface water sewerage system.
- A Factual and Interpretive Short Report Bespoke Ground Investigation was undertaken by Delta-Simons in August 2019 (report issued 12/09/2020). This ground investigation report has been submitted as part of the Environmental Permit Application. In general, raw material storage and process equipment is located on areas of hard-surfacing or within buildings. Infiltration of minor spills and leaks is not expected to be significant.
- The Site is not in an area at risk from flooding.
- There is no combined sewer system at the Site.

- Rainfall data for the Site was obtained from the UK Centre for Ecology and Hydrology, Flood Estimation Handbook Web Service[1]. Detailed rainfall return graphs are presented in Appendix A and data summarised below:
    - Annual rainfall is estimated to be 21.02 mm; and
    - 1 in 100 year event rainfall is estimated to be 72.57 mm.

  All external bunded areas are covered with a canopy which extends to the outside of the bund wall. This is expected to intercept and divert the majority of the rainfall. However, it is acknowledged that some sideways rainfall is expected to enter the bunds, and in the case of the filter press bund, rainwater can enter down the vehicle access ramp.

  As the bunds for the dump tanks and effluent treatment plant are roofed and generally small, it is not expected that a provision in excess of the 10% allowance from the largest tank is required. The filter press bund has capacity in excess of containment requirements and so even significant rainfall will not compromise the holding capacity.

The surface water drainage system is a potential pathway to carry hazardous materials from site, but this is expected to only be possible in the event of significant quantities of water being used in the event of a fire

Pathway Transport Potential Index: Moderate

3.1.3 Receptors

There are no known water abstractions for public water consumption within 2km of the Site.

There are no sensitive sites such as Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC) or Special Protection Areas (SPA) within 2km of the site.

While it could not be confirmed, the nearby drainage channels which are likely to receive surface water from the Site are considered to form tributaries of the River Ise some 5km west of the Site, which joins the River Nene some 6km south east of the Site.

Surface water receptors are considered the most likely to become affected in the event of a loss of containment through release of fire water.

Pathway Transport Potential Index: Moderate

3.1.4 Overall Site Hazard Rating

Using the methodology in Section 2.4 of CIRIA C736, the site hazard rating has been calculated as follows:

Source	Pathway	Receptor
Moderate	Moderate	Moderate
Overall SITE HAZARD rating		
Moderate		

This is in line with the expectations that installations subject to the Environmental Permitting Regulations are likely to be classified as at least an overall hazard rating of medium.

[1] https://fehweb.ceh.ac.uk/ accessed 12th October 2020.

3.2 Likelihood of Loss of Containment

No quantitative risk assessment for likelihood of loss of containment has been performed. This Site is not subject to the Control of Major Accident Hazards Regulations 2015 (COMAH) and so a quantified safety report is not required, nor assessment of Major Accidents To The Environment (MATTE).

The following factors reduce the likelihood of loss of containment:

- There are no known significant loss of containment incidents at the site within the last 10 years.
- All pipework is above ground, which reduces the likelihood of leaks or spills from pipework going unnoticed.
- Primary containment vessels are located away from traffic routes, reducing the likelihood of vehicle collision.
- The construction and condition of the primary containment vessels was observed to be good.
- The effluent treatment plant operates on a batch basis, requiring input from trained operators.
- There are no floor drains in the factory building.
- Access to the primary containment vessels to vandals is not easy.

However, the construction of the secondary containment bunds as unlined brick and block, and the general condition of the brick bunding, is poor. Furthermore, some secondary containment capacity is inadequate. If there were an incident to affect the primary containment, such as overflowing, or damage through failure of pipework joints, then the secondary containment could not be relied upon to contain the release.

Pathway Transport Potential Index: Moderate

3.3 Site Risk Rating

3.3.1 Source Hazards

Using the methodology in Section 2.4 of CIRIA C736, the site hazard rating has been calculated as follows:

Site Hazard Rating	Frequency of Loss of Containment
Moderate	Moderate
Overall SITE RISK rating	
Moderate	

The suggested containment risk type for Moderate rating is **Class 2**, i.e. intermediate integrity.

