

## Outline Drainage Strategy

Proposed Changing Rooms,  
Hensingham ALFC, Whitehaven

Day Cummins Ltd

Ref: 2026-0164-001-DS

| Version  | Date                       | Prepared By    | Checked By | Approved By |
|----------|----------------------------|----------------|------------|-------------|
| Original | 15 <sup>th</sup> June 2026 | R. Heron-Guest | O. Sugden  | O. Sugden   |

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## GLOSSARY OF TERMS

|       |                                    |
|-------|------------------------------------|
| AEP   | Annual Exceedance Probability      |
| AOD   | Above Ordnance Datum               |
| BGL   | Below Ground Level                 |
| BGS   | British Geological Society         |
| CC    | Climate Change                     |
| DSM   | Digital Surface Model              |
| DTM   | Digital Terrain Model              |
| EA    | Environment Agency                 |
| FEH   | Flood Estimation Handbook          |
| FFL   | Finished Floor Level               |
| GIS   | Geographical Information System    |
| LiDAR | Light Detection and Ranging        |
| LLFA  | Lead Local Flood Authority         |
| NPPF  | National Planning Policy Framework |
| OS    | Ordnance Survey                    |
| RGP   | RG Parkins & Partners Ltd          |
| SFRA  | Strategic Flood Risk Assessment    |
| SuDS  | Sustainable Drainage System        |
| UU    | United Utilities                   |

## 1. INTRODUCTION

### 1.1 BACKGROUND

This report has been prepared by R. G. Parkins & Partners Ltd (RGP) for Day Cummins Ltd in support of their drainage proposals for proposed changing rooms at Hensingham ARLFC, in Hensingham, Whitehaven.

RGP has been appointed to undertake an Outline Surface & Foul Water Drainage Strategy in accordance with the National Planning Policy Framework (NPPF) <sup>[1][2]</sup> to support a planning application that fulfils the requirements of the Local Planning Authority.

## 2. SITE CHARACTERISATION

### 2.1 SITE LOCATION

The site is Hensingham ARLFC and is located off Cleator Moor Road (B5295), adjacent to The Whitehaven Academy (Figure 2.1). The National Grid Co-Ordinates to the location of the proposed changing rooms are 299274E 517270N. The site's location is shown in Figure 2.1.



**Figure 2.1 Site Location Plan**

### 2.2 SITE DESCRIPTION

The site covers an area of approximately 350 m<sup>2</sup> (0.035 ha). The proposed changing rooms are to be located on the north west boundary of the rugby pitch, on an earth mound. The building will comprise 2 no. changing rooms for 22no. people in total, with showers and toilets, officials room, a storage room and plant room.

The site is accessed from Cleator Moor Road and is bounded by industrial units to the north and west. Whitehaven Academy, and associated parking lies to the east, and The Haven Club, a public house lies to the south.

Topographically the site is located on a earth mound, alongside the pitch, ground levels rise from ~127.300 to 128.600 mAOD.

### 2.3 GEOLOGY & HYDROGEOLOGY

British Geological Survey (BGS) <sup>[3]</sup> and Land Information Systems (LandIS) <sup>[4]</sup> mapping indicates the site is underlain by the geological sequences outlined in Table 2.1. The EA Groundwater

Vulnerability Map <sup>[5]</sup> indicates there are no Groundwater Source Protection Zones within 10km of the site. There are also no drinking water protected areas for surface or groundwater.

**Table 2.1 Site Geological Summary**

| Geological Unit | Classification   | Description                                                 | Aquifer Classification       |
|-----------------|------------------|-------------------------------------------------------------|------------------------------|
| Soil            | Soilscape 17     | Slowly permeable seasonally wet acid loamy and clayey soils | N/A                          |
| Drift           | Till, Devensian  | Diamicton- clay, silt, sand and gravels                     | Secondary (undifferentiated) |
| Solid           | Brockram-Breccia | Brockram                                                    | Principle                    |

## 2.4 HYDROLOGY

There are no known watercourses or surface water features within close proximity to the site.

## 2.5 SEWERS

Reference to UU sewer records shows the nearest public sewer lies to the north east of the site, serving several dwellings and the former public house (The Haven Club). This is a 100 mm dia. combined sewer.

A drainage survey undertaken by SK Drainage Solutions undertaken in October 2023 (report no. SK-S-144-2023) confirmed the existing rugby club is served by 2 no. separate drainage systems serving foul and surface water. Surface water appears to discharge into a pipe running along the highway verge to the north east, alongside the pitch. The survey was however abandoned due to a build-up of debris. The camera unit could not pass.

