# TECHNICAL NOTE

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**Job Name:** Sheringham Waste Recycling Centre, Holt Road, Norfolk

**Job No:** 49868

**Note No:** TN001

**Date:** 25.04.2023

**Prepared By:** [redacted]

**Checked By:** [redacted]

**Subject:** **Addendum to the Flood Risk Assessment and Surface Water Drainage Strategy**

## Introduction

This Technical Note is an addendum to the Flood Risk Assessment and Surface Water Drainage Strategy (FRA) for the development of Sheringham Waste Recycling Centre, Holt Road, Norfolk (332210167_4001, dated: 10.01.2023). This addendum should be read in conjunction with the FRA.

The FRA outlines the drainage strategy for the proposed development and includes details of how surface water runoff will be treated, conveyed, and discharged from the site. The purpose of this technical note is to provide further details regarding the surface water design for planning approval.

## 1. Assessment of the site and local flood issues.

The Site Investigation Report (102894 Rev A, dated: 09/06/2022) has been attached in **Appendix A** within this technical note.

The ground investigation taken from borehole B09 shows that groundwater is more than 10 metres below the ground level.

According to the Regional Hydrogeology Map of Northern East Anglia, the Norwich Crag is the principle aquifer for the area. The estimated minimum hydrostatic level of the Crag water table in the vicinity of the site is 45m AOD. Ground level in the area is around 89m AOD. Groundwater is therefore approximately 44 metres below existing ground level.

Infiltration testing for the site was carried out in two trial pits (TP07 and TP08) in accordance with BRE365, these can be summarised as being, $4.2x10^{-5}$ and $3.5x10^{-5}$ the average of these two results ($3.85x10^{-5}$) has been used for the design.

## 2. Drainage Scheme, SuDS Component Elements, and the Four Pillars of SuDS

There are four key aspects of Sustainable (urban) Drainage Systems (SuDS) that have been taken into account in this drainage design. These are referred to as the four pillars of SuDS, as set out in CIRIA C753, the 'SuDS Manual', and are as follows.

- Water Quantity
- Water Quality
- Biodiversity
- Amenity

The design objectives for each of the four pillars are set out in Table 1.

*Table 1: Design Objectives for the Four Pillars of SuDS*

| Pillar | Design Objectives |
|---|---|
| **Water quantity** | 1. Use surface water runoff as a resource.<br>2. Support the management of flood risk in the receiving catchment.<br>3. Protect morphology and ecology in receiving surface waters.<br>4. Preserve and protect natural hydrological systems on the site.<br>5. Drain the site effectively.<br>6. Manage on-site flood risk.<br>7. Design system flexibility/adaptability to cope with future change. |
| **Water quality** | 1. Support the management of water quality in the receiving surface waters and groundwaters.<br>2. Design system resilience to cope with future change. |
| **Amenity** | 1. Maximise multi-functionality.<br>2. Enhance visual character.<br>3. Deliver safe surface water management systems.<br>4. Support development resilience/adaptability to future change.<br>5. Maximise legibility.<br>6. Support community environmental learning |
| **Biodiversity** | 1. Support and protect natural local habitats and spaces.<br>2. Contribute to the delivery of local biodiversity objectives.<br>3. Contribute to habitat connectivity.<br>4. Create diverse, self-sustaining, and resilient ecosystems. |

The following section outlines how the four pillars of SuDS have been considered throughout the design of the development.

**Water quantity:**

The development site is split into two catchments:

**1. The customer access road and car park**

Runoff from these areas will drain via kerb outlets along the length of the road into the northern infiltration swale. With the adequate infiltration rate (an average of $3.85 \times 10^{-5}$) that has been verified, and storage within the swale, we are able to drain the site and manage flood risk within the site boundary for the design storm event.

**2. The service yard**

The runoff from this area will be captured by a series of sump gullies and pipe network, through a hydrodynamic separator and finally into a bioretention swale. Again, with the infiltration rate that has been verified, we are able to drain the site and manage flood risk within the site boundary for the design storm event.

The drainage for both catchments has been modelled using a computer based hydraulic modelling software. Model simulations indicate that there is no flooding in the worst-case storm durations for the 1 in100-year storm (+45% climate change).

**Water quality:**

The runoff from the proposed customer access road and car parking has been identified as having a low risk of pollution, with the service yard having a high risk of pollution.

Pollution hazard indices have been calculated using the Simple Index Approach, as per CIRIA C753, and a surface water management treatment train has been proposed to mitigate the calculated pollution hazard. The Simple Index Approach calculation is included in the FRA.