4.0 Baseline Survey

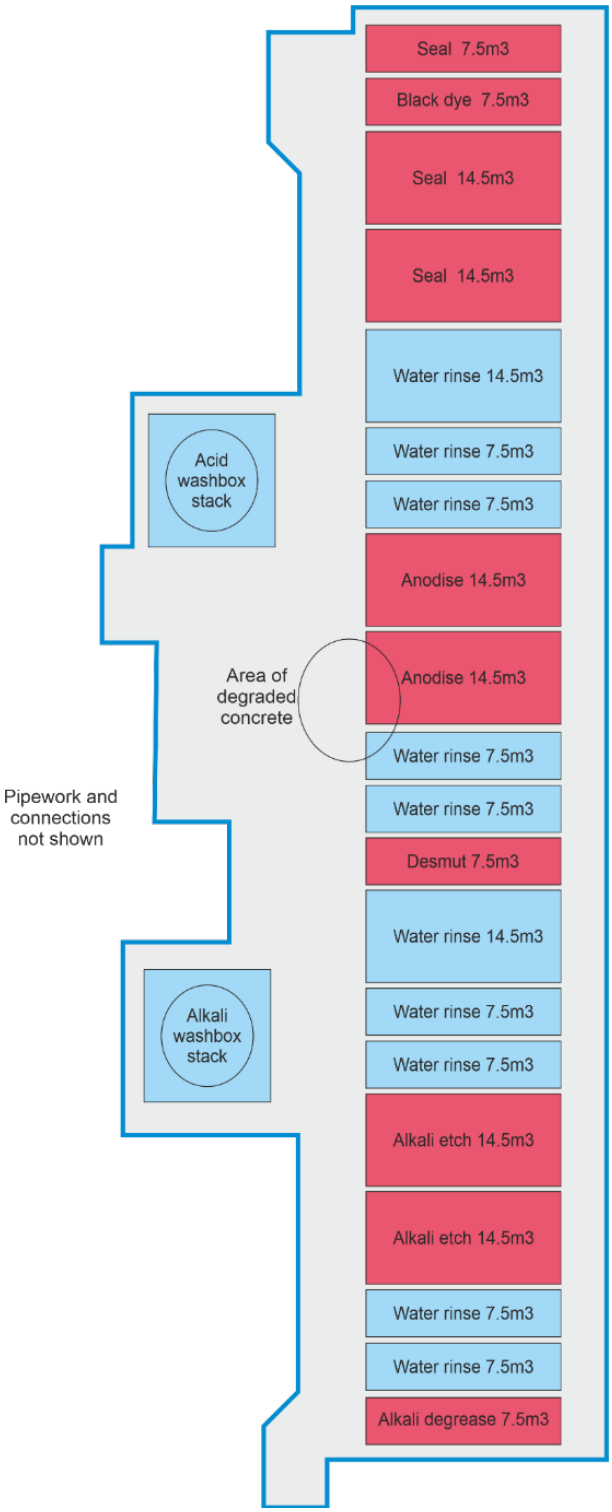
A baseline survey of the construction and condition of the bunds was undertaken in accordance with Section 5.4 of CIRIA C736. The following bund groups were identified:

- Bund A – Anodising Line;
- Bund B – Dump Tanks;
- Bund C – Effluent Treatment; and
- Bund D – Filter Press.

4.1 Bund A – Anodising Line

Primary Containment	The anodising line utilises the raw materials listed in Section 3.1.1 of this Report. All tanks are welded and coated steel, impervious to the contents held for anodising purposes.
Containment	The volume of the bund is calculated in the next page using standard height x length x depth calculations. Local containment. Secondary containment around the process tanks is provided by a steel fabricated bund attached to the concrete floor. Some level of tertiary containment will be provided by the factory building itself as there are no floor drains within the concrete floor. All internal floor drains from the previous use of the building were reportedly infilled with concrete and sealed at the surface. There is the potential for planned tertiary containment by providing low bund kerbs at doorways – however access for the fork trucks must be considered. The bund has sufficient containment. In the event that a tank leak is identified, the documented emergency plan involves switching off the tank heating system (if installed) and pumping the contents into dedicated emergency IBCs ready on dedicated racking adjacent near the etching line. ▲ There are thirty-two (32) IBCs on the racking, labelled as for emergency use only; ▲ An additional two (2) IBCs are located adjacent to the etching line ready for immediate use; ▲ These IBCs are capable of receiving the liquid in its heated state; ▲ Sufficient capacity is available to fully empty two 14.5 m^3 tanks; and ▲ Dedicated pumps, one acid and one alkali, are stored in a black plastic open topped container ready for immediate use.
Type of construction	The concrete slab base is assumed to be of the same poured concrete that the factory floor is made of. The design standard used for the poured concrete floor is not known. There are no known coatings applied to the concrete floor. The steel bund is coated to prevent attack from process fluids. The nature of the coating is not known, but the visual condition of the steel bund is good.