Foul flows also appear to follow the same direction of the surface water, foul flows appear to discharge into a tank arrangement, with an outlet pipe discharging along side the highway and the rugby pitch.

Drainage was installed as part of the construction of the new school (The Whitehaven Academy). This is also served by a separate foul and surface water network. Although not present on UU records, it is assumed this drainage is public as it runs under a public highway.

## 2.6 GROUND INVESTIGATION

Infiltration tests were under taken In May 2026 by Stobbarts Ltd. 2no. test holes were excavated either side of the proposed changing rooms, with testing was undertaken to BRE 365 methodology, at a depth of 1.00 mBGL.

Ground conditions comprised of turf, overlaying clay. The test holes were filled with water and the time taken for the water level to drop between 75% and 25% recorded (Figures 2.2 and 2.3). The test holes were left over night, and the water levels had dropped a maximum of 300 mm. As such the tests were aborted due to the poor permeability of the soils.

For further information the full results (provided by Stobbarts) are presented in Appendix B for reference.



**Figure 2.2 Infiltration Testing**



**Figure 2.3 Infiltration Testing**

## 3. SURFACE WATER DRAINAGE STRATEGY

### 3.1 INTRODUCTION

The principal aim of the following drainage strategy is to design the development to avoid, reduce and delay the discharge of rainfall to public sewers and ensure flood risk to watercourses is not adversely affected. In order to satisfy these criteria this surface water runoff assessment and drainage design has been undertaken in accordance with the following reports and guidance documents:

- SuDS Manual, CIRIA Report C753, 2015<sup>[7]</sup>
- Code of Practice for Surface Water Management, BS8582:2013, November 2013<sup>[8]</sup>
- Rainfall Runoff Management for Developments, Defra/EA, SC030219, October 2013<sup>[9]</sup>
- Designing for Exceedance in Urban Drainage – Good Practice, CIRIA Report C635, 2006<sup>[10]</sup>
- Flood Estimation Handbook (FEH)<sup>[11]</sup>
- Flood Studies Report (FSR), Volume 1, Hydrological Studies, 1993<sup>[12]</sup>
- Flood Studies Supplementary Report No 14 (FSSR14), Review of Regional Growth Curves, 1983<sup>[13]</sup>
- Flood Estimation for Small Catchments, Marshall & Bayliss, Institute of Hydrology, Report No. 124 (IoH 124), 1994<sup>[14]</sup>
- Department for Environment, Food and Rural Affairs, Non-Statutory Technical Standards for Sustainable Drainage Systems, March 2015<sup>[15]</sup>
- Water UK, Design and Construction Guidance for Foul & Surface Water Sewers Offered for Adoption Under the Code for Adoption Agreements for Water and Sewage Companies Operating Wholly or Mainly in England, Approved Version 2.0, March 2020<sup>[16]</sup>

Any alterations to the site layout plan by Day Cummins Ltd (drawing no. 6210-03) resulting in changes to impermeable areas will require the drainage strategy to be revisited.

### 3.2 PRE-DEVELOPMENT RUNOFF ASSESSMENT

As the developable site covers an area of less than 200 ha, (0.035 ha impermeable areas only) the peak rate of runoff calculations been undertaken in accordance with FEH Statistical (2025) methodology. This methodology uses the most up to date rainfall data and updated methodology.

Full details of the calculations and the methodology for deriving the Peak Rate of Runoff are included in Appendix C. A summary of the results is included in Table 3.1.

**Table 3.1 Pre-Development Runoff Rates**

| Rate of Runoff (l/s) |            |
|----------------------|------------|
| Event                | Greenfield |
| Q1                   | 0.4        |
| QBAR                 | 0.4        |
| Q10                  | 0.6        |
| Q30                  | 0.7        |
| Q100                 | 0.9        |
| Q100 + 50% CC        | 1.0        |

It is proposed that runoff from the site will be restricted to the Qbar rate of 0.4 l/s.

### 3.3 PERCENTAGE IMPERMEABILITY (PIMP)

The percentage impermeability (PIMP) for all contributing areas is modelled as 100%. The entirety of the impermeable areas is to be positively drained.

### 3.4 VOLUMETRIC RUNOFF COEFFICIENT (CV)

The volumetric runoff coefficient describes the volume of rainfall which runs off an impermeable surface following losses due to infiltration, depression storage, initial wetting and evaporation. The coefficient is dimensionless.