The proposed infiltration swale and bio-retention swale provide sufficient treatment of surface water runoff for the anticipated pollution hazards from the site. Both swale features are to be underlain with 400mm of Bio-retention soil and planted in accordance with the Landscape Architect's specification. The following tree species may also be considered within the swale features:

- Quercus Palustris,
- Alnus Incana,
- Alnus Glutinosa,
- Alnus Spaethii, and
- Liquidambar Styraciflua.

For the service yard catchment area, a Hydrodynamic separator has also been proposed to ensure that runoff is sufficiently treated prior to entering the surrounding natural soils.

**Amenity / Biodiversity:**

The proposed drainage strategy utilises available space within the site to provide some biodiversity and amenity value. By positioning the swales along the northern and eastern edges of the site, along with suitable planting, the aesthetics of the site have been enhanced and the visual impact of the site from the surrounding area has been softened. The planting will also help to support local fauna whilst helping to treat water within the swales.

With a minimum side slope gradient 1:3, the swales can be accessed for maintenance and recreation; although, it is unlikely that the swales will be used for recreation due to the nature of the development.

**Drainage Features:**

From a biodiversity objective, both the infiltration swale and the bioretention swale have been designed and specified to overtreat the runoff by incorporating a soil with good contaminant attenuation potential of a thickness of 400mm minimum.

The only difference between them is that the eastern swale is wider and deeper to provide a greater percolation area and storage volume, which is required to discharge the larger catchment area for the eastern swale (i.e., including the service yard).

Initially, biofilter tree pits were proposed in the south-west of the site, near the entrance. Due to the site layout constraints, there was insufficient space to accommodate a separate tree pit or soakaway discharge in this area and, therefore, the southwestern area has been incorporated into the service yard piped network, which treats runoff via the Hydrodynamic separator and bio-retention swale prior to discharge into the ground.

The proposed proprietary treatment system (V-Septor Hydrodynamic Separator by ACO) has been specified due to the site layout constraints and has bis located upstream of the bioretention swale as a management component to mitigate the pollution risk. A strict maintenance regime has been outlined in the FRA to ensure that the separator operates as it should and to its full potential.

## 3. Drainage Design Calculations / Modelling and Residual Risk

The proposed drainage design has been modelled and designed for no flooding in the 100-year (plus 45% for climate change) rainfall event. In the event of rainfall in exceedance of the 100-year (plus 45% for climate change) rainfall event, site levels direct flood water away from site buildings and car parking areas and towards the open green spaces along the northern and the eastern edges of the site. Drainage calculations are attached in **Appendix B**.

## 4. Drainage Strategy Drawings

The following drawings show the proposed surface water drainage strategy.

3. Drawings in **Appendix C.**

| | |
|---|---|
| 49868/2001/501 | Proposed Drainage Layout |
| 49868/2001/503 | Catchment Plan |
| 49868/2001/521 | Construction Details |
| 49868/2001/601 | Proposed Contour Plan |

## 5. Drainage Detail Drawings

The peak water levels for each storm duration has been calculated in Microdrainage (Infodrainage) and can be seen on drawing 49868/2001/521 Construction Details **(Appendix C)**.

The table below shows the peak water levels on the site for each of the storm durations, the 30 and 100-year events include a 45% additional rainfall allowance for climate change. Both the welfare office and the re-use shop will be static prefabricated buildings, where the finished floor levels of both buildings will be 150mm above the proposed finished level of the finished surface. As can be seen in the table, there is more than 300mm freeboard for the building structures.

| Infiltration (Northern) Swale | | | | | |
|---|---|---|---|---|---|
| **Storm Event** | **Peak Flood Level (Ave)** | **Welfare Floor Level** | **Freeboard** | **Shop Floor Level** | **Freeboard** |
| **1:2 year** | 89.058 | 90.575 | 1.517 | 90.363 | 1.305 |
| **1:30 year** | 89.130 | 90.575 | 1.445 | 90.363 | 1.233 |
| **1:100 year** | 89.201 | 90.575 | 1.374 | 90.363 | 1.162 |

## 6. Drainage Features - Protection from all Sources of Flooding

Subject to the proposed scheme and, as per the design of the drainage network, the site is not subject to flood risk from, fluvial, surface water / pluvial, ground water, reservoirs, canals, ponds, or any other artificial sources.

## 7. Drainage Hierarchy and Viability

Rainwater harvesting was considered for this scheme with the installation of either a green roof for the buildings or using the grey water to be reused to flush the single toilet in the welfare office. But due to budget restraints, it was agreed that this would not be viable due to budget limitations for the size of the site.