Potential leakage pathways	▲ The bund is purpose fabricated welded and coated steel. ▲ All joints are welded. ▲ There are no joint armouring plates across joints. ▲ There are no penetrations through the containment. ▲ The condition of the concrete beneath the acid etching tanks appears to be in poor condition. This will require cleaning and inspection by qualified contractors. ▲ The retention of process fluids in the sumps indicated general watertightness, though the permeability is not known. Additionally, these sumps are not subject to regular condition monitoring. ▲ There is no leak detection system installed and none is considered necessary. ▲ No gaps between the concrete floor and the steel bund were observed. Liquids within the bund collect in the two 1 m^3 sumps in the concrete and are pumped into the effluent treatment plant when required. Potential leakage out of the building would likely flow to the car park area. Temporary containment could be provided in the car park. This would require a levelling survey to determine the likely low points and containment capacity. As there is a gully drain which runs for a significant proportion of the car park length it is not feasible to use temporary drain covers; it would also require installation of a penstock valve to allow isolation of the drainage in the event of an emergency.

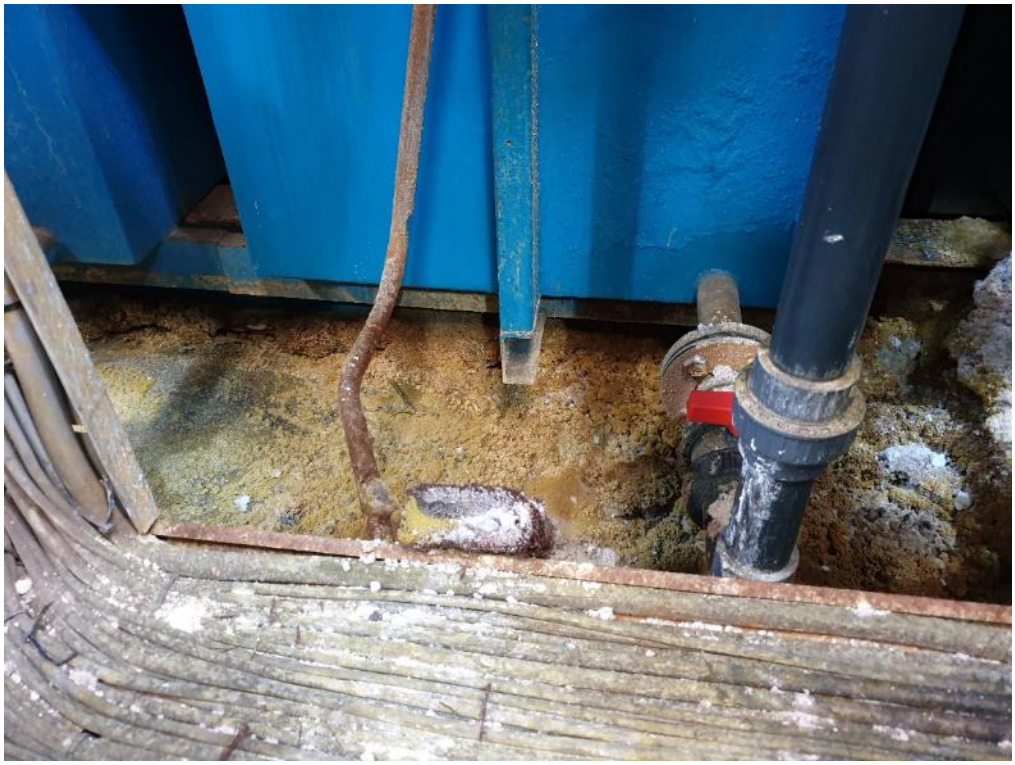


#	Treatment (m^3)	Water rinse (m^3)
1	7.5	-
2	7.5	-
3	14.5	-
4	-	14.5
5	-	7.5
6	14.5	7.5
7	14.5	-
8	-	7.5
9	-	7.5
10	7.5	-
11	-	14.5
12	-	7.5
13	-	7.5
14	14.5	-
15	14.5	-
16	-	7.5
17	-	7.5
18	7.5	-
Total	**117.0**	**89.0**

Total volume of process tanks (primary containment)	**206.0 m^3**
Total volume of bund and sumps (secondary containment)	**50.2 m^3**
Secondary Containment percentage	**24.3%**

Coated steel process vessels of the anodising line. The left tank is the alkaline cleaning tank.

The steel bund around the process vessels with the coating in good visual condition.

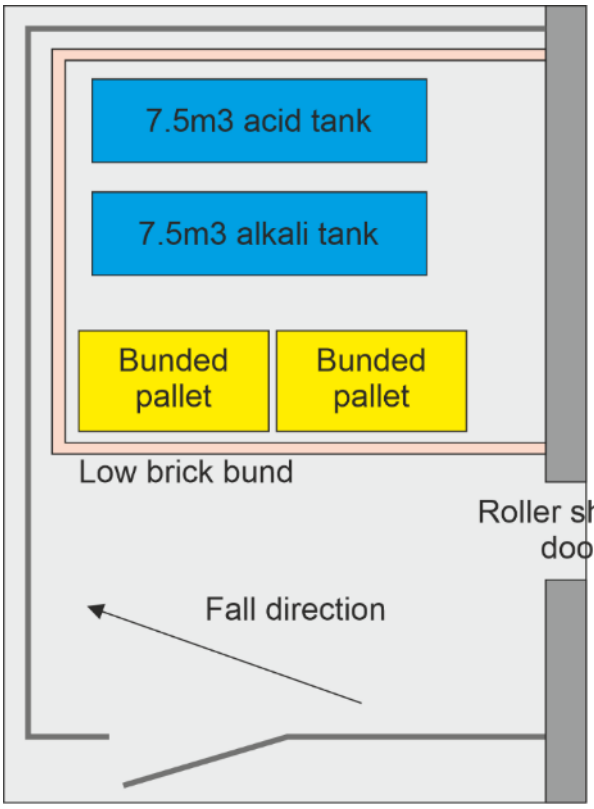


Evidence of concrete degradation beneath the acid process tanks.

Concrete degradation around the acid process tanks 1 m^3 sump.

4.2 Bund B – Dump Tanks

Primary Containment	The two dump tanks are steel single skinned tanks in acceptable visual condition. The tanks are 7.5m^3 each in volume.
Containment	The volume of the bund is calculated in the next page using standard height x length x depth calculations. The bund holds the acid and alkali dump tanks which accept waste liquid pumped from the process line sumps. The brick bund represents secondary containment. The bund also contains two plastic bunded pallets. For drums stored on these pallets, the brick bund represents tertiary containment.
Type of construction	The bund is formed of brick and mortar, and concrete block and mortar. It appears to have been installed using general bricklaying techniques and is not lined with any discernible coating. No reinforcement is evident. The general condition of the mortar joints appears poor. There is evidence of missing bricks and cracks in the mortar.
Potential leakage pathways	▲ There are no water-stops in walls and floors across joints. ▲ There are no joint armouring plates across joints. ▲ There are no penetrations through the containment. ▲ The absence of rainwater in the base of the bund and general visual condition indicate that the watertight nature of the bund is questionable. ▲ There is no leak detection system installed and none is considered necessary. Rainwater is emptied by means of a portable submersible pump. This would be manually lowered into the bund and operated when required.



Brick bund volume	11.54 m^3
Primary tank volume	15.0 m^3
Volume of tanks and bunded pallets	5.9 m^3
Available volume	5.64 m^3
110% of largest tank	8.25 m^3
Containment percentage	**68%**

The brick bund wall is only 36cm high. If the bunded pallets were removed (currently occupying 2.4m^3) then this would provide 8.04m^3. This is still only 97.5% of the required containment.

Also, the brickwork is in poor condition. It has a missing brick on the 3rd course of 4 bricks height, reducing the containment volume by 50%, even if the remainder of the brickwork was in prime condition.

Release of significant quantities of liquid into the bund may result in the plastic bunded pallets becoming buoyant, which can result in the containers on top being tipped over, potentially out of the brick bunded area.

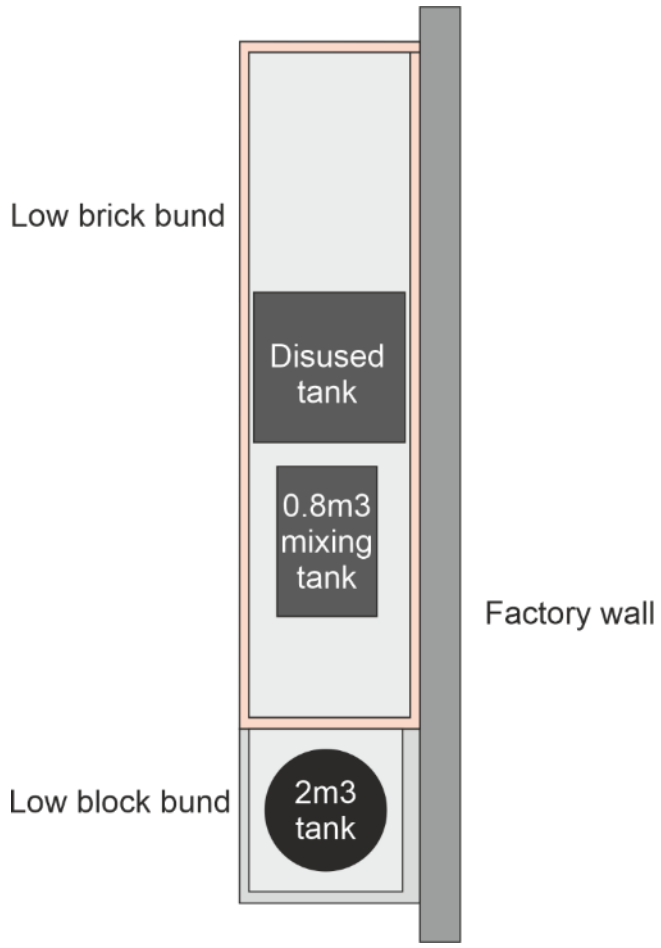
The contents of the bund with the bunded pallets visible. The missing brickwork can be seen on the left.

The brick wall is currently in poor condition with cracked mortar throughout

The bund wall is formed on one side by the factory brick wall.

4.3 Bund C – Effluent Treatment

Primary Containment	The effluent treatment 2m^3 tank is black single skinned plastic. The mixing tank is presumed to be black GRP (access not obtained as the tank is within a cage, the mixer is a hazardous moving part).
Containment	The volume of the bund is calculated in the next page using standard height x length x depth calculations. The bund holds the filter press, filter press skip and the storage tanks for the treated effluent. The brick bund represents secondary containment. No tertiary containment is present.
Type of construction	The bund is formed of brick and mortar, and concrete block and mortar. It appears to have been installed using general bricklaying techniques and is not lined with any discernible coating. No reinforcement is evident. The general condition of the mortar joints appears poor. There is evidence that entire layers of bricks have delaminated from the layer below.
Potential leakage pathways	▲ There are no water-stops in walls and floors across joints. ▲ There are no joint armouring plates across joints. ▲ There are no penetrations through the containment. ▲ The absence of rainwater in the base of the bund and general visual condition indicate that the watertight nature of the bund is questionable. ▲ There is no leak detection system installed and none is considered necessary. ▲ Rainwater is emptied by means of a portable submersible pump. This would be manually lowered into the bund and operated when required.



Mixing tank bund volume	4.3m^3
Volume of disused tank within bund	0.91m^3
Available volume	3.39m^3
Primary mixing tank volume	0.8m^3
110% of largest tank	0.88m^3
Containment percentage	**385%**

Low block bund volume	1.00m^3
Volume of primary buffer tank within bund	0.46m^3
Available volume	0.54m^3
Primary buffer tank volume	2.0m^3
110% of largest tank	2.2m^3
Containment percentage	**24.5%**

The mixing tank is slightly raised from the concrete base of the bund.

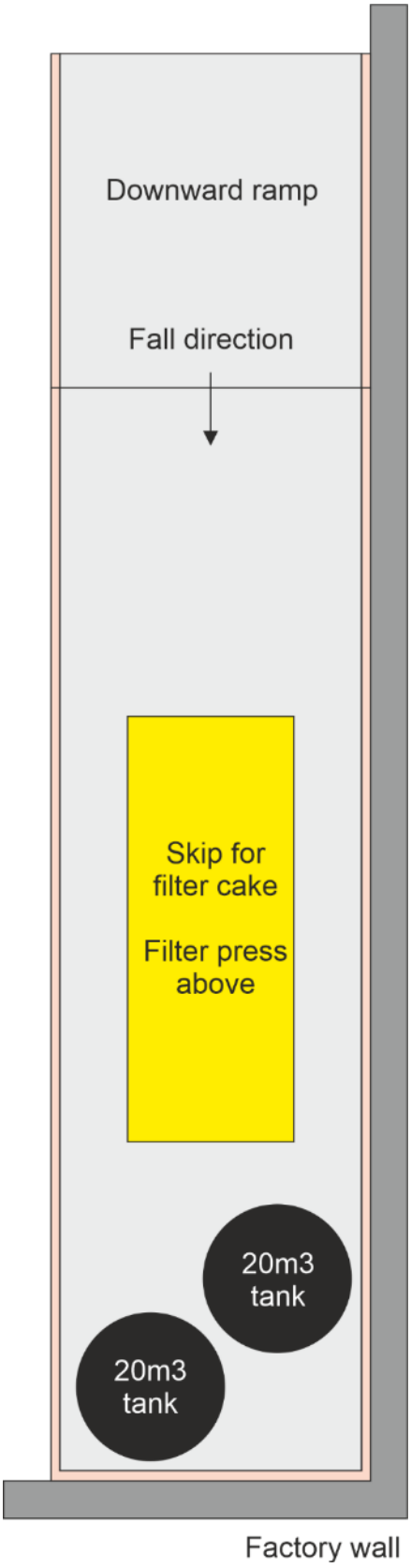
The 2m^3 storage tank is located in a bund where blockwork is attached to brickwork. Bund capacity is insufficient and the blockwork joint condition is poor.

The base of the block bund has some form of sealant between concrete floor and blockwork. However, the blockwork joint condition is poor.

The condition of the brickwork is poor. In any event, this bund serves a larger area than required, with redundant tankage present.

4.4 Bund D – Filter Press and Tanks

Primary Containment	The bund holds the filter press, filter press skip and the storage tanks for the treated effluent (each 20m^3).
Containment	The volume of the bund is calculated in the next page using standard height x length x depth calculations. Local containment. The brick walls form the secondary containment around the filter press storage tanks. The bund is formed of the same brick and mortar used in the construction of the main building. It is unknown if the facility was constructed to conform to a particular containment class.
Type of construction	The bund is formed of the same brick and mortar used in the construction of the main building. It does not appear to be reinforced. The concrete base and walls do not appear to have a coating applied. There is no joint compound applied to the interface between the concrete base and the masonry of the walls. The brickwork is completed in common stretcher bond. The condition of the mortar appeared good and no seepage through the bund walls was evident.
Type of construction	▲ There are no water-stops in walls and floors across joints. ▲ There are no joint armouring plates across joints. ▲ There are no penetrations through the containment. ▲ The presence of rainwater in the base of the bund and reports from site personnel about emptying frequency indicate that it is generally watertight. ▲ There is no leak detection system installed and none is considered necessary. Rainwater is emptied by means of a portable submersible pump. This is manually lowered into the bund and operated when required.



Whole sunken area volume	91.36m^3
Volume of filter cake skip within bund	16.06m^3
Volume of settlement tanks within bund	7.77m^3
Available volume	67.53m^3

Total primary settling tank volume	40.0m^3
110% of largest tank	22.0m^3
Containment percentage	**307%**

In the event of a catastrophic release from one of the 20m^3 storage tanks in this bund, there is sufficient containment capacity to store the spillage in the short-term so that a third-party tanker could be brought to site to collect and remove effluent for off-site treatment.

Filter cake press above the collection skip. The roof extends over, reducing rainfall ingress.

Base of the bund showing black 20m^3 tank and above ground pipework. The bund wall is brick and mortar.

5.0 Conclusions and Recommendations

The risk ranking following the methodology in CIRIA C736 classifies the site as Moderate Risk, requiring Class 2 containment systems.

Following the assessment of the containment at the Site, the following recommendations to improve secondary and tertiary containment are below:

Bund A – Etching Plant

- The existing steel and concrete secondary containment currently surrounds 20 tanks, of either 7.5m^3 or 14.5m^3 capacity. The bund has sufficient capacity to easily retain two 14.5m^3 process tanks. It is not envisaged that more than one tank would leak at any one time.
- The building housing the etching plant has the potential to hold a significant quantity of liquid for temporary storage. Doorways and vehicle entrances may benefit from a low bund or lip, while not presenting a hazard for fork lift trucks which may use that route.
- To ensure the emergency IBCs are always accessible in an emergency, it is recommended that the area in front of the racking holding the emergency IBCs is painted, or hazard tape installed, to inform operatives that no equipment should be stored in this area.
- The concrete floor within the bund is showing signs of degradation from spilled process liquids. These areas should be professionally cleaned and inspected. The concrete should be repaired and lined in accordance with the results of the inspection.
- The two 1m^3 sumps within the concrete flooring of the bund should similarly be cleaned, inspected and repaired/lined as appropriate.
- Maintain a programme of inspection and cleaning within the bunded area to prevent future concrete degradation.