Default industry standard volumetric runoff coefficients are typically 0.75 for summer and 0.84 for winter for drainage design. However, these have been uplifted to 1.0 for both summer and winter as part of the conservative drainage design.

### 3.5 RAINFALL MODEL

The calculations use the REFH2 unit hydrograph methodology in line with best practice as outlined in the SuDS Manual <sup>[7]</sup>. The calculations use the most up to date available catchment descriptors (2022) provided by the Centre for Ecology and Hydrology Flood Estimation Handbook web service.

### 3.6 CLIMATE CHANGE

Projections of future climate change indicate that more frequent short-duration, high intensity rainfall and more frequent periods of long-duration rainfall are likely to occur over the next few decades in the UK. These future changes will have implications for river flooding and for local flash flooding. These factors will lead to increased and new risks of flooding within the lifetime of planned developments.

The EA have provided a peak rainfall online map showing the anticipated changes in peak rainfall intensity across the UK. Climate change allowances are now provided on a catchment-by-catchment basis.

The site falls within the South West Lakes Management Catchment. Table 3.4 outlines the EA guidance for this catchment, for the anticipated design life of the proposed development. In line with current guidance and for conservative design, a 50% allowance shall be used within this assessment.

**Table 3.2 South West Lakes Management Catchment Peak Rainfall Allowances (1.0 AEP)**

| Management Catchment (1.0%AEP) | Central Allowance (%) | Upper End Allowance (%) |
|--------------------------------|-----------------------|-------------------------|
| 2050s                          | 30                    | 45                      |
| 2070s                          | 35                    | 50                      |

### 3.7 INFILTRATION

Infiltration testing was undertaken as part of the ground investigation for the planning application at the site by the contractor (see section 2.6), it was concluded that disposal of surface water via soakaways will not form an effective drainage solution for this site.

On this basis it is concluded that disposal of surface water using an attenuation-based SuDS will be progressed.

### 3.8 SURFACE WATER DRAINAGE DESIGN

The proposed surface water drainage system serving the developable areas of the site that require attenuation have been modelled using Causeway Flow (results are included in Appendix C).

The drainage design has been sized to store a future 1% AEP event of critical duration without any flooding. The potential impact of future climate change (+50% to rainfall) is accounted for within the calculations. An additional 10% on all catchment areas has also been included to account for urban creep.

It is proposed that the roof area for the changing rooms will drain via gravity through a network of pipes and chambers into a private geocellular attenuation tank. An advanced silt trap will be located upstream of the inlet to provide surface water treatment and access for maintenance. Silt traps isolate silt and other particles by encouraging settlement into removal silt buckets, preventing ingress into the tank. The tank will be founded at a suitable level providing a minimum cover depth of 600 mm over the top.

The attenuation tank shall measure 11 x 8 x 0.4 m deep providing a storage volume of ~34 m<sup>3</sup>.

An orifice flow control device will limit discharge from the geocellular tank to the proposed downstream network at a rate of 0.4 l/s. Discharge shall be to the existing surface water network in to the east of the site.

For further detail of the drainage proposals refer to the Outline Drainage Layout Plan (2026-0164-41) included in Appendix A.

## 3.9 DESIGNING FOR LOCAL DRAINAGE SYSTEM FAILURE

In accordance with the general principles discussed in CIRIA Report C635 – Designing for Exceedance in Urban Drainage <sup>[10]</sup> the proposed surface water drainage, where practical, should be designed to ensure there is no increased risk of flooding on the site or elsewhere as a result of extreme rainfall, lack of maintenance, blockages or other causes. These measures are discussed below.

**Drainage Contingency** – the sustainable drainage system to be utilised for the development has been designed to attenuate a 100-year design storm including a 50% allowance for climate change. The drainage system will also provide capacity for lower probability (greater design storm events) which are not critical duration.

**Building Layout & Detail** – the attenuation tank will be sited ~1.20 m below the anticipated FFL of the proposed changing room facility and will therefore not increase flood risk to the building.

**Blockage and exceedance** – In the unlikely case of exceedance or blockage of the surface water drainage pipes and/or associated inspection chambers, flows will spill overland and flow downslope to the rugby pitch, and away from any highways or buildings.

## 3.10 OPERATIONS & MAINTENANCE RESPONSIBILITY

The drainage will remain private and will therefore be maintained by the site owners. A SuDS Operations & Maintenance Plan will be made available to the site owners detailing the requirements for future maintenance of the drainage system.

## 4. FOUL WATER DRAINAