J840 – STC IED Containment

Long Reach STC – Containment Options Report

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Thames Water

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Content

1. Executive Summary

Thames Water is required by the Environment Agency to provide secondary containment to their sludge treatment centres (STC) to satisfy provisions of the Industrial Emissions Directive and to safeguard the operation of the adjacent sewage treatments works and any neighbouring receptors. Twenty-five sludge treatment centres have been identified where containment proposals are required. This report deals with the proposals for Long Reach.

Long Reach serves a population equivalent of some 900,000 receiving flows from parts of Bexley, Bromley, Croydon, Dartford, Sevenoaks, Tandridge and Tonbridge & Malling. The sludge treatment centre shares the same site as the sewage treatment works.

CIRIA Report 736 – Containment systems for the prevention of pollution sets out principles and direction. This report sets out options to apply the CIRIA 736 principles within the accepted constraints of a retrofitted solution.

Long Reach holds some 31,000m^3 of liquid within the sludge treatment centre. The liquid sludge is stored in sixteen tanks with individual volumes varying between 250-3739m^3, refer to section 3.4.1 for full list of tanks and their respective volumes. The majority of the tanks are concrete, the site is manned and subject to regular tours by operations staff. The site is generally low lying and flat. The containment volume of 7751m^3 is driven by the 25% rule (25% of total tank volumes which includes allowance for rainfall) rather than 110% (of the largest single tank) of the total tanks volume.

Two options for containment have been identified and reviewed with Operations to confirm that the working of the sewage treatment work is not compromised by proposals, refer to section 4.1 for details of the two options and section 4.3 for preferred option:

1. Wide area containment whereby the sludge tanks are contained within a bunded boundary with sufficient area to generate shallow depth that does not deny emergency access to equipment when the spill has been contained

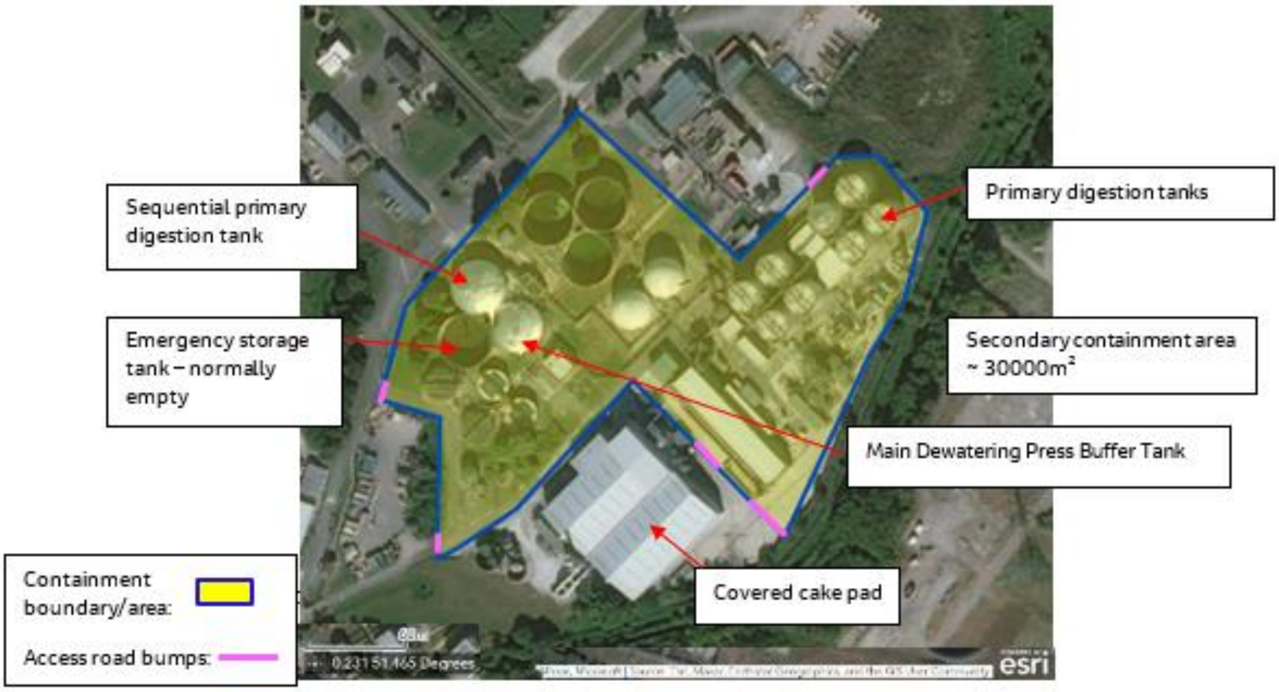
2. The creation of two smaller containment areas: one around the secondary digestors and picket fence thickeners; the other around the primary digestors. These then work with a transfer system to utilise the potential storage available within the old secondary tanks.

In addition to the creation of bunds, existing grass or gravelled areas will be replaced with a bound impermeable material (high cement replacement concrete) to provide a surface that can be cleared of sludge to meet three-day recovery period. These new concrete areas with the existing concrete roads and slabs to provide the impermeable base to the containment area as a whole. Vehicular access into the containment areas is by ramps (speed humps) restricted to nom 250-300mm in height; traffic movements on site make the use of permanent flood gates impracticable. There is the potential for some flow to overtop the access ramps during an initial burst which is addressed by tertiary containment and conveyance to the site drainage system which discharges to the inlet works. Whilst the site is identified as requiring Class 2 containment (impermeable soil with a liner), the proposed solution is intending to adopt concrete (with no liner) on the basis of the impermeability of the concrete, inherent strength and long-term mechanical resistance to cope with potential cleaning activity. Remedial works to existing concrete slabs/roads will be undertaken to ensure that they provide a competent surface, for example resealing of joints.

The containment volume identified reflects the potential escape volume from the tanks and the 1 in 10 year rainfall that could arrive during the clearing up period.

Bund heights are being set to provide freeboard considering both static conditions when the containment has been filled and during the transient condition at initial failure. The bunds have been identified to be concrete due to space constraints. The bund profile will facilitate turning the flow back on itself to mitigate the risk of overtopping during the initial failure. There is the potential for some flow to overtop the access ramps during the conditions of the initial burst which is addressed by tertiary containment and conveyance to the site drainage system which discharges to the inlet works.

General layout of the proposed solution:



The modelling highlights that the design detailing may need to consider reprofiling some of the high spots within the yellow area to distribute the flow more evenly across the site and hence lower its depth.

Grassed and gravel areas within the yellow area to be replaced by concrete. Some of the concrete roads in the yellow area may need to be replaced/repaired to enable them to be impermeable.

2. Background

Following initial audits by the Environment Agency (EA) in 2019 that examined the primary, secondary, and tertiary containment provisions for Thames Water's anaerobic digestion (AD) process and associated tanks, the EA reported *"there is no provision of secondary containment for the AD process at any of Thames Water's sites.* Jacobs were appointed to assess site risks and outline the options available for providing secondary containment of a catastrophic tank or digester failure across 28 Thames Water sites. Based on CIRIA C736 and ADBA risk assessment tools this containment report addresses the site-specific risks at Long Reach and outlines the options available for providing secondary containment in the event of a catastrophic tank or digester failure.

The current assessment identified gaps between the existing conditions of the sludge assets in Long Reach STW and the requirements to meet the industrial standard (i.e., CIRIA C736 and The Anaerobic Digestion and Bioresources Association Limited (ADBA)). Site-specific risks, credible failure scenario and design containment volume for the Long Reach STW were identified through a desktop study, Light Detection and Ranging Analysis (LiDAR) analysis and a site visit.

Long Reach STW (Figures i-iii) is located on the south bank of River Thames in Dartford, with the Dartford Marshes to the west and warehouses to the east. There are a mixture of housing and warehouses to the south of the site. Long Reach STW serves a population equivalent of 900,000 for a catchment area of 518 km^2 around Dartford and Long Reach.

Figure iv shows the boundary of the permitted IED area and the assets contained within Long Reach STW.

There is a watercourse that commences on the site and is culverted under the cake barn and discharges outside of the site boundary (Figure iii). This tree-planted source area will need to be isolated from the wider containment area.