Bund B – Dump Tanks

- The existing secondary containment has sufficient capacity to retain the contents of both tanks located within it. However, blockwork bunds are not considered suitable for Class 2 containment systems.
- Remove the yellow bunded pallets from the bund. These are reducing the overall effective volume of the bund and could become buoyant if the bund fills with process liquids.
- It is recommended that the brick bund be replaced with a properly designed engineered concrete structure which meets the 110% / 25% rule. The side wall of the current brick bund is currently formed by the factory wall and any replacement concrete bund will need to prevent this practice in the future. Ensure that the jointing between the concrete slab base and the bund wall is adequately sealed.
- There is currently no sump or sloped floor to provide a liquid collection point. Any replacement bund must be properly engineered to provide a pumping location.

Bund C – Effluent Treatment

- The containment capacity for the low block bund is currently inadequate. It is only 24.5% of the required capacity of 110% of the tank contents.
- Blockwork bunds are not considered suitable for Class 2 containment systems.
- The block bund could be hydraulically linked to the adjacent brick bund to increase capacity. However, the condition of the brick bund is currently poor.
- The brick bund and the block bund do not appear to be impermeable with many cracks in the mortar visible and little confidence in the seal between bund wall and concrete base. It is recommended that these bunds be rebuilt, ideally with a properly designed engineered concrete structure which meets the 110% / 25% rule.
- Consider removing redundant tankage which can conceal damage to the concrete base of the bund.

Bund D – Filter Press

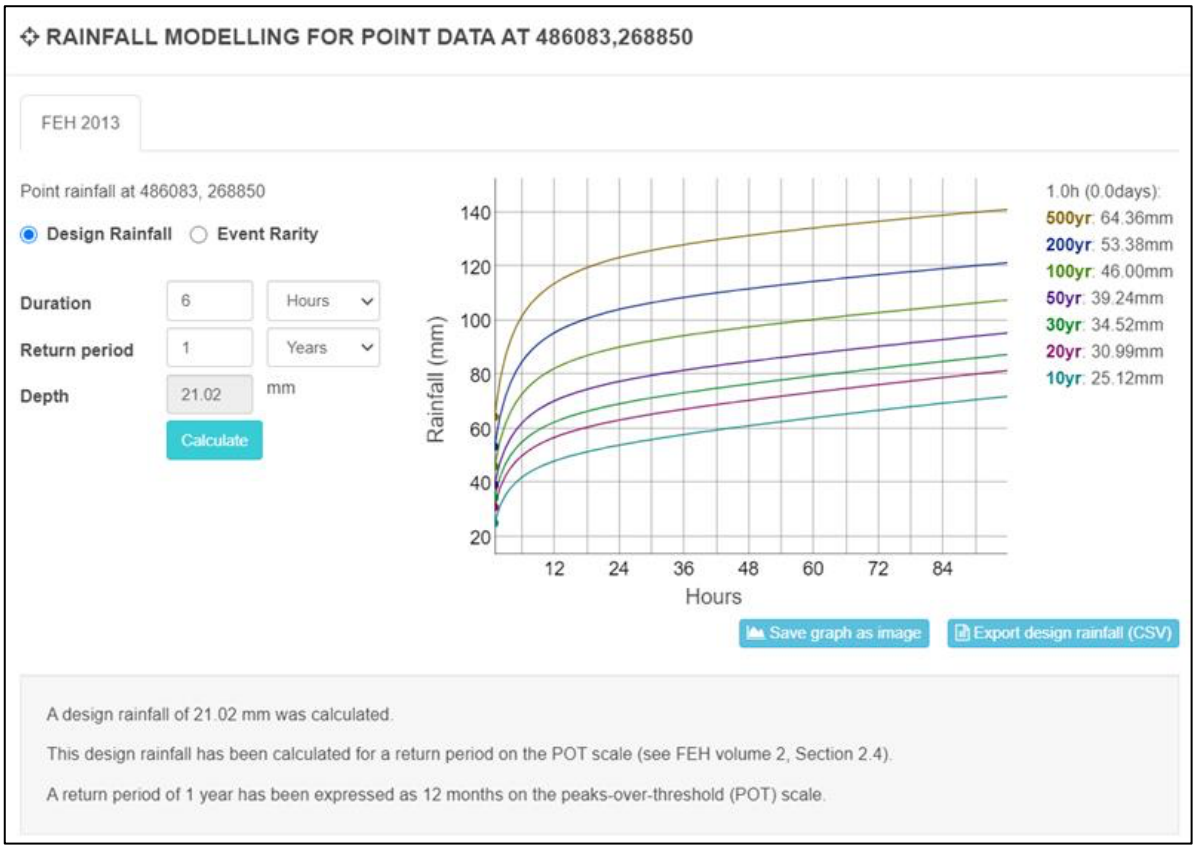
- The existing secondary containment has sufficient capacity to retain the contents of both tanks located within it.
- While blockwork bunds are not considered by CIRIA C736 to be suitable for Class 2 containment systems, it is considered that this area will only be containing effluent for the filter press. This is non-aggressive and so a painted coating system may be appropriate. It is recommended that a bund lining contractor be approached for compatible solutions. Ensure the joint between the concrete slab and the brick wall is adequately sealed.
- Sealing the concrete base is unlikely to be practicable given the requirement to periodically remove the filter cake skip, which would mechanically degrade the sealant or lining. The concrete flooring appears to be in acceptable visual condition and is retaining surface water.

Site wide

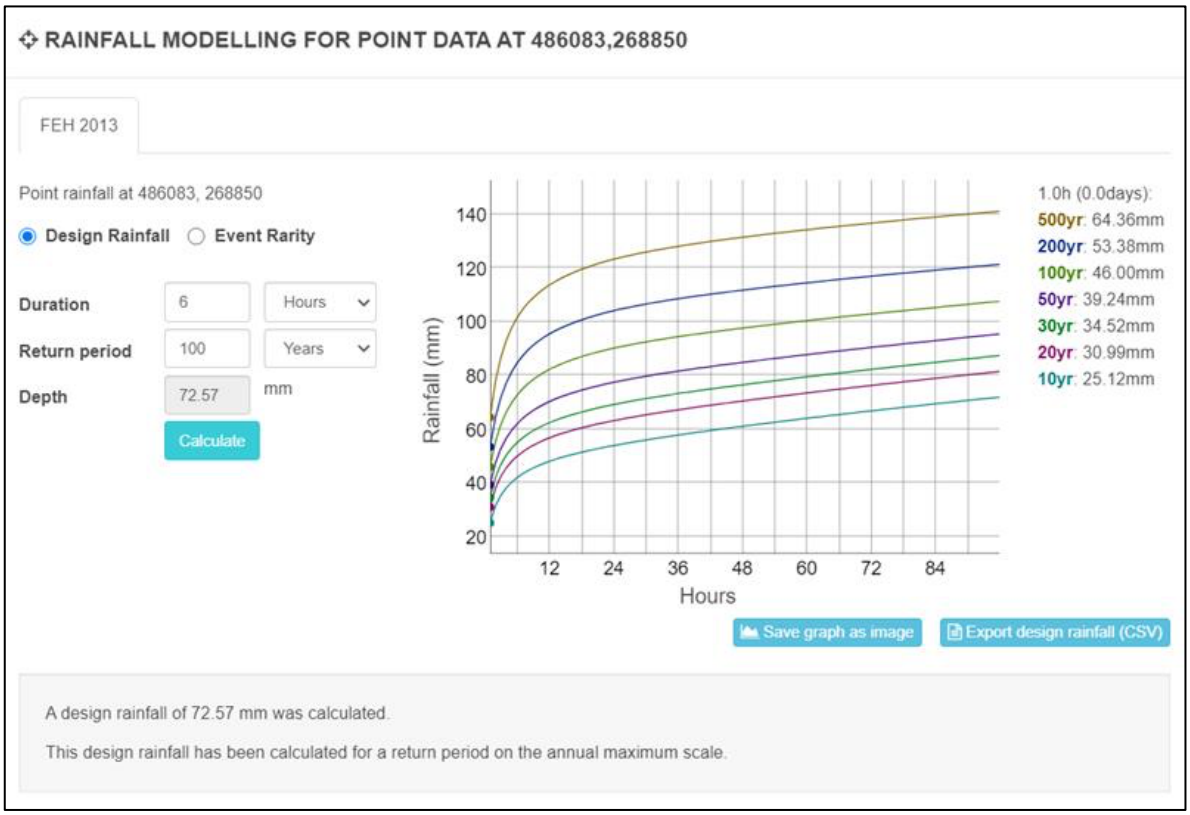
- Implement an inspection strategy for the upgraded bunds, including removal of water following periods of rain, and visual inspection for integrity.
- Potential leakage away from secondary containment or during deliveries would likely flow to the car park area. Temporary containment could be provided in the car park. This would require a levelling survey to determine the likely low points and containment capacity. As there is a gully drain which runs for a significant proportion of the car park length it is not feasible to use temporary drain covers; it would also require installation of a penstock valve to allow isolation of the drainage in the event of an emergency.

Appendix A – Rainfall Data

Annual rainfall data:



1 in 100 year rainfall data:



Appendix B – Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Sustainability Consultant.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

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