

PROPOSED ANAEROBIC DIGESTION FACILITY AT ASHTON KEYNES

Flood Risk Assessment and Surface Water Drainage Strategy

Prepared for: Acorn Bioenergy Limited

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EXECUTIVE SUMMARY

SLR Consulting Ltd has prepared this Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) on behalf of Acorn Bioenergy Limited. to support the Planning Application for the construction of an Anaerobic Digestion (AD) Plant at land north of North End Farm Works, Ashton Keynes, Swindon SN6 6QT (the 'Site'). A summary of the key findings from the FRA and SWDS are provided below.

Subject	Element	Findings
Site	Name	land north of North End Farm Works, Ashton Keynes, Swindon SN6 6QT
	Date Inspected	Site inspection undertaken by an experienced hydrologist on 17 th November 2022.
Existing Site	Description	The Site covers an area of 6.99ha. The Site is located off Ashton Road and is accessible through a newly constructed gate in the south east corner of the boundary. Surrounding fields are used for agriculture and pasture. A central ditch and parallel hedgerow run west to east through the middle of the Site. More hedgerows to the north, east and most of the west boundary surrounding the Site. The south west corner of boundary is an open clearing, providing access for farming vehicles.
	Topography	Ground levels across the Site falls from east to west from a maximum elevation of 102.25m Above Ordnance Direction (AOD) to 89.75m AOD in the south eastern corner. On a regional scale the Site is situated on the east side of an isolated hill known as Ashton Downs.
	Geology & Hydrogeology	The bedrock geology across the Site consists entirely of <i>Kellaways Clay Member – Mudstone</i>. There is a small extent of superficial deposits present along the east boundary. The <i>Kellaways Clay Member</i> is designated as an <i>Unproductive</i> stratum with '<i>layers of rock or drift deposits that are largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.</i>' The <i>Northmoor sand and gravel</i> superficial later is designated as a <i>Secondary A</i> Stratum which is a '<i>permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers, lakes or wetlands.</i>' The soil has been classified as being '<i>Slightly acid loamy and clayey soils with impeded drainage.</i>' Groundwater vulnerability across the Site is therefore predominantly designated as '<i>Unproductive</i>'; The extent of the superficial Northmoor geology is designated as '<i>Medium – Low</i>'. The Site also lies within a Zone II Source Protection Zone (SPZ) – '<i>Outer Protection Zone</i>'.
	Hydrology	Several lakes formed from historic gravel extraction make up the Cotswold waterpark to the south of the Site. The closest lake is 500m south east of the Site. • The River Churn flows south east, 1km north east of Site. • The River Thames, 3km east of the Site flows from the north then meanders to the south east through Ashton Keynes. • There exists an unnamed watercourse 600m west of Site. • There is tributary 350m east of Site which connects to the Thames 4km downstream.
	Drainage	Several drainage ditches are present within or along the boundaries of the Site as follows: • The northern ditch follows topography east and discharges into the highways ditch; • A ditch to the west captures runoff from the neighbouring field which then drains to; • A small 0.5m² vegetated circular depression, leading to; • The central ditch following topography west to east, and; • A 1x1m highways ditch along the east boundary along Ashton Road, serviced by a 450mm culvert below the access hardstanding. The Site is considered to drain primarily as overland flow, following topography into the highways ditch. Pooled surface water will both evaporate and <i>slowly</i> infiltrate to ground.

Subject	Element	Findings
Proposals	Description	The proposed development will consist of an AD facility. It is anticipated that the Site will consist of c. 4.52ha of impermeable hardstanding and lagoons that do not allow infiltration. The AD facility would process agricultural crops and manures in the region of c.91,000 tonnes per annum. The AD Plant facility will capture as much rainwater as possible for use in the process. Based on annual average estimates, rainwater capture is expected to be sufficient for up to 100% of the process water demand. The AD facility would generate biomethane, carbon dioxide and digestate. The biomethane would be tankered from the Site to a central 'hub' where it would be injected into the UK gas grid. The carbon dioxide would be sold and the digestate would be spread to local farmland as fertiliser. The AD facility would have the capacity to produce in the region of c. 9,703,744 m³ per annum of biomethane (subject to change).
	Lifetime	The proposed AD plant has an anticipated operational lifespan of 25 years. A 25-year operational period is therefore assumed for this application.
	Vulnerability	Table 2: Flood risk vulnerability classification at PPG Annex 3, 'Waste treatment' facilities are classified as 'Less Vulnerable'.
Site Flood Risk	Fluvial	The site is located entirely within Flood Zone 1 which is described as having a low risk of flooding. Climate change is unlikely to increase the risk of fluvial flooding at the Site over the anticipated 25-year lifetime of the development.
	Tidal	Site is remote from any tidal extent and at low risk of tidal flooding.
	Surface Water	Site is at <i>very low</i> pluvial flood risk. Low risk areas identified are confined within the highways ditch parallel to the east boundary. A small area of 0.1% AEP flood extent is identified within the Site access but is not expected to inundate the Site drainage as the extent is extremely limited and would likely be confined to the Highways ditch.
	Groundwater	The geology below the Site is considered to have a low overall potential to allow groundwater to rise. Groundwater was identified within the superficial strata 1.4m bgl; it is not expected that groundwater flow can emerge through the mudstone to result in significant risk. Thames Water estimated in their Groundwater Impacted System Plan that groundwater hazard depths within the boundary are negligible. The superficial extent has higher risk but emerging groundwater would drain directly to the highways ditch and be conveyed away from the Site.
	Sewers and Artificial Sources	A utilities search revealed no sewer systems exist near the development boundary. Clay pipes were identified during a utilities survey prior to excavating the infiltration trial pit, assumed redundant field drainage pipes. However, they not expected to increase flood risk to the Site. There is a quarry reservoir 1.75km north west, however; should failure occur, flow would follow topography south and is not incident the Site. The nearest upstream lake is located 600m west of Site. Flows are not expected to be incident to Site due to Ashton Downs providing interception, conveying flow west away from Site. Cirencester Waste Treatment Works is located 1.0km north west of Site, however; should failure occur, there are no incident flow paths to the Site.
Planning Requirements	Sequential Test and Exception Test	The Sequential Test and Exception Test are deemed to have been passed as the Site is within Flood Zone 1 and the proposed development has been classified as 'Less Vulnerable', appropriate in Flood Zone 1.
Essential Mitigation	Design Flood Event	The design flood event (DFE) is the defended 1% AEP event. A climate change allowance has been considered for peak rainfall intensity (20%) at the development Site with no anticipated adverse impact. No mitigation is required.
	Development Levels/ Layout	Finished floor levels should ideally be at least 150mm above external hardstanding areas to prevent progression of water into the infrastructure. It is proposed that all elements of the proposed development be either located outside the surface water flood risk area or, where this is not possible, be protected from flooding (e.g. by land raising, elevated infrastructure or bunding). These mitigations have been incorporated in the scheme.
	Safe access and egress	Mitigation not required.
	Floodplain compensation	Mitigation not required.

Subject	Element	Findings
	Surface water drainage strategy	Infiltration testing was conducted 7th December 2022, that confirmed discharge to ground is not viable. The development shall drain hardstanding by gravity into a below ground crate system to attenuate all runoff onsite. Water will then be pumped to a conveyance rainwater lagoon and discharged at greenfield rates into the highways ditch at the proposed outfall. In line with best practice, Sustainable Drainage Systems (SuDS) will need to be incorporated to control offsite discharge of runoff, provide water treatment and, where possible, biodiversity and amenity enhancement. Attenuation storage will also be required.
	Residual Risk	Flood events in excess of the design standard have been considered in the development layout and will mimic existing flow paths. A standby pump should be made available in the event of operational failure of the duty pump.
	Conclusion	This Flood Risk Assessment and Surface Water Drainage Strategy concludes that the requirements of national, county and local planning policy can be achieved at the Site given the nature of development proposed.

1.0 INTRODUCTION

1.1 Terms of Reference

In February 2022, SLR Consulting Limited (SLR) was appointed by Acorn Bioenergy Limited, (the Client), to prepare a Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) to support a planning application for the proposed Anaerobic Digestion (AD) Plant at land north of North End Farm Works, Ashton Keynes, Swindon SN6 6QT ('the Site').

This FRA and SWDS have been prepared by SLR, under the direction of a Technical Director for Hydrology at SLR who specialises in flood risk and associated planning matters. Reporting has been completed in accordance with guidance presented within the National Planning Policy Framework¹ (NPPF) and its associated Planning Practice Guidance² (PPG), taking due account of current best practice documents relating to assessment of flood risk published by the British Standards Institution BS8533³.

1.2 Administrative Context

The proposed development falls completely within the planning jurisdiction of Wiltshire Council who act as the Lead Local Flood Authority (LLFA) for this area.

1.3 Site Location

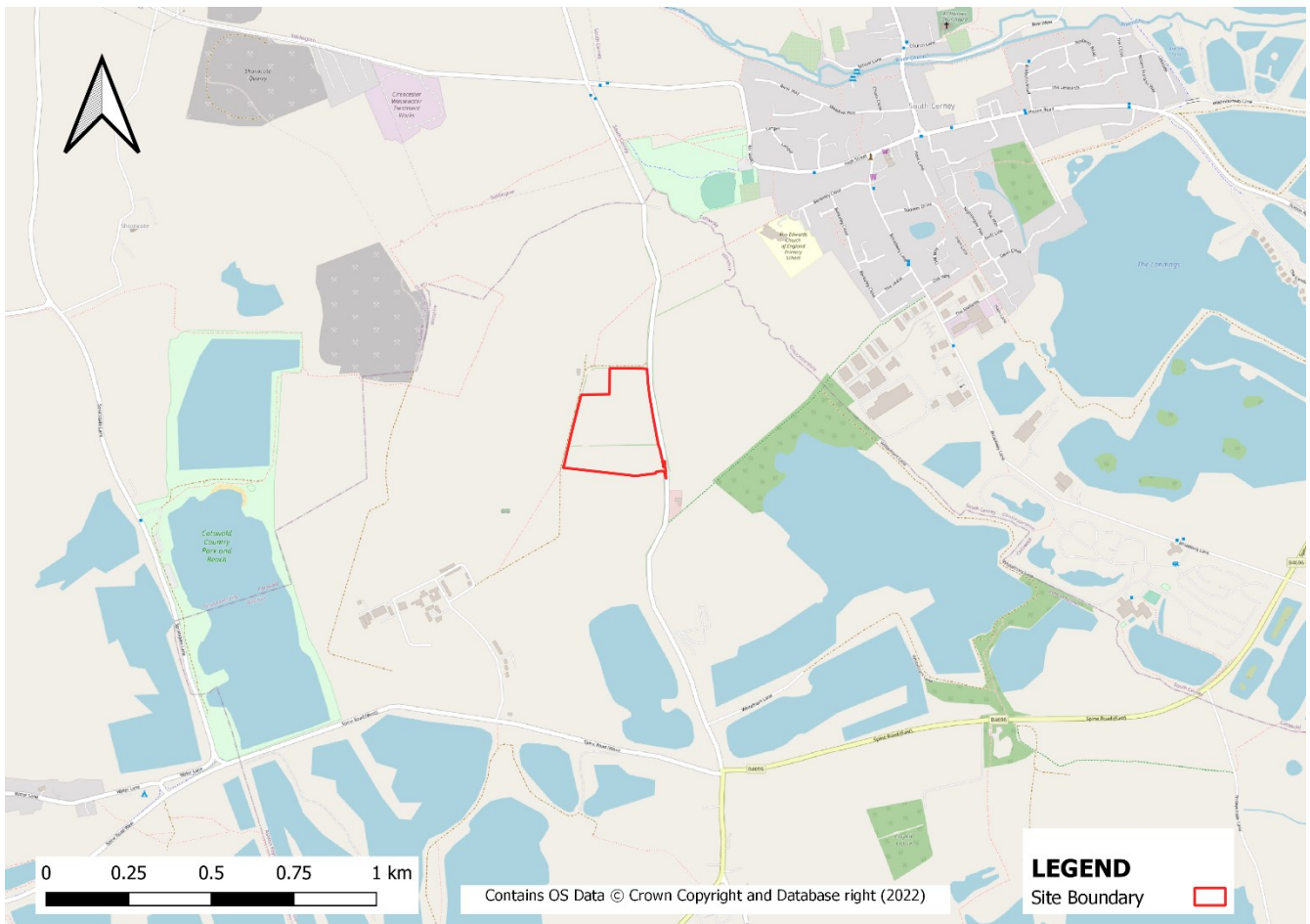
The Site is centred on National Grid Reference (NGR) SU 04014 96189, 1.75km north of Ashton Keynes. A site location plan is provided as Figure 1-1.

1 National Planning Policy Framework: Communities and Local Government (Updated July 2021)

2 Planning Practice Guidance: Communities and Local Government (Updated June 2021)

3 BS8533:2017, Assessing and managing flood risk in development: Code of Practice (December 2017)

Figure 1-1
Site Location Plan

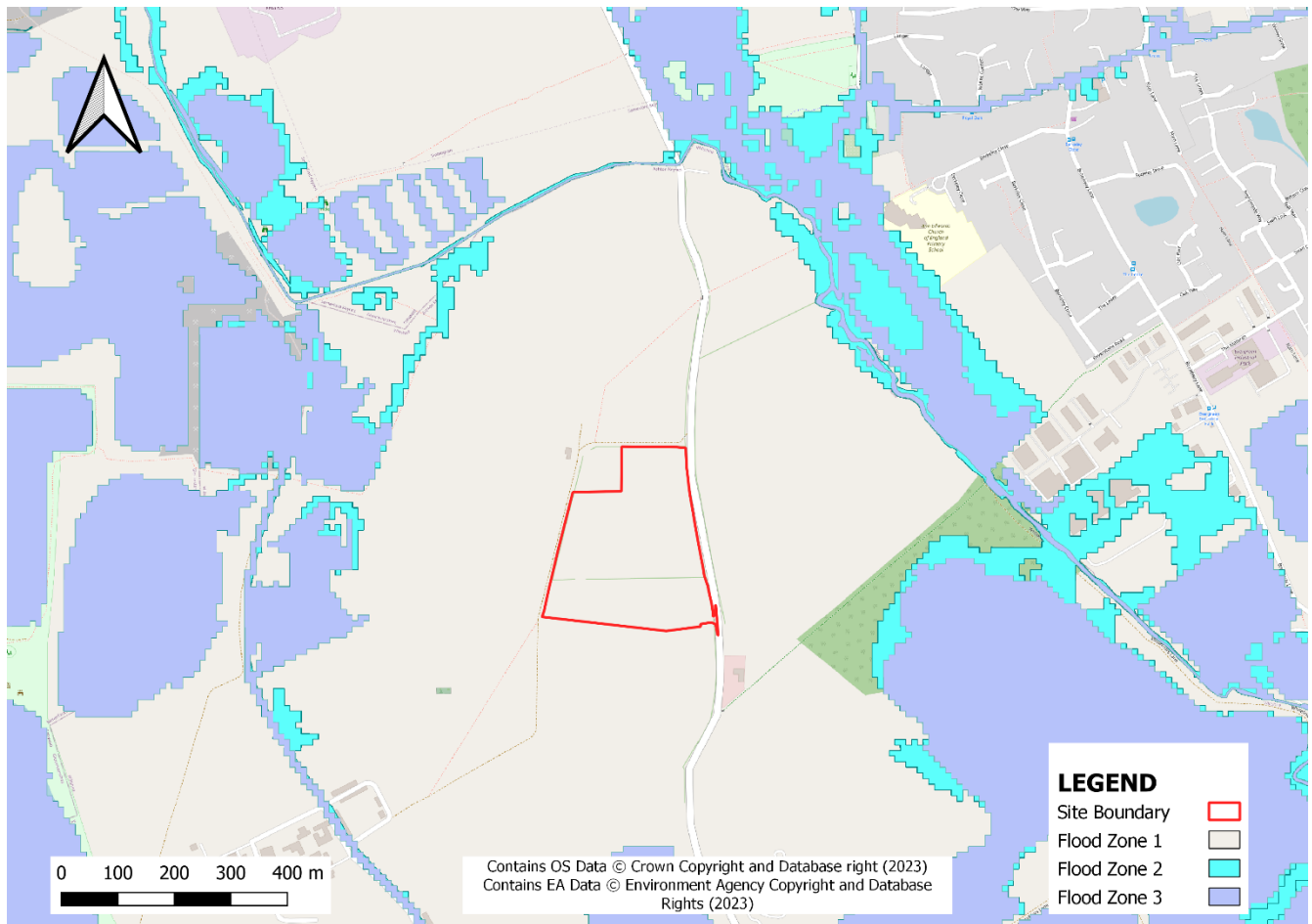


1.4 Background and Aims

With reference to the *Flood Map for Planning (Rivers and Sea)*⁴ the Site lies within an area that is not considered to be at risk of fluvial or tidal flooding. An extract of the Flood Map for Planning is provided by Figure 1-2.

4 Government Digital Service (Accessed 4 January 2023) <https://flood-map-for-planning.service.gov.uk/>

Figure 1-2
Extract of the Flood Map for Planning



However, as the Site covers an area greater than 1 hectare (ha), with reference to footnote 55 of the National Planning Policy Framework (NPPF), any planning application for development at the Site needs to be accompanied by a site-specific FRA.

2.0 SITE DETAILS

2.1 Existing Site Description

A site visit was undertaken by an experienced hydrologist on the 17th November 2022 that confirmed the Site is greenfield. The Site encloses an area of 6.99ha as seen by the development boundary in Figure 2-1. The Site is located off Ashton Road and is accessible through a newly constructed gate in the south east corner of the development boundary - not shown in satellite data. Surrounding fields are used for agriculture and pasture.

The Site is split by a central ditch and parallel hedgerow through the middle of the development boundary, running west to east. Additional hedgerows run the north, east and most of the west boundary. The south west corner of the Site, at the junction of neighbouring fields, is an open clearing that provides access for farming vehicles.

Figure 2-1
Satellite Imagery of the Site

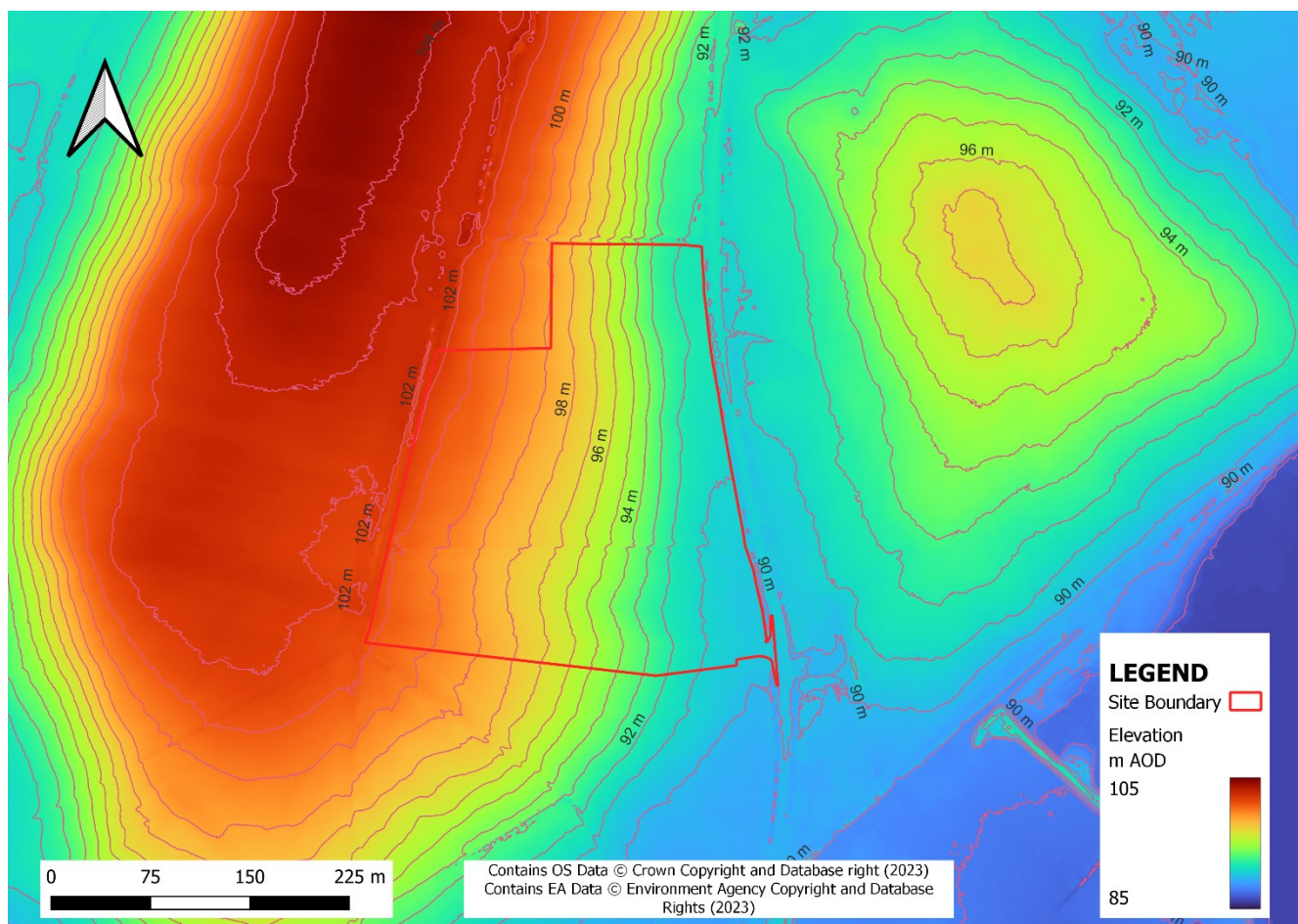


2.2 Topography

Topographic data for the Site was acquired by Acorn in 2022 and is enclosed in **Appendix 01** with the wider locality provided by 1m resolution Light Detection and Ranging (LiDAR) aerial photogrammetric data, downloaded from the Environment Agency open data website⁵.

The data has been used to generate contours, as shown in Figure 2-2. Ground levels slope from west to east from maximum elevation of 102.25m Above Ordnance Datum (AOD) to 89.75m AOD in the south eastern corner of the Site. The data identifies that the Site has been situated on the east side of an isolated hill known as Ashton Downs.

Figure 2-2
Topography of the Site



2.3 Geological and Hydrogeological Context

2.3.1 Geology

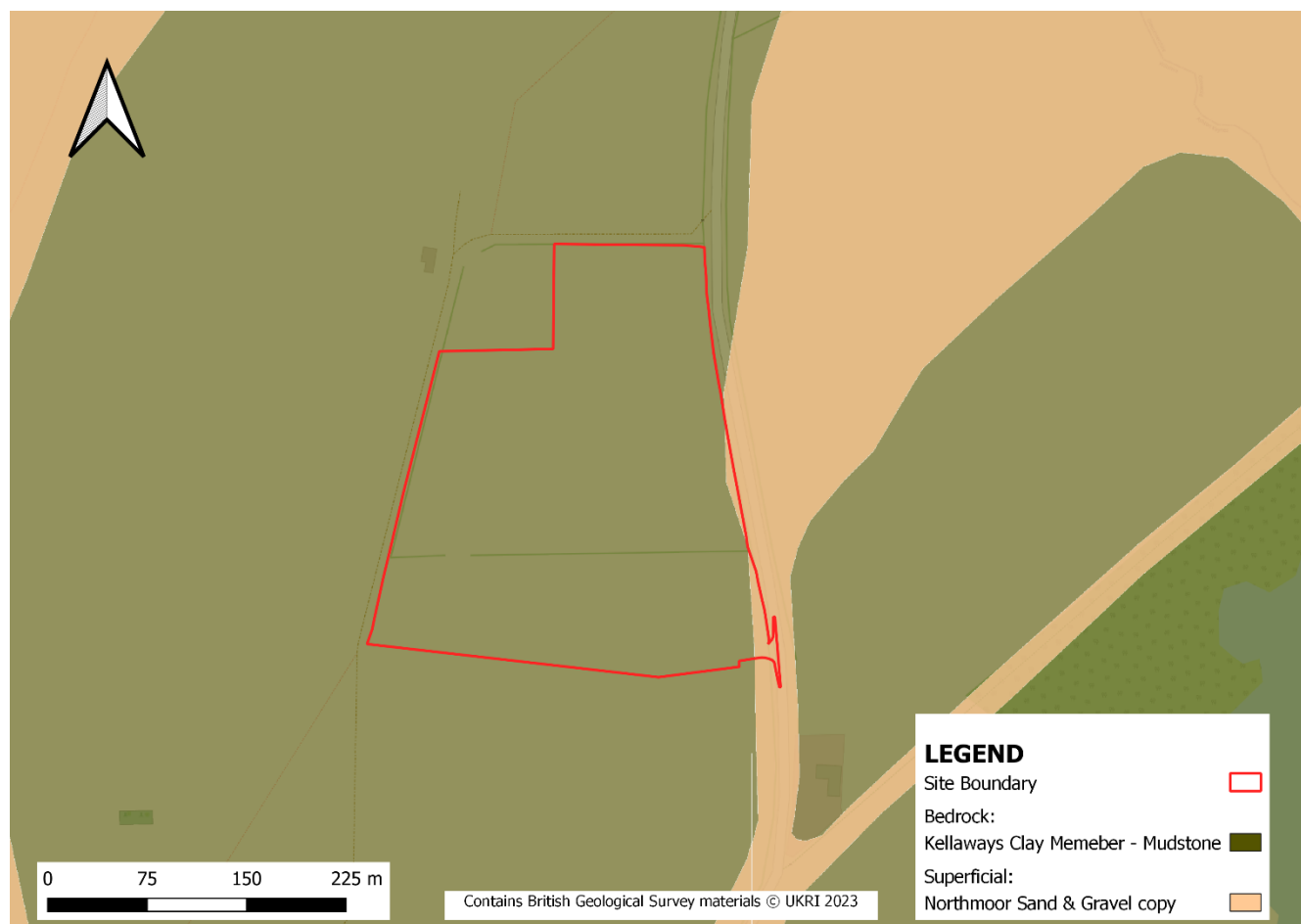
Published British Geological Survey (BGS) online geology maps⁶ indicate that the bedrock geology across Ashton Downs consists of primarily 'Kellaways' Clay Member – Mudstone as shown in Figure 2-3.