It was therefore decided to drain both roof areas via a gutter, downpipe system through a piped network into a rainwater garden as referenced in the SuDS Manual 2015 and finally into the infiltration swale to the north of the site. This can be seen on drawing 49868/2001/501 Proposed Drainage Layout in **Appendix C**

## 8. Greenfield Runoff Rates Pre- and Post-development

The following greenfield runoff rates have been calculated for the site using the FEH methodology. Calculations are in **Appendix E.**

- 1-year - 0.2 l/s
- Q-bar - 0.3 l/s
- 30-year - 0.7 l/s
- 100-year - 1.0 l/s

## 9. Water Quality Testing

To ensure that the runoff meets all the necessary water quality requirements, sampling points are to be installed at strategic locations next to the eastern swale, so that they can be monitored. These can be seen on the proposed drainage layout drawing 49868/2001/501.

It will not be possible to take samples during periods of dry weather, so the intention will be to carry out monitoring of the water quality from the sampling points during significant rainfall after a dry period of at least three days, to ensure that sampling represents a worst-case scenario in terms of contaminant concentration.

Soils testing will include, but not be limited to Total Suspended Solids (TSS), Metals and Hydrocarbons.

The Environment Agency have confirmed that they are satisfied with the simple index approach as described in the SuDS Manual (CIRIA C753, 2015) for this scheme. The confirmation email from them, dated, Thursday 27th April 2023, is in **Appendix D.**

## 10. Phasing of the Scheme

It is intended that the recycling centre is to be constructed as one scheme as a single phase.

## 11. Maintenance and Management

The gullies, catch pits, hydrodynamic separator (maintained using any maintenance specification provided be the product manufacturer) and swales are to be maintained by regular inspections and cleaning / maintenance activities as required as per the maintenance schedules laid out in the Flood Risk Assessment and Surface Water Drainage Strategy.

Further clarification of these maintenance requirements are outlined below:

**4. Gullies, Catch Pits and Pipework**

The maintenance of this network will be carried out on a yearly basis, or before as deemed necessary. It will be undertaken by the site operator who is responsible for running the site.

**5. ACO V-Septor Hydrodynamic Separator (ACO)**

The unit should be inspected every 6 months, and the oil and floatable chamber and sludge trap emptied between 6 months and 3 years depending on pollution load. In accordance with the manufacturer's specification. This should be undertaken by an ACO Service Partner who work closely with the UK Environment Agency and are able to offer ongoing maintenance and service programmes, waste disposal, inspection and testing of separators.

**6. Infiltration Swale**

Maintenance of swales will be as per the schedule covered in the Flood Risk Assessment and Surface Water Drainage Strategy. Mowing will be carried out from April to October on a rota with site visits every seven weeks. The cutting season can begin earlier or go on for longer, depending on the weather in the year. Inspection of the plants within the swales will be monitored and inspected quarterly.

These works will be carried out by Norfolk County Councils own maintenance contractor.

**7. Bioretention Swale**

Maintenance of swales will be as per the schedule covered in the Flood Risk Assessment and Surface Water Drainage Strategy. Mowing will be carried out from April to October on a rota with site visits every seven weeks. The cutting season can begin earlier or go on for longer, depending on the weather in the year. Inspection of the plants within the swales will be monitored and inspected quarterly.

These works will be carried out by Norfolk County Councils own maintenance contractor.

**12. Summary of alignment to relevant Non-Statutory Technical Standards for Sustainable Drainage Systems**

The proposed drainage layout has been designed in accordance with the non-statutory requirements for Sustainable Drainage Systems set out in the DEFRA guidance document 'Sustainable drainage systems: non-statutory technical standards' (March 2015). The following clauses from the DEFRA guidance document are relevant to the design of this site and are achieved through the proposed drainage design.

- S7: The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30-year rainfall event.

- S8: The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100-year rainfall event in any part of: a building (including a basement); or in any utility

plant susceptible to water (e.g. pumping station or electricity substation) within the development.

- S9: The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property.S12: Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.

The proposed drainage design outlined in the design drawings and calculations (summarised in Section 5 of this report) show compliance with the above guidance.

The design has also been developed in accordance with best practice design guidance from CIRIA C753, the 'SuDS Manual'.

## 13. APPENDICIES

Appendix A - Soil Investigation Report

Appendix B - Microdrainage / Infodrainage Calculations

Appendix C - Drawings

Appendix D - Email Confirmation from the Environment Agency

Appendix E - Greenfield Runnoff Calculations