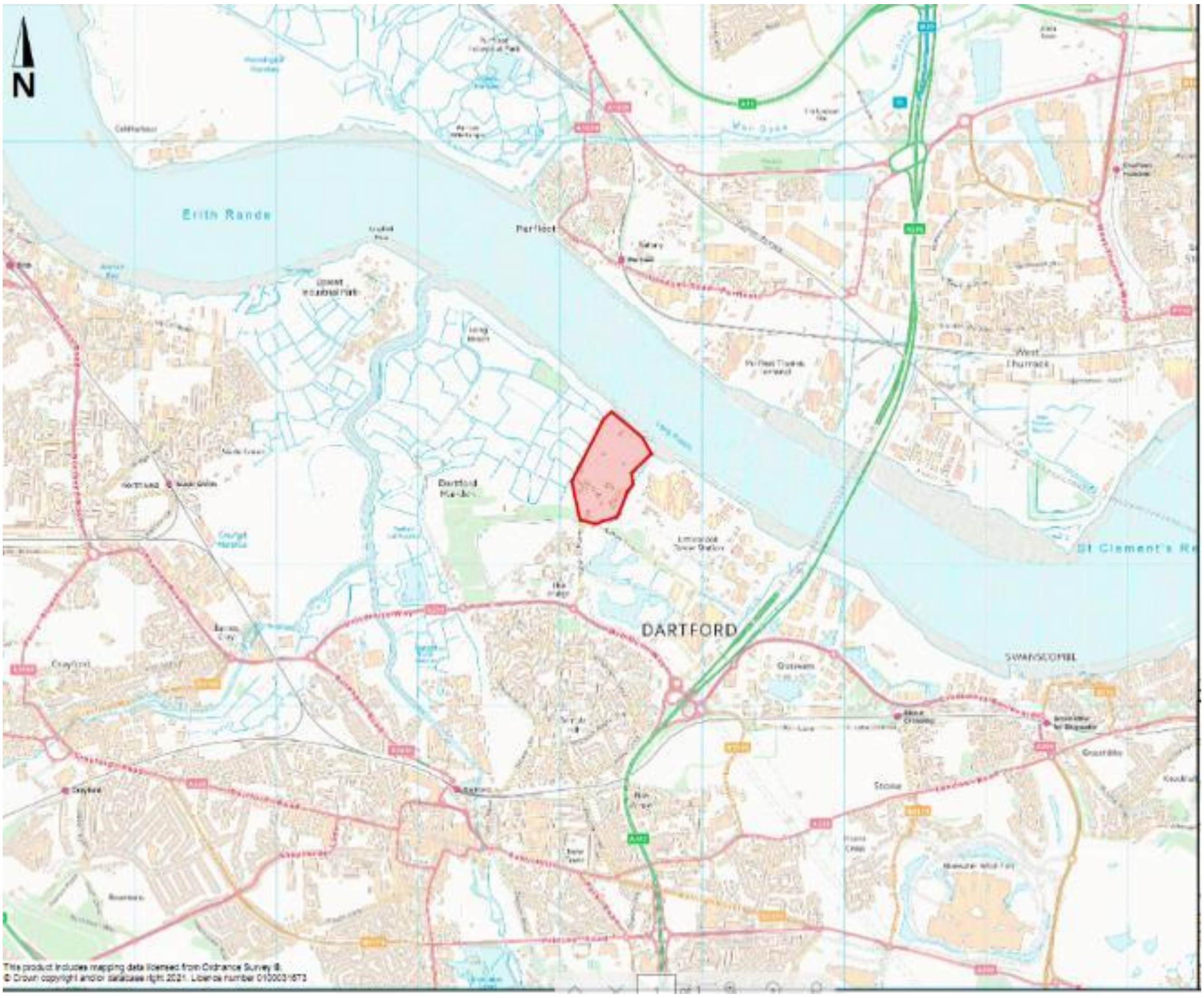


Figure i Location plan of Long Reach Sewage Treatment Works and STC

Figure ii Satellite view of Long Reach Sewage Treatment Works and STC

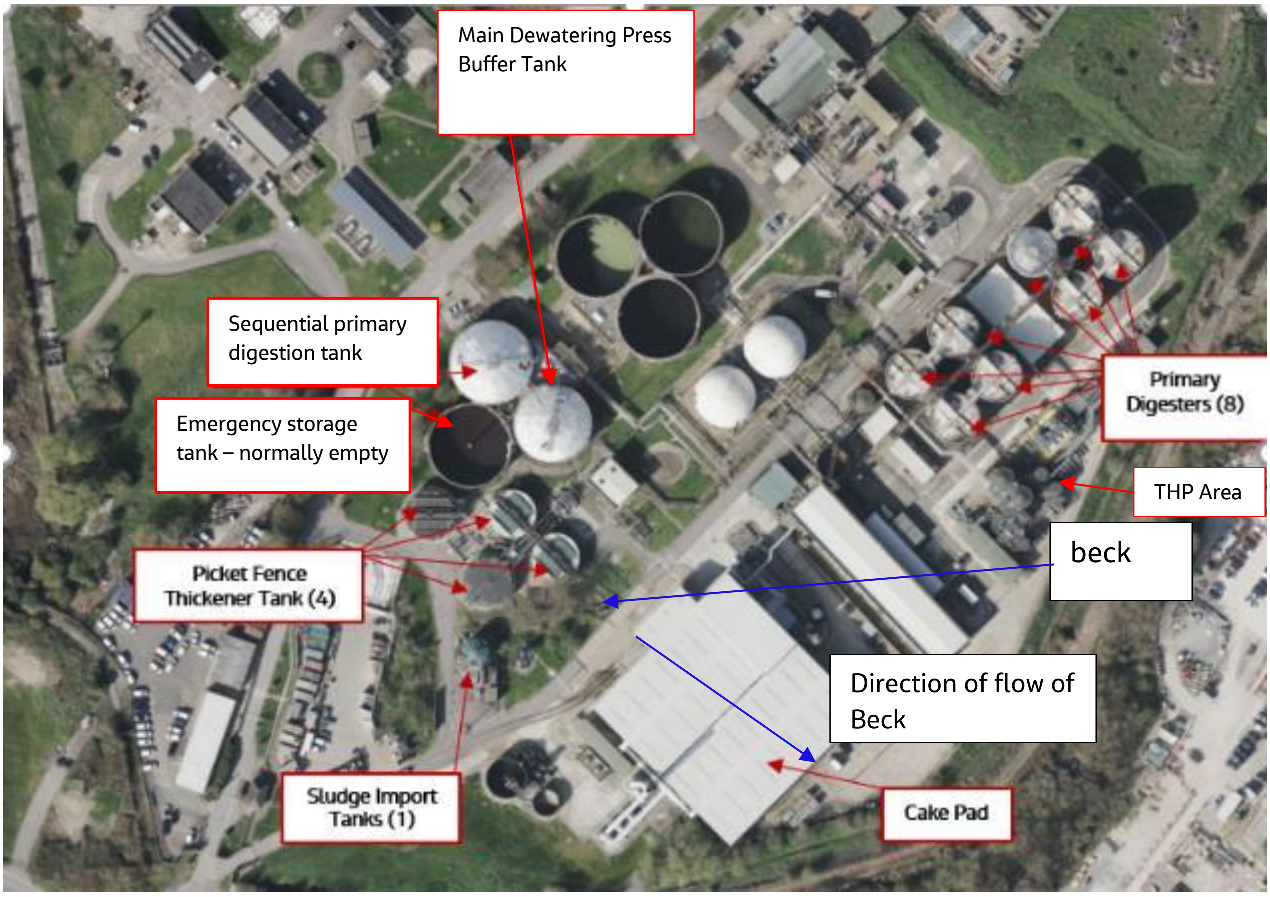


Figure iii Long Reach Sludge Treatment Centre – Digester Area plan

This document has been developed from the Long Reach STW, Risk Identification and Containment Assessment Report, which outlines the impact of an uncontained spill and the risk assessment completed.

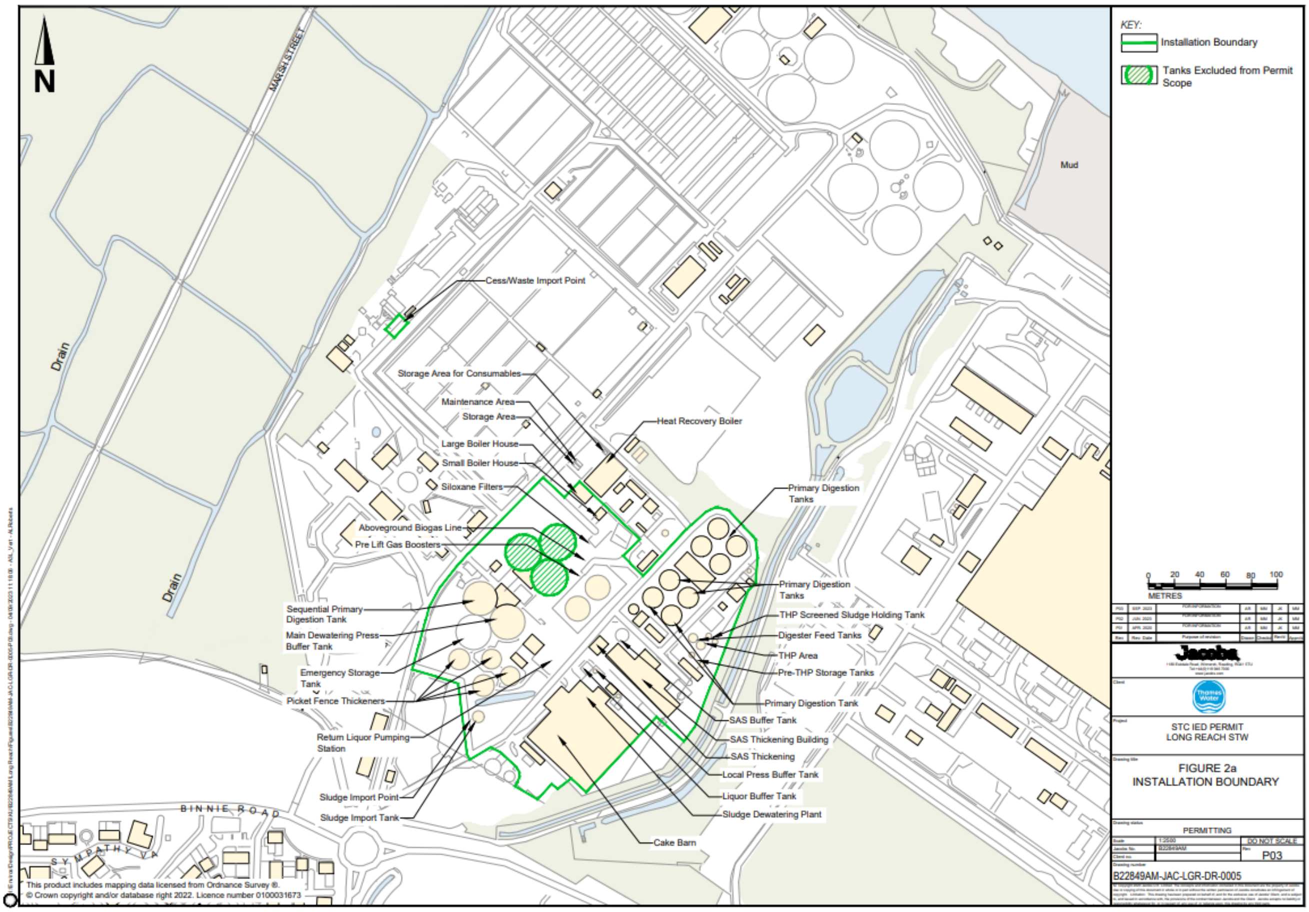


Figure iv Boundary of the permitted IED area and the assets contained within Long Reach STW.

3. Proposed Containment at Long Reach STW

3.1 CIRIA C736

This containment option report has been prepared using CIRIA C736 as the basis of design and guidelines. Where a deviation from C736 has been recommended it is highlighted in the text.

CIRIA guidance document C736 *(Containment systems for the prevention of pollution – Secondary, tertiary, and other measures for industrial and commercial premises, 2014)* describes various options for containment of spillages from a credible failure scenario. It makes reference to a key plan, reproduced below;

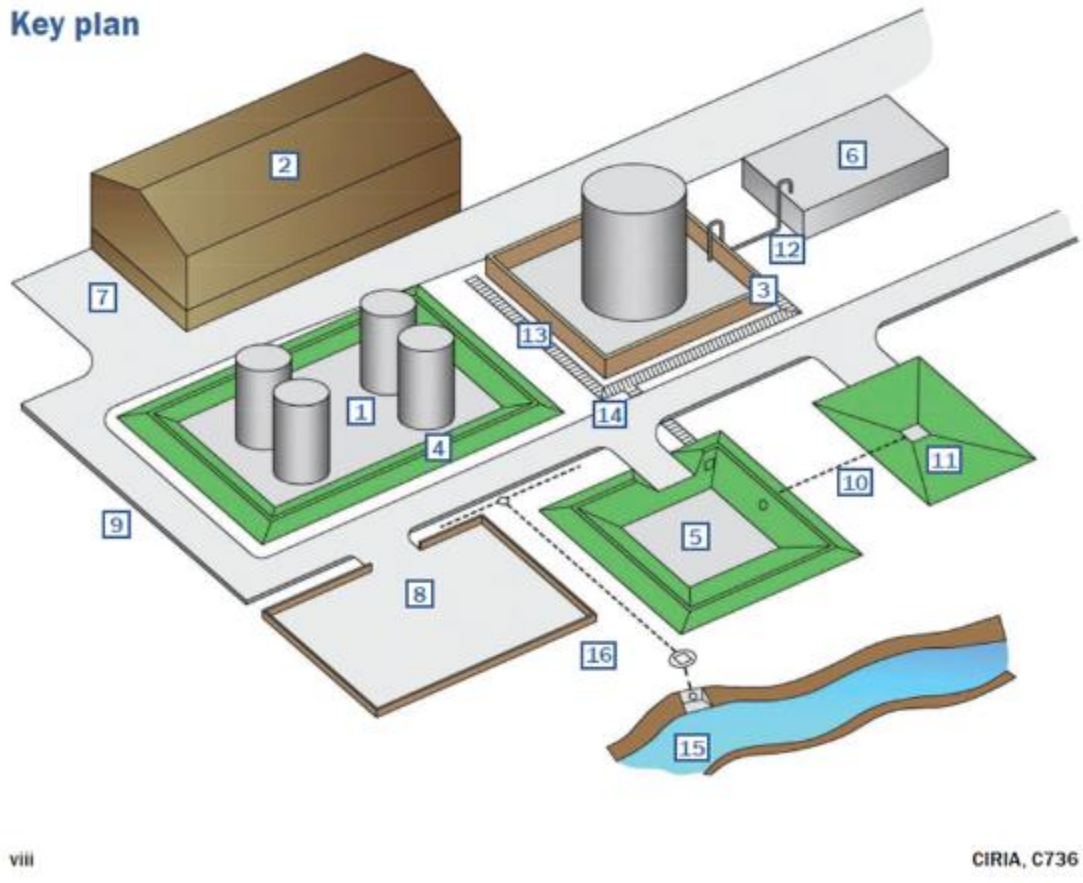


Figure 3.1 Diagram of primary, secondary and tertiary containment examples

-**Primary containment** is provided by the actual tank or vessel [1]

-**Secondary containment** is provided by a bund immediately surrounding the primary vessel e.g. [3] and [4], or by a lagoon [5] or tank [6]. If containment is provided away from the primary vessels this is known as **remote containment** and may be considered as either **remote secondary** or **tertiary containment**.

-**Tertiary containment** can be provided by a number of means including lagoons [5], or impermeable areas such car parks [8]. Roadways with high kerbing of sufficient height [9] can also form part of a tertiary containment system, or the **transfer system** to the remote containment.

The distinction between *remote secondary* and *tertiary* containment is not always clear but, if properly designed, a combined system can be provided that is capable of providing the necessary degree of environmental protection. The overriding concern is not the terminology but the robustness and reliability of the system which depends on a number of factors such as;

- Its complexity – the more there is to go wrong, the greater the risk. Passive systems relying solely on gravity are more reliable than pumped.
- Whether manual intervention is relied on to make the system work or whether the system can be automated to include fail-safes and interlocks.
- The ease of maintenance and monitoring of the system's integrity, and repair of any defects.

During and after an incident any rainfall runoff from the secondary storage areas, from the spillage catchment areas and from the transfer systems must also be prevented from reaching any outfall(s) to surface water by closure of control valve(s).

3.2 Objectives of secondary containment

The objectives of the secondary containment measures proposed in this report are to safely contain spillages from credible failure scenarios and prevent them from:

- escaping off site
- entering surface waters
- percolating into groundwater
- being discharged to the inlet of the sewage works in an uncontrolled manner.

As the project is retrofitting the provisions of CIRIA 736 to an existing facility, the secondary containment may seek to maximise the use of existing impermeable surfaced areas.

The interface between the contained area and existing process/site drainage return systems is managed to protect the sewage treatment works from shock loads that might otherwise arise from a tank failure.

3.2.1 Uncontained Spill modelling

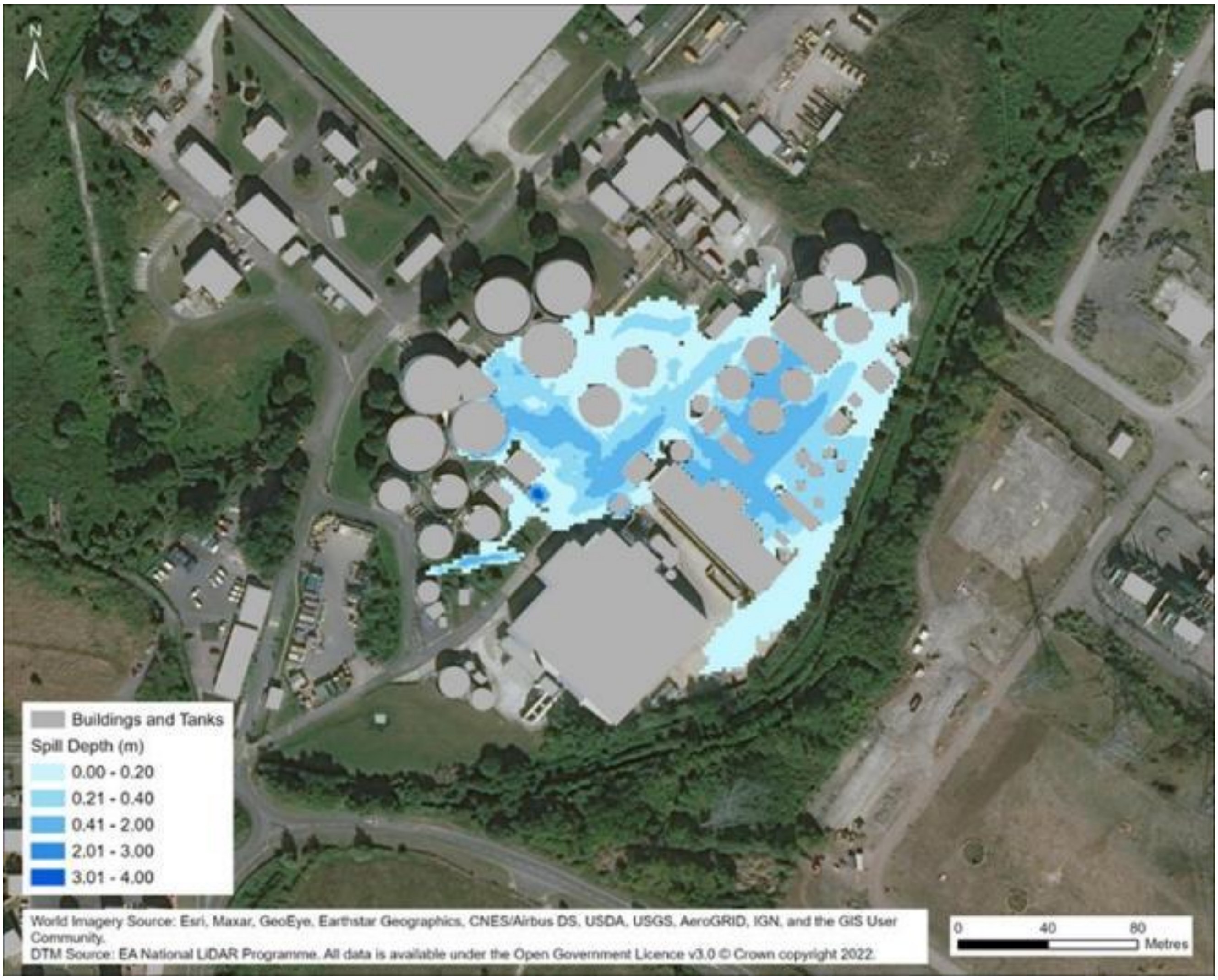


Figure 3.2 Uncontained Spill Model Results

As seen from Figure 3.2, the sludge spill mapping of an uncontained event in Long Reach STW shows that a potential sludge spill from the one of the Primary Digesters will be self-contained within the site boundary and therefore passive containment may not need to be implemented to safeguard the nearby receptors. According to the model the spill will spread and reach its full extent in approximately 8 minutes after failure of one of the Primary Digesters. The sludge content will split and part of it will spread east towards the Thermal Hydrolysis Plant (THP) area and flow southward following the road inside the STW to reach the Secondary Activated Sludge belt thickener building. Part of the flow will travel west following the internal roads and will reach the Biogas Holders, where it is expected that some sludge will flow in the ditch next to the Picket Fence Thickeners.

3.3 Site Classification Long Reach

Based on the use of the ADBA risk assessment, considering the source, pathway and receptor risk Long Reach site hazard rating is deemed to be High. When considering the mitigated likelihood as low a class 2 secondary containment is required.

Source Risk	Pathway Risk	Receptor Risk	Site Hazard Rating	Likelihood	Overall Site Risk Rating
High	**High**	**High**	**High**	**Low**	**Medium (Class 2)**

Refer to Appendix 1 for more detailed summary of the ADBA risk assessment tool.

3.3.1 Spill Volume Summary

There are two components that contribute to the required capacity of secondary containment, the source spill volume requiring containment and rainfall. Section 4 of CIRIA 736 forms the basis of this assessment. Section 4.2 reviews current industry practice relating to source spill volume, section 4.2.8 then summarises current industry practice relating to source spill volume in a tabular form. However section 4.2.8 does not cover specifically sewage sludges and associated regulations / guidance.

Within section 4.2.1 there is detailed reference to the use of 110% of the largest tank or 25% of the total tank inventory volume, whichever is greater, and the rationale for this. CIRIA recognises that this approach is not quantitative or based on a risk assessment and are arbitrary methods. Section 4.3 and 4.4 provide guidance on a quantitative risk assessment methodology and this is what is being used for the calculation of the required capacity for containment in this report.

3.3.2 Total Spill Volumes

The containment volume has been checked against the 110 and 25% rule and the 25% rule applies.

The total spill volume is 7751m^3 (25% of the total volume of all tanks within the containment area, which includes allowance for rainfall), compared to largest single tank failure of 3532m^3 and total rainfall of 2104mm^3 from Flood estimating handbook over the catchment area, which gave a lesser total spill volume of 5636m^3.

3.4 Long Reach STW Summary of Containment volumes and assets

3.4.1 Assets for Containment

The tanks for which containment is required are summarised below:

Tank Purpose	Number	Operational Volume (m^3)	Construction
Picket Fence Thickeners	4	884	Steel
Sludge Import Tank	1	251	Steel
High Energy Blending Tank	1	10	Steel
Pre-THP Storage Tank	2	59	Steel
THP Screened Sludge Holding Tank	2	59	Steel
THP Feed Silo	1	73	Steel
THP Pulper Tank	1	34	Steel
THP Reactor Tank	3	13	Steel
THP Flash Tank	1	42	Steel
Digester Feed Tanks	2	254	Steel
Primary Digestion Tank	8	2,000	Steel
Sequential Primary Digestion Tank	1	3,739	Concrete
Emergency Storage Tank	1	3,739	Concrete
Main Dewatering Press Buffer Tank	1	3739	Concrete
Local Press Buffer Tank	1	35	Steel
Liquor Buffer Tank	1	200	Concrete

3.4.2 Digital Terrain Model

The terrain model (Figure 3.3) shows that Longreach is low lying and fairly flat in topography.

Figure 3.3 Digital Terrain Model of Reading Sewage Treatment Works

The contained model output is shown in Figure 3.4. This identifies the flow will be contained at a fairly uniform depth across the site. The containment model shows that for 100% volume loss the top water level will settle at 2.84m A.O.D. Therefore allowing for 250mm freeboard on the bund wall the bund height will vary between 0.5 – 1m with the higher bund wall along the southern side of the containment area.

Figure 3.5 shows the contour plot for the containment area. There is the potential for some flow to overtop the access ramps during the conditions of the initial burst which is addressed by tertiary containment and conveyance to the site drainage system which discharges to the inlet works.

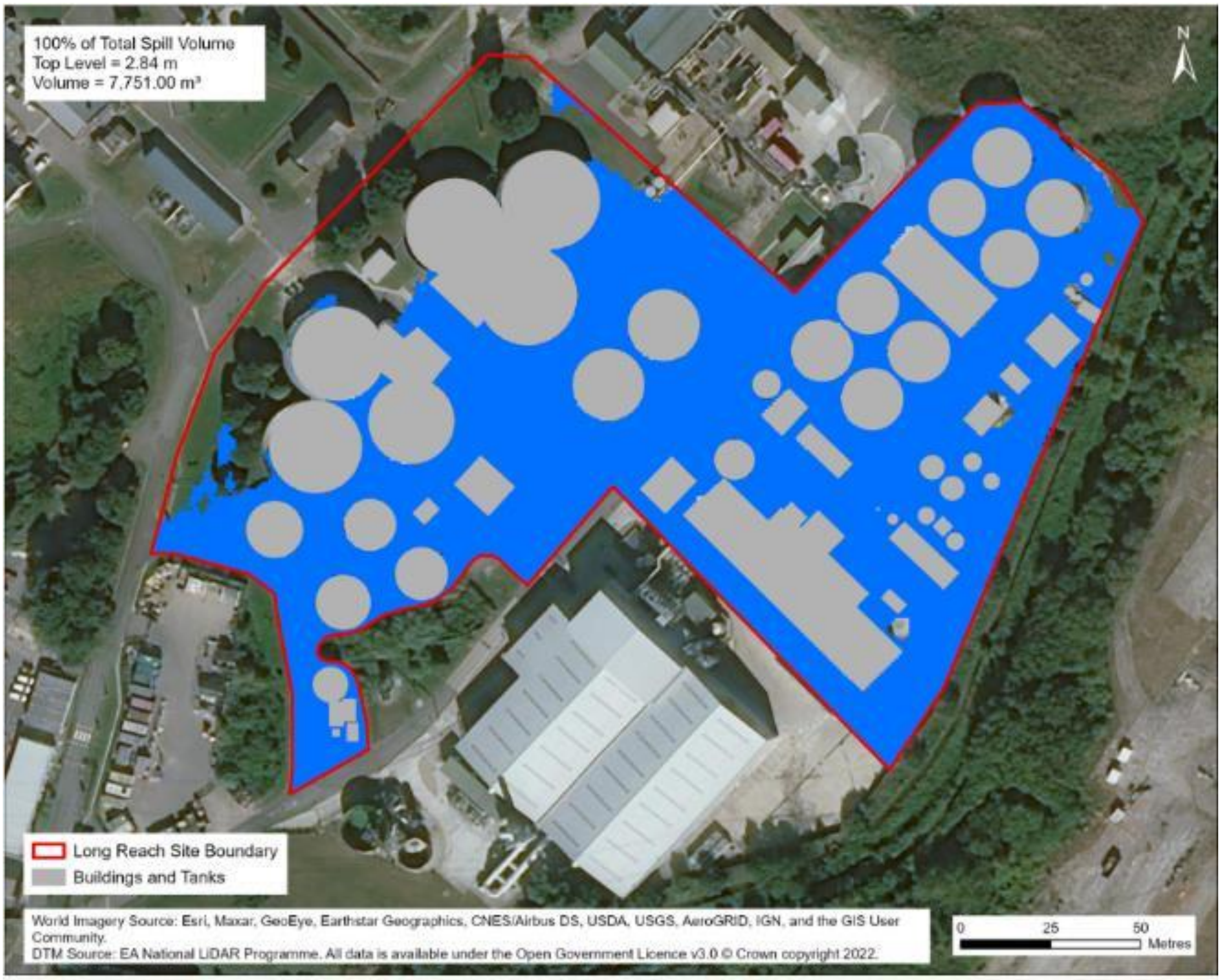


Figure 3.4 Containment spill model

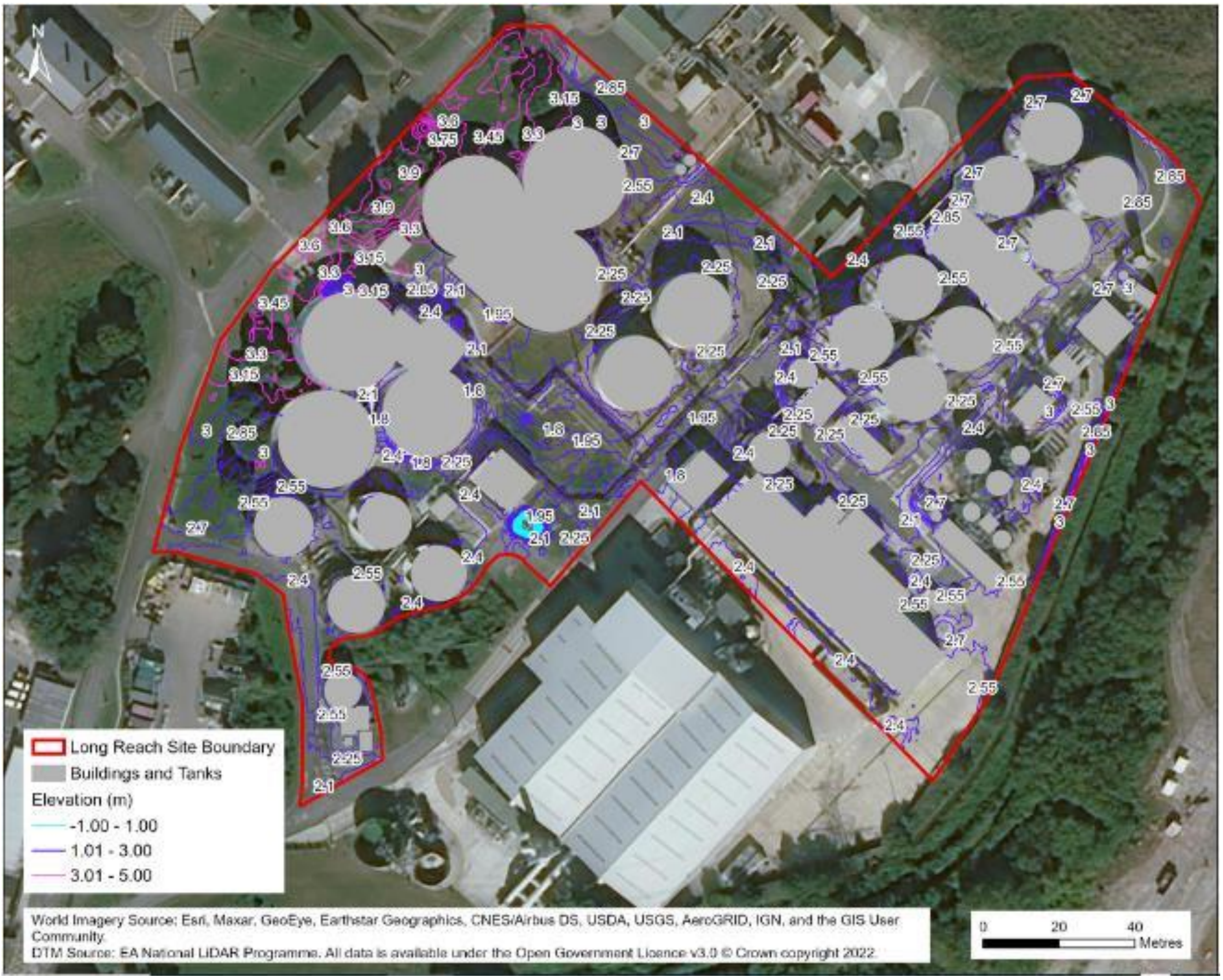


Figure 3.5 contour map of the contained area

3.5 Identified Constraints

Operational constraints

Figure 3.4 Plan showing existing surfaces to be replaced with impermeable surface

The existing ground surfaces are mainly grass and gravel and this will need to be replaced with impermeable surface e.g. concrete from which sludge can be cleared up easily. TW operation have stated that it would be difficult to clean up sludge from gravel areas as the gravel would also sucked up with the sludge.

The time to recovery and return site back to operation has been set at 8 days as per CIRIA guidance maximum allowance as Thames Water operations are unable to commit to a shorter figure.

The sludge cake barn has not been included in the proposed containment area. Any spills onto the dried sludge cake would be difficult to clean up and take a long time, the sludge cake would need to be passed through a centrifuge again to dry it and re-thicken it or sent back to the head of the works.

Geotechnical and Environmental constraints

Sub soil ground condition at Longreach STW are Loamy and clayey soils with naturally high groundwater, extract from Magic maps website.

The potential use of the old secondary tanks as secondary containment lagoons. The tanks have been redundant for several years and contain rainwater and remains of old sludge so an ecology survey would need to be undertaken to determine there is now wildlife of interest living in the tanks.

Other constraints

There is a beck which runs from near the picket fence thickeners then travels underground under the cake barn, this beck will need to be isolated from any spills.

3.6 Design allowance for rainfall

In addition to the maximum volume arising from a credible failure scenario, extra allowance for rainfall that may accumulate within the contained area before and after an incident has been made. The CIRIA guidance recommends that the containment volume should include an allowance for the total rainfall accumulated in response to a 1 in 10-year return period events for the 24 hours preceding an incident and for an eight-day period following an incident or other time period as dictated by site specific assessment. Thames Water has indicated that the clean up and return to operation is feasible in 3 to 4 days. Therefore, a three-day period following an incident has been allowed for in the design allowance for rainfall following the incident. The arising average rainfall depths for a 1 in 10-year storm over the event period for Long Reach is 69.53 mm. It should be noted that the rainfall depths for Long Reach have been estimated using the depth-duration-frequency rainfall model contained on the *Flood Estimation Handbook* (FEH), which provides location specific rainfall totals for given durations and return periods.

4. Secondary Containment

The constituent parts of secondary containment are;

- The contained area itself.
- The transfer system.
- Isolation of the drainage from both the contained area and from the transfer system.

For Long Reach, where possible, existing features of the site (e.g. suitable structures and impermeable surfaces) are used as much as possible to provide the secondary containment to reduce cost. The options considered, modifications and their functionality at Long Reach STW are listed below:

- Bund/walls to contain liquid. The heights of bund/walls given in Section 4.1 are the minimum heights required such that that top of the bund/wall is equal to the top water level plus a 250mm freeboard consideration for potential surge (to reflect the planned use of concrete walls with a recurved profile to return flow back on itself) in accordance with CIRIA. Containment ramps provide a barrier for the liquid on roads that still need to be accessible to vehicles for site operation. The maximum height of these will be 250-300mm to avoid issues with vehicle passage. The risk of spill at the ramps is mitigated by conveyance of the flow to site drainage and return to the head of the works.
- Local infill of grass/gravel to create an impermeable surface and facilitate containment and conveyance.
- Raised kerbs on roadways to channel spill to the remote containment area.
- All buildings within the containment and transfer areas must either have doors that lie above the top water levels detailed in Section 4.1 or do not contain sensitive equipment below the anticipated the top water level.

4.1 Containment Options

Containment Option 1 – Wide Area Approach

This option utilises containment surrounding the tanks in the permit area, which provides secondary containment to the sludge processing facilities. The containment area is approximately 30,246m^2 but the actual available containment area will be less than this as areas such as the offline secondary digestor tanks and buildings will not be included in the storage volume.

The containment volume has been checked against the 110 and 25% rule and the 25% rule applies.

The total spill volume is 7751m^3 (25% of the total volume of all tanks within the containment area, which includes allowance for rainfall), compared to largest single tank failure of 3532m^3 and total rainfall of 2104mm^3 from Flood estimating handbook over the catchment area, which gave a lesser total spill volume of 5636m^3.

LiDAR spill modelling calculated the top water level (TWL) when 7751m^3 is contained in this area to be at 2.84m A.O.D.

Figure 4.1 below highlights the containment area for option 1.

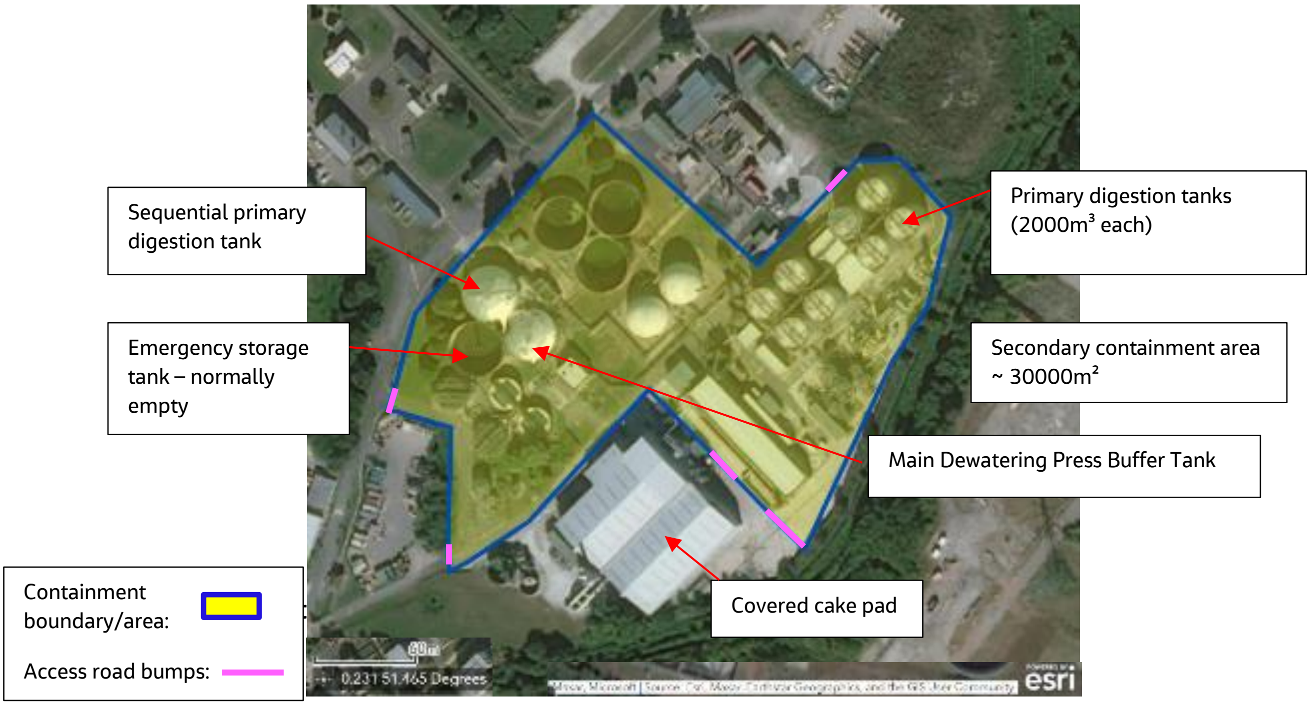


Figure 4.1 – Containment Option 1 – Wide area containment option

Bunding will be utilised around containment boundary and ramps constructed across roads to enable vehicular access. Maximum height of ramps will be 250mm and bunding height nominal 500mm. The top of the bund could incorporate a deflection profile that will reduce risk of overtopping immediately after a spill event and ensuring spill volumes remains within the containment area. Detailed design will assist with the final deflection profile to account for this risk. There is the potential for some flow to overtop the access ramps during the conditions of the initial burst which is addressed by tertiary containment and conveyance to the site drainage system which discharges to the inlet works.

All grass and gravel areas will be excavated and resurfaced with concrete to mitigate seepage into the local ground and soil refer to figure 3.4. The ground can be reprofiled in these high areas to assist with the sludge flow path. This also aids cleaning procedures following a spill.

The existing drainage network on site is pumped back to the head of the works, as per confirmation from TW Operations of Long Reach and the site drainage plans, ref section 5.2.

Containment Option 2 – close containment and transfer

Option 2 provides close containment option for the primary and sequential primary digestors. This option provides approximately 17,000m^2 of close containment area. The old secondary tanks will be the remote secondary containment and using new pipework and pumps to connect to the active digestors.

Figure 4.2 below highlights the containment area for option 2.

Bunding will be utilised around containment boundaries and ramps constructed across roads to enable vehicular access. Maximum height of ramps 250mm and bund height nominal 500mm. The top of the bund will incorporate a deflection profile that will reduce risk of overtopping immediately after a spill event and ensuring spill volumes remains within the containment area. Detailed design will assist with the final deflection profile to account for this risk. There is the potential for some flow to overtop the access ramps during the conditions of the initial burst which is addressed by tertiary containment and conveyance to the site drainage system which discharges to the inlet works.

All grass and gravel areas will be excavated and resurfaced with concrete to mitigate seepage into the local ground and soil. This also aids cleaning procedures following a spill. The existing drainage network on site is pumped back to the head of the works, as per confirmation from TW Operations of Long Reach and site drainage plans.

The sludge from each containment area will be pumped and discharged into the old secondary tanks.

This option has been discounted due to the requirement and cost of pumping the sludge to the old secondary tanks and cleaning out of the old secondary digesters.

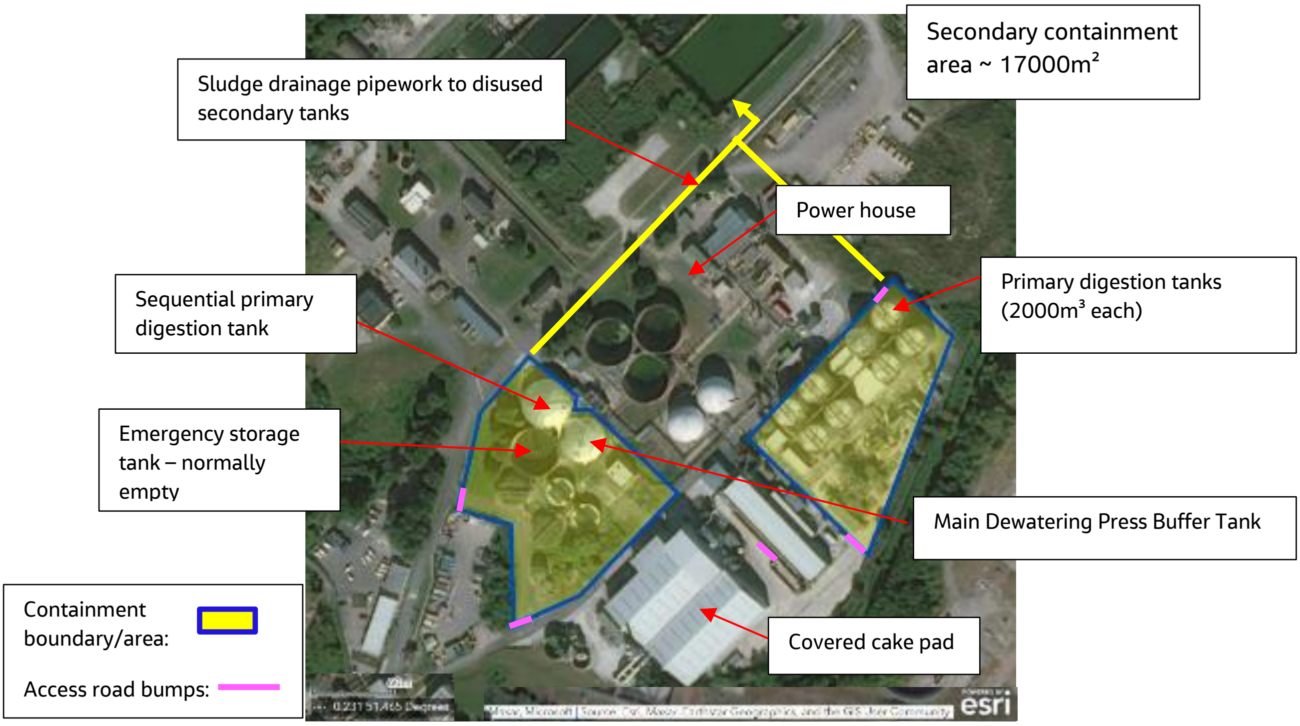


Figure 4.2 – Containment Option 2 – close containment option

4.2 Mitigation of Site-Specific Risks

Jetting and Surge Flows

There is a low risk of jetting occurring as the majority of the digester tanks are concrete construction, for which catastrophic failure is deemed to be less of an issue. Failure is more likely to begin with major seeping from the tanks which would be spotted during routine site walkabout tours each day. The Picket Fence Thickeners are close to a road but that is not a boundary.

Due to the location of the tanks and their distance from the boundary of the containment area, there is little risk of contamination through jetting.

Surge effects have been mitigated by the bund profile (recurved to return flows back on itself) and the distance of the bund wall to the tanks.

Flooding

According to the UK Government's Flood Map for Planning, Long Reach STW is within a flooding zone 3 that benefits from flood defences as shown in Figure 4.3.

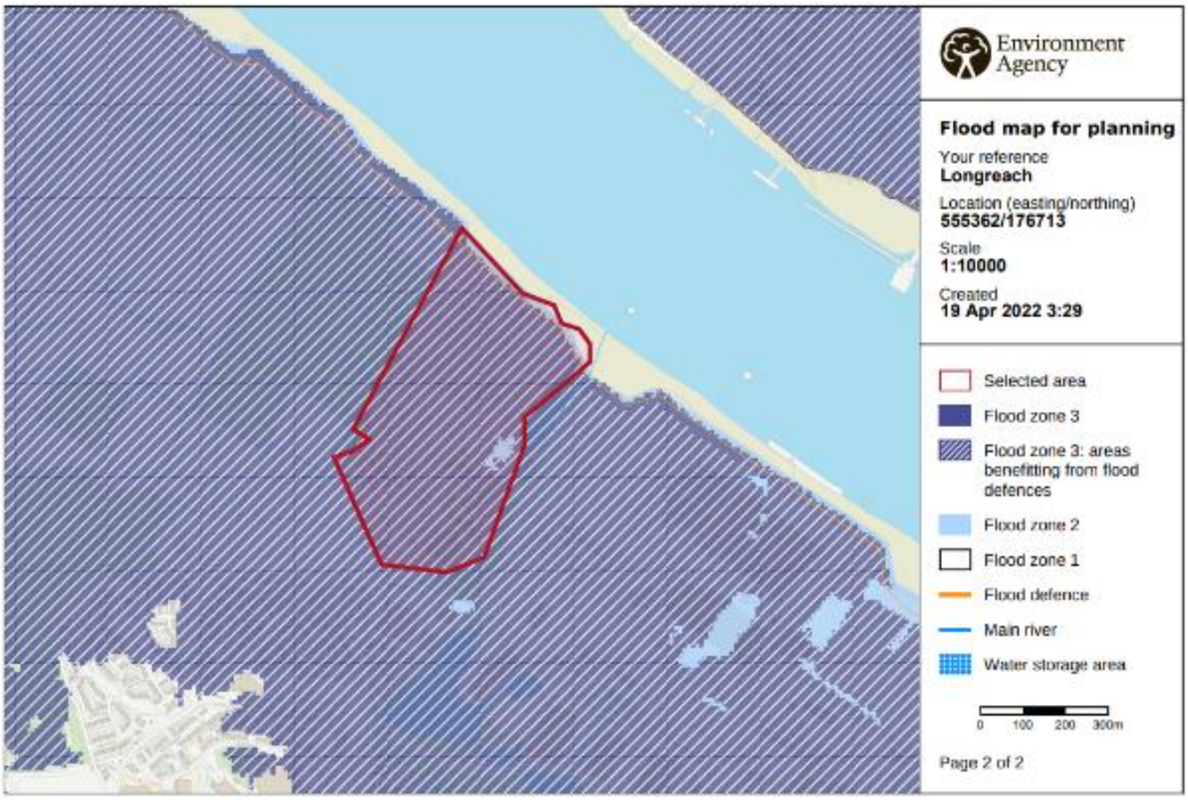


Figure 4.3 Extent of Fluvial flooding due to extreme weather events

4.3 Identification of Preferred Option

The preferred containment option is option 1 the wide area containment, constructing a low bund wall (nominal 500mm high) around the wide containment area and constructing ramps at road crossings. Option 1 has been selected based on lower cost and relative higher reliability because it is passive and does not rely upon pumping to utilise containment storage.

4.4 Potential issues for solution detail (Inc H&S)

- Cable ducts and fibre ducts acting as conduits to transport the sludge spilt around the site. Work will be required to seal covers (installation of sealing plate) or sealing of ducts required.
- Prevention of sludge spills into watercourse (beck) isolate the tree-planted area near the picket fence thickeners from the containment zone to prevent spills discharging to the beck which runs under the sludge cake barn and discharges to the local watercourse.

5. Site Drainage and liquor returns

5.1 Process flow diagram

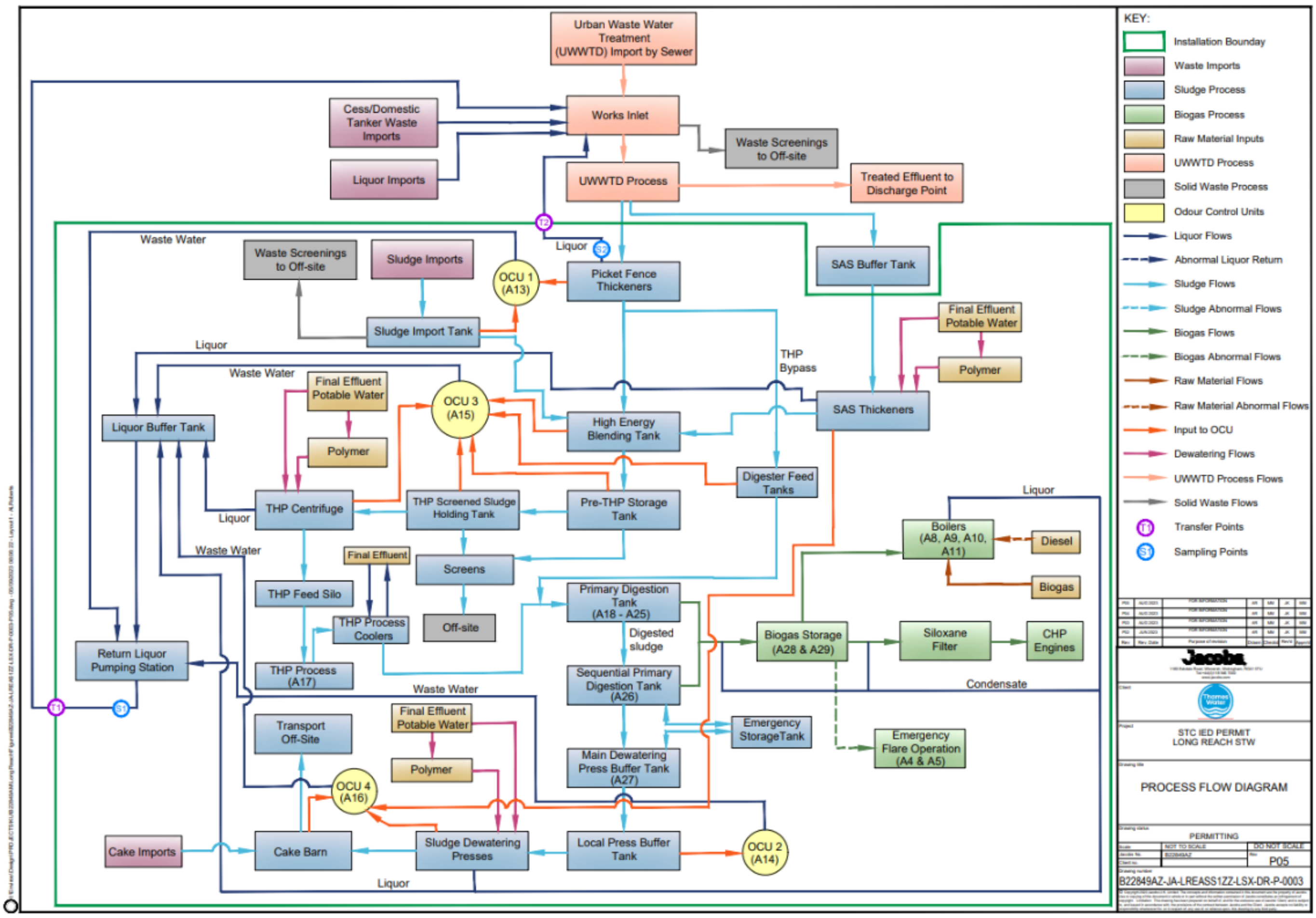


Figure 5.1 Process Flow Diagram

5.2 Foul, Process and Effluent Drainage

Site drainage assessments are based on Long Reach Sewage Works Layout Plan Drawing Numbers LREAS1ZZ-DPL-001 and 002.

The Sewage Works Layout Plan for Long Reach shows all surface/ Combined/ Process/ Effluent drainage pipes within the containment boundary, indicated by blue lines going back to the head of the works shown in figure 5.2 and figure 5.3. In the event of sludge entering the head of the works, the shock load could adversely impact the sewage works treatment process. Therefore, in the event of a catastrophic loss of containment, this line should be isolated or pumping should be inhibited to allow operations to manage the use of the available treatment capacity.

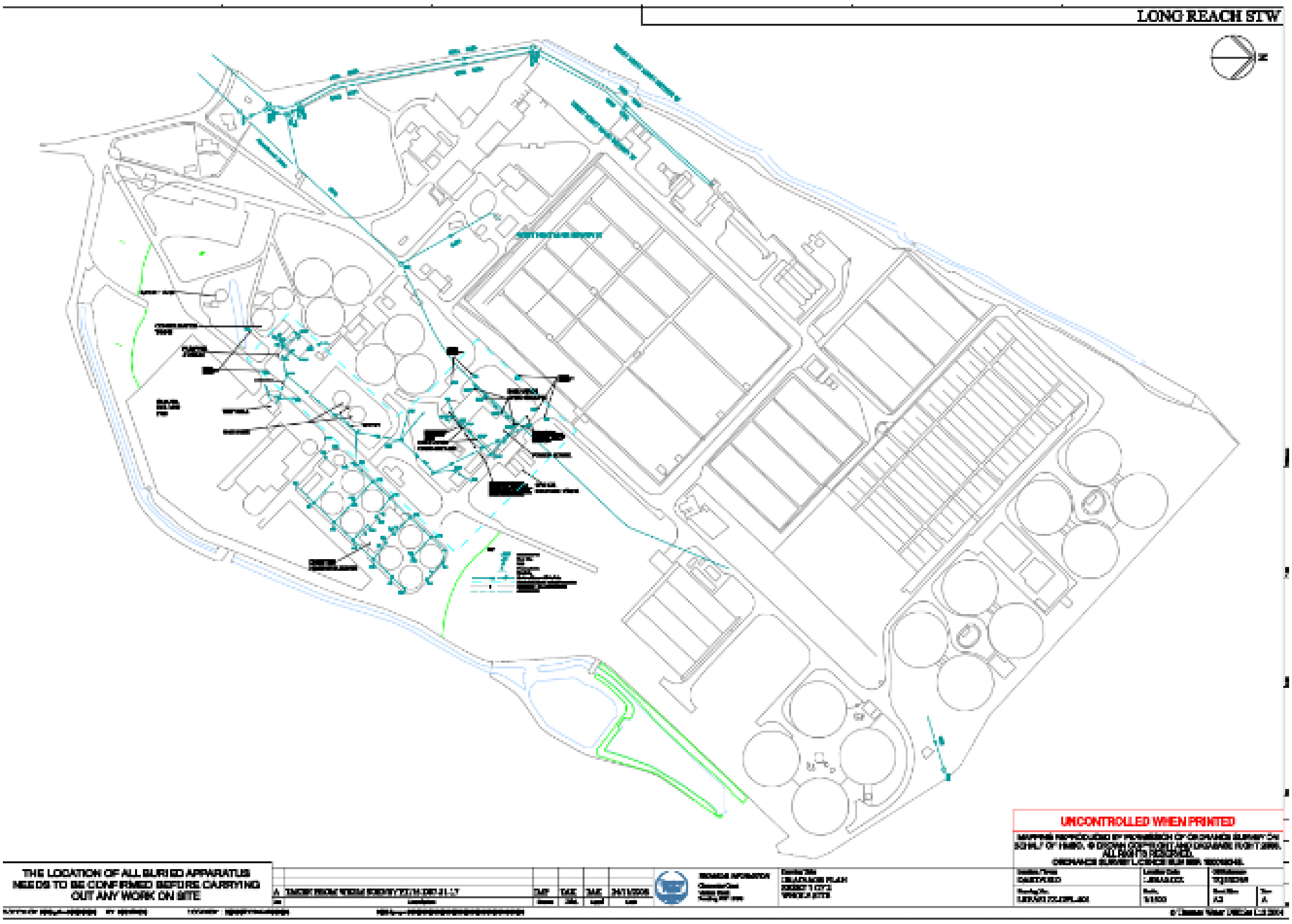


Figure 5.2 Overall Site Drainage plan

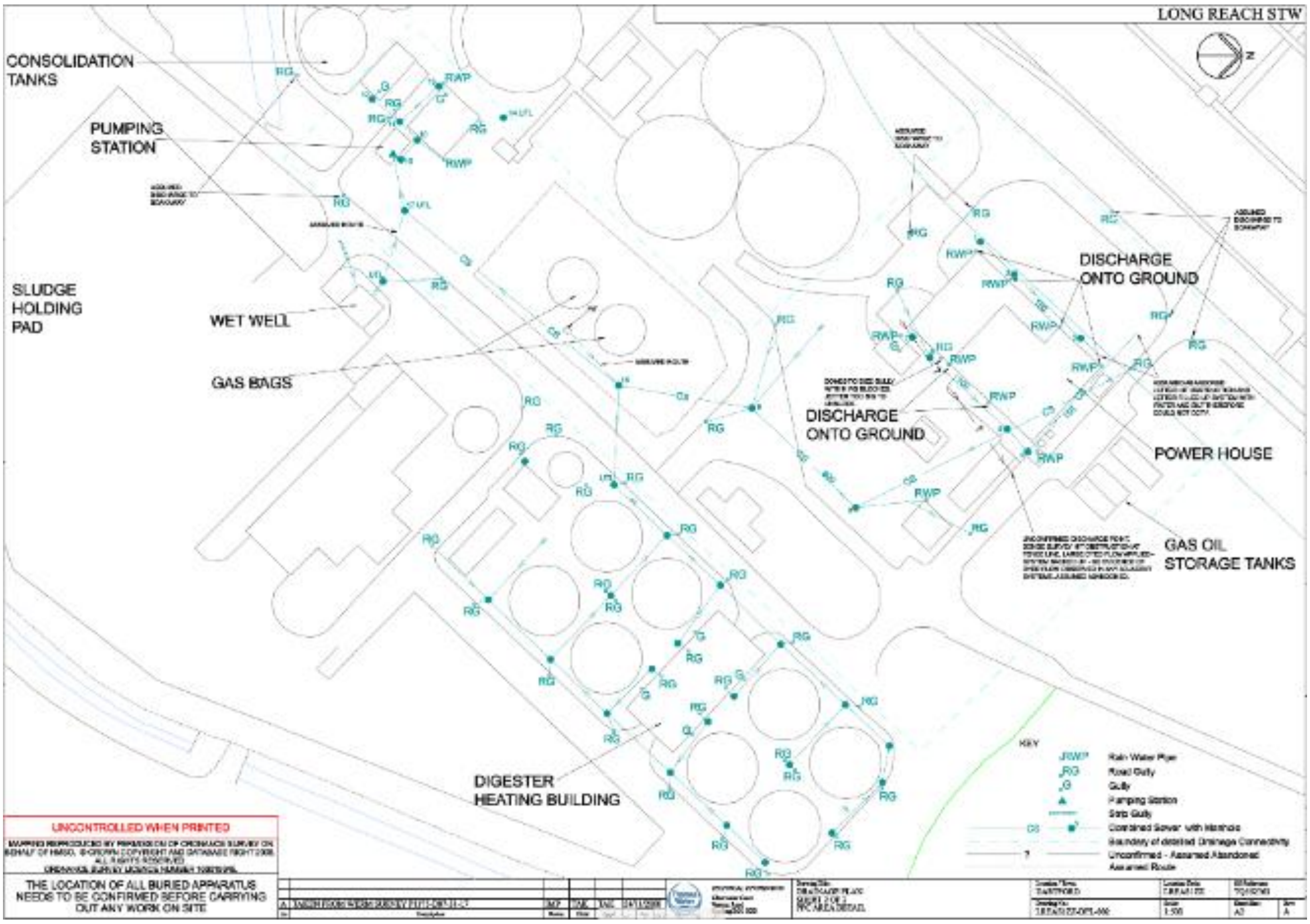


Figure 5.3 Sludge area drainage

5.3 Liquor Returns

The existing liquor return system is not being altered by the containment system, other than the control modifications proposed in 5.4.

Details of the liquor returns sampling are being developed outside of this report for incorporation within the permit submission.

5.4 Automatic Isolation Valves – Site Drainage and Tanks

For the catastrophic loss of containment scenarios for digester area discussed, such a loss could be automatically detected by the level sensors in the tanks. A catastrophic failure would be identified by the rate of change in tank level being larger than expected at normal operation. The signal from the sensors would be used to generate an alarm.

In the event of a catastrophic sludge spill, flows entering the head of the works via the drainage pipes could adversely impact the sewage works treatment process. Therefore, in the event of a catastrophic loss of containment, this line should be isolated.

It is recommended that float operated isolation valves are installed on all outgoing drainage lines from the containment area. These valves will remain normally open but will close when high levels in the existing drainage system are encountered. This drainage configuration will have the following impacts:

- In heavy or intense rain events these drainage isolation valves may be triggered, and operators onsite will need to manual operate these valves to release flows into the existing drainage network.
- In minor or slow flow tank spill events, the sludge spill will flow into the existing drainage network (and into the head of the works) unless operators intervene to isolate the drainage networks. Due to the flow to full treatment at Long Reach being large, minor spill flows will not adversely impact the process.
- In most locations, to accommodate the new isolation valves, new manholes need to be constructed over the existing drainage lines.

6. Conclusions

This section summarises the findings of the containment assessment options report for Long Reach Sewage Treatment Works.

In the Risk Identification Report for Long Reach a containment classification report was carried out. An overall site risk rating of medium was determined meaning that class 2 containment is needed. The detailed requirements for class 2 containment have been outlined in the Risk Identification Report in section 3.3.

The assessment focuses on site-specific risks and outlines the options available for providing secondary containment of a catastrophic tank or digester failure.

The preferred option is option 1 wide containment approach as outlined in section 4.1.1, to construct a 900 linear m long concrete bund wall (nom 500mm high) around the wide containment area. Containment ramps will be constructed across the road crossings. In addition to the containment elements, isolation of the site drainage system linked to the containment area will be required to mitigate the risk of unmanaged flows impacting the sewage treatment works.

The results of the uncontained spill mapping show that a catastrophic spill will be contained with the boundary of the site.

The contained spill modelling shows that the depth within the containment bund is nom 200mm. Replacement of permeable surfaces will allow minor reprofiling of the finished ground levels to generate a more uniform standing water depth.

Freeboard allowances and the profile of the containment bund wall and the distance of the bund wall to tanks provides mitigation against surge effects.

Due to the location of the tanks and their distance from the boundary of the containment area, there is little risk of contamination through jetting.

Appendix 1 - ADBA Site Hazard Risk Assessment Summary for Long Reach STW

ADBA Industry Guide and CIRIA C736 state how the site hazard rating and, the site risk and classification are to be calculated. A summary of the hazard risks for Long Reach STW are as follows:

Source – There are two sources that have been identified:

1. Domestic and trade effluent Wastewater sludges, both in a raw, semi-treated and treated state.

2. Polyelectrolyte chemicals (Ferric Sulphate) for sludge thickening.

The Source Hazard rating was determined as High.

Pathway – There are three pathways that have been identified:

1. The process and site drains take both process and surface water to the head of the works which would negatively impact the process stability on site and would eventually impact on the receiving watercourse (if risk of decline in STW performance realised) unless mitigation/control applied.

2. The River Thames is adjacent to the north side of the site; some 350m from the STC

3. There are several areas where a sludge spill could pass over permeable ground. This is being mitigated by replacement of permeable soils in the containment/spill zones.

Consequently, the Pathway Hazard rating was determined as High.

Receptor – There are multiple potential receptors which have been identified:

1. There is a “medium-high” and “medium” groundwater vulnerability in this location.

2. The Littlebrook power station and industrial estate to the east of the STW.

3. The habitation of large populaces nearby, the nearest of which is southwest across Binnie Road.

The river Thames directly to the north of Long Reach STW is outside of the trigger distances from the STC. No SSSI/SPA/SAC/RAMSAR Sites identified within trigger distances from the STC.

The Receptor Hazard rating was determined as High.

Likelihood – The review prompts generate the likelihood rating of low.

Pre-mitigation measures operational failures were highlighted as a high risk, shortfalls in design (provision of alarms and monitoring) together with structural failure were highlighted as a medium risk.

Post-mitigation measures operational failures were re-scored as a low risk, concrete tank construction provides further mitigation. Therefore, the final Likelihood Hazard rating was determined as Low.

Based on the information above, the overall site risk rating was calculated to be medium which means that class 2 secondary containment is required (per CIRIA736 Chapter 2.2).

Appendix 2 - Tank Covering initial review

Thames Water commits to covering permitted open top tanks at the facility in accordance with the IED and BAT 14. Thames Water will take a risk-based approach, including use of PAS110, to determine our approach to abatement if required for individual tanks at Long Reach. Thames Water confirm that our approach to abatement includes use of a biogas system if required. Engineering design assessment may result in replacement of tanks or reduction in number of applicable tanks. Our programme of delivery will need to be phased so that for each location a minimum number of existing AD tanks are always in continued operation to ensure process requirements are met. Thames Water will use PAS110 to determine whether individual tanks are biologically active. Non-biologically active tanks will be considered in accordance with the guidance Covering Slurry Lagoons (publishing.service.gov.uk).