⁵ Environment Agency open data website (Accessed 24 October 2022) <https://environment.data.gov.uk/>

⁶ British Geological Survey, Geoindex (Accessed on 4 February 2022) <http://mapapps.bgs.ac.uk/geologyofbritain3d/>

There is a strip of superficial deposits, comprising of ‘Northmoor’ - *Sand and Gravel*, adjacent the east boundary of the Site. A trial pit of depth 2.20m revealed the unlaying strata characteristics and confirmed the presence both geologies at along the eastern perimeter. A copy of the trial pit log is enclosed at **Appendix 02**.

Figure 2-3
Site Geological Conditions



Soil composition⁷ is described as ‘*Slightly acid loamy and clayey soils with impeded drainage*’ across the Site (confirmed during the Site Walkover).

2.3.2 Hydrogeology

Review of the online MAGIC mapping⁸ indicates that the ‘Kellaways’ Clay Member - Mudstone is designated as an *Unproductive* stratum with ‘*layers of rock or drift deposits that are largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.*’

The ‘Northmoor’ - *Sand and Gravel* superficial layer is designated as a *Secondary A* Stratum which is a ‘*permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers, lakes or wetlands.*’

⁷ Soilscales, Cranfield Soil and Agrifood Institute, Cranfield University, DEFRA, (Accessed on 12 November 2022) <http://www.landis.org.uk/soilscales/>

⁸ Magic Map, DEFRA, (Accessed on 4 February 2022) <https://magic.defra.gov.uk/MagicMap.aspx>

Groundwater vulnerability across the Site predominantly designated as '*Unproductive*'; the extent of the superficial Northmoor geology is designated as '*Medium – Low*'. The Site lies in a Zone II Source Protection Zone (SPZ) – Outer Protection Zone.

2.3.2.1 Infiltration Testing

BRE 365 Digest infiltration testing was carried out at the Site on 7th December 2022. The location of the trial pit and estimate of the infiltration rate are provided in **Appendix 03**. Based on local geological characteristic (high clay content), it was not expected suitable rates for infiltration would be acquired; this is conceptually supported by the results of the testing, where water levels decreased by just 0.06m over 310 mins.

2.4 Hydrological Context

2.4.1 Local Hydrology

Within Ashton Keynes there are several parks, lakes, nature reserves and areas of special scientific interest: forming the Cotswold Water Park. The lakes resulted from historic gravel extraction, which allowed high groundwater tables to backfill the voids. By the 1960s, the lakes became a prominent feature of Ashton Keynes and have been a focus of conservation and public amenity⁹. The closest lake to the Site is located approximately 500m to the south east.

Additional local hydrology:

- The River Churn flowing south east is 1km north east of the Site;
- The Thames located 3km west of the Site flows from the north, then east, bisecting Ashton Keynes roughly 2.1km south of Site and meanders the lakes to the southwest of the Site;
- There is a tributary to the River Thames 350m east of the Site flowing south; joining the Thames 4km downstream, and;
- An additional watercourse 600m west of the Site flowing south, joining a highway ditch along Spine Road to the south.

2.4.2 Existing Site Drainage

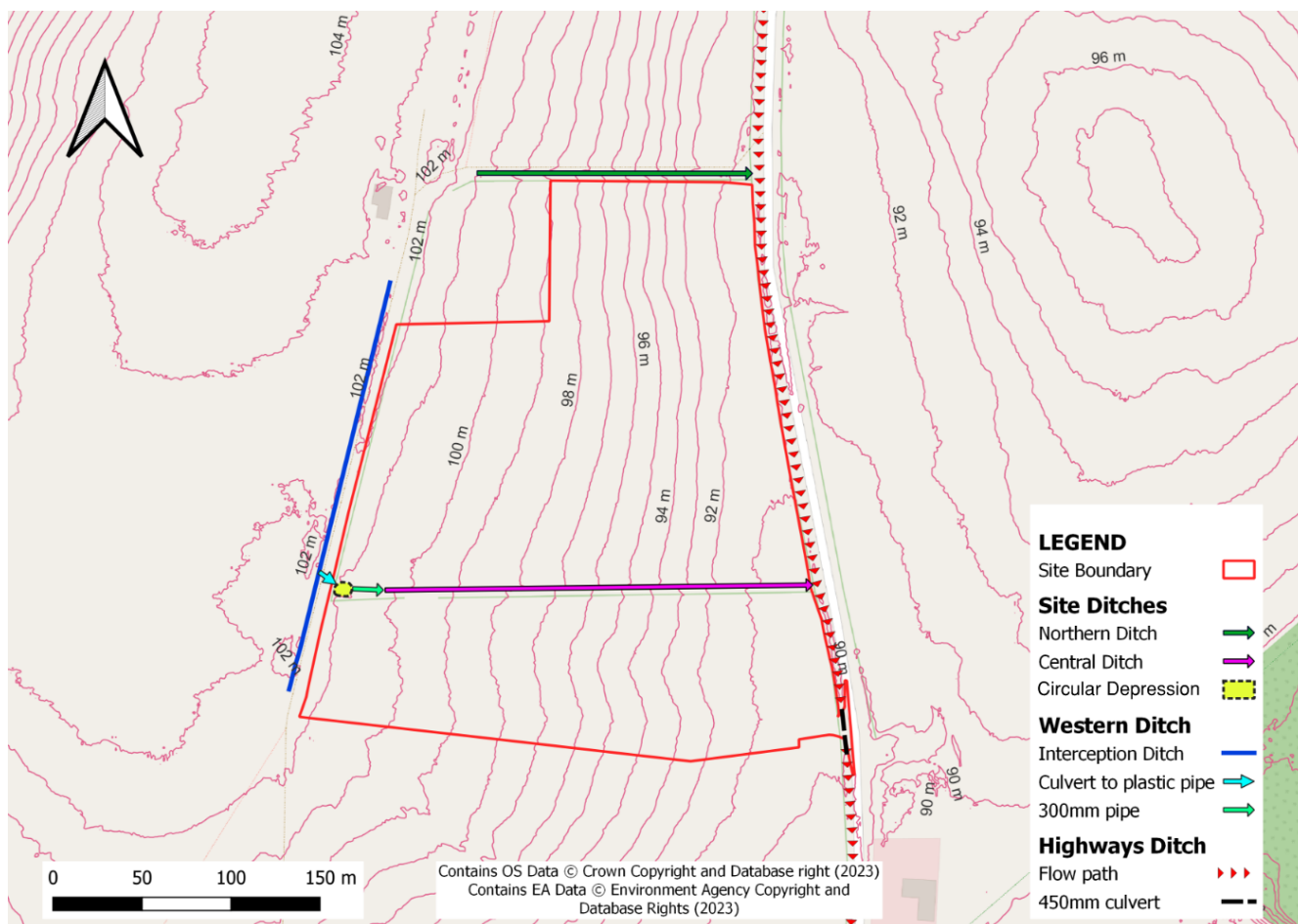
Several drainage ditches are present within or along the boundary of the Site as follows:

- Ashton Road has a formal highways ditch (approximately 1m deep and 1m wide), owned by Wiltshire Council Highways Authority, that flows south and services Ashton Road;
- The northern ditch follows topography east and discharges into the highways ditch;
- A ditch to the west captures runoff from the neighbouring field and drains through a 200mm culvert connected to a 40mm plastic outfall pipe (assumed). Runoff then attenuates in a 0.5m³ vegetated circular depression then discharges through a 300mm pipe to the central ditch;
 - The central ditch follows topography east which then finally discharges to the highways ditch;
- A 450mm culvert allows flow to cross the Site access below the access hardstanding. It is assumed the ditch finally discharges to a nearby downstream lake, 500m to the south, and;
- Prior to breaking ground, clay pipes were detected near where the infiltration trial pit was excavated. The Site may have existing, assumed redundant, drainage or irrigation features within the Site boundary – the full extent of which is unknown.

Figure 2-4 demonstrates the drainage features with anticipated flow paths identified.

⁹ Bainbridge. V. "Historic Parishes - Ashton Keynes," in *A History of the County of Wiltshire: Volume 18*, ed. Virginia Bainbridge (Woodbridge: Boydell & Brewer for Victoria County History, 2011), 109-140 [Accessed November 17, 2022].

Figure 2-4
Existing Site Drainage Arrangement



Ponding of surface water was observed at the top Ashton Downs, outside of the western boundary and inside the eastern boundary in localised depressions. Additionally, soil in the southern half of the Site was found to be water logged.

As discussed in the Sections above, soil and ground geology at the Site has low infiltration conditions. Additionally, given the evidence of pooling surface water, the Site is considered to principally drain by overland flow, following topography into the highways ditch. Remaining pooled surface water in localised depressions will both evaporate and *slowly* infiltrate to ground.

3.0 DEVELOPMENT PROPOSAL

3.1 Proposed Development Summary

The proposed development would consist of approximately 4.52ha of impermeable hardstanding, ancillary infrastructure and lagoons located on farmland approximately c.550m north of North End Farm Works, Ashton Keynes, Wiltshire.

The total Site area is approximately 6.99ha. The proposed development would accept in the region of 91,000 tonnes per annum of feedstock from local farms. The feedstock material would undergo a process of controlled decomposition (anaerobic digestion) within the proposed facility. The process produces biomethane (biogas) which would be stored on Site prior to being transported by tanker to a central gas injection point. The proposed development would generate biomethane (biogas) which will be processed before being removed from Site by tanker to a central facility where it will be injected into the national grid.

The AD facility would have the capacity to produce approximately 19,711,888m³ of biogas per annum; this results in approximately 9,703,744m³ of upgraded biomethane.

The gas upgrading process would also result in the production of CO₂ as a natural by-product. The AD plant will be fitted with the equipment required to capture the clean CO₂ to a food grade level standard, which makes it suitable for almost all industrial and commercial applications in the UK. Upgraded CO₂ would be liquefied and transported by road to end users, ideally located locally.

Details of the proposed development layout are enclosed at **Appendix 04**.

3.2 Anticipated Lifetime of Development

The proposed AD plant has an anticipated operational lifespan of 25 years. A 25-year operational period is therefore assumed for this application.

3.3 Flood Risk Vulnerability

With reference to PPG Annex 3: *Flood risk vulnerability classification*, 'waste treatment' facilities are classified as 'Less Vulnerable'.

3.4 Planning Context

3.4.1 National Planning Policy

This FRA report has been completed in accordance with the guidance presented in the NPPF¹ and with reference to PPG². The NPPF states that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and develop policies to manage flood risk from all sources taking account of advice from the Environment Agency. It is crucial that Local Planning Authorities consider the risks posed by flooding within their boundary when determining planning applications.

3.4.2 County Planning Policy

In addition to national planning policy and associated guidance, Wiltshire Council, as the LLFA, have emphasised the need to consider flood risk to any proposed developments under the following policies which are covered until 2026 in their Wiltshire Core Strategy¹⁰.

Wiltshire Core Strategy Adopted January 2015:

Core Policy 67

Flood Risk Development proposed in Flood Zones 2 and 3 as identified within the Strategic Flood Risk Assessment will need to refer to the Strategic Housing Land Availability Assessment when providing evidence to the local planning authority in order to apply the sequential test in line with the requirements of national policy and established best practice.

All new development will include measures to reduce the rate of rainwater run-off and improve rainwater infiltration to soil and ground (sustainable urban drainage) unless site or environmental conditions make these measures unsuitable.

Core Policy 68

Water resources Development must not prejudice the delivery of the actions and targets of the relevant River Basin or Catchment Management Plan and should contribute towards their delivery where possible.

Non-residential development will be required to incorporate water efficiency measures. Developers will be expected to submit details of how water efficiency has been taken into account during the design of proposals.

Development proposals within a Source Protection Zone, Safeguard Zone or Water Protection Zone must assess any risk to groundwater resources and groundwater quality and demonstrate that these would be protected throughout the construction and operational phases of development.

The national and county policies relating to the management of flood risk, including the design of a sustainable surface water drainage strategy, for Site have been considered in the following Sections of this FRA.

10 Wiltshire Council, 2015. 'Wiltshire Core Strategy' pg 307-312.

4.0 ASSESSMENT OF FLOOD RISK

This report has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to management of flood risk in development published by the Construction Industry Research and Information Association (CIRIA)¹¹ and BS85333³.

A screening study has been completed to identify whether there are any potential sources of flooding at the Site which may warrant further consideration. If required any potential flooding issues identified in the screening study would then be considered in subsequent sections of the assessment.

4.1 Potential sources of flooding

There are a number of potential sources of flooding and these include:

- Flooding from rivers or fluvial flooding;
- Flooding from the sea or tidal flooding;
- Flooding from surface water or pluvial flooding;
- Flooding from groundwater;
- Flooding from sewers;
- Flooding from reservoirs, canals, and other artificial sources; and
- Flooding from infrastructure failure.

The flood risk from each of these potential sources is discussed below.

4.1.1 Flooding from Rivers or Fluvial Flooding

With reference to the *Flood Map for Planning (Rivers and Sea)*⁴, The Site lies entirely within an area having less than 0.1% Annual Exceedance Probability (AEP) of flooding from this source.

The flood risk to the proposed development is therefore low and is not considered further.

4.1.2 Flooding from Sea or Tidal Flooding

The Site is located in excess of 40km away from the coast and is elevated to levels at least 89m AOD as discussed at Section 2.2.

The flood risk from this source is therefore negligible and is not considered further.

4.1.3 Flooding from Surface Water or Pluvial Flooding

An extract from the *Long Term Flood Risk Information*¹² mapping showing areas potentially at risk of flooding from surface water has been provided as Figure 4–1.

The surface water flood risk categories are defined as:

- **Very Low:** less than 1 in 1,000 (0.1% AEP) chance of flooding in any given year;
- **Low:** less than 1 in 100 (1% AEP) but greater than or equal to 1 in 1,000 (0.1% AEP) chance of flooding in any given year;

11 CIRIA Report C624, Development and flood risk: guidance for the construction industry

12 Long Term Flood Risk, Government Digital Service (Accessed on 23 November 2022) Available from: <https://flood-warning-information.service.gov.uk/longterm-flood-risk/>

- **Medium:** between 1 in 100 (1% AEP) and 1 in 30 (3.3% AEP) chance of flooding in any given year; and
- **High:** greater than 1 in 30 (3.3% AEP) chance of flooding in any given year.

Figure 4-1
Environment Agency Surface Water Flood Risk



Figure 4-1 identifies The Site to be at *very low* pluvial flood risk with higher risk areas confined to the highways ditch along the east boundary. There is an a low-risk extent adjacent to the Site access, but this is likely a result of the limited resolution of the LiDAR data in relation to the 1m wide highways ditch. It is expected that the extent will be confined to the ditch and any exceedance would be conveyed by Ashton Road around the Site access.

The flood risk from this source is therefore low and is not considered further.

4.1.4 Flooding from Groundwater

Groundwater flooding can occur where sites are located on permeable ground, particularly where there are significant variations in local topography and geology. After a prolonged period of rainfall and groundwater recharge, a considerable rise in the water table can result in this intersecting the ground surface, resulting in flooding. Due to the slow response of groundwater systems any resulting flows and inundation could persist for an extended period.

As discussed in Section 2.3.2, the *Kellaways Clay Member - Mudstone* is designated as an *Unproductive* stratum; the bedrock geology of The Site is therefore considered to have an overall low potential to allow for groundwater emergence to surface.

The Northmoor – Sand and Gravel superficial layer is classed as a Secondary A stratum which generally allows for groundwater flow. Groundwater was struck at 1.4m below ground level (bgl) during infiltration testing which was undertaken on the 7th of December 2022. Groundwater was then observed emerging from the superficial layer and is considered likely to be perched above the bedrock. Groundwater is expected to be hydraulically linked with the highway ditch at a similar elevation of 89m AOD.

Groundwater movement through clayey soils is extremely slow, as indicated by the failed infiltration test. When groundwater cannot drain by gravity it is forced horizontally by lateral pressures, however; given the extent of mudstone confining the superficial layer, groundwater is expected to continue to flow south through the more hydraulically conductive superficial layer.

Additionally, Thames Water produced a Groundwater Impacted System Plan¹³ for the Cirencester Sewage Treatment Works in response to high prevalent groundwater. The Plan predicted that groundwater hazard depths within the boundary are negligible with higher risk areas confined within the superficial extent. Any emergence would likely flow directly into the highways ditch and be conveyed away from the Site.

The flood risk to the development from this source is considered low.

4.1.5 Flooding from Sewers

A utilities search was completed 18th November 2022 and revealed the area is not serviced by any sewer utilities.

Clay pipes were identified during a utilities survey prior to excavating the infiltration trial pit which are assumed redundant field drainage pipes. However, they are not expected to increase flood risk to the Site.

The flood risk from this source is therefore negligible and is not considered further.

4.1.6 Flooding from Reservoirs, Canals and other Artificial Sources

Based upon *Long Term Flood Risk Information*¹⁴ mapping, the Site lies outside an area denoted as being at risk of flooding from a breach (failure) of a raised reservoir embankment.

With reference to 1:25,000 scale OS Mapping, there are no canals near the Site. However, there are several artificial sources as follows:

- i. There is a quarry reservoir 1.75km north west, however; should failure occur, flow would follow topography south. Ashton Downs would intercept and convey flows around the western side, avoiding the Site.
- ii. The nearest upstream lake is located 600m west of the Site. It is anticipated that Ashton Downs would intercept and convey flows around the western side.

The flood risk from these sources is therefore considered low and is not considered further.

¹³ Groundwater Impacted System Management Plan – Cirencester System (including South Cerney), Thames Water, January 2021 (Accessed 17 November 2022) available from: <https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-reports/groundwater-infiltration-management-plans/cirencester-groundwater-infiltration-management-plan.pdf>

¹⁴ Long Term Flood Risk, Government Digital Service (Accessed on 4 February 2022) [Check for flooding in England - GOV.UK \(check-for-flooding.service.gov.uk\)](https://www.gov.uk/check-for-flooding)

4.1.7 Flooding from Infrastructure Failure

With reference to 1:25,000 scale OS Mapping, the Cirencester Waste Treatment Works is located 1.0km north west of The Site, however; should failure occur, there are no incident flow paths to the Site as flow would be directed around the western side of the Ashton Downs, avoiding the Site.

Additionally, Environment Agency¹⁵ data reveals that the Site is not within zones considered at risk of hydrological infrastructure failure.

The flood risk from this source is therefore Negligible and is not considered further.

4.2 Flood Risk Summary

A summary of the potential sources of flooding and the flood risk arising from them is presented in Table 4-1. Though groundwater inundation risk is low, it has been considered a potential design constraint in section 8.0.

Table 4-1
Potential Sources of Flooding

Potential Source of flooding	Significant Flood Risk at Site (Y/N)
Rivers or Fluvial Flooding	N
Sea or Tidal Flooding	N
Surface Water or Pluvial Flooding	N
Groundwater	N
Sewers	N
Reservoirs, Canals and other Artificial Sources	N
Infrastructure Failure	N

The flood risk to the proposed development is therefore considered low.

4.3 Flood Zone

The definition of flood zones is provided by *Table 1: Flood zones* at PPG Paragraph 077 and is summarised below:

- **Zone 1 - low probability** (Flood Zone 1). Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
- **Zone 2 - medium probability** (Flood Zone 2) Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map)
- **Zone 3a - high probability** (Flood Zone 3a) Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
- **Zone 3b - the functional floodplain** (Flood Zone 3b) This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take

¹⁵ Environment Agency, (2016). *Reservoir Flood Extents* (Accessed 23 November 2022) available at: [Reservoir Flood Extents - Wet Day \(National\) - data.gov.uk](https://www.environment-agency.gov.uk/data-and-information/data-and-information/Reservoir_Flood_Extents_-_Wet_Day_(National)_-data.gov.uk)

account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:

- land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or
- land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

Based on the screening study, the Site lies in Flood Zone 1.

5.0 CLIMATE CHANGE

In July 2021 the Environment Agency issued updated guidance on the impacts of climate change¹⁶ on flood risk in the UK to support NPPF. This advice sets out that peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change.

The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios.

PPG recommends that considerations for future climate change are included in FRA's for proposed developments. The consideration of climate change for this Site considers the possible changes in peak river flows and peak rainfall intensity.

Concerns relating to offshore wind speed, wave height and sea level are only of relevance in contexts that are in direct proximity to the open coast or other large open bodies of water. This is not the case for this Site; therefore, potential changes in these are not considered further.

5.1 Peak River Flow

An extract of the Environment Agency's *Climate change allowances for peak river flow in England* map is reproduced in Table 5-1 for the *Gloucestershire and the Vale Management Catchment*.

Table 5-1
Peak River Flow Climate Change Allowances in the Gloucestershire and the Vale Management Catchment (1981-2000 baseline)

Management Catchment	Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2125)
Gloucestershire and the Vale	Upper End	33%	43%	84%
	Higher Central	17%	19%	41%
	Central	11%	11%	26%

The Environment Agency advise that for 'Less Vulnerable' uses in Flood Zone 2 and 3a, the *Higher Central* allowance category should be applied to assess the impact of climate change on fluvial flood risk.

While the Site lies entirely within Flood Zone 1, the peak river flow allowances should still be applied to understand the impact of the climate change on the flood risk at the Site over the 25-year lifetime of development (to 2047). As such, and as a conservative approach, a *Higher Central* allowance of 19% has been assessed.

It is typically expected that the 0.1% AEP peak river flow is roughly equivalent to the 1% AEP inclusive of a 20% uplift.

16 Environment Agency, February 2016 (updated October 2021). Flood risk assessments: climate change allowances (Accessed October 2021 at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>)

With reference to the *Flood Map for Planning (Rivers and Sea)*⁴, the closest Flood Zone 2 is located 300m to the east of the Site and 400m to the west. Comparison of this flood extent against the LiDAR data indicates that there are no incident flow paths and the extent is not anticipated to be incident to the Site.

It is therefore expected that the Site would remain dry when accounting for a 19% uplift to the 1% AEP peak fluvial flow.

5.2 Peak Rainfall Intensity Allowance

The most recent advice on climate change is provided by the Environment Agency¹⁷. An extract of the *Gloucestershire and the Vale Management Catchment peak rainfall allowances* is reproduced as Table 5-2.

Table 5-2

Peak River Rainfall Climate Change Allowances in the Gloucestershire and the Vale Management Catchment

Management Catchment	Annual Exceedance Probability (%)	Allowance Category	Total potential change anticipated for the 2050s	Total potential change anticipated for the 2070s
Gloucestershire and the Vale	3.3	Upper End	35	35
		Central	20	25
	1	Upper End	40	40
		Central	20	25

As discussed at Section 3, the proposed AD plant has an anticipated operational lifespan of 25 years (to 2047). The Environment Agency recommends that flood risk assessments for developments with a lifetime up to 2060, the central allowance for the 2050s epoch should be assessed. As detailed in Table 5-2, this equates to a 20% uplift.

¹⁷ Environment Agency, February 2016 (updated May 2022). Flood risk assessments: climate change allowances (Accessed on 17 February 2022 at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>)

6.0 Policy Status for Proposed Development

6.1 Flood Risk Compatibility

As discussed at Section 3.1, the proposed development is classified as a 'Less vulnerable' use and has been assessed to lie in Flood Zone 1.

Therefore, with reference to *Table 2: Flood risk vulnerability and flood zone 'incompatibility'* at PPG Paragraph 078 (reproduced as Table 6-1), the proposed development would be considered an 'appropriate' form of development.

Table 6-1
Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (PPG Table 2)		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone (PPG Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
	Zone 3b (functional floodplain)	Exception Test Required	x	x	x	✓

Key: ✓ Development is appropriate x Development should not be permitted

6.2 Sequential Test

NPPF Paragraph 162 advises that the aim the Sequential Test is to 'steer new development to areas with the lowest risk of flooding from any source'. Furthermore, it states:

'Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding.'

The *Flood Map for Planning (Rivers and Sea)*⁴ (Figure 1-2) and the local SFRA provide the basis for applying this test. The Site is located entirely within Flood Zone 1 (i.e., has the lowest risk of flooding). It has therefore been deemed that the Sequential Test has been passed.

6.3 Exception Test

The Exception Test is required to show that the sustainability benefits of the proposed development to the community outweigh the flood risk. The sustainability benefits of the development are considered fully elsewhere in the planning application however, renewable energy generation is a key element in reducing carbon emissions. The Exception Test also must show that the development will be safe for its lifetime and will not increase the flood risk elsewhere.

As discussed at Section 3.3, PPG identified that the '*Less Vulnerable*' developments located within Flood Zone 1 is not required to pass the Exception Test as the development is already deemed appropriate.

7.0 DRAINAGE PHILOSOPHY

7.1 Summary

The AD facility would capture as much rainwater as possible for use in the process. Based on annual average estimates, rainwater capture is expected to be sufficient for up to 100% of the process water demand.

Two primary drainage systems would be adopted, for the clean (surface water runoff) and contaminated (foul) water systems.

In accordance with Wiltshire Council 'Adoptable Highway Drainage Guidance'¹⁸, the Site has been designed to manage all flows up to and including the 1% AEP event plus 20% climate change, considered as the Design Flood Event (DFE).

The Site will be provided with hardstanding and secondary containment constructed in accordance with industry best practice standards to prevent pollution to surface water and groundwater. The clamps, storage bunkers, digestate storage bay, connecting concrete apron and digestate off-take area all drain to the sealed drainage system (leachate system).

The Site has been designed in accordance with CIRIA C736 and Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations (SSAFO). The silage clamps have been designed in accordance with the latest SSAFO regulations and in accordance with CIRIA 759. An Environmental Management System (EMS) will be in place prior to the commencement of site operations. The scope for the EMS applies to all processes and activities undertaken by the operator at the installation.

Accordingly, the Site has been designed to have a clean water lagoon to capture surface water runoff. However, the invert level of this lagoon will be designed such as to ensure that sufficient capacity remains for the 1% AEP rainfall event inclusive of allowance for climate change (+20%), to allow for flood management.

7.1.1 Contaminated Runoff

Contaminated runoff, caused by silage residue, from the silage clamps and sections of hardstanding area would be collected through a series of drainage channels, pipes, and chambers and be brought into a below ground holding tank. From this tank, runoff will be pumped to three 400m³ holding tanks within the containment bund where it will be reused within the process.

The process has a yearly demand of 62,000m³, equating to 2l/s continuous flow. This offers a sustainable drainage system, compliant with the hierarchy.

The foul water strategy is outlined in **Appendix 05**.

7.1.2 Clean Water

Surface water runoff would be collected from the remaining Site area, comprising building roofs and certain sections of hardstanding, and conveyed to the lagoon using a network of channel drains and underground pipes. It is anticipated that petrochemicals may be present within the surface water runoff from the hardstanding areas, which would be separated and removed through a full retention petrol interceptor. Runoff would then be discharged into the adjacent highways ditch at greenfield rates.

The runoff from within the bunds has the potential to become contaminated through process residue. This would be collected through a channel drain and discharged into a pump chamber where it would be sampled and pumped to the lagoon (if clean) or reused in the process (if contaminated).

The SWDS is outlined at Section 8.0.

¹⁸ Wiltshire Council, (July 2020). 'Adoptable Highway Drainage Guidance'.

8.0 SURFACE WATER DRAINAGE STRATEGY

8.1 Context

Without mitigation, the proposed redevelopment of Site could lead to an increase in the rate and volume of surface water runoff generated due to the increase in impermeable coverage. To comply with current guidance and best practice, sustainable drainage systems (SuDS) will be required to manage the quantum and quality of surface water runoff discharge off-Site.

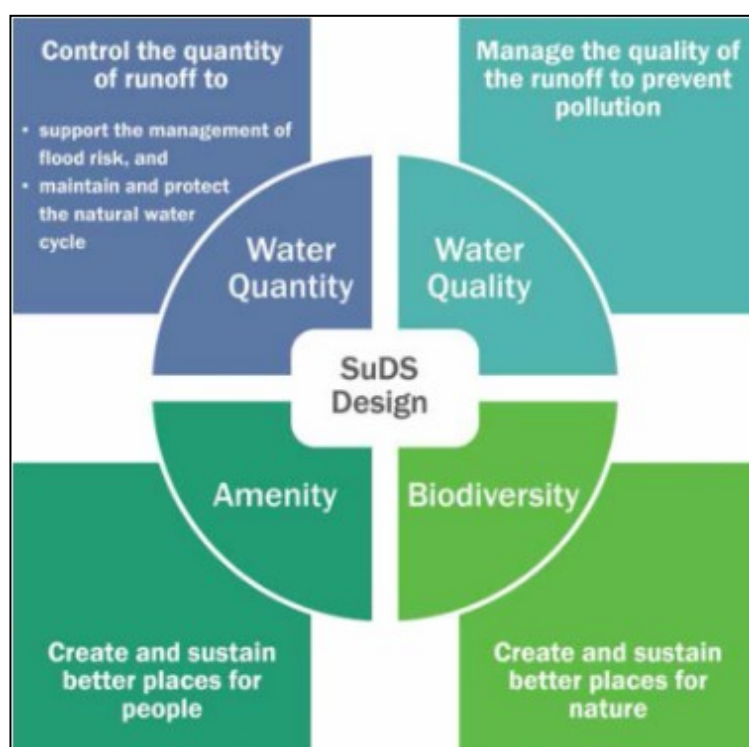
This SWDS sets out high level principles for managing storm water on the Site, in line with best practice and has been produced in support of the planning application.

This strategy is intended to demonstrate that, given the nature and quantum of development proposed, it will be feasible to drain the Site in line with policy and best practice guidance.

8.2 Sustainable Drainage Systems

Current best practice guidance document, The SuDS Manual (CIRIA Report C753)¹⁹, promotes sustainable water management through the use of SuDS. There are four main categories of SuDS which are referred to as the ‘four pillars of SuDS’ as shown in **Figure 8-1**.

Figure 8-1
Four Pillars of SuDS (after CIRIA Report C753)

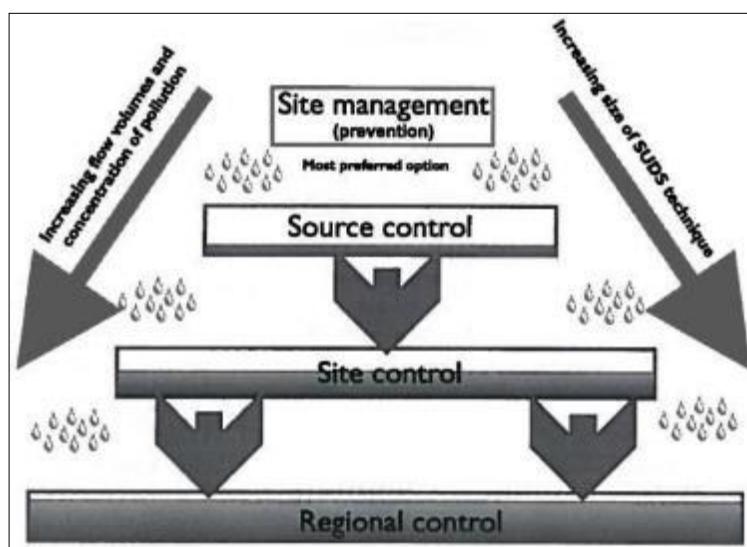


The SuDS Manual identifies a hierarchy of SuDS for managing runoff, which is commonly referred to as a ‘management train’ and is depicted in **Figure 8-2**:

¹⁹ CIRIA (2015). Report C753, The SuDS Manual

- **Prevention** – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
- **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting).
- **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole site).
- **Regional Control** – management of runoff from several sites, typically in a retention pond or wetland.

Figure 8-2
SuDS Management Train



It is generally accepted that the implementation of SuDS, as opposed to conventional drainage systems, provides several benefits by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- Reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- Reducing potable water demand through rainwater harvesting;
- Improving amenity through the provision of public open spaces and wildlife habitat; and replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

8.3 Proposed Drained Area

It is proposed that all impermeable surfaces of the proposed development comprising roofs, external hardstanding operational area, parking area and access road, be positively drained. All other impermeable areas drain to the dirty water system.

Section 3.2.7 of The SuDS Manual recommends that the potential increase in the '*impermeability of the contributing catchment through the design life of the drainage system should (...) be taken into account.*'

Section 24.7.2 of The SuDS Manual defines urban creep as:

'any increase in impervious area that is drained to an existing drainage system without planning permission being required, and therefore without any consideration of whether the capacity of the receiving sewerage system can accommodate the increased flow.'

The SuDS Manual recommends that an allowance of 10% is made in respect of urban creep. However, as the proposed development is non-residential, the application of urban creep does not apply.

The post-development land use is shown in **Drawing SW1** and shows an area of 2.08ha to contribute to surface water runoff.

Interception of runoff from the access and hardstanding areas will avoid capturing additional runoff from Ashton Road.

8.4 Proposed Discharge Arrangement

With reference to The SuDS Manual, the hierarchy of preferred disposal options for surface water runoff from development sites in decreasing order of sustainability is as follows:

1. Infiltration to Ground;
2. Discharge to Surface Waters; or
3. Discharge to Sewer.

Table 8-1 summarises the suitability of disposal methods suitability in the context of the Site and the proposed development.

Table 8-1
Suitability of Surface Water Disposal Methods

Surface Water Disposal Method (in Order of Preference)	Suitability Description	Method Suitable? (Y / N)
Infiltration to Ground	Infiltration testing to BRE Digest 365 was conducted on the 7th December 2022, results presented in Appendix 03. Testing lasted 310 minutes and was failed due to insufficient infiltration, where it is recommended a minimum rate of $1 \times 10^{-6} \text{ms}^{-1}$ be required to allow for discharge to ground. Infiltration is considered unviable and not considered further. No infiltration rate was applied to proposed features outlined in the SWDS.	N
Discharge to Surface Waters	As discussed in Section 2.4.1, there are several ditches that are available to utilise on the Site. The highways ditch adjacent the east boundary has been selected for consideration. The Site naturally drains rainfall by topography and is known to poorly infiltrate to ground; it is assumed that connection is possible to match existing drainage arrangement adopted for the SWDS. Alternatively, the Lead Planning Authority (LPA) will be contacted to confirm the proposed connection. Images of the proposed the Site outfall connection to the highways ditch can be found in Appendix 06.	Y
Discharge to Sewer	There are no existing sewer systems within reasonable proximity to the Site, discharge to sewer has therefore not been considered.	N

8.5 Proposed Outline SuDS Strategy

It is proposed to manage surface water runoff from the development via the following 'Source Control', 'Conveyance' and 'Site Control' options as summarised in **Table 8-2**.

Table 8-2
Summary of Surface Water Management Strategy SuDS Options

SuDS Management Train Mechanism	Application	Potential Suitable SuDS Features
Source Control	For the interception of surface water runoff at the source such as office roofs, parking lots and equipment hardstanding.	
Conveyance	To convey surface water runoff from 'Source Control' mechanisms to 'Site Control'.	Rainwater Lagoon
Site Control	Provides the required surface water attenuation / storage prior to controlled discharge to the water environment.	Below Ground Crate System

Due to the likelihood of contamination from the hardstanding and other open areas of the Site, it is recommended that SuDS source control and conveyance features are not adopted on the Site. It is therefore proposed that intercepting Aquadrains and underground pipes are used to intercept and convey runoff across Site.

'Site Control' feature in the form of a rainwater lagoon is a viable option in terms of the downstream discharge arrangement. The below ground crate system has been designed to provide full upstream attenuation of all generated surface water runoff prior to controlled discharge to the highways ditch from the lagoon.

8.5.1 Below Ground Crate System

The below ground crate system is proposed to be installed under the hardstanding to the west side of the weighing bridge as shown in **Drawing SW2**. The crates have been designed to provide full attenuation for clean surface water runoff. A pump has been utilised to drain the crates to the connecting rainwater lagoon prior to discharge to the highways ditch.

To appropriately locate both the development assets and drainage features, a single pump arrangement has been utilised as the preferable option. This allows the Site to drain all impermeable areas by gravity to the crate whilst able to discharge at greenfield rates.

8.5.2 Lagoon

The lagoon has been located at the lowest point to the south east corner of the Site – north side of the Site access. The lagoon shall function as a above ground conveyance feature to the proposed the Site outfall, assumed to provide no attenuation.

8.6 Water Quantity Design Standard

8.6.1 Control of Runoff Volume

Section 3.3.1 of The SuDS Manual sets out volume control criteria for:

- Frequent rainfall events.
- Extreme rainfall events.

Frequent rainfall events

The SuDS Manual requires *'the prevention of runoff from the [Site] for the majority of small (frequent) rainfall events (or for the initial depth of rainfall for larger events)'*. This is known as *Interception* and *'Inception of about 5mm is normally achievable.'*

With reference to Section 24.8 of The SuDS Manual:

'Inception can be delivered using one or a combination of process:

- *Rainwater harvesting*
- *Infiltration*
- *Evapotranspiration using temporary shallow ponding or storage within the soil or upper aggregate layers.'*

As discussed at Section 7.1, rainwater harvesting will be incorporated within the design of the AD facility. Interception is therefore provided.

Extreme rainfall events

For extreme rainfall events, the drainage system should be designed such that *'the volume of runoff from the Site (or development) area [does] not exceed the volume of runoff from the equivalent area in its natural undeveloped or "greenfield" state'*.

As summarised within **Table 8-1**, surface water runoff resulting from the proposed development will discharge to surface water.

In line with Section 3.3.1 of The SuDS Manual, it is proposed that *'all the runoff from the site for the 1:100 year [1% AEP] event [to] be discharged at either a rate of $2\text{ls}^{-1}\text{ha}^{-1}$ or the average annual peak flow rate (i.e. the mean annual flood, QBAR), whichever is greater.'*

Table 24.1 Summary of runoff estimation methods of The SuDS Manual recommends the application of the Revitalised Rainfall-Runoff Method (ReFH2) to estimate greenfield runoff rates. ReFH2 has therefore been used to estimate greenfield runoff rate for the 50% AEP (1 in 2 year) rainfall event as summarised at **Table 4-5**. It should be noted that QBAR has a return period of approximately 1 in 2.3 years, however, only integers can be inputted into ReFH2. A conservative QBAR peak runoff rate has been estimated assuming a 1 in 2 year return period.

The descriptors for the Site, extracted from the Flood Estimation Handbook²⁰ (FEH) Web Service, were used in the ReFH2 analysis with the AREA set to 1.00ha.

With reference to **Drawing SW1**, the proposed development will render impermeable an area of 4.52ha. Of this impermeable area, 2.08ha will be drained to the proposed surface water system as shown on **Drawing SW1**, the remaining impermeable area will drain to the proposed foul water system.

While the area draining to the foul water system will not discharge into the water environment, greenfield runoff rate from the total proposed impermeable area of 4.52ha is considered available for the surface water system to discharge at.

²⁰ Centre for Ecology and Hydrology (CEH), 2017. Flood Estimation Handbook Web Service (Accessed on 29 April 2022) <https://fehweb.ceh.ac.uk/GB/map>

Table 8-3
Summary of Pre-Development Greenfield Runoff Rates for Drained Area

AEP (%)	Estimated Greenfield Runoff Rate	
	ls ⁻¹ ha ⁻¹	ls ⁻¹ 4.52ha ⁻¹
50	1.02	4.62

As 2ls⁻¹ha⁻¹ is greater than QBAR peak runoff rate of 4.62ls⁻¹; 9.05ls⁻¹ has been adopted for the SWDS.

8.6.2 Control of Peak Rate of Runoff

Section 3.3.2 of The SuDS Manual sets out peak rate of runoff criteria for:

- Events likely to impact on morphology, ecology or capacity of the receiving surface waters, or the capacity of receiving sewers.
- Extreme events.

Events likely to impact on morphology, ecology or capacity of the receiving surface waters, or the capacity of receiving sewers

The SWDS has been designed such that the discharge into the highways ditch in the south east corner of the Site and will be limited to 2ls⁻¹ha⁻¹ (9.05ls⁻¹) for all AEP rainfall events assessed up to and including the 1% AEP inclusive of an allowance for climate change (+20%).

Therefore, it is considered that the proposed development will have no significant impact on the '*morphology, ecology or capacity of the receiving surface waters*' by virtue of the rate or volume of surface water runoff.

Extreme events

In line with Section 3.3.2 of The SuDS Manual, the SWDS '*should be designed so that peak runoff rates for extreme rainfall events (...) are constrained to the greenfield rates of runoff for the same event.*'

As a conservative approach, the SWDS has been designed such that any discharge into surface waters is restricted to 2ls⁻¹ha⁻¹ for all AEP rainfall events assessed up to and including the 1% AEP +20%.

8.7 Water Quality Design Standard

Due to the likelihood of contamination from the hardstanding and other open areas of the Site and with acknowledgement of the SPZ II designation identified in Section 2.3.2, it is recommended that SuDS source control and conveyance features are not adopted on the Site. Consequently, a full retention interceptor & catchpit will be adopted to mitigate runoff contaminants. Additionally, the proposed AD plant will operate under an Environmental Permit, with a strict operational & maintenance procedure in place. These procedures are developed to ensure compliance and protection of the local receptors.

As part of the environmental permit a detailed maintenance schedule will be regulated against. This shall cover the drainage, external surfacing, buildings & concrete containment bund as a minimum.

The drainage maintenance document typically outlines daily, weekly, biweekly, monthly, quarterly & year inspection work to be carried out, along with the necessary actions required.

As part of the actions under the permit, water quality checks will be required on the outfall locations, covering TSS, PH, volume & hydrocarbons. These will be recorded and submitted to the Environment Agency under the permit conditions annually or more frequently (pending permit conditions).

Therefore, the proposed surface water drainage system shall conform and be regulated to a robust, audited & recorded operational & maintenance plan. This will ensure the performance of the drainage system is maintained throughout the life of the plant.

8.8 Attenuation Volume Estimate

Based on a total contributing area of 2.08ha using the MicroDrainage 'Source Control' module, the attenuation volumes required for the proposed development in response to a range of AEP rainfall events up to and including the 1% AEP rainfall event inclusive of an allowance for climate change (+20%).

Table 8-4
Drainage Performance and Sizing

AEP (%)	Maximum Allowable Discharge (ls ⁻¹) ¹	Maximum Proposed Discharge (ls ⁻¹)	Maximum Water Depth (m)	Maximum Attenuation Storage Required (m ³)	Half Drain Time (minutes)
50	9.0	9.0	0.201	293.1	282
3.3			0.508	739.6	697
1			0.728	1059.6	998
1 +20%			0.913	1329.6	1247

A *constraint* area of approximately 1,915m² has been made available based on the Site level and design constraints, to identify a maximum area available for installation of the below ground crate system; from this, a *design area* of **1,532m²** has been determined for the volume estimation. Crates will be stacked to provide a storage depth of **1.05m**. In total, the crates provide a maximum storage of **1,529m³**. Further details are provided in **Drawing SW2**.

The crates will be lined to prevent groundwater percolating into the crate from surrounding soils; floatation of the crates will be considered during design stages with respect to the installation depth with regard to known groundwater levels. Discharge from the crates will be controlled by a pump with an inlet 0.3m above the invert level of the lagoon, totalling a rise of **1.81m**.

Details of analysis are enclosed at **Appendix 07**.

With reference to the National Standards for sustainable drainage system²¹ published by Defra:

'Drainage systems must be designed so that (...) flooding from the drainage system does not occur:

- a) *On any part of site for a 1 in 30 year [3.33% AEP] rainfall event; and*
- b) *During a 1 in 100 year [1% AEP] rainfall event in any part of:*
 - *a building (including a basement); or*
 - *utility plant susceptible to water (e.g. pumping station or electricity substation); or*
- c) *On neighbouring sites during a 1 in 100 year [1% AEP] rainfall event.'*

²¹ Defra, December 2011. National Standards for sustainable drainage systems - Designing, constructing, operating and maintaining drainage for surface runoff

The proposed SWDS meets the above criteria with no flooding during the range of AEP rainfall events assessed up to and including the 1% AEP rainfall event +20%.

8.9 Design Exceedance Arrangement

The proposed SWDS has also considered residual events i.e. those that are in excess of the design rainfall event.

It is understood that the containment bund will be designed to contain all surface water runoff from within this area. Additionally, all roads will be designed with a perimeter kerb and levels across the Site will be set such that surface water runoff during an exceedance event will be contained within the Site.

8.9.1 Pump Failure

In the event of a duty pump failure, a standby pump will be made available so that the down time of the duty pump does not risk stored volume exceeding capacity of the crates. The Site will be fully attended and maintained in accordance with the operation and maintenance plan to mitigate operational failure of the pump.

9.0 PRINCIPAL OPERATION AND MAINTENANCE REQUIREMENTS

All surface water drainage and pollution control features associated with the Site would remain private and would be maintained and regulated by the Environment Agency under the Environmental Permit.

An operation and maintenance plan for the maintenance requirements for the various aspects of the drainage system for the proposed development that the developer would adopt will be defined when the Site is operational to suit specific conditions in accordance with the Environmental Permit.

10.0 CONCLUSIONS

SLR Consulting Limited (SLR) was appointed by Acorn Bioenergy Limited. (the client) to prepare a Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) to support a planning application for the construction of an Anaerobic Digestion (AD) Plant at land north of North End Farm Works, Ashton Keynes, Swindon SN6 6QT ('the Site').

10.1 Flood Risk

Flood risk has been assessed in line with BS8533³, taking account of national and local planning policy and guidance, and all potential sources of flooding to the Site have been considered.

A screening assessment, detailed at Section 4.0 has reviewed the flood risk posed by sources including fluvial, tidal, surface water, groundwater, sewer, reservoirs, canals and infrastructure failure. The screening assessment concluded that the Site lies in Flood Zone 1 and, therefore, in terms of both the Exception and Sequential Tests, the Site is suitable for development.

Allowances for changes to peak river flows due to climate have been considered. The Site has however, been assessed to be outside an area at risk of flooding over the 25-year lifetime of the proposed development. Additionally, in line with national, regional and local policies, the development must make allowance for a 20% uplift in peak rainfall to accommodate for climate change, which has been included within the SWDS for the Site.

10.2 Drainage Philosophy

Two primary drainage systems will be adopted, for the clean (surface water runoff) and contaminated (foul) water systems.

In accordance with local guidance, the proposed clean water system will be designed to manage all flows up to and including the 1% AEP event plus 20% climate change.

The runoff corresponding to the foul water system will be harvested and used on the process to meet up to 100% of the water demand of the process.

Such an arrangement (which depends on management controls) will need to be agreed with the LLFA (planning) and Environment Agency (permitting).

10.3 Surface Water Drainage Strategy

The SWDS has been developed to demonstrate that the requirements of national, county and local planning policy can be achieved at the Site given the nature and the quantum of development proposed.

Surface water runoff resulting from the proposed development will be intercepted and conveyed to below ground storage crates which will provide the required attenuation prior to discharging to the highways ditch located to the south east corner of the Site. A pump has been utilised to discharge the crates to a rainwater lagoon at greenfield rates, functioning as a conveyance feature to the highways ditch.

The crates have been designed to provide manage all surface water runoff without flooding during rainfall events up to and including a 1% AEP rainfall event inclusive of an allowance for climate change (+20%).

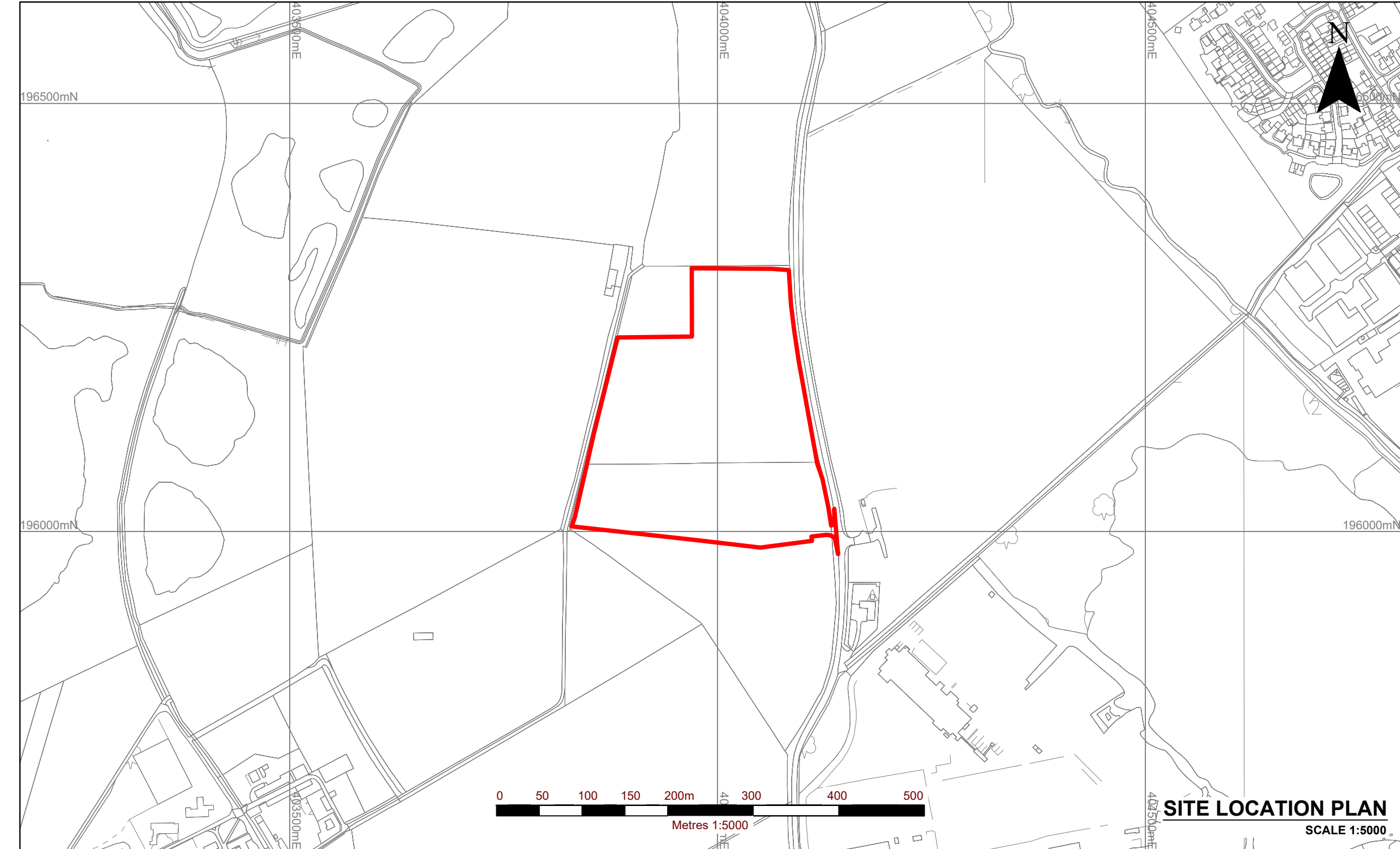
The proposed AD plant has been designed in accordance with CIRIA C736, Water Resources (Control of Pollution) (Sludge, Slurry and Agricultural Fuel Oil) (England) Regulations (SSAFO) and CIRIA 759. Additionally, the plant will be operated under strict operational & maintenance procedures to ensure protection of the local receptors.

In common with most drainage strategies put forward in support of planning applications, the strategy presented here will need to be subject to detailed design and relevant approvals before construction commences.

DRAWINGS

Drawing 01: SW1 Proposed Areas

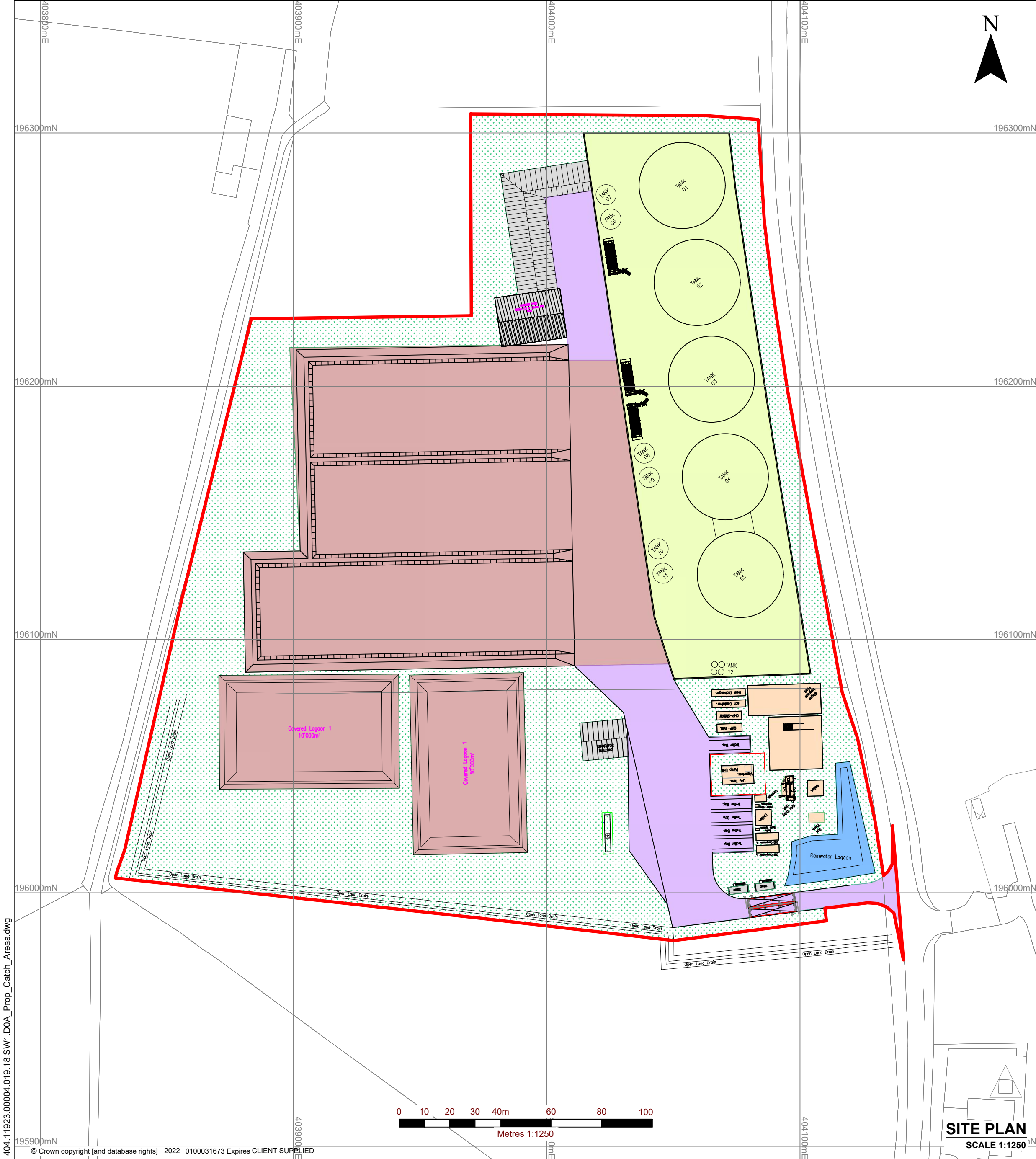
Drawing 02: SW2 Surface Water Drainage Strategy



NOTES

1. DRAWING GENERATED FROM INFORMATION SUPPLIED BY THE CLIENT. REF: GGP-29419-P-101-E-Ashton
Keynes-Site Layout (1).DWG, DATED: OCTOBER 2022.

- LEGEND
- SITE BOUNDARY (69,900m²)
 - LANDSCAPE (23,800m²)
 - CONTAMINATED RUNOFF CATCHMENTS
 - CONTAMINATED RUNOFF AREAS (24,460m²)
 - CLEAN RUNOFF SUB-CATCHMENTS
 - EQUIPMENT RUNOFF (1,240m²)
 - ROOFS (1,815m²)
 - HARDSTANDING WITH PETROCHEMICAL (5,405m²)
 - CLEAN BUND RUNOFF (12,310m²)



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ASHTON KEYNES

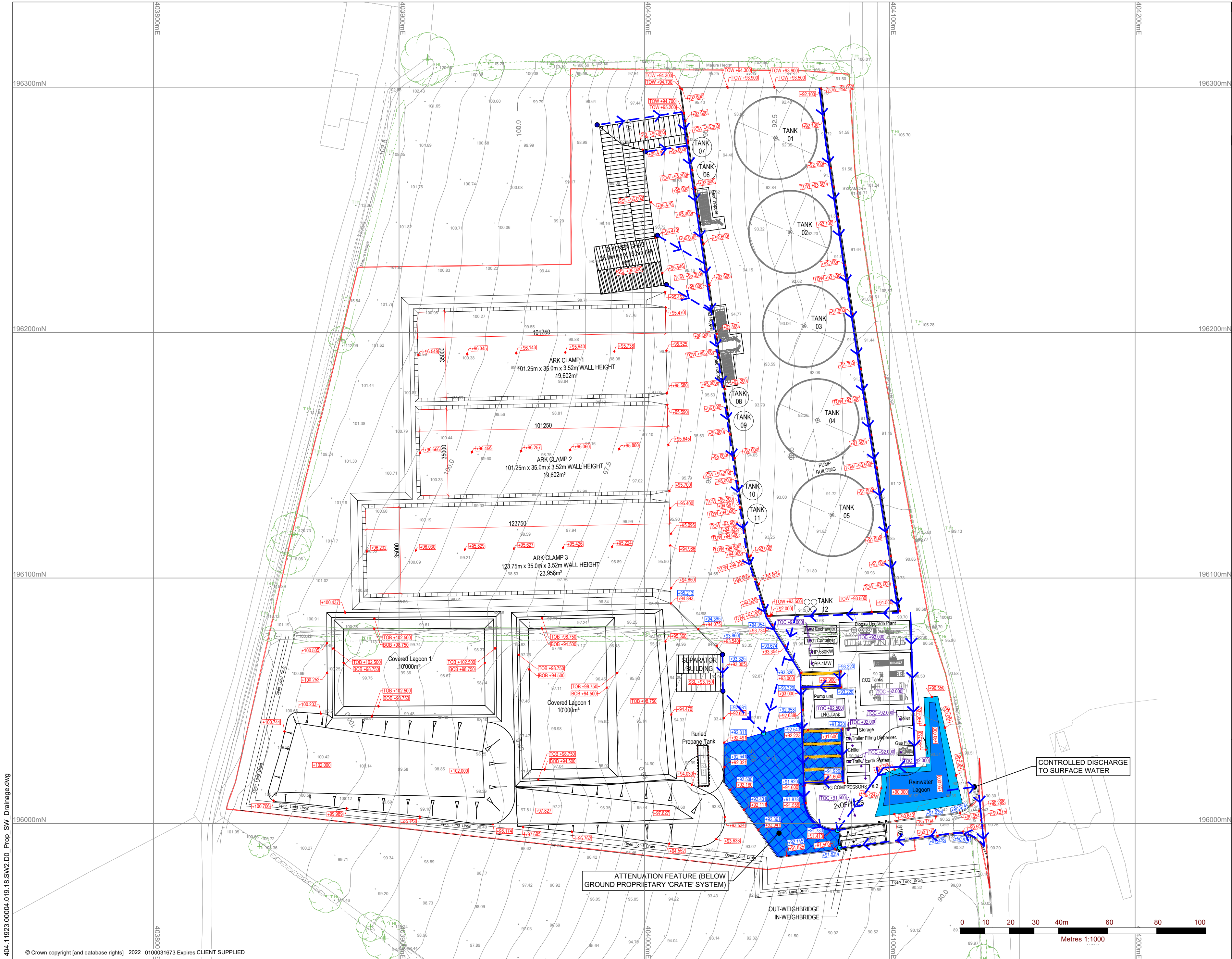
SURFACE WATER DRAINAGE STRATEGY

PROPOSED CATCHMENT AREAS

SW1

Scale AS SHOWN @ A2

Date FEBRUARY 2023



NOTES

1. DRAWING GENERATED FROM INFORMATION SUPPLIED BY THE CLIENT. REF: GGP-29419-P-101-E-Ashton Keynes-Site Layout (1).DWG, DATED: OCTOBER 2022.

LEGEND

- SITE BOUNDARY (69,900m²)
- TOP OF KERB LEVEL
- FINISHED GROUND LEVEL
- TOP OF CONCRETE LEVEL
- ANTICIPATED RAINWATER DOWN PIPE LOCATION
- INTERCEPTION / CONVEYANCE FEATURES (ACO DRAINS)
- PIPED FEATURES
- ATTENUATION FEATURE (BELOW GROUND PROPRIETARY 'CRATE' SYSTEM)
- BELOW GROUND PROPRIETARY 'CRATE' SYSTEM TERMINAL

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ASHTON KEYNES
SURFACE WATER DRAINAGE STRATEGY
PROPOSED SURFACE WATER DRAINAGE STRATEGY PLAN
SW2

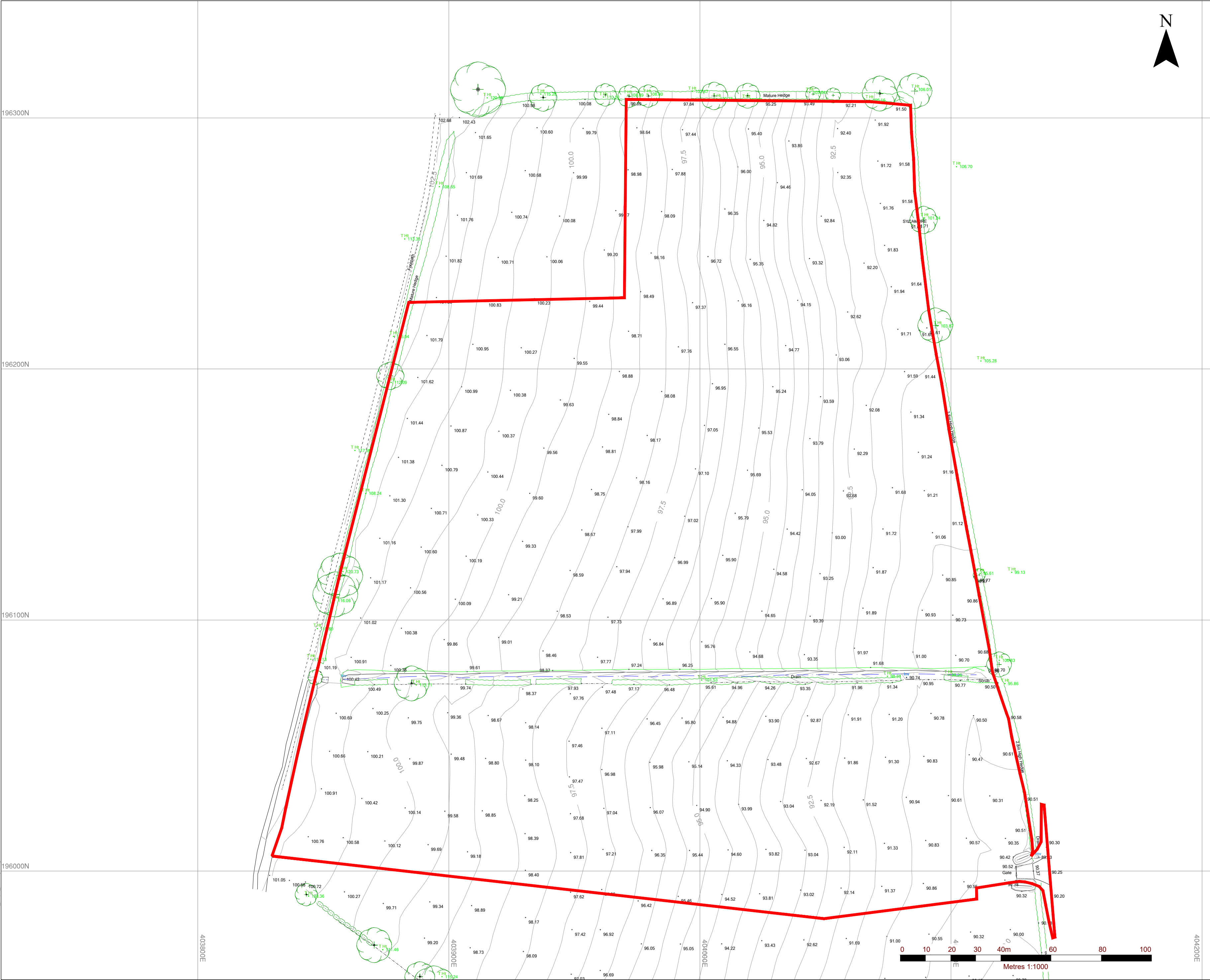
Scale 1:1000 @ A2

Date FEBRUARY 2023

404.11923.0004.019.18.SW2.DO_Prop_SW_Drainage.dwg

APPENDIX 01

Topography



LEGEND

SITE BOUNDARY

EXISTING GROUND CONTOURS

0	IG	CM	02/03	
Revision	By	Chk'd By	Date	Comments

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Site
ASHTON KEYNES

Project

Drawing Title
TOPOGRAPHIC SURVEY

Scale
1:1000 @ A2

Date
FEBRUARY 2023

Drawing Number
001

Revision
0

APPENDIX 02

Trial Pit Geology

Legend



0 10m 20m 30m 40m 50m
Scale 1:1000 @ A1

0 10m 20m 30m 40m 50m
Scale 1:1000 @ A1



Site Location Plan.
Scale: 1:5000 @ A1.

Site Plan.
Scale: 1:1000 @ A1.

- NOTES:
1. All dimensions must be checked on site and not scaled from this drawing.
 2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
 3. All levels shown on this drawing are relative to Agreed Topographic survey.
 4. This drawing is to be read in conjunction with 29419/100 Series Drawings.
 5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

— Site Red Line Boundary (6.99m)



Rev	Date	Description	By	CHK
E	06/12/22	Hatched Plan	ac	ac
D	30/11/22	Layout update	ac	ac
C	02/11/22	Redline & Entrance Update	ac	ac
B	26/10/22	Redline Update	ac	ac
A	04/10/22	Concept Layout	ac	ac

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Qualification via Audit

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AD Plant,
Ashton Keynes.

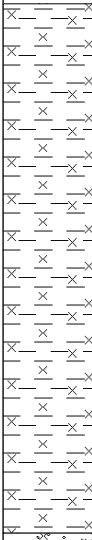
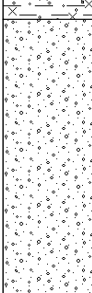
Drawing Title
Site Layout Plan.

Scale	Planning
As Noted @ A1	Date Oct '22
Drawn By J. Collins	Checked JHC
Approved JHC	
Ref No 29419/P/101	Rev E

NOT FOR CONSTRUCTION

Trial Pit Log

Project Name: Ashton Keynes		Client: SLR Consulting		Date: 07/12/2022	
Location: near South Cerny		Contractor: Marriott Geotechnical Drilling			
Project No. : 16294		Crew Name:		Equipment: 8t tracked excavator	
Location Number TP1	Location Type TP	Level	Logged By L. Williams	Scale 1:15	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.35			Crops over dark brown slightly clayey SILT. [Agricultural Reworked]	
								Soft light brown slightly sandy silty CLAY. [Undifferentiated Superficial]	
					1.40 1.45			Light brown gravelly slightly sandy silty CLAY. Gravel is rounded to subrounded fine and medium of limestone. [Undifferentiated Superficial]	
								Light brown very sandy rounded to subrounded fine and medium GRAVEL of limestone and sandstone. [Northmoor Sand and Gravel]	
					2.00			Soft to firm light grey mottled light brown slightly silty occasional closely fissured CLAY. [Kellaway Clay]	
					2.20			End of Trial Pit at 2.200m	
									1
									2
									3

Dimensions		Trench Support and Comment		
Pit Length	Pit Width	Pit Stability Stable	Shoring Used None	Remarks

Remarks	
1. Water seepage at 1.40m. At a pit depth of 2.20m the water rose to 2.10m within 10min.	



APPENDIX 03

Infiltration Rates

SOIL INFILTRATION TEST RATE		 Marriott GEOTECHNICAL DRILLING	
In accordance general with BRE Digest 365 (2016)			
Client	SLR Consulting		
Job Name:	Ashton Keynes	Date:	07/12/2022
Job Number:	16294	Test Pit Reference.:	TP01
Technician:	LRW	Test No.:	1 of 1

Pit Dimensions (m)			
Pit depth (m)	2.2	Test Time Start	09:25 (09:29)
Pit width (m)	0.6	Test Time End	
Pit length (m)	2.1	Quantity Water added	1800l
Initial depth of ground water (bgl)	2.1	Time Taken to add water	4 minutes

Time (mins)	Depth to water (m bgl)	Time (mins)	Depth to water (m bgl)
0	1.12		
0.5	1.12		
1	1.12		
1.5	1.12		
2	1.12		
2.5	1.12		
3	1.12		
3.5	1.12		
4	1.12		
4.5	1.12		
5	1.12		
6	1.12		
7	1.12		
8	1.12		
9	1.12		
10	1.12		
15	1.12		
20	1.12		
25	1.12		
30	1.11		
45	1.10	Material heard collapsing in to pit at depth at ~40 minutes	
60	1.10		
75	1.10		
95	1.10		
130	1.09		
150	1.08		
170	1.08		
190	1.08		
220	1.07		
240	1.07		
285	1.06		
310	1.06		

APPENDIX 04

Development Layout

0 10m 20m 30m 40m 50m
Scale 1:1000 @ A1

0 50m 100m 150m 200m 250m
Scale 1:5000 @ A1



Site Location Plan.
Scale: 1:5000 @ A1.



Site Plan.
Scale: 1:1000 @ A1.

NOT FOR CONSTRUCTION

- NOTES:-
1. All dimensions must be checked on site and not scaled from this drawing.
 2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
 3. All levels shown on this drawing are relative to Agreed Topographic survey
 4. This drawing is to be read in conjunction with 29419/100 Series Drawings.
 5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

Site Red Line Boundary (6.99Ha)



E	08/12/22	Hatched Plan	JHC	JHC
D	30/11/22	Layout update	JHC	JHC
C	02/11/22	Redline & Entrance Update	JHC	JHC
B	28/10/22	Redline Update	JHC	JHC
A	04/10/22	Concept Layout	JHC	JHC
Rev	Date	Description	DR	CH

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Client



Job Title

AD Plant.
Ashton Keynes

Drawing Title
Site Layout Plan.

Status
Planning

Scale
As Noted @ A1

Date
Oct' '22

Drawn By
J. Collins

Checked
JHC

Approved
JHC

Dwg. No.
29419/P/101

Rev
E

APPENDIX 05

AD Plant Dirty Water Usage Strategy (GGP)

**ANAEROBIC DIGESTION PLANT DIRTY
WATER USAGE STRATEGY**

FOR

PROPOSED ANAEROBIC DIGESTION PLANT

ON BEHALF OF



Project ref: 29346/DWS/JHC

Date First Issued: 5th July 2022

Issue: 01

Revision Date: N/A

Prepared by: J. Collins
BSc. (Hons), MCIWEM

Checked by: J. Collins
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CONTENTS

1. Introduction
2. Description of Proposed Site
3. Catchment Areas
4. Design Philosophy
5. Proposed Discharge Rates
6. Clean/Contaminated Bund Runoff
7. Contaminated Silage Clamp Runoff
8. Plant Water Demand Against Annual Average Rainfall

APPENDICES

- I Bund Calculations
- II Silage Clamp 2l/s Calculations
- III Silage Clamp Amended Discharge Rate Calculations

Document Revision Box			
Revision	Date	Description	Author
01	5 th July 2022	Draft	JHC

1.0 Introduction

GGP Consult has been instructed by Acorn Bioenergy Ltd to prepare a dirty water usage strategy drainage impact assessment to establish the storage requirements associated with the operation function of the proposed anaerobic digestion plant.

The calculations will detail how surface water from the site will be managed, in compliance with local policy and an environmental permit.

2.0 Description of Proposed Site

It is typically proposed to develop an anaerobic digestion plant, consisting of 5nr digestate tank, silage clamps, a digestate lagoon, gas equipment, material storage buildings, a pond or similar, offices, parking and additional miscellaneous equipment.

3.0 Catchment Areas

Various areas within the site will be subject to different operation functions, causing some areas being contaminated, some clean, and some with the potential to be contaminated. Therefore, to improve water quality and optimise site efficiency, the site is split into catchments and subject to different drainage philosophies.

4.0 Design Philosophy

As stated within section 3.0, the site has been split into different catchments based on level of contamination. These catchments will be split into different drainage systems.

Two primary drainage systems will be adopted: clean and contaminated.

Contaminated runoff, caused by silage residue, from the silage clamps and sections of hardstanding area will be collected through a series of drainage channels, pipes, and chambers and be brought into a below ground holding tank. From this tank, runoff will be pumped to 3nr 400m³ holding tanks within the bund where it will be reused within the process.

The process has a yearly demand of 62,000m³, equating to 2l/s continuous flow. This offers a sustainable drainage system, compliant with the hierarchy.

Clean runoff will be collected from buildings and sections of hardstanding and discharged into the pond or similar. Petrochemicals will be present within the clean hardstanding runoff, which will be mitigated through a full retention petrol interceptor.

Runoff will then be discharged into the adjacent watercourse at greenfield rates.

Bund runoff has the potential to become contaminated through process residue. This will be collected through a channel drain and discharged into a pump chamber where it will be sampled and pumped to a pond feature (if clean) or reused in the process (if contaminated).

5.0 Clean / Contaminated Bund Runoff

Rainfall collected within the bund has the potential to be contaminated through process residue. Therefore, runoff is collected and contained within the bund until it is sampled to determine if contamination is present.

If clean, runoff will be pumped to the pond or similar. If contaminated, runoff will be pumped into the process for reuse.

Runoff must be sampled prior to discharge, therefore, when the site is unmanned, the bund will store runoff until sampling can be undertaken. The longest period the site will be unmanned is over a 12hr night period. Therefore, the bund will be modelled within no outfall with the 12hr storm events will be taken as the critical event.

A typical bund has a slab level of between 72.500m - 73.000m AOD (AOD levels Site specific) with a top of wall level of 75.000m AOD. A internal area of 9,727m², 3,889m² of which is taken by the tanks, resulting in an available bund area of 5,836m².

These parameters have been used to model the bund within MicroDrainage 'Source Control'. An extract of the structure can be seen below.

Depth (m)	Area (m ²)
0.000	0.0
0.500	5836.0
2.500	5836.0

The model has been run over a variety of storm events with the resultant volumes and depths detailed below.

Storm Event	Volume	Depth
1:1 Yr 12hr + 40%CC	305.6m ³	340mm
1:2 Yr 12hr + 40%CC	368.0m ³	362mm
1:10 Yr 12hr + 40%CC	518.8m ³	405mm
1:30 Yr 12hr + 40%CC	651.6m ³	437mm
1:100 Yr 12hr + 40%CC	836.4m ³	475mm

The above results shall vary slightly based on site geographical area. However, the result shows the bund has more than sufficient capacity. The bund is typically designed for 110% of the largest tank i.e., 8,489m³

Refer to Appendix VI for the full bund calculations.

6.0 Contaminated Silage Clamp Runoff

The runoff from the silage clamps will be contaminated with leachate from the crop. As the runoff has leachate within it, it has value to be reused within the process. Therefore, the site will use contaminated runoff as a main source of water.

Runoff will be collected through channel drains running along the front of the clamps where it will be brought to the south of the clamps and discharged into an underground holding tank of 50m³.

This will then be pumped into 3nr 400m³ holding tanks within the bund where it will be used within the process at a rate of 2l/s/. This provides a total storage capacity of 1,250m³.

All the storage capacity will be modelled as a single tank with a pumped discharge of 2l/s.

An extract of the storage structure and pump structure is shown below.

Tank or Pond Structure

Cover Level (m) 74.450 Storage is Online

Dividing Weir Level (m) 0.000

Invert Level (m) 72.450

Depth (m)	Area (m ²)
0.000	625.0
2.000	625.0

Scale Factor (%) 0

0.1m 0.2m 0.4m Clear Repeat

Enter Area between 0.0 and 999999.9 Depth (m): 2.000 Volume Available (m³): 1250.0

MicroDrainage 'Source Control' Tank Structure

Pump Outflow Control

Invert Level (m) 72.450

Depth (m)	Outflow (l/s)
0.100	2.0000
0.200	2.0000
0.300	2.0000
0.400	2.0000
0.500	2.0000
0.600	2.0000
0.700	2.0000
0.800	2.0000
0.900	2.0000
1.000	2.0000
1.100	2.0000
1.200	2.0000

0.1m 0.2m Default Repeat Clear

Enter Invert Level between -9999.999 and 9999.999

MicroDrainage 'Source Control' Pump Overflow

The model has been run over a variety of storm events with the resultant volumes and depths detailed below. During extreme storm events, the discharge into the process will be increased to prevent above ground flooding.

As the site for a maximum period of 12hrs, the peak and 12hr event will be analysed.

Storm Event	Volume	Discharge Rate	
1:1 Yr 12hr + 40%CC	492.7m ³	2.0l/s	
1:1 Yr 36hr + 40%CC	546.5m ³	2.0l/s	
1:2 Yr 12hr + 40%CC	605.9m ³	2.0l/s	
1:2 Yr 36hr + 40%CC	678.1m ³	2.0l/s	
1:10 Yr 12hr + 40%CC	880.9m ³	2.0l/s	
1:10 Yr 48hr + 40%CC	1,011.4m ³	2.0l/s	
1:30 Yr 12hr + 40%CC	1,124.4m ³	2.0l/s	
1:30 Yr 48hr + 40%CC	1,305.6m ³	2.0l/s	Flood
1:100 Yr 12hr + 40%CC	1,464.2m ³	2.0l/s	Flood
1:100 Yr 48hr + 40%CC	1,712.9m ³	2.0l/s	Flood

Refer to Appendix IX for silage clamp 2l/s calculations.

As shown within the above calculations, the contaminated drainage system floods within the peak 1:30 event and both 1:100 events.

In these extreme storm events, it is proposed to increase the discharge rate into the process. The calculations have been remodelled with higher discharge rates to determine what rates are required to prevent flooding.

Storm Event	Volume	Discharge Rate
1:30 Yr 36hr + 40%CC	1,231.2m ³	2.5l/s
1:100 Yr 12hr + 40%CC	1,247.8m ³	7.6l/s
1:100 Yr 12hr (Peak) + 40%CC	1,247.8m ³	7.6l/s

Refer to Appendix X for amended pump rate calculations.

As shown above, during the peak 1:30 event, the process must increase the discharge to 2.5l/s and increase the 1:100 to 7.6l/s/ to prevent above ground flooding. It should also be noted that additional storage tank are likely to be available to hold further water.

10.0 Plant Water Demand Against Average Annual Rainfall

The site has been designed to contain all flows up to and including the 1:100 year +40% CC below ground.

An assessment has been undertaken to compare the average annual rainfall (AAR) against the process' water demand to determine if the process demand is greater than the harvested water.

From reviewing the process, it is expected the process has a yearly operation demand of 62,000m³, equating to a continuous flow of 2l/s.

AAR = 0.667

Area (Total Catchment) = 46,347m²

CC = 40%

Total annual rainfall (including climate change) = 43,278.8m³

The rainfall generated within the contaminated catchment provides 43,278.8m³ of water each year, 70% of the yearly demand.

As shown above, the plant has a greater demand than the yearly rainfall within the site with the addition of climate change. The attenuation capacity has been solely provided to satisfy local and national policy.

Therefore, the collected runoff is recycled within the process, satisfying sustainability and drainage hierarchy requirements.

APPENDIX I

Bund Calculations

GGP Consult		Page 1																																																																																																																																																																																													
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Bund Calcs AD Plant																																																																																																																																																																																														
Date 01/05/2022 File Bund Calcs No Outfall.SRCX	Designed by DJC Checked by JHC																																																																																																																																																																																														
Innovyze	Source Control 2019.1																																																																																																																																																																																														
<u>Summary of Results for 1 year Return Period (+40%)</u> Outflow is too low. 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<u>Summary of Results for 1 year Return Period (+40%)</u>				
Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status
30 min Winter	72.747	0.247	117.1	O K
60 min Winter	72.767	0.267	148.3	O K
120 min Winter	72.787	0.287	184.0	O K
180 min Winter	72.799	0.299	207.8	O K
240 min Winter	72.807	0.307	226.2	O K
360 min Winter	72.819	0.319	253.4	O K
480 min Winter	72.828	0.328	273.9	O K
600 min Winter	72.834	0.334	290.9	O K
720 min Winter	72.840	0.340	305.6	O K
960 min Winter	72.849	0.349	330.3	O K
1440 min Winter	72.862	0.362	368.7	O K
2160 min Winter	72.875	0.375	411.9	O K
2880 min Winter	72.885	0.385	445.0	O K
4320 min Winter	72.900	0.400	496.4	O K
5760 min Winter	72.910	0.410	536.7	O K
7200 min Winter	72.919	0.419	570.4	O K
8640 min Winter	72.926	0.426	599.7	O K
10080 min Winter	72.932	0.432	625.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	28.301	0.0	38	
60 min Winter	17.920	0.0	68	
120 min Winter	11.119	0.0	128	
180 min Winter	8.370	0.0	188	
240 min Winter	6.835	0.0	248	
360 min Winter	5.105	0.0	368	
480 min Winter	4.138	0.0	488	
600 min Winter	3.516	0.0	608	
720 min Winter	3.078	0.0	728	
960 min Winter	2.495	0.0	968	
1440 min Winter	1.857	0.0	1448	
2160 min Winter	1.383	0.0	2168	
2880 min Winter	1.120	0.0	2888	
4320 min Winter	0.833	0.0	4328	
5760 min Winter	0.676	0.0	5768	
7200 min Winter	0.574	0.0	7208	
8640 min Winter	0.503	0.0	8648	
10080 min Winter	0.450	0.0	10088	
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.985

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.492	4	8	0.493

Time Area Diagram

Total Area (ha) 0.000

Time (mins) Area		
From:	To:	(ha)
0	4	0.000

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<u>Model Details</u> Storage is Online Cover Level (m) 75.000 <u>Tank or Pond Structure</u> Invert Level (m) 72.500 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>0.0</td><td>0.500</td><td>5836.0</td><td>2.500</td><td>5836.0</td></tr></tbody></table>			Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	0.000	0.0	0.500	5836.0	2.500	5836.0
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Innovyze	Source Control 2019.1			
<u>Summary of Results for 2 year Return Period (+40%)</u>				
Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status
30 min Winter	72.768	0.268	150.4	O K
60 min Winter	72.789	0.289	187.7	O K
120 min Winter	72.809	0.309	229.3	O K
180 min Winter	72.821	0.321	256.4	O K
240 min Winter	72.829	0.329	277.2	O K
360 min Winter	72.841	0.341	308.2	O K
480 min Winter	72.849	0.349	331.8	O K
600 min Winter	72.856	0.356	351.3	O K
720 min Winter	72.862	0.362	368.0	O K
960 min Winter	72.871	0.371	395.9	O K
1440 min Winter	72.884	0.384	438.9	O K
2160 min Winter	72.897	0.397	486.6	O K
2880 min Winter	72.907	0.407	523.3	O K
4320 min Winter	72.921	0.421	579.8	O K
5760 min Winter	72.931	0.431	623.6	O K
7200 min Winter	72.939	0.439	660.0	O K
8640 min Winter	72.946	0.446	691.4	O K
10080 min Winter	72.952	0.452	719.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	36.348	0.0	38	
60 min Winter	22.680	0.0	68	
120 min Winter	13.855	0.0	128	
180 min Winter	10.330	0.0	188	
240 min Winter	8.375	0.0	248	
360 min Winter	6.209	0.0	368	
480 min Winter	5.013	0.0	488	
600 min Winter	4.246	0.0	608	
720 min Winter	3.706	0.0	728	
960 min Winter	2.991	0.0	968	
1440 min Winter	2.210	0.0	1448	
2160 min Winter	1.634	0.0	2168	
2880 min Winter	1.318	0.0	2888	
4320 min Winter	0.973	0.0	4328	
5760 min Winter	0.785	0.0	5768	
7200 min Winter	0.665	0.0	7208	
8640 min Winter	0.580	0.0	8648	
10080 min Winter	0.517	0.0	10088	
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Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.985

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.492	4	8	0.493

Time Area Diagram

Total Area (ha) 0.000

Time (mins) Area		
From:	To:	(ha)
0	4	0.000

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Model Details Storage is Online Cover Level (m) 75.000 Tank or Pond Structure Invert Level (m) 72.500 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>0.0</td><td>0.500</td><td>5836.0</td><td>2.500</td><td>5836.0</td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	0.0	0.500	5836.0	2.500	5836.0
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0.000	0.0	0.500	5836.0	2.500	5836.0									
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Innovyze	Source Control 2019.1			
<u>Summary of Results for 10 year Return Period (+40%)</u>				
Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status
30 min Winter	72.807	0.307	224.2	O K
60 min Winter	72.829	0.329	278.0	O K
120 min Winter	72.851	0.351	336.1	O K
180 min Winter	72.863	0.363	372.6	O K
240 min Winter	72.872	0.372	399.7	O K
360 min Winter	72.884	0.384	440.5	O K
480 min Winter	72.893	0.393	471.7	O K
600 min Winter	72.900	0.400	497.1	O K
720 min Winter	72.905	0.405	518.8	O K
960 min Winter	72.915	0.415	554.6	O K
1440 min Winter	72.928	0.428	609.0	O K
2160 min Winter	72.941	0.441	668.3	O K
2880 min Winter	72.951	0.451	713.5	O K
4320 min Winter	72.965	0.465	782.2	O K
5760 min Winter	72.975	0.475	834.6	O K
7200 min Winter	72.983	0.483	877.5	O K
8640 min Winter	72.990	0.490	914.2	O K
10080 min Winter	72.995	0.495	946.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	54.206	0.0	38	
60 min Winter	33.604	0.0	68	
120 min Winter	20.311	0.0	128	
180 min Winter	15.011	0.0	188	
240 min Winter	12.078	0.0	248	
360 min Winter	8.874	0.0	368	
480 min Winter	7.126	0.0	488	
600 min Winter	6.008	0.0	608	
720 min Winter	5.225	0.0	728	
960 min Winter	4.190	0.0	968	
1440 min Winter	3.067	0.0	1448	
2160 min Winter	2.244	0.0	2168	
2880 min Winter	1.797	0.0	2888	
4320 min Winter	1.313	0.0	4328	
5760 min Winter	1.051	0.0	5768	
7200 min Winter	0.884	0.0	7208	
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10080 min Winter	0.681	0.0	10088	
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.985

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.492	4	8	0.493

Time Area Diagram

Total Area (ha) 0.000

Time (mins) Area		
From:	To:	(ha)
0	4	0.000

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Innovyze	Source Control 2019.1			
<u>Summary of Results for 30 year Return Period (+40%)</u>				
Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status
30 min Winter	72.833	0.333	286.7	O K
60 min Winter	72.858	0.358	356.9	O K
120 min Winter	72.881	0.381	431.3	O K
180 min Winter	72.894	0.394	476.6	O K
240 min Winter	72.903	0.403	509.4	O K
360 min Winter	72.916	0.416	558.4	O K
480 min Winter	72.925	0.425	595.7	O K
600 min Winter	72.932	0.432	625.9	O K
720 min Winter	72.937	0.437	651.6	O K
960 min Winter	72.947	0.447	693.7	O K
1440 min Winter	72.960	0.460	757.1	O K
2160 min Winter	72.973	0.473	825.2	O K
2880 min Winter	72.983	0.483	876.6	O K
4320 min Winter	72.997	0.497	953.7	O K
5760 min Winter	73.007	0.507	1011.8	O K
7200 min Winter	73.015	0.515	1059.0	O K
8640 min Winter	73.022	0.522	1098.9	O K
10080 min Winter	73.028	0.528	1133.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	69.298	0.0	38	
60 min Winter	43.136	0.0	68	
120 min Winter	26.061	0.0	128	
180 min Winter	19.202	0.0	188	
240 min Winter	15.393	0.0	248	
360 min Winter	11.248	0.0	368	
480 min Winter	8.999	0.0	488	
600 min Winter	7.565	0.0	608	
720 min Winter	6.562	0.0	728	
960 min Winter	5.240	0.0	968	
1440 min Winter	3.812	0.0	1448	
2160 min Winter	2.770	0.0	2168	
2880 min Winter	2.207	0.0	2888	
4320 min Winter	1.601	0.0	4328	
5760 min Winter	1.274	0.0	5768	
7200 min Winter	1.067	0.0	7208	
8640 min Winter	0.922	0.0	8648	
10080 min Winter	0.816	0.0	10088	
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GGP Consult		Page 3
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Date 01/05/2022 File Bund Calcs No Outfall.SRCX	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.985

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.492	4	8	0.493

Time Area Diagram

Total Area (ha) 0.000

Time (mins) Area		
From:	To:	(ha)
0	4	0.000

GGP Consult		Page 4												
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Bund Calcs AD Plant													
Date 01/05/2022 File Bund Calcs No Outfall.SRCX	Designed by DJC Checked by JHC													
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Model Details Storage is Online Cover Level (m) 75.000 Tank or Pond Structure Invert Level (m) 72.500 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>0.0</td><td>0.500</td><td>5836.0</td><td>2.500</td><td>5836.0</td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	0.0	0.500	5836.0	2.500	5836.0
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Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>138.153</td><td>0.0</td><td>23</td></tr><tr><td>30 min Summer</td><td>90.705</td><td>0.0</td><td>38</td></tr><tr><td>60 min Summer</td><td>56.713</td><td>0.0</td><td>68</td></tr><tr><td>120 min Summer</td><td>34.246</td><td>0.0</td><td>128</td></tr><tr><td>180 min Summer</td><td>25.149</td><td>0.0</td><td>188</td></tr><tr><td>240 min Summer</td><td>20.078</td><td>0.0</td><td>248</td></tr><tr><td>360 min Summer</td><td>14.585</td><td>0.0</td><td>368</td></tr><tr><td>480 min Summer</td><td>11.622</td><td>0.0</td><td>488</td></tr><tr><td>600 min Summer</td><td>9.738</td><td>0.0</td><td>608</td></tr><tr><td>720 min Summer</td><td>8.424</td><td>0.0</td><td>728</td></tr><tr><td>960 min Summer</td><td>6.697</td><td>0.0</td><td>968</td></tr><tr><td>1440 min Summer</td><td>4.839</td><td>0.0</td><td>1448</td></tr><tr><td>2160 min Summer</td><td>3.490</td><td>0.0</td><td>2168</td></tr><tr><td>2880 min Summer</td><td>2.766</td><td>0.0</td><td>2888</td></tr><tr><td>4320 min Summer</td><td>1.989</td><td>0.0</td><td>4328</td></tr><tr><td>5760 min Summer</td><td>1.573</td><td>0.0</td><td>5768</td></tr><tr><td>7200 min Summer</td><td>1.311</td><td>0.0</td><td>7208</td></tr><tr><td>8640 min Summer</td><td>1.129</td><td>0.0</td><td>8648</td></tr><tr><td>10080 min Summer</td><td>0.994</td><td>0.0</td><td>10088</td></tr><tr><td>15 min Winter</td><td>138.153</td><td>0.0</td><td>23</td></tr></tbody></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status	15 min Summer	72.820	0.320	255.2	O K	30 min Summer	72.850	0.350	335.0	O K	60 min Summer	72.878	0.378	419.0	O K	120 min Summer	72.902	0.402	506.0	O K	180 min Summer	72.915	0.415	557.4	O K	240 min Summer	72.924	0.424	593.3	O K	360 min Summer	72.936	0.436	646.5	O K	480 min Summer	72.945	0.445	686.9	O K	600 min Summer	72.952	0.452	719.4	O K	720 min Summer	72.958	0.458	746.8	O K	960 min Summer	72.967	0.467	791.6	O K	1440 min Summer	72.980	0.480	857.9	O K	2160 min Summer	72.992	0.492	928.3	O K	2880 min Summer	73.001	0.501	980.7	O K	4320 min Summer	73.015	0.515	1058.1	O K	5760 min Summer	73.025	0.525	1115.7	O K	7200 min Summer	73.032	0.532	1161.8	O K	8640 min Summer	73.039	0.539	1200.5	O K	10080 min Summer	73.045	0.545	1233.9	O K	15 min Winter	72.832	0.332	285.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	138.153	0.0	23	30 min Summer	90.705	0.0	38	60 min Summer	56.713	0.0	68	120 min Summer	34.246	0.0	128	180 min Summer	25.149	0.0	188	240 min Summer	20.078	0.0	248	360 min Summer	14.585	0.0	368	480 min Summer	11.622	0.0	488	600 min Summer	9.738	0.0	608	720 min Summer	8.424	0.0	728	960 min Summer	6.697	0.0	968	1440 min Summer	4.839	0.0	1448	2160 min Summer	3.490	0.0	2168	2880 min Summer	2.766	0.0	2888	4320 min Summer	1.989	0.0	4328	5760 min Summer	1.573	0.0	5768	7200 min Summer	1.311	0.0	7208	8640 min Summer	1.129	0.0	8648	10080 min Summer	0.994	0.0	10088	15 min Winter	138.153	0.0	23
Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status																																																																																																																																																																																											
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GGP Consult		Page 2		
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Bund Calcs AD Plant			
Date 01/05/2022 File Bund Calcs No Outfall.SRCX	Designed by DJC Checked by JHC			
Innovyze	Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>				
Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status
30 min Winter	72.864	0.364	375.2	O K
60 min Winter	72.892	0.392	469.2	O K
120 min Winter	72.918	0.418	566.7	O K
180 min Winter	72.931	0.431	624.2	O K
240 min Winter	72.940	0.440	664.5	O K
360 min Winter	72.953	0.453	724.1	O K
480 min Winter	72.962	0.462	769.3	O K
600 min Winter	72.970	0.470	805.8	O K
720 min Winter	72.975	0.475	836.4	O K
960 min Winter	72.985	0.485	886.6	O K
1440 min Winter	72.998	0.498	960.9	O K
2160 min Winter	73.011	0.511	1039.7	O K
2880 min Winter	73.022	0.522	1098.4	O K
4320 min Winter	73.036	0.536	1185.1	O K
5760 min Winter	73.047	0.547	1249.6	O K
7200 min Winter	73.056	0.556	1301.3	O K
8640 min Winter	73.064	0.564	1344.6	O K
10080 min Winter	73.070	0.570	1382.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	90.705	0.0	38	
60 min Winter	56.713	0.0	68	
120 min Winter	34.246	0.0	128	
180 min Winter	25.149	0.0	188	
240 min Winter	20.078	0.0	248	
360 min Winter	14.585	0.0	368	
480 min Winter	11.622	0.0	488	
600 min Winter	9.738	0.0	608	
720 min Winter	8.424	0.0	728	
960 min Winter	6.697	0.0	968	
1440 min Winter	4.839	0.0	1448	
2160 min Winter	3.490	0.0	2168	
2880 min Winter	2.766	0.0	2888	
4320 min Winter	1.989	0.0	4328	
5760 min Winter	1.573	0.0	5768	
7200 min Winter	1.311	0.0	7208	
8640 min Winter	1.129	0.0	8648	
10080 min Winter	0.994	0.0	10088	
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GGP Consult		Page 3
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Bund Calcs AD Plant	
Date 01/05/2022 File Bund Calcs No Outfall.SRCX	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.985

Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)	
0 4 0.492		4 8 0.493	

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To: (ha)	
0 4 0.000	

GGP Consult		Page 4												
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Bund Calcs AD Plant													
Date 01/05/2022 File Bund Calcs No Outfall.SRCX	Designed by DJC Checked by JHC													
Innovyze	Source Control 2019.1													
<u>Model Details</u> Storage is Online Cover Level (m) 75.000 <u>Tank or Pond Structure</u> Invert Level (m) 72.500 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>0.0</td><td>0.500</td><td>5836.0</td><td>2.500</td><td>5836.0</td></tr></tbody></table>			Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	0.000	0.0	0.500	5836.0	2.500	5836.0
Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)									
0.000	0.0	0.500	5836.0	2.500	5836.0									
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APPENDIX II

Silage Clamp 21/s Calculations

GGP Consult					Page 1	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY			Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....			Designed by DJC Checked by JHC			
Innovyze			Source Control 2019.1			
<u>Summary of Results for 1 year Return Period (+40%)</u>						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		72.683	0.233	2.0	145.8	O K
30 min Summer		72.753	0.303	2.0	189.6	O K
60 min Summer		72.831	0.381	2.0	238.3	O K
120 min Summer		72.917	0.467	2.0	291.6	O K
180 min Summer		72.970	0.520	2.0	325.0	O K
240 min Summer		73.009	0.559	2.0	349.5	O K
360 min Summer		73.062	0.612	2.0	382.4	O K
480 min Summer		73.097	0.647	2.0	404.3	O K
600 min Summer		73.122	0.672	2.0	420.3	O K
720 min Summer		73.142	0.692	2.0	432.4	O K
960 min Summer		73.168	0.718	2.0	449.0	O K
1440 min Summer		73.193	0.743	2.0	464.2	O K
2160 min Summer		73.197	0.747	2.0	466.6	O K
2880 min Summer		73.191	0.741	2.0	463.0	O K
4320 min Summer		73.170	0.720	2.0	449.7	O K
5760 min Summer		73.143	0.693	2.0	433.1	O K
7200 min Summer		73.114	0.664	2.0	415.0	O K
8640 min Summer		73.084	0.634	2.0	396.4	O K
10080 min Summer		73.054	0.604	2.0	377.5	O K
15 min Winter		72.712	0.262	2.0	163.5	O K
30 min Winter		72.790	0.340	2.0	212.7	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		43.387	0.0	132.2	27	
30 min Summer		28.301	0.0	160.4	41	
60 min Summer		17.920	0.0	239.6	70	
120 min Summer		11.119	0.0	290.8	130	
180 min Summer		8.370	0.0	318.6	190	
240 min Summer		6.835	0.0	333.3	250	
360 min Summer		5.105	0.0	336.5	368	
480 min Summer		4.138	0.0	334.1	488	
600 min Summer		3.516	0.0	331.7	606	
720 min Summer		3.078	0.0	329.4	726	
960 min Summer		2.495	0.0	324.8	964	
1440 min Summer		1.857	0.0	315.5	1442	
2160 min Summer		1.383	0.0	640.0	1888	
2880 min Summer		1.120	0.0	629.4	2280	
4320 min Summer		0.833	0.0	590.5	3068	
5760 min Summer		0.676	0.0	884.1	3880	
7200 min Summer		0.574	0.0	939.5	4696	
8640 min Summer		0.503	0.0	986.0	5536	
10080 min Summer		0.450	0.0	1020.3	6360	
15 min Winter		43.387	0.0	144.8	26	
30 min Winter		28.301	0.0	169.0	41	
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GGP Consult				Page 2	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 1 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	72.878	0.428	2.0	267.5	O K
120 min Winter	72.975	0.525	2.0	327.8	O K
180 min Winter	73.035	0.585	2.0	365.9	O K
240 min Winter	73.081	0.631	2.0	394.1	O K
360 min Winter	73.142	0.692	2.0	432.4	O K
480 min Winter	73.183	0.733	2.0	458.3	O K
600 min Winter	73.214	0.764	2.0	477.7	O K
720 min Winter	73.238	0.788	2.0	492.7	O K
960 min Winter	73.273	0.823	2.0	514.2	O K
1440 min Winter	73.310	0.860	2.0	537.3	O K
2160 min Winter	73.324	0.874	2.0	546.5	O K
2880 min Winter	73.314	0.864	2.0	539.9	O K
4320 min Winter	73.282	0.832	2.0	520.2	O K
5760 min Winter	73.241	0.791	2.0	494.3	O K
7200 min Winter	73.194	0.744	2.0	465.0	O K
8640 min Winter	73.145	0.695	2.0	434.3	O K
10080 min Winter	73.095	0.645	2.0	403.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	17.920	0.0	266.1	70	
120 min Winter	11.119	0.0	317.4	128	
180 min Winter	8.370	0.0	337.8	186	
240 min Winter	6.835	0.0	339.4	246	
360 min Winter	5.105	0.0	337.2	362	
480 min Winter	4.138	0.0	334.9	480	
600 min Winter	3.516	0.0	332.8	596	
720 min Winter	3.078	0.0	330.7	714	
960 min Winter	2.495	0.0	326.5	944	
1440 min Winter	1.857	0.0	318.1	1400	
2160 min Winter	1.383	0.0	650.7	2060	
2880 min Winter	1.120	0.0	636.7	2656	
4320 min Winter	0.833	0.0	604.8	3324	
5760 min Winter	0.676	0.0	990.2	4224	
7200 min Winter	0.574	0.0	1051.1	5128	
8640 min Winter	0.503	0.0	1098.9	6048	
10080 min Winter	0.450	0.0	1118.7	6864	
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GGP Consult		Page 3
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.818

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 0.606	4	8 0.606	8	12 0.606

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area (ha)
From:	To:
0	4 0.000

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area (ha)
From:	To:
0	4 0.000

GGP Consult		Page 4
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 74.450

Tank or Pond Structure

Invert Level (m) 72.450

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	625.0	2.000	625.0

Pump Outflow Control

Invert Level (m) 72.450

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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GGP Consult				Page 1	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 2 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	72.752	0.302	2.0	188.9	O K
30 min Summer	72.841	0.391	2.0	244.3	O K
60 min Summer	72.935	0.485	2.0	302.9	O K
120 min Summer	73.035	0.585	2.0	365.7	O K
180 min Summer	73.097	0.647	2.0	404.4	O K
240 min Summer	73.142	0.692	2.0	432.6	O K
360 min Summer	73.204	0.754	2.0	471.5	O K
480 min Summer	73.247	0.797	2.0	498.1	O K
600 min Summer	73.278	0.828	2.0	517.8	O K
720 min Summer	73.303	0.853	2.0	532.9	O K
960 min Summer	73.337	0.887	2.0	554.1	O K
1440 min Summer	73.371	0.921	2.0	575.4	O K
2160 min Summer	73.379	0.929	2.0	580.5	O K
2880 min Summer	73.369	0.919	2.0	574.3	O K
4320 min Summer	73.342	0.892	2.0	557.3	O K
5760 min Summer	73.311	0.861	2.0	538.1	O K
7200 min Summer	73.278	0.828	2.0	517.8	O K
8640 min Summer	73.245	0.795	2.0	496.9	O K
10080 min Summer	73.212	0.762	2.0	476.0	O K
15 min Winter	72.789	0.339	2.0	211.8	O K
30 min Winter	72.888	0.438	2.0	274.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	56.082	0.0	159.8	27	
30 min Summer	36.348	0.0	171.3	41	
60 min Summer	22.680	0.0	295.9	72	
120 min Summer	13.855	0.0	337.1	130	
180 min Summer	10.330	0.0	340.9	190	
240 min Summer	8.375	0.0	339.8	250	
360 min Summer	6.209	0.0	337.7	368	
480 min Summer	5.013	0.0	335.7	488	
600 min Summer	4.246	0.0	333.7	608	
720 min Summer	3.706	0.0	331.7	726	
960 min Summer	2.991	0.0	327.8	966	
1440 min Summer	2.210	0.0	319.9	1444	
2160 min Summer	1.634	0.0	653.0	2148	
2880 min Summer	1.318	0.0	638.7	2460	
4320 min Summer	0.973	0.0	604.7	3208	
5760 min Summer	0.785	0.0	1027.1	4032	
7200 min Summer	0.665	0.0	1084.4	4832	
8640 min Summer	0.580	0.0	1122.5	5696	
10080 min Summer	0.517	0.0	1105.7	6464	
15 min Winter	56.082	0.0	168.9	27	
30 min Winter	36.348	0.0	171.4	41	
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GGP Consult					Page 2
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 2 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	72.994	0.544	2.0	340.0	O K
120 min Winter	73.108	0.658	2.0	411.0	O K
180 min Winter	73.178	0.728	2.0	455.1	O K
240 min Winter	73.230	0.780	2.0	487.4	O K
360 min Winter	73.302	0.852	2.0	532.5	O K
480 min Winter	73.352	0.902	2.0	563.8	O K
600 min Winter	73.390	0.940	2.0	587.4	O K
720 min Winter	73.419	0.969	2.0	605.9	O K
960 min Winter	73.462	1.012	2.0	632.7	O K
1440 min Winter	73.510	1.060	2.0	662.8	O K
2160 min Winter	73.535	1.085	2.0	678.1	O K
2880 min Winter	73.530	1.080	2.0	674.9	O K
4320 min Winter	73.489	1.039	2.0	649.5	O K
5760 min Winter	73.446	0.996	2.0	622.5	O K
7200 min Winter	73.396	0.946	2.0	591.5	O K
8640 min Winter	73.344	0.894	2.0	558.6	O K
10080 min Winter	73.290	0.840	2.0	525.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	22.680	0.0	322.3	70	
120 min Winter	13.855	0.0	342.3	128	
180 min Winter	10.330	0.0	341.2	188	
240 min Winter	8.375	0.0	340.2	246	
360 min Winter	6.209	0.0	338.2	364	
480 min Winter	5.013	0.0	336.3	480	
600 min Winter	4.246	0.0	334.4	598	
720 min Winter	3.706	0.0	332.6	716	
960 min Winter	2.991	0.0	328.9	948	
1440 min Winter	2.210	0.0	321.7	1408	
2160 min Winter	1.634	0.0	656.2	2080	
2880 min Winter	1.318	0.0	644.1	2736	
4320 min Winter	0.973	0.0	616.3	3460	
5760 min Winter	0.785	0.0	1147.9	4376	
7200 min Winter	0.665	0.0	1201.3	5264	
8640 min Winter	0.580	0.0	1196.1	6216	
10080 min Winter	0.517	0.0	1151.8	7064	
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2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.818

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)		From: To: (ha)	
0 4 0.606		4 8 0.606		8 12 0.606	

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To: (ha)	
0 4 0.000	

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To: (ha)	
0 4 0.000	

GGP Consult		Page 4
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 74.450

Tank or Pond Structure

Invert Level (m) 72.450

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	625.0	2.000	625.0

Pump Outflow Control

Invert Level (m) 72.450

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant				
Date 01/05/2022 File Clamp Calcs No Outfall....		Designed by DJC Checked by JHC				
Innovyze		Source Control 2019.1				
<u>Summary of Results for 10 year Return Period (+40%)</u>						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		72.904	0.454	2.0	283.7	O K
30 min Summer		73.035	0.585	2.0	365.8	O K
60 min Summer		73.172	0.722	2.0	451.5	O K
120 min Summer		73.316	0.866	2.0	540.9	O K
180 min Summer		73.402	0.952	2.0	594.8	O K
240 min Summer		73.463	1.013	2.0	633.1	O K
360 min Summer		73.550	1.100	2.0	687.6	O K
480 min Summer		73.612	1.162	2.0	726.0	O K
600 min Summer		73.658	1.208	2.0	754.9	O K
720 min Summer		73.694	1.244	2.0	777.7	O K
960 min Summer		73.747	1.297	2.0	810.8	O K
1440 min Summer		73.808	1.358	2.0	848.5	O K
2160 min Summer		73.840	1.390	2.0	868.7	O K
2880 min Summer		73.837	1.387	2.0	866.7	O K
4320 min Summer		73.793	1.343	2.0	839.2	O K
5760 min Summer		73.747	1.297	2.0	810.8	O K
7200 min Summer		73.704	1.254	2.0	783.9	O K
8640 min Summer		73.663	1.213	2.0	757.8	O K
10080 min Summer		73.621	1.171	2.0	732.2	O K
15 min Winter		72.959	0.509	2.0	318.0	O K
30 min Winter		73.106	0.656	2.0	410.1	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		83.912	0.0	172.0	27	
30 min Summer		54.206	0.0	171.5	42	
60 min Summer		33.604	0.0	343.8	72	
120 min Summer		20.311	0.0	342.8	132	
180 min Summer		15.011	0.0	342.0	190	
240 min Summer		12.078	0.0	341.2	250	
360 min Summer		8.874	0.0	339.6	370	
480 min Summer		7.126	0.0	338.2	490	
600 min Summer		6.008	0.0	336.7	608	
720 min Summer		5.225	0.0	335.3	728	
960 min Summer		4.190	0.0	332.5	968	
1440 min Summer		3.067	0.0	327.0	1446	
2160 min Summer		2.244	0.0	663.9	2164	
2880 min Summer		1.797	0.0	654.2	2880	
4320 min Summer		1.313	0.0	630.7	3680	
5760 min Summer		1.051	0.0	1291.3	4440	
7200 min Summer		0.884	0.0	1253.6	5192	
8640 min Summer		0.767	0.0	1210.6	5976	
10080 min Summer		0.681	0.0	1163.6	6856	
15 min Winter		83.912	0.0	172.0	27	
30 min Winter		54.206	0.0	171.6	41	
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GGP Consult					Page 2
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 10 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	73.260	0.810	2.0	506.4	O K
120 min Winter	73.422	0.972	2.0	607.5	O K
180 min Winter	73.520	1.070	2.0	668.6	O K
240 min Winter	73.590	1.140	2.0	712.3	O K
360 min Winter	73.690	1.240	2.0	775.0	O K
480 min Winter	73.761	1.311	2.0	819.7	O K
600 min Winter	73.816	1.366	2.0	853.8	O K
720 min Winter	73.859	1.409	2.0	880.9	O K
960 min Winter	73.924	1.474	2.0	921.4	O K
1440 min Winter	74.003	1.553	2.0	970.5	O K
2160 min Winter	74.055	1.605	2.0	1003.4	O K
2880 min Winter	74.068	1.618	2.0	1011.4	O K
4320 min Winter	74.036	1.586	2.0	991.4	O K
5760 min Winter	73.971	1.521	2.0	950.8	O K
7200 min Winter	73.915	1.465	2.0	915.8	O K
8640 min Winter	73.857	1.407	2.0	879.2	O K
10080 min Winter	73.796	1.346	2.0	841.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	33.604	0.0	343.9	70	
120 min Winter	20.311	0.0	343.0	130	
180 min Winter	15.011	0.0	342.1	188	
240 min Winter	12.078	0.0	341.3	246	
360 min Winter	8.874	0.0	339.8	364	
480 min Winter	7.126	0.0	338.3	482	
600 min Winter	6.008	0.0	336.9	600	
720 min Winter	5.225	0.0	335.5	718	
960 min Winter	4.190	0.0	332.8	952	
1440 min Winter	3.067	0.0	327.3	1420	
2160 min Winter	2.244	0.0	664.8	2108	
2880 min Winter	1.797	0.0	656.1	2796	
4320 min Winter	1.313	0.0	636.6	4104	
5760 min Winter	1.051	0.0	1303.8	4792	
7200 min Winter	0.884	0.0	1274.4	5616	
8640 min Winter	0.767	0.0	1240.4	6488	
10080 min Winter	0.681	0.0	1202.5	7456	
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2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.818

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.606	4	8	0.606
			8	12	0.606

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From:	To:
0	4
	0.000

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From:	To:
0	4
	0.000

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2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 74.450

Tank or Pond Structure

Invert Level (m) 72.450

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	625.0	2.000	625.0

Pump Outflow Control

Invert Level (m) 72.450

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY			Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....			Designed by DJC Checked by JHC			
Innovyze			Source Control 2019.1			
<u>Summary of Results for 30 year Return Period (+40%)</u>						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		73.027	0.577	2.0	360.4	O K
30 min Summer		73.200	0.750	2.0	468.6	O K
60 min Summer		73.380	0.930	2.0	581.2	O K
120 min Summer		73.566	1.116	2.0	697.3	O K
180 min Summer		73.675	1.225	2.0	765.6	O K
240 min Summer		73.751	1.301	2.0	813.1	O K
360 min Summer		73.859	1.409	2.0	880.7	O K
480 min Summer		73.936	1.486	2.0	928.9	O K
600 min Summer		73.995	1.545	2.0	965.6	O K
720 min Summer		74.041	1.591	2.0	994.5	O K
960 min Summer		74.110	1.660	2.0	1037.5	O K
1440 min Summer		74.192	1.742	2.0	1088.7	O K
2160 min Summer		74.244	1.794	2.0	1121.5	O K
2880 min Summer		74.254	1.804	2.0	1127.3	O K
4320 min Summer		74.209	1.759	2.0	1099.3	O K
5760 min Summer		74.145	1.695	2.0	1059.4	O K
7200 min Summer		74.086	1.636	2.0	1022.8	O K
8640 min Summer		74.033	1.583	2.0	989.4	O K
10080 min Summer		73.983	1.533	2.0	958.2	O K
15 min Winter		73.096	0.646	2.0	403.9	O K
30 min Winter		73.290	0.840	2.0	525.3	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		106.449	0.0	172.0	27	
30 min Summer		69.298	0.0	171.7	42	
60 min Summer		43.136	0.0	344.0	72	
120 min Summer		26.061	0.0	343.3	132	
180 min Summer		19.202	0.0	342.6	190	
240 min Summer		15.393	0.0	341.9	250	
360 min Summer		11.248	0.0	340.7	370	
480 min Summer		8.999	0.0	339.5	490	
600 min Summer		7.565	0.0	338.4	610	
720 min Summer		6.562	0.0	337.2	728	
960 min Summer		5.240	0.0	335.0	968	
1440 min Summer		3.812	0.0	330.6	1446	
2160 min Summer		2.770	0.0	669.5	2164	
2880 min Summer		2.207	0.0	662.2	2884	
4320 min Summer		1.601	0.0	644.8	4276	
5760 min Summer		1.274	0.0	1313.2	4848	
7200 min Summer		1.067	0.0	1283.0	5552	
8640 min Summer		0.922	0.0	1246.1	6312	
10080 min Summer		0.816	0.0	1204.1	7064	
15 min Winter		106.449	0.0	172.1	27	
30 min Winter		69.298	0.0	171.7	41	
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2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 30 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	73.493	1.043	2.0	651.7	O K
120 min Winter	73.702	1.252	2.0	782.7	O K
180 min Winter	73.826	1.376	2.0	860.0	O K
240 min Winter	73.913	1.463	2.0	914.1	O K
360 min Winter	74.037	1.587	2.0	991.6	O K
480 min Winter	74.126	1.676	2.0	1047.4	O K
600 min Winter	74.194	1.744	2.0	1090.1	O K
720 min Winter	74.249	1.799	2.0	1124.4	O K
960 min Winter	74.332	1.882	2.0	1176.1	Flood Risk
1440 min Winter	74.435	1.985	2.0	1240.6	Flood Risk
2160 min Winter	74.511	2.061	2.0	1288.2	FLOOD
2880 min Winter	74.539	2.089	2.0	1305.6	FLOOD
4320 min Winter	74.523	2.073	2.0	1295.4	FLOOD
5760 min Winter	74.458	2.008	2.0	1255.0	FLOOD
7200 min Winter	74.375	1.925	2.0	1202.9	Flood Risk
8640 min Winter	74.306	1.856	2.0	1160.0	Flood Risk
10080 min Winter	74.239	1.789	2.0	1117.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	43.136	0.0	344.1	72	
120 min Winter	26.061	0.0	343.3	130	
180 min Winter	19.202	0.0	342.6	188	
240 min Winter	15.393	0.0	341.9	248	
360 min Winter	11.248	0.0	340.7	366	
480 min Winter	8.999	0.0	339.4	484	
600 min Winter	7.565	0.0	338.2	602	
720 min Winter	6.562	0.0	337.0	720	
960 min Winter	5.240	0.0	334.7	956	
1440 min Winter	3.812	0.0	330.1	1426	
2160 min Winter	2.770	38.2	668.9	2124	
2880 min Winter	2.207	55.6	661.9	2804	
4320 min Winter	1.601	45.4	646.6	4152	
5760 min Winter	1.274	5.0	1320.1	5424	
7200 min Winter	1.067	0.0	1297.5	6480	
8640 min Winter	0.922	0.0	1269.3	6752	
10080 min Winter	0.816	0.0	1236.4	7672	
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2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.818

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)		From: To: (ha)	
0 4 0.606		4 8 0.606		8 12 0.606	

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To: (ha)	
0 4 0.000	

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To: (ha)	
0 4 0.000	

GGP Consult		Page 4
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 74.450

Tank or Pond Structure

Invert Level (m) 72.450

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	625.0	2.000	625.0

Pump Outflow Control

Invert Level (m) 72.450

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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GGP Consult				Page 1	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	73.200	0.750	2.0	468.5	O K
30 min Summer	73.433	0.983	2.0	614.4	O K
60 min Summer	73.676	1.226	2.0	766.1	O K
120 min Summer	73.922	1.472	2.0	920.1	O K
180 min Summer	74.063	1.613	2.0	1008.3	O K
240 min Summer	74.159	1.709	2.0	1068.0	O K
360 min Summer	74.294	1.844	2.0	1152.7	O K
480 min Summer	74.392	1.942	2.0	1213.9	Flood Risk
600 min Summer	74.467	2.017	2.0	1260.4	FLOOD
720 min Summer	74.526	2.076	2.0	1297.5	FLOOD
960 min Summer	74.615	2.165	2.0	1353.0	FLOOD
1440 min Summer	74.724	2.274	2.0	1421.4	FLOOD
2160 min Summer	74.802	2.352	2.0	1470.1	FLOOD
2880 min Summer	74.828	2.378	2.0	1486.0	FLOOD
4320 min Summer	74.800	2.350	2.0	1468.7	FLOOD
5760 min Summer	74.720	2.270	2.0	1418.4	FLOOD
7200 min Summer	74.635	2.185	2.0	1365.6	FLOOD
8640 min Summer	74.560	2.110	2.0	1318.5	FLOOD
10080 min Summer	74.492	2.042	2.0	1276.0	FLOOD
15 min Winter	73.290	0.840	2.0	524.9	O K
30 min Winter	73.552	1.102	2.0	688.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	138.153	0.0	172.1	27	
30 min Summer	90.705	0.0	171.8	42	
60 min Summer	56.713	0.0	344.3	72	
120 min Summer	34.246	0.0	343.7	132	
180 min Summer	25.149	0.0	343.1	192	
240 min Summer	20.078	0.0	342.6	252	
360 min Summer	14.585	0.0	341.6	370	
480 min Summer	11.622	0.0	340.7	490	
600 min Summer	9.738	10.4	339.8	610	
720 min Summer	8.424	47.5	338.9	730	
960 min Summer	6.697	103.0	337.2	970	
1440 min Summer	4.839	171.4	333.8	1448	
2160 min Summer	3.490	220.1	674.3	2168	
2880 min Summer	2.766	236.0	668.9	2884	
4320 min Summer	1.989	218.7	656.5	4324	
5760 min Summer	1.573	168.4	1332.2	5592	
7200 min Summer	1.311	115.6	1311.3	6128	
8640 min Summer	1.129	68.5	1283.5	6832	
10080 min Summer	0.994	26.0	1249.0	7568	
15 min Winter	138.153	0.0	172.1	27	
30 min Winter	90.705	0.0	171.8	42	
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GGP Consult				Page 2	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs No Outfall....		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	73.824	1.374	2.0	858.9	O K
120 min Winter	74.102	1.652	2.0	1032.3	O K
180 min Winter	74.261	1.811	2.0	1132.0	O K
240 min Winter	74.370	1.920	2.0	1199.8	Flood Risk
360 min Winter	74.524	2.074	2.0	1296.5	FLOOD
480 min Winter	74.637	2.187	2.0	1366.8	FLOOD
600 min Winter	74.723	2.273	2.0	1420.8	FLOOD
720 min Winter	74.793	2.343	2.0	1464.2	FLOOD
960 min Winter	74.898	2.448	2.0	1530.1	FLOOD
1440 min Winter	75.033	2.583	2.0	1614.2	FLOOD
2160 min Winter	75.138	2.688	2.0	1680.1	FLOOD
2880 min Winter	75.185	2.735	2.0	1709.4	FLOOD
4320 min Winter	75.191	2.741	2.0	1712.9	FLOOD
5760 min Winter	75.135	2.685	2.0	1677.9	FLOOD
7200 min Winter	75.047	2.597	2.0	1623.1	FLOOD
8640 min Winter	74.945	2.495	2.0	1559.2	FLOOD
10080 min Winter	74.852	2.402	2.0	1501.3	FLOOD
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	56.713	0.0	344.3	72	
120 min Winter	34.246	0.0	343.6	130	
180 min Winter	25.149	0.0	343.0	190	
240 min Winter	20.078	0.0	342.5	248	
360 min Winter	14.585	46.5	341.4	366	
480 min Winter	11.622	116.8	340.4	484	
600 min Winter	9.738	170.8	339.3	604	
720 min Winter	8.424	214.2	338.3	722	
960 min Winter	6.697	280.1	336.4	958	
1440 min Winter	4.839	364.2	332.5	1430	
2160 min Winter	3.490	430.1	672.4	2128	
2880 min Winter	2.766	459.4	666.5	2828	
4320 min Winter	1.989	462.9	654.2	4196	
5760 min Winter	1.573	427.9	1332.1	5536	
7200 min Winter	1.311	373.1	1316.8	6840	
8640 min Winter	1.129	309.2	1297.7	7960	
10080 min Winter	0.994	251.3	1272.5	8080	
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GGP Consult		Page 3
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps Hornage Farm, AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.818

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.606	4	8	0.606
				8	12
					0.606

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From:	To:
	(ha)
0	4
	0.000

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From:	To:
	(ha)
0	4
	0.000

GGP Consult		Page 4
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs No Outfall....	Designed by DJC Checked by JHC	
Innovyze Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 74.450

Tank or Pond Structure

Invert Level (m) 72.450

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	625.0	2.000	625.0

Pump Outflow Control

Invert Level (m) 72.450

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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APPENDIX III

Silage Clamp Amended Discharge Rate Calculations

GGP Consult				Page 1	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs Adjusted Ou...		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 30 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	73.026	0.576	2.5	359.8	O K
30 min Summer	73.198	0.748	2.5	467.6	O K
60 min Summer	73.377	0.927	2.5	579.5	O K
120 min Summer	73.560	1.110	2.5	694.0	O K
180 min Summer	73.667	1.217	2.5	760.7	O K
240 min Summer	73.741	1.291	2.5	806.6	O K
360 min Summer	73.843	1.393	2.5	870.9	O K
480 min Summer	73.915	1.465	2.5	915.9	O K
600 min Summer	73.969	1.519	2.5	949.3	O K
720 min Summer	74.010	1.560	2.5	975.0	O K
960 min Summer	74.068	1.618	2.5	1011.5	O K
1440 min Summer	74.130	1.680	2.5	1049.8	O K
2160 min Summer	74.152	1.702	2.5	1063.7	O K
2880 min Summer	74.132	1.682	2.5	1051.5	O K
4320 min Summer	74.055	1.605	2.5	1003.4	O K
5760 min Summer	73.985	1.535	2.5	959.1	O K
7200 min Summer	73.921	1.471	2.5	919.4	O K
8640 min Summer	73.861	1.411	2.5	881.9	O K
10080 min Summer	73.803	1.353	2.5	845.7	O K
15 min Winter	73.095	0.645	2.5	403.3	O K
30 min Winter	73.289	0.839	2.5	524.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	106.449	0.0	215.0	27	
30 min Summer	69.298	0.0	214.6	42	
60 min Summer	43.136	0.0	430.0	72	
120 min Summer	26.061	0.0	429.1	132	
180 min Summer	19.202	0.0	428.2	190	
240 min Summer	15.393	0.0	427.4	250	
360 min Summer	11.248	0.0	425.8	370	
480 min Summer	8.999	0.0	424.3	490	
600 min Summer	7.565	0.0	422.8	608	
720 min Summer	6.562	0.0	421.4	728	
960 min Summer	5.240	0.0	418.5	968	
1440 min Summer	3.812	0.0	412.6	1446	
2160 min Summer	2.770	0.0	835.2	2164	
2880 min Summer	2.207	0.0	824.4	2880	
4320 min Summer	1.601	0.0	796.5	3640	
5760 min Summer	1.274	0.0	1619.5	4376	
7200 min Summer	1.067	0.0	1572.4	5120	
8640 min Summer	0.922	0.0	1516.3	5960	
10080 min Summer	0.816	0.0	1455.2	6760	
15 min Winter	106.449	0.0	215.1	27	
30 min Winter	69.298	0.0	214.6	41	
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GGP Consult				Page 2	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs Adjusted Ou...		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 30 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	73.490	1.040	2.5	650.0	O K
120 min Winter	73.697	1.247	2.5	779.4	O K
180 min Winter	73.818	1.368	2.5	855.2	O K
240 min Winter	73.902	1.452	2.5	907.7	O K
360 min Winter	74.021	1.571	2.5	981.9	O K
480 min Winter	74.105	1.655	2.5	1034.5	O K
600 min Winter	74.169	1.719	2.5	1074.1	O K
720 min Winter	74.218	1.768	2.5	1105.1	O K
960 min Winter	74.291	1.841	2.5	1150.4	O K
1440 min Winter	74.374	1.924	2.5	1202.3	Flood Risk
2160 min Winter	74.420	1.970	2.5	1231.2	Flood Risk
2880 min Winter	74.419	1.969	2.5	1230.7	Flood Risk
4320 min Winter	74.351	1.901	2.5	1187.9	Flood Risk
5760 min Winter	74.252	1.802	2.5	1126.3	O K
7200 min Winter	74.169	1.719	2.5	1074.4	O K
8640 min Winter	74.085	1.635	2.5	1021.8	O K
10080 min Winter	74.000	1.550	2.5	968.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	43.136	0.0	430.1	70	
120 min Winter	26.061	0.0	429.1	130	
180 min Winter	19.202	0.0	428.2	188	
240 min Winter	15.393	0.0	427.4	248	
360 min Winter	11.248	0.0	425.8	364	
480 min Winter	8.999	0.0	424.2	482	
600 min Winter	7.565	0.0	422.7	600	
720 min Winter	6.562	0.0	421.2	718	
960 min Winter	5.240	0.0	418.2	952	
1440 min Winter	3.812	0.0	412.2	1420	
2160 min Winter	2.770	0.0	835.3	2108	
2880 min Winter	2.207	0.0	825.6	2792	
4320 min Winter	1.601	0.0	803.2	4072	
5760 min Winter	1.274	0.0	1637.7	4680	
7200 min Winter	1.067	0.0	1599.6	5552	
8640 min Winter	0.922	0.0	1555.0	6480	
10080 min Winter	0.816	0.0	1505.7	7368	
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GGP Consult		Page 3
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps Hornage Farm, AD Plant	
Date 01/05/2022 File Clamp Calcs Adjusted Ou...	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.818

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.606	4 8	0.606	8 12	0.606

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To:	(ha)
0 4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To:	(ha)
0 4	0.000

GGP Consult		Page 4																																																																																
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY																																																																																		
Date 01/05/2022 File Clamp Calcs Adjusted Ou...																																																																																		
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<u>Model Details</u> Storage is Online Cover Level (m) 74.450 <u>Tank or Pond Structure</u> Invert Level (m) 72.450 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>625.0</td><td>2.000</td><td>625.0</td></tr></table> <u>Pump Outflow Control</u> Invert Level (m) 72.450 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>2.5000</td><td>0.900</td><td>2.5000</td><td>1.700</td><td>2.5000</td><td>2.500</td><td>2.5000</td></tr><tr><td>0.200</td><td>2.5000</td><td>1.000</td><td>2.5000</td><td>1.800</td><td>2.5000</td><td>2.600</td><td>2.5000</td></tr><tr><td>0.300</td><td>2.5000</td><td>1.100</td><td>2.5000</td><td>1.900</td><td>2.5000</td><td>2.700</td><td>2.5000</td></tr><tr><td>0.400</td><td>2.5000</td><td>1.200</td><td>2.5000</td><td>2.000</td><td>2.5000</td><td>2.800</td><td>2.5000</td></tr><tr><td>0.500</td><td>2.5000</td><td>1.300</td><td>2.5000</td><td>2.100</td><td>2.5000</td><td>2.900</td><td>2.5000</td></tr><tr><td>0.600</td><td>2.5000</td><td>1.400</td><td>2.5000</td><td>2.200</td><td>2.5000</td><td>3.000</td><td>2.5000</td></tr><tr><td>0.700</td><td>2.5000</td><td>1.500</td><td>2.5000</td><td>2.300</td><td>2.5000</td><td></td><td></td></tr><tr><td>0.800</td><td>2.5000</td><td>1.600</td><td>2.5000</td><td>2.400</td><td>2.5000</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	625.0	2.000	625.0	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	2.5000	0.900	2.5000	1.700	2.5000	2.500	2.5000	0.200	2.5000	1.000	2.5000	1.800	2.5000	2.600	2.5000	0.300	2.5000	1.100	2.5000	1.900	2.5000	2.700	2.5000	0.400	2.5000	1.200	2.5000	2.000	2.5000	2.800	2.5000	0.500	2.5000	1.300	2.5000	2.100	2.5000	2.900	2.5000	0.600	2.5000	1.400	2.5000	2.200	2.5000	3.000	2.5000	0.700	2.5000	1.500	2.5000	2.300	2.5000			0.800	2.5000	1.600	2.5000	2.400	2.5000		
Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																															
0.000	625.0	2.000	625.0																																																																															
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																											
0.100	2.5000	0.900	2.5000	1.700	2.5000	2.500	2.5000																																																																											
0.200	2.5000	1.000	2.5000	1.800	2.5000	2.600	2.5000																																																																											
0.300	2.5000	1.100	2.5000	1.900	2.5000	2.700	2.5000																																																																											
0.400	2.5000	1.200	2.5000	2.000	2.5000	2.800	2.5000																																																																											
0.500	2.5000	1.300	2.5000	2.100	2.5000	2.900	2.5000																																																																											
0.600	2.5000	1.400	2.5000	2.200	2.5000	3.000	2.5000																																																																											
0.700	2.5000	1.500	2.5000	2.300	2.5000																																																																													
0.800	2.5000	1.600	2.5000	2.400	2.5000																																																																													
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GGP Consult				Page 1	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps Hornage Farm, AD Plant			
Date 01/05/2022 File Clamp Calcs Adjusted Ou...		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	73.188	0.738	7.6	461.6	O K
30 min Summer	73.416	0.966	7.6	603.5	O K
60 min Summer	73.644	1.194	7.6	746.3	O K
120 min Summer	73.862	1.412	7.6	882.3	O K
180 min Summer	73.973	1.523	7.6	952.1	O K
240 min Summer	74.040	1.590	7.6	993.5	O K
360 min Summer	74.117	1.667	7.6	1041.6	O K
480 min Summer	74.156	1.706	7.6	1066.3	O K
600 min Summer	74.172	1.722	7.6	1076.5	O K
720 min Summer	74.174	1.724	7.6	1077.5	O K
960 min Summer	74.149	1.699	7.6	1062.2	O K
1440 min Summer	74.063	1.613	7.6	1008.1	O K
2160 min Summer	73.949	1.499	7.6	936.9	O K
2880 min Summer	73.850	1.400	7.6	874.8	O K
4320 min Summer	73.666	1.216	7.6	760.3	O K
5760 min Summer	73.497	1.047	7.6	654.3	O K
7200 min Summer	73.340	0.890	7.6	556.5	O K
8640 min Summer	73.198	0.748	7.6	467.6	O K
10080 min Summer	73.070	0.620	7.6	387.6	O K
15 min Winter	73.279	0.829	7.6	518.0	O K
30 min Winter	73.534	1.084	7.6	677.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	138.153	0.0	469.7	26	
30 min Summer	90.705	0.0	605.1	41	
60 min Summer	56.713	0.0	773.3	70	
120 min Summer	34.246	0.0	933.8	130	
180 min Summer	25.149	0.0	1028.4	190	
240 min Summer	20.078	0.0	1094.2	248	
360 min Summer	14.585	0.0	1188.8	366	
480 min Summer	11.622	0.0	1252.3	486	
600 min Summer	9.738	0.0	1284.2	604	
720 min Summer	8.424	0.0	1282.8	724	
960 min Summer	6.697	0.0	1271.9	960	
1440 min Summer	4.839	0.0	1243.2	1216	
2160 min Summer	3.490	0.0	1713.3	1580	
2880 min Summer	2.766	0.0	1810.1	1972	
4320 min Summer	1.989	0.0	1952.6	2776	
5760 min Summer	1.573	0.0	2058.9	3584	
7200 min Summer	1.311	0.0	2144.1	4336	
8640 min Summer	1.129	0.0	2215.5	5104	
10080 min Summer	0.994	0.0	2277.1	5848	
15 min Winter	138.153	0.0	524.4	26	
30 min Winter	90.705	0.0	649.2	41	
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GGP Consult				Page 2	
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY		Silage Clamps AD Plant			
Date 01/05/2022 File Clamp Calcs Adjusted Ou...		Designed by DJC Checked by JHC			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	73.793	1.343	7.6	839.4	O K
120 min Winter	74.042	1.592	7.6	995.1	O K
180 min Winter	74.173	1.723	7.6	1076.8	O K
240 min Winter	74.253	1.803	7.6	1126.6	O K
360 min Winter	74.350	1.900	7.6	1187.4	Flood Risk
480 min Winter	74.405	1.955	7.6	1221.7	Flood Risk
600 min Winter	74.434	1.984	7.6	1240.0	Flood Risk
720 min Winter	74.446	1.996	7.6	1247.8	Flood Risk
960 min Winter	74.440	1.990	7.6	1243.6	Flood Risk
1440 min Winter	74.360	1.910	7.6	1193.5	Flood Risk
2160 min Winter	74.207	1.757	7.6	1097.8	O K
2880 min Winter	74.070	1.620	7.6	1012.4	O K
4320 min Winter	73.799	1.349	7.6	842.9	O K
5760 min Winter	73.541	1.091	7.6	681.8	O K
7200 min Winter	73.305	0.855	7.6	534.2	O K
8640 min Winter	73.094	0.644	7.6	402.4	O K
10080 min Winter	72.912	0.462	7.6	288.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	56.713	0.0	866.1	70	
120 min Winter	34.246	0.0	1045.6	128	
180 min Winter	25.149	0.0	1150.1	186	
240 min Winter	20.078	0.0	1219.5	244	
360 min Winter	14.585	0.0	1292.9	360	
480 min Winter	11.622	0.0	1292.0	476	
600 min Winter	9.738	0.0	1287.4	592	
720 min Winter	8.424	0.0	1282.8	708	
960 min Winter	6.697	0.0	1273.0	932	
1440 min Winter	4.839	0.0	1250.2	1362	
2160 min Winter	3.490	0.0	1918.9	1696	
2880 min Winter	2.766	0.0	2027.3	2160	
4320 min Winter	1.989	0.0	2182.5	3032	
5760 min Winter	1.573	0.0	2306.3	3872	
7200 min Winter	1.311	0.0	2401.4	4680	
8640 min Winter	1.129	0.0	2481.7	5376	
10080 min Winter	0.994	0.0	2550.7	6056	
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GGP Consult		Page 3
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs Adjusted Ou...	Designed by DJC Checked by JHC	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.818

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)		From: To: (ha)	
0 4 0.606		4 8 0.606		8 12 0.606	

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To: (ha)	
0 4 0.000	

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From: To: (ha)	
0 4 0.000	

GGP Consult		Page 4
2 Hallam Road, Priory Park East Hull, Humberside HU4 7DY	Silage Clamps AD Plant	
Date 01/05/2022 File Clamp Calcs Adjusted Ou...	Designed by DJC Checked by JHC	
Innovyze Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 74.450

Tank or Pond Structure

Invert Level (m) 72.450

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	625.0	2.000	625.0

Pump Outflow Control

Invert Level (m) 72.450

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.6000	1.200	7.6000	3.000	7.6000	7.000	7.6000
0.200	7.6000	1.400	7.6000	3.500	7.6000	7.500	7.6000
0.300	7.6000	1.600	7.6000	4.000	7.6000	8.000	7.6000
0.400	7.6000	1.800	7.6000	4.500	7.6000	8.500	7.6000
0.500	7.6000	2.000	7.6000	5.000	7.6000	9.000	7.6000
0.600	7.6000	2.200	7.6000	5.500	7.6000	9.500	7.6000
0.800	7.6000	2.400	7.6000	6.000	7.6000		
1.000	7.6000	2.600	7.6000	6.500	7.6000		

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APPENDIX 06

Proposed Outfall



LEGEND

Site Boundary



Photo Locations

Outfall location from access



Highways ditch downstream of outfall



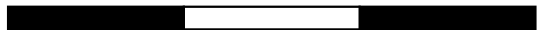
Highways culvert below access



Proposed lagoon outfall



0 10 20 30 m



Source: ESRI, Maxaar, GeoEye, Earthstar geographics, CNES/
Airbus DS, USDA, AreaGRID, IGN, and the GIS User community

Highways ditch downstream
of outfall



Highways culvert below
access



Outfall location from access



Proposed Lagoon outfall



APPENDIX 07

Post Development Runoff Calculations

SLR Consulting Ltd							Page 1																																																																																																																																																																																																																																																																																	
4/5 Lockside View Edinburgh Park Edinburgh, EH12 9DH																																																																																																																																																																																																																																																																																								
Date 06/03/2023 15:27 File CELLULAR STORAGE ARRANG...			Designed by cmiddleton Checked by																																																																																																																																																																																																																																																																																					
Innovyze			Source Control 2020.1.3																																																																																																																																																																																																																																																																																					
<u>Summary of Results for 100 year Return Period (+20%)</u> Half Drain Time : 1247 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>88.810</td><td>0.320</td><td>0.0</td><td>9.0</td><td>9.0</td><td>466.1</td><td>O K</td></tr><tr><td>30 min Summer</td><td>88.906</td><td>0.416</td><td>0.0</td><td>9.0</td><td>9.0</td><td>606.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>88.997</td><td>0.507</td><td>0.0</td><td>9.0</td><td>9.0</td><td>738.2</td><td>O K</td></tr><tr><td>120 min Summer</td><td>89.104</td><td>0.614</td><td>0.0</td><td>9.0</td><td>9.0</td><td>894.0</td><td>O K</td></tr><tr><td>180 min Summer</td><td>89.170</td><td>0.680</td><td>0.0</td><td>9.0</td><td>9.0</td><td>989.6</td><td>O K</td></tr><tr><td>240 min Summer</td><td>89.213</td><td>0.723</td><td>0.0</td><td>9.0</td><td>9.0</td><td>1052.8</td><td>O K</td></tr><tr><td>360 min Summer</td><td>89.260</td><td>0.770</td><td>0.0</td><td>9.0</td><td>9.0</td><td>1120.3</td><td>O K</td></tr><tr><td>480 min Summer</td><td>89.276</td><td>0.786</td><td>0.0</td><td>9.0</td><td>9.0</td><td>1143.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>89.275</td><td>0.785</td><td>0.0</td><td>9.0</td><td>9.0</td><td>1143.2</td><td>O K</td></tr><tr><td>720 min Summer</td><td>89.264</td><td>0.774</td><td>0.0</td><td>9.0</td><td>9.0</td><td>1127.3</td><td>O K</td></tr><tr><td>960 min Summer</td><td>89.223</td><td>0.733</td><td>0.0</td><td>9.0</td><td>9.0</td><td>1067.6</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>89.144</td><td>0.654</td><td>0.0</td><td>9.0</td><td>9.0</td><td>952.7</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>89.061</td><td>0.571</td><td>0.0</td><td>9.0</td><td>9.0</td><td>831.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>88.997</td><td>0.507</td><td>0.0</td><td>9.0</td><td>9.0</td><td>738.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>88.904</td><td>0.414</td><td>0.0</td><td>9.0</td><td>9.0</td><td>602.8</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>88.834</td><td>0.344</td><td>0.0</td><td>9.0</td><td>9.0</td><td>501.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>88.784</td><td>0.294</td><td>0.0</td><td>9.0</td><td>9.0</td><td>428.3</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>88.747</td><td>0.257</td><td>0.0</td><td>9.0</td><td>9.0</td><td>374.8</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>88.720</td><td>0.230</td><td>0.0</td><td>9.0</td><td>9.0</td><td>335.1</td><td>O K</td></tr><tr><td>15 min Winter</td><td>88.850</td><td>0.360</td><td>0.0</td><td>9.0</td><td>9.0</td><td>524.2</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>124.281</td><td>0.0</td><td>483.3</td><td>34</td></tr><tr><td>30 min Summer</td><td>81.100</td><td>0.0</td><td>631.1</td><td>48</td></tr><tr><td>60 min Summer</td><td>50.030</td><td>0.0</td><td>779.1</td><td>78</td></tr><tr><td>120 min Summer</td><td>31.020</td><td>0.0</td><td>966.1</td><td>136</td></tr><tr><td>180 min Summer</td><td>23.410</td><td>0.0</td><td>1093.7</td><td>194</td></tr><tr><td>240 min Summer</td><td>19.080</td><td>0.0</td><td>1188.6</td><td>254</td></tr><tr><td>360 min Summer</td><td>14.126</td><td>0.0</td><td>1319.7</td><td>370</td></tr><tr><td>480 min Summer</td><td>11.297</td><td>0.0</td><td>1407.0</td><td>488</td></tr><tr><td>600 min Summer</td><td>9.442</td><td>0.0</td><td>1470.2</td><td>606</td></tr><tr><td>720 min Summer</td><td>8.125</td><td>0.0</td><td>1518.5</td><td>724</td></tr><tr><td>960 min Summer</td><td>6.367</td><td>0.0</td><td>1556.7</td><td>954</td></tr><tr><td>1440 min Summer</td><td>4.470</td><td>0.0</td><td>1525.9</td><td>1150</td></tr><tr><td>2160 min Summer</td><td>3.121</td><td>0.0</td><td>1749.9</td><td>1516</td></tr><tr><td>2880 min Summer</td><td>2.428</td><td>0.0</td><td>1816.0</td><td>1916</td></tr><tr><td>4320 min Summer</td><td>1.737</td><td>0.0</td><td>1948.1</td><td>2724</td></tr><tr><td>5760 min Summer</td><td>1.393</td><td>0.0</td><td>2091.2</td><td>3512</td></tr><tr><td>7200 min Summer</td><td>1.197</td><td>0.0</td><td>2244.7</td><td>4264</td></tr><tr><td>8640 min Summer</td><td>1.071</td><td>0.0</td><td>2411.0</td><td>5024</td></tr><tr><td>10080 min Summer</td><td>0.986</td><td>0.0</td><td>2591.3</td><td>5760</td></tr><tr><td>15 min Winter</td><td>124.281</td><td>0.0</td><td>541.4</td><td>34</td></tr></table>								Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	88.810	0.320	0.0	9.0	9.0	466.1	O K	30 min Summer	88.906	0.416	0.0	9.0	9.0	606.1	O K	60 min Summer	88.997	0.507	0.0	9.0	9.0	738.2	O K	120 min Summer	89.104	0.614	0.0	9.0	9.0	894.0	O K	180 min Summer	89.170	0.680	0.0	9.0	9.0	989.6	O K	240 min Summer	89.213	0.723	0.0	9.0	9.0	1052.8	O K	360 min Summer	89.260	0.770	0.0	9.0	9.0	1120.3	O K	480 min Summer	89.276	0.786	0.0	9.0	9.0	1143.9	O K	600 min Summer	89.275	0.785	0.0	9.0	9.0	1143.2	O K	720 min Summer	89.264	0.774	0.0	9.0	9.0	1127.3	O K	960 min Summer	89.223	0.733	0.0	9.0	9.0	1067.6	O K	1440 min Summer	89.144	0.654	0.0	9.0	9.0	952.7	O K	2160 min Summer	89.061	0.571	0.0	9.0	9.0	831.2	O K	2880 min Summer	88.997	0.507	0.0	9.0	9.0	738.6	O K	4320 min Summer	88.904	0.414	0.0	9.0	9.0	602.8	O K	5760 min Summer	88.834	0.344	0.0	9.0	9.0	501.0	O K	7200 min Summer	88.784	0.294	0.0	9.0	9.0	428.3	O K	8640 min Summer	88.747	0.257	0.0	9.0	9.0	374.8	O K	10080 min Summer	88.720	0.230	0.0	9.0	9.0	335.1	O K	15 min Winter	88.850	0.360	0.0	9.0	9.0	524.2	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	124.281	0.0	483.3	34	30 min Summer	81.100	0.0	631.1	48	60 min Summer	50.030	0.0	779.1	78	120 min Summer	31.020	0.0	966.1	136	180 min Summer	23.410	0.0	1093.7	194	240 min Summer	19.080	0.0	1188.6	254	360 min Summer	14.126	0.0	1319.7	370	480 min Summer	11.297	0.0	1407.0	488	600 min Summer	9.442	0.0	1470.2	606	720 min Summer	8.125	0.0	1518.5	724	960 min Summer	6.367	0.0	1556.7	954	1440 min Summer	4.470	0.0	1525.9	1150	2160 min Summer	3.121	0.0	1749.9	1516	2880 min Summer	2.428	0.0	1816.0	1916	4320 min Summer	1.737	0.0	1948.1	2724	5760 min Summer	1.393	0.0	2091.2	3512	7200 min Summer	1.197	0.0	2244.7	4264	8640 min Summer	1.071	0.0	2411.0	5024	10080 min Summer	0.986	0.0	2591.3	5760	15 min Winter	124.281	0.0	541.4	34
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																																	
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30 min Summer	88.906	0.416	0.0	9.0	9.0	606.1	O K																																																																																																																																																																																																																																																																																	
60 min Summer	88.997	0.507	0.0	9.0	9.0	738.2	O K																																																																																																																																																																																																																																																																																	
120 min Summer	89.104	0.614	0.0	9.0	9.0	894.0	O K																																																																																																																																																																																																																																																																																	
180 min Summer	89.170	0.680	0.0	9.0	9.0	989.6	O K																																																																																																																																																																																																																																																																																	
240 min Summer	89.213	0.723	0.0	9.0	9.0	1052.8	O K																																																																																																																																																																																																																																																																																	
360 min Summer	89.260	0.770	0.0	9.0	9.0	1120.3	O K																																																																																																																																																																																																																																																																																	
480 min Summer	89.276	0.786	0.0	9.0	9.0	1143.9	O K																																																																																																																																																																																																																																																																																	
600 min Summer	89.275	0.785	0.0	9.0	9.0	1143.2	O K																																																																																																																																																																																																																																																																																	
720 min Summer	89.264	0.774	0.0	9.0	9.0	1127.3	O K																																																																																																																																																																																																																																																																																	
960 min Summer	89.223	0.733	0.0	9.0	9.0	1067.6	O K																																																																																																																																																																																																																																																																																	
1440 min Summer	89.144	0.654	0.0	9.0	9.0	952.7	O K																																																																																																																																																																																																																																																																																	
2160 min Summer	89.061	0.571	0.0	9.0	9.0	831.2	O K																																																																																																																																																																																																																																																																																	
2880 min Summer	88.997	0.507	0.0	9.0	9.0	738.6	O K																																																																																																																																																																																																																																																																																	
4320 min Summer	88.904	0.414	0.0	9.0	9.0	602.8	O K																																																																																																																																																																																																																																																																																	
5760 min Summer	88.834	0.344	0.0	9.0	9.0	501.0	O K																																																																																																																																																																																																																																																																																	
7200 min Summer	88.784	0.294	0.0	9.0	9.0	428.3	O K																																																																																																																																																																																																																																																																																	
8640 min Summer	88.747	0.257	0.0	9.0	9.0	374.8	O K																																																																																																																																																																																																																																																																																	
10080 min Summer	88.720	0.230	0.0	9.0	9.0	335.1	O K																																																																																																																																																																																																																																																																																	
15 min Winter	88.850	0.360	0.0	9.0	9.0	524.2	O K																																																																																																																																																																																																																																																																																	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																																				
15 min Summer	124.281	0.0	483.3	34																																																																																																																																																																																																																																																																																				
30 min Summer	81.100	0.0	631.1	48																																																																																																																																																																																																																																																																																				
60 min Summer	50.030	0.0	779.1	78																																																																																																																																																																																																																																																																																				
120 min Summer	31.020	0.0	966.1	136																																																																																																																																																																																																																																																																																				
180 min Summer	23.410	0.0	1093.7	194																																																																																																																																																																																																																																																																																				
240 min Summer	19.080	0.0	1188.6	254																																																																																																																																																																																																																																																																																				
360 min Summer	14.126	0.0	1319.7	370																																																																																																																																																																																																																																																																																				
480 min Summer	11.297	0.0	1407.0	488																																																																																																																																																																																																																																																																																				
600 min Summer	9.442	0.0	1470.2	606																																																																																																																																																																																																																																																																																				
720 min Summer	8.125	0.0	1518.5	724																																																																																																																																																																																																																																																																																				
960 min Summer	6.367	0.0	1556.7	954																																																																																																																																																																																																																																																																																				
1440 min Summer	4.470	0.0	1525.9	1150																																																																																																																																																																																																																																																																																				
2160 min Summer	3.121	0.0	1749.9	1516																																																																																																																																																																																																																																																																																				
2880 min Summer	2.428	0.0	1816.0	1916																																																																																																																																																																																																																																																																																				
4320 min Summer	1.737	0.0	1948.1	2724																																																																																																																																																																																																																																																																																				
5760 min Summer	1.393	0.0	2091.2	3512																																																																																																																																																																																																																																																																																				
7200 min Summer	1.197	0.0	2244.7	4264																																																																																																																																																																																																																																																																																				
8640 min Summer	1.071	0.0	2411.0	5024																																																																																																																																																																																																																																																																																				
10080 min Summer	0.986	0.0	2591.3	5760																																																																																																																																																																																																																																																																																				
15 min Winter	124.281	0.0	541.4	34																																																																																																																																																																																																																																																																																				
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<u>Rainfall Details</u> <table> <tr><td>Rainfall Model</td><td>FEH</td></tr> <tr><td>Return Period (years)</td><td>100</td></tr> <tr><td>FEH Rainfall Version</td><td>2013</td></tr> <tr><td>Site Location</td><td>GB 403977 196102 SU 03977 96102</td></tr> <tr><td>Data Type</td><td>Point</td></tr> <tr><td>Summer Storms</td><td>Yes</td></tr> <tr><td>Winter Storms</td><td>Yes</td></tr> <tr><td>Cv (Summer)</td><td>0.750</td></tr> <tr><td>Cv (Winter)</td><td>0.840</td></tr> <tr><td>Shortest Storm (mins)</td><td>15</td></tr> <tr><td>Longest Storm (mins)</td><td>10080</td></tr> <tr><td>Climate Change %</td><td>+20</td></tr> </table> <u>Time Area Diagram</u> Total Area (ha) 2.077 <table> <thead> <tr> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> </tr> <tr> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> </tr> </thead> <tbody> <tr> <td>0 4</td> <td>0.415</td> <td>8 12</td> <td>0.415</td> <td>16 20</td> <td>0.416</td> </tr> <tr> <td>4 8</td> <td>0.415</td> <td>12 16</td> <td>0.416</td> <td></td> <td></td> </tr> </tbody> </table>			Rainfall Model	FEH	Return Period (years)	100	FEH Rainfall Version	2013	Site Location	GB 403977 196102 SU 03977 96102	Data Type	Point	Summer Storms	Yes	Winter Storms	Yes	Cv (Summer)	0.750	Cv (Winter)	0.840	Shortest Storm (mins)	15	Longest Storm (mins)	10080	Climate Change %	+20	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	0 4	0.415	8 12	0.415	16 20	0.416	4 8	0.415	12 16	0.416		
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Model Details Storage is Online Cover Level (m) 91.413 Cellular Storage Structure Invert Level (m) 88.490 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>1532.4</td><td>1532.4</td><td>1.051</td><td>0.0</td><td>1532.4</td></tr><tr><td>1.050</td><td>1532.4</td><td>1532.4</td><td></td><td></td><td></td></tr></table> Pump Outflow Control Invert Level (m) 88.490 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.001</td><td>9.0460</td><td>0.900</td><td>9.0460</td><td>1.700</td><td>0.0000</td><td>2.500</td><td>0.0000</td></tr><tr><td>0.100</td><td>9.0460</td><td>1.000</td><td>9.0460</td><td>1.800</td><td>0.0000</td><td>2.600</td><td>0.0000</td></tr><tr><td>0.200</td><td>9.0460</td><td>1.050</td><td>9.0460</td><td>1.900</td><td>0.0000</td><td>2.700</td><td>0.0000</td></tr><tr><td>0.300</td><td>9.0460</td><td>1.200</td><td>0.0000</td><td>2.000</td><td>0.0000</td><td>2.800</td><td>0.0000</td></tr><tr><td>0.400</td><td>9.0460</td><td>1.300</td><td>0.0000</td><td>2.100</td><td>0.0000</td><td>2.900</td><td>0.0000</td></tr><tr><td>0.500</td><td>9.0460</td><td>1.400</td><td>0.0000</td><td>2.200</td><td>0.0000</td><td>3.000</td><td>0.0000</td></tr><tr><td>0.600</td><td>9.0460</td><td>1.500</td><td>0.0000</td><td>2.300</td><td>0.0000</td><td></td><td></td></tr><tr><td>0.800</td><td>9.0460</td><td>1.600</td><td>0.0000</td><td>2.400</td><td>0.0000</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	1532.4	1532.4	1.051	0.0	1532.4	1.050	1532.4	1532.4				Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.001	9.0460	0.900	9.0460	1.700	0.0000	2.500	0.0000	0.100	9.0460	1.000	9.0460	1.800	0.0000	2.600	0.0000	0.200	9.0460	1.050	9.0460	1.900	0.0000	2.700	0.0000	0.300	9.0460	1.200	0.0000	2.000	0.0000	2.800	0.0000	0.400	9.0460	1.300	0.0000	2.100	0.0000	2.900	0.0000	0.500	9.0460	1.400	0.0000	2.200	0.0000	3.000	0.0000	0.600	9.0460	1.500	0.0000	2.300	0.0000			0.800	9.0460	1.600	0.0000	2.400	0.0000		
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<u>Summary of Results for 100 year Return Period</u> Half Drain Time : 998 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>88.755</td><td>0.265</td><td>0.0</td><td>9.0</td><td>9.0</td><td>385.7</td><td>O K</td></tr><tr><td>30 min Summer</td><td>88.834</td><td>0.344</td><td>0.0</td><td>9.0</td><td>9.0</td><td>501.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>88.908</td><td>0.418</td><td>0.0</td><td>9.0</td><td>9.0</td><td>608.4</td><td>O K</td></tr><tr><td>120 min Summer</td><td>88.994</td><td>0.504</td><td>0.0</td><td>9.0</td><td>9.0</td><td>733.1</td><td>O K</td></tr><tr><td>180 min Summer</td><td>89.045</td><td>0.555</td><td>0.0</td><td>9.0</td><td>9.0</td><td>808.2</td><td>O K</td></tr><tr><td>240 min Summer</td><td>89.078</td><td>0.588</td><td>0.0</td><td>9.0</td><td>9.0</td><td>855.3</td><td>O K</td></tr><tr><td>360 min Summer</td><td>89.109</td><td>0.619</td><td>0.0</td><td>9.0</td><td>9.0</td><td>901.3</td><td>O K</td></tr><tr><td>480 min Summer</td><td>89.115</td><td>0.625</td><td>0.0</td><td>9.0</td><td>9.0</td><td>910.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>89.108</td><td>0.618</td><td>0.0</td><td>9.0</td><td>9.0</td><td>899.4</td><td>O K</td></tr><tr><td>720 min Summer</td><td>89.092</td><td>0.602</td><td>0.0</td><td>9.0</td><td>9.0</td><td>875.9</td><td>O K</td></tr><tr><td>960 min Summer</td><td>89.051</td><td>0.561</td><td>0.0</td><td>9.0</td><td>9.0</td><td>817.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>88.989</td><td>0.499</td><td>0.0</td><td>9.0</td><td>9.0</td><td>726.0</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>88.917</td><td>0.427</td><td>0.0</td><td>9.0</td><td>9.0</td><td>621.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>88.859</td><td>0.369</td><td>0.0</td><td>9.0</td><td>9.0</td><td>537.2</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>88.772</td><td>0.282</td><td>0.0</td><td>9.0</td><td>9.0</td><td>410.7</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>88.707</td><td>0.217</td><td>0.0</td><td>9.0</td><td>9.0</td><td>316.1</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>88.661</td><td>0.171</td><td>0.0</td><td>9.0</td><td>9.0</td><td>249.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>88.628</td><td>0.138</td><td>0.0</td><td>9.0</td><td>9.0</td><td>200.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>88.603</td><td>0.113</td><td>0.0</td><td>9.0</td><td>9.0</td><td>165.1</td><td>O K</td></tr><tr><td>15 min Winter</td><td>88.788</td><td>0.298</td><td>0.0</td><td>9.0</td><td>9.0</td><td>434.2</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>103.567</td><td>0.0</td><td>402.7</td><td>34</td></tr><tr><td>30 min Summer</td><td>67.584</td><td>0.0</td><td>525.7</td><td>48</td></tr><tr><td>60 min Summer</td><td>41.692</td><td>0.0</td><td>648.9</td><td>76</td></tr><tr><td>120 min Summer</td><td>25.850</td><td>0.0</td><td>804.4</td><td>136</td></tr><tr><td>180 min Summer</td><td>19.508</td><td>0.0</td><td>911.0</td><td>194</td></tr><tr><td>240 min Summer</td><td>15.900</td><td>0.0</td><td>990.0</td><td>252</td></tr><tr><td>360 min Summer</td><td>11.772</td><td>0.0</td><td>1099.8</td><td>370</td></tr><tr><td>480 min Summer</td><td>9.414</td><td>0.0</td><td>1172.2</td><td>486</td></tr><tr><td>600 min Summer</td><td>7.868</td><td>0.0</td><td>1225.4</td><td>604</td></tr><tr><td>720 min Summer</td><td>6.771</td><td>0.0</td><td>1264.7</td><td>722</td></tr><tr><td>960 min Summer</td><td>5.306</td><td>0.0</td><td>1322.1</td><td>836</td></tr><tr><td>1440 min Summer</td><td>3.725</td><td>0.0</td><td>1392.3</td><td>1068</td></tr><tr><td>2160 min Summer</td><td>2.601</td><td>0.0</td><td>1457.8</td><td>1460</td></tr><tr><td>2880 min Summer</td><td>2.024</td><td>0.0</td><td>1513.5</td><td>1856</td></tr><tr><td>4320 min Summer</td><td>1.448</td><td>0.0</td><td>1623.4</td><td>2644</td></tr><tr><td>5760 min Summer</td><td>1.161</td><td>0.0</td><td>1741.1</td><td>3408</td></tr><tr><td>7200 min Summer</td><td>0.997</td><td>0.0</td><td>1872.2</td><td>4128</td></tr><tr><td>8640 min Summer</td><td>0.892</td><td>0.0</td><td>2008.5</td><td>4856</td></tr><tr><td>10080 min Summer</td><td>0.822</td><td>0.0</td><td>2160.9</td><td>5560</td></tr><tr><td>15 min Winter</td><td>103.567</td><td>0.0</td><td>451.0</td><td>34</td></tr></table>								Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	88.755	0.265	0.0	9.0	9.0	385.7	O K	30 min Summer	88.834	0.344	0.0	9.0	9.0	501.1	O K	60 min Summer	88.908	0.418	0.0	9.0	9.0	608.4	O K	120 min Summer	88.994	0.504	0.0	9.0	9.0	733.1	O K	180 min Summer	89.045	0.555	0.0	9.0	9.0	808.2	O K	240 min Summer	89.078	0.588	0.0	9.0	9.0	855.3	O K	360 min Summer	89.109	0.619	0.0	9.0	9.0	901.3	O K	480 min Summer	89.115	0.625	0.0	9.0	9.0	910.5	O K	600 min Summer	89.108	0.618	0.0	9.0	9.0	899.4	O K	720 min Summer	89.092	0.602	0.0	9.0	9.0	875.9	O K	960 min Summer	89.051	0.561	0.0	9.0	9.0	817.3	O K	1440 min Summer	88.989	0.499	0.0	9.0	9.0	726.0	O K	2160 min Summer	88.917	0.427	0.0	9.0	9.0	621.3	O K	2880 min Summer	88.859	0.369	0.0	9.0	9.0	537.2	O K	4320 min Summer	88.772	0.282	0.0	9.0	9.0	410.7	O K	5760 min Summer	88.707	0.217	0.0	9.0	9.0	316.1	O K	7200 min Summer	88.661	0.171	0.0	9.0	9.0	249.1	O K	8640 min Summer	88.628	0.138	0.0	9.0	9.0	200.3	O K	10080 min Summer	88.603	0.113	0.0	9.0	9.0	165.1	O K	15 min Winter	88.788	0.298	0.0	9.0	9.0	434.2	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	103.567	0.0	402.7	34	30 min Summer	67.584	0.0	525.7	48	60 min Summer	41.692	0.0	648.9	76	120 min Summer	25.850	0.0	804.4	136	180 min Summer	19.508	0.0	911.0	194	240 min Summer	15.900	0.0	990.0	252	360 min Summer	11.772	0.0	1099.8	370	480 min Summer	9.414	0.0	1172.2	486	600 min Summer	7.868	0.0	1225.4	604	720 min Summer	6.771	0.0	1264.7	722	960 min Summer	5.306	0.0	1322.1	836	1440 min Summer	3.725	0.0	1392.3	1068	2160 min Summer	2.601	0.0	1457.8	1460	2880 min Summer	2.024	0.0	1513.5	1856	4320 min Summer	1.448	0.0	1623.4	2644	5760 min Summer	1.161	0.0	1741.1	3408	7200 min Summer	0.997	0.0	1872.2	4128	8640 min Summer	0.892	0.0	2008.5	4856	10080 min Summer	0.822	0.0	2160.9	5560	15 min Winter	103.567	0.0	451.0	34
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Model Details Storage is Online Cover Level (m) 91.413 Cellular Storage Structure Invert Level (m) 88.490 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>1532.4</td><td>1532.4</td><td>1.051</td><td>0.0</td><td>1532.4</td></tr><tr><td>1.050</td><td>1532.4</td><td>1532.4</td><td></td><td></td><td></td></tr></table> Pump Outflow Control Invert Level (m) 88.490 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.001</td><td>9.0460</td><td>0.900</td><td>9.0460</td><td>1.700</td><td>0.0000</td><td>2.500</td><td>0.0000</td></tr><tr><td>0.100</td><td>9.0460</td><td>1.000</td><td>9.0460</td><td>1.800</td><td>0.0000</td><td>2.600</td><td>0.0000</td></tr><tr><td>0.200</td><td>9.0460</td><td>1.050</td><td>9.0460</td><td>1.900</td><td>0.0000</td><td>2.700</td><td>0.0000</td></tr><tr><td>0.300</td><td>9.0460</td><td>1.200</td><td>0.0000</td><td>2.000</td><td>0.0000</td><td>2.800</td><td>0.0000</td></tr><tr><td>0.400</td><td>9.0460</td><td>1.300</td><td>0.0000</td><td>2.100</td><td>0.0000</td><td>2.900</td><td>0.0000</td></tr><tr><td>0.500</td><td>9.0460</td><td>1.400</td><td>0.0000</td><td>2.200</td><td>0.0000</td><td>3.000</td><td>0.0000</td></tr><tr><td>0.600</td><td>9.0460</td><td>1.500</td><td>0.0000</td><td>2.300</td><td>0.0000</td><td></td><td></td></tr><tr><td>0.800</td><td>9.0460</td><td>1.600</td><td>0.0000</td><td>2.400</td><td>0.0000</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	1532.4	1532.4	1.051	0.0	1532.4	1.050	1532.4	1532.4				Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.001	9.0460	0.900	9.0460	1.700	0.0000	2.500	0.0000	0.100	9.0460	1.000	9.0460	1.800	0.0000	2.600	0.0000	0.200	9.0460	1.050	9.0460	1.900	0.0000	2.700	0.0000	0.300	9.0460	1.200	0.0000	2.000	0.0000	2.800	0.0000	0.400	9.0460	1.300	0.0000	2.100	0.0000	2.900	0.0000	0.500	9.0460	1.400	0.0000	2.200	0.0000	3.000	0.0000	0.600	9.0460	1.500	0.0000	2.300	0.0000			0.800	9.0460	1.600	0.0000	2.400	0.0000		
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Summer</td><td>88.910</td><td>0.420</td><td>0.0</td><td>9.0</td><td>9.0</td><td>611.2</td><td>O K</td></tr><tr><td>360 min Summer</td><td>88.924</td><td>0.434</td><td>0.0</td><td>9.0</td><td>9.0</td><td>631.7</td><td>O K</td></tr><tr><td>480 min Summer</td><td>88.919</td><td>0.429</td><td>0.0</td><td>9.0</td><td>9.0</td><td>624.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>88.906</td><td>0.416</td><td>0.0</td><td>9.0</td><td>9.0</td><td>604.9</td><td>O K</td></tr><tr><td>720 min Summer</td><td>88.892</td><td>0.402</td><td>0.0</td><td>9.0</td><td>9.0</td><td>585.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>88.869</td><td>0.379</td><td>0.0</td><td>9.0</td><td>9.0</td><td>552.1</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>88.829</td><td>0.339</td><td>0.0</td><td>9.0</td><td>9.0</td><td>493.1</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>88.777</td><td>0.287</td><td>0.0</td><td>9.0</td><td>9.0</td><td>418.5</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>88.735</td><td>0.245</td><td>0.0</td><td>9.0</td><td>9.0</td><td>356.5</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>88.669</td><td>0.179</td><td>0.0</td><td>9.0</td><td>9.0</td><td>260.0</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>88.619</td><td>0.129</td><td>0.0</td><td>9.0</td><td>9.0</td><td>188.1</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>88.585</td><td>0.095</td><td>0.0</td><td>9.0</td><td>9.0</td><td>138.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>88.559</td><td>0.069</td><td>0.0</td><td>9.0</td><td>9.0</td><td>100.9</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>88.541</td><td>0.051</td><td>0.0</td><td>9.0</td><td>9.0</td><td>74.8</td><td>O K</td></tr><tr><td>15 min Winter</td><td>88.715</td><td>0.225</td><td>0.0</td><td>9.0</td><td>9.0</td><td>327.1</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak 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Summer</td><td>2.896</td><td>0.0</td><td>1082.4</td><td>996</td></tr><tr><td>2160 min Summer</td><td>2.066</td><td>0.0</td><td>1157.4</td><td>1400</td></tr><tr><td>2880 min Summer</td><td>1.636</td><td>0.0</td><td>1222.9</td><td>1800</td></tr><tr><td>4320 min Summer</td><td>1.201</td><td>0.0</td><td>1346.5</td><td>2564</td></tr><tr><td>5760 min Summer</td><td>0.980</td><td>0.0</td><td>1469.8</td><td>3296</td></tr><tr><td>7200 min Summer</td><td>0.851</td><td>0.0</td><td>1598.2</td><td>4032</td></tr><tr><td>8640 min Summer</td><td>0.767</td><td>0.0</td><td>1729.2</td><td>4752</td></tr><tr><td>10080 min Summer</td><td>0.708</td><td>0.0</td><td>1864.4</td><td>5448</td></tr><tr><td>15 min Winter</td><td>78.977</td><td>0.0</td><td>344.0</td><td>33</td></tr></table>								Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	88.689	0.199	0.0	9.0	9.0	290.2	O K	30 min Summer	88.745	0.255	0.0	9.0	9.0	370.9	O K	60 min Summer	88.798	0.308	0.0	9.0	9.0	448.5	O K	120 min Summer	88.858	0.368	0.0	9.0	9.0	536.3	O K	180 min Summer	88.891	0.401	0.0	9.0	9.0	583.6	O K	240 min Summer	88.910	0.420	0.0	9.0	9.0	611.2	O K	360 min Summer	88.924	0.434	0.0	9.0	9.0	631.7	O K	480 min Summer	88.919	0.429	0.0	9.0	9.0	624.9	O K	600 min Summer	88.906	0.416	0.0	9.0	9.0	604.9	O K	720 min Summer	88.892	0.402	0.0	9.0	9.0	585.7	O K	960 min Summer	88.869	0.379	0.0	9.0	9.0	552.1	O K	1440 min Summer	88.829	0.339	0.0	9.0	9.0	493.1	O K	2160 min Summer	88.777	0.287	0.0	9.0	9.0	418.5	O K	2880 min Summer	88.735	0.245	0.0	9.0	9.0	356.5	O K	4320 min Summer	88.669	0.179	0.0	9.0	9.0	260.0	O K	5760 min Summer	88.619	0.129	0.0	9.0	9.0	188.1	O K	7200 min Summer	88.585	0.095	0.0	9.0	9.0	138.4	O K	8640 min Summer	88.559	0.069	0.0	9.0	9.0	100.9	O K	10080 min Summer	88.541	0.051	0.0	9.0	9.0	74.8	O K	15 min Winter	88.715	0.225	0.0	9.0	9.0	327.1	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	78.977	0.0	307.1	33	30 min Summer	50.812	0.0	395.1	48	60 min Summer	31.351	0.0	487.4	76	120 min Summer	19.492	0.0	607.1	134	180 min Summer	14.684	0.0	686.0	192	240 min Summer	11.957	0.0	744.1	250	360 min Summer	8.864	0.0	827.6	366	480 min Summer	7.101	0.0	884.0	482	600 min Summer	5.953	0.0	927.1	572	720 min Summer	5.141	0.0	960.1	620	960 min Summer	4.065	0.0	1012.7	740	1440 min Summer	2.896	0.0	1082.4	996	2160 min Summer	2.066	0.0	1157.4	1400	2880 min Summer	1.636	0.0	1222.9	1800	4320 min Summer	1.201	0.0	1346.5	2564	5760 min Summer	0.980	0.0	1469.8	3296	7200 min Summer	0.851	0.0	1598.2	4032	8640 min Summer	0.767	0.0	1729.2	4752	10080 min Summer	0.708	0.0	1864.4	5448	15 min Winter	78.977	0.0	344.0	33
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Model Details Storage is Online Cover Level (m) 91.413 Cellular Storage Structure Invert Level (m) 88.490 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>1532.4</td><td>1532.4</td><td>1.051</td><td>0.0</td><td>1532.4</td></tr><tr><td>1.050</td><td>1532.4</td><td>1532.4</td><td></td><td></td><td></td></tr></table> Pump Outflow Control Invert Level (m) 88.490 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.001</td><td>9.0460</td><td>0.900</td><td>9.0460</td><td>1.700</td><td>0.0000</td><td>2.500</td><td>0.0000</td></tr><tr><td>0.100</td><td>9.0460</td><td>1.000</td><td>9.0460</td><td>1.800</td><td>0.0000</td><td>2.600</td><td>0.0000</td></tr><tr><td>0.200</td><td>9.0460</td><td>1.050</td><td>9.0460</td><td>1.900</td><td>0.0000</td><td>2.700</td><td>0.0000</td></tr><tr><td>0.300</td><td>9.0460</td><td>1.200</td><td>0.0000</td><td>2.000</td><td>0.0000</td><td>2.800</td><td>0.0000</td></tr><tr><td>0.400</td><td>9.0460</td><td>1.300</td><td>0.0000</td><td>2.100</td><td>0.0000</td><td>2.900</td><td>0.0000</td></tr><tr><td>0.500</td><td>9.0460</td><td>1.400</td><td>0.0000</td><td>2.200</td><td>0.0000</td><td>3.000</td><td>0.0000</td></tr><tr><td>0.600</td><td>9.0460</td><td>1.500</td><td>0.0000</td><td>2.300</td><td>0.0000</td><td></td><td></td></tr><tr><td>0.800</td><td>9.0460</td><td>1.600</td><td>0.0000</td><td>2.400</td><td>0.0000</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	1532.4	1532.4	1.051	0.0	1532.4	1.050	1532.4	1532.4				Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.001	9.0460	0.900	9.0460	1.700	0.0000	2.500	0.0000	0.100	9.0460	1.000	9.0460	1.800	0.0000	2.600	0.0000	0.200	9.0460	1.050	9.0460	1.900	0.0000	2.700	0.0000	0.300	9.0460	1.200	0.0000	2.000	0.0000	2.800	0.0000	0.400	9.0460	1.300	0.0000	2.100	0.0000	2.900	0.0000	0.500	9.0460	1.400	0.0000	2.200	0.0000	3.000	0.0000	0.600	9.0460	1.500	0.0000	2.300	0.0000			0.800	9.0460	1.600	0.0000	2.400	0.0000		
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<u>Summary of Results for 2 year Return Period</u> Half Drain Time : 282 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>88.571</td><td>0.081</td><td>0.0</td><td>9.0</td><td>9.0</td><td>118.4</td><td>O K</td></tr><tr><td>30 min Summer</td><td>88.592</td><td>0.102</td><td>0.0</td><td>9.0</td><td>9.0</td><td>148.3</td><td>O K</td></tr><tr><td>60 min Summer</td><td>88.609</td><td>0.119</td><td>0.0</td><td>9.0</td><td>9.0</td><td>173.1</td><td>O K</td></tr><tr><td>120 min Summer</td><td>88.641</td><td>0.151</td><td>0.0</td><td>9.0</td><td>9.0</td><td>219.4</td><td>O K</td></tr><tr><td>180 min Summer</td><td>88.654</td><td>0.164</td><td>0.0</td><td>9.0</td><td>9.0</td><td>238.8</td><td>O K</td></tr><tr><td>240 min Summer</td><td>88.658</td><td>0.168</td><td>0.0</td><td>9.0</td><td>9.0</td><td>245.1</td><td>O K</td></tr><tr><td>360 min Summer</td><td>88.659</td><td>0.169</td><td>0.0</td><td>9.0</td><td>9.0</td><td>245.5</td><td>O K</td></tr><tr><td>480 min Summer</td><td>88.655</td><td>0.165</td><td>0.0</td><td>9.0</td><td>9.0</td><td>240.6</td><td>O K</td></tr><tr><td>600 min Summer</td><td>88.651</td><td>0.161</td><td>0.0</td><td>9.0</td><td>9.0</td><td>233.9</td><td>O K</td></tr><tr><td>720 min Summer</td><td>88.645</td><td>0.155</td><td>0.0</td><td>9.0</td><td>9.0</td><td>225.9</td><td>O K</td></tr><tr><td>960 min Summer</td><td>88.633</td><td>0.143</td><td>0.0</td><td>9.0</td><td>9.0</td><td>208.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>88.609</td><td>0.119</td><td>0.0</td><td>9.0</td><td>9.0</td><td>173.3</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>88.577</td><td>0.087</td><td>0.0</td><td>9.0</td><td>9.0</td><td>126.0</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>88.550</td><td>0.060</td><td>0.0</td><td>9.0</td><td>9.0</td><td>87.7</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>88.516</td><td>0.026</td><td>0.0</td><td>9.0</td><td>9.0</td><td>38.4</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>88.499</td><td>0.009</td><td>0.0</td><td>9.0</td><td>9.0</td><td>12.6</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>88.491</td><td>0.001</td><td>0.0</td><td>9.0</td><td>9.0</td><td>2.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>88.491</td><td>0.001</td><td>0.0</td><td>9.0</td><td>9.0</td><td>2.1</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>88.491</td><td>0.001</td><td>0.0</td><td>9.0</td><td>9.0</td><td>1.9</td><td>O K</td></tr><tr><td>15 min Winter</td><td>88.582</td><td>0.092</td><td>0.0</td><td>9.0</td><td>9.0</td><td>134.4</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 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Summer</td><td>1.611</td><td>0.0</td><td>602.0</td><td>902</td></tr><tr><td>2160 min Summer</td><td>1.184</td><td>0.0</td><td>663.8</td><td>1288</td></tr><tr><td>2880 min Summer</td><td>0.958</td><td>0.0</td><td>715.7</td><td>1652</td></tr><tr><td>4320 min Summer</td><td>0.726</td><td>0.0</td><td>813.8</td><td>2344</td></tr><tr><td>5760 min Summer</td><td>0.606</td><td>0.0</td><td>910.8</td><td>3000</td></tr><tr><td>7200 min Summer</td><td>0.534</td><td>0.0</td><td>1004.5</td><td>3536</td></tr><tr><td>8640 min Summer</td><td>0.485</td><td>0.0</td><td>1097.6</td><td>4304</td></tr><tr><td>10080 min Summer</td><td>0.452</td><td>0.0</td><td>1191.4</td><td>5200</td></tr><tr><td>15 min Winter</td><td>34.592</td><td>0.0</td><td>150.3</td><td>32</td></tr></table>								Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	88.571	0.081	0.0	9.0	9.0	118.4	O K	30 min Summer	88.592	0.102	0.0	9.0	9.0	148.3	O K	60 min Summer	88.609	0.119	0.0	9.0	9.0	173.1	O K	120 min Summer	88.641	0.151	0.0	9.0	9.0	219.4	O K	180 min Summer	88.654	0.164	0.0	9.0	9.0	238.8	O K	240 min Summer	88.658	0.168	0.0	9.0	9.0	245.1	O K	360 min Summer	88.659	0.169	0.0	9.0	9.0	245.5	O K	480 min Summer	88.655	0.165	0.0	9.0	9.0	240.6	O K	600 min Summer	88.651	0.161	0.0	9.0	9.0	233.9	O K	720 min Summer	88.645	0.155	0.0	9.0	9.0	225.9	O K	960 min Summer	88.633	0.143	0.0	9.0	9.0	208.3	O K	1440 min Summer	88.609	0.119	0.0	9.0	9.0	173.3	O K	2160 min Summer	88.577	0.087	0.0	9.0	9.0	126.0	O K	2880 min Summer	88.550	0.060	0.0	9.0	9.0	87.7	O K	4320 min Summer	88.516	0.026	0.0	9.0	9.0	38.4	O K	5760 min Summer	88.499	0.009	0.0	9.0	9.0	12.6	O K	7200 min Summer	88.491	0.001	0.0	9.0	9.0	2.1	O K	8640 min Summer	88.491	0.001	0.0	9.0	9.0	2.1	O K	10080 min Summer	88.491	0.001	0.0	9.0	9.0	1.9	O K	15 min Winter	88.582	0.092	0.0	9.0	9.0	134.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	34.592	0.0	133.9	32	30 min Summer	22.002	0.0	170.5	45	60 min Summer	13.516	0.0	210.3	72	120 min Summer	9.205	0.0	286.2	126	180 min Summer	7.200	0.0	336.1	184	240 min Summer	5.989	0.0	372.9	236	360 min Summer	4.548	0.0	424.6	298	480 min Summer	3.700	0.0	460.3	362	600 min Summer	3.139	0.0	488.5	430	720 min Summer	2.737	0.0	511.4	498	960 min Summer	2.198	0.0	547.0	634	1440 min Summer	1.611	0.0	602.0	902	2160 min Summer	1.184	0.0	663.8	1288	2880 min Summer	0.958	0.0	715.7	1652	4320 min Summer	0.726	0.0	813.8	2344	5760 min Summer	0.606	0.0	910.8	3000	7200 min Summer	0.534	0.0	1004.5	3536	8640 min Summer	0.485	0.0	1097.6	4304	10080 min Summer	0.452	0.0	1191.4	5200	15 min Winter	34.592	0.0	150.3	32
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																																	
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Model Details Storage is Online Cover Level (m) 91.413 Cellular Storage Structure Invert Level (m) 88.490 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>1532.4</td><td>1532.4</td><td>1.051</td><td>0.0</td><td>1532.4</td></tr><tr><td>1.050</td><td>1532.4</td><td>1532.4</td><td></td><td></td><td></td></tr></table> Pump Outflow Control Invert Level (m) 88.490 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.001</td><td>9.0460</td><td>0.900</td><td>9.0460</td><td>1.700</td><td>0.0000</td><td>2.500</td><td>0.0000</td></tr><tr><td>0.100</td><td>9.0460</td><td>1.000</td><td>9.0460</td><td>1.800</td><td>0.0000</td><td>2.600</td><td>0.0000</td></tr><tr><td>0.200</td><td>9.0460</td><td>1.050</td><td>9.0460</td><td>1.900</td><td>0.0000</td><td>2.700</td><td>0.0000</td></tr><tr><td>0.300</td><td>9.0460</td><td>1.200</td><td>0.0000</td><td>2.000</td><td>0.0000</td><td>2.800</td><td>0.0000</td></tr><tr><td>0.400</td><td>9.0460</td><td>1.300</td><td>0.0000</td><td>2.100</td><td>0.0000</td><td>2.900</td><td>0.0000</td></tr><tr><td>0.500</td><td>9.0460</td><td>1.400</td><td>0.0000</td><td>2.200</td><td>0.0000</td><td>3.000</td><td>0.0000</td></tr><tr><td>0.600</td><td>9.0460</td><td>1.500</td><td>0.0000</td><td>2.300</td><td>0.0000</td><td></td><td></td></tr><tr><td>0.800</td><td>9.0460</td><td>1.600</td><td>0.0000</td><td>2.400</td><td>0.0000</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	1532.4	1532.4	1.051	0.0	1532.4	1.050	1532.4	1532.4				Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.001	9.0460	0.900	9.0460	1.700	0.0000	2.500	0.0000	0.100	9.0460	1.000	9.0460	1.800	0.0000	2.600	0.0000	0.200	9.0460	1.050	9.0460	1.900	0.0000	2.700	0.0000	0.300	9.0460	1.200	0.0000	2.000	0.0000	2.800	0.0000	0.400	9.0460	1.300	0.0000	2.100	0.0000	2.900	0.0000	0.500	9.0460	1.400	0.0000	2.200	0.0000	3.000	0.0000	0.600	9.0460	1.500	0.0000	2.300	0.0000			0.800	9.0460	1.600	0.0000	2.400	0.0000		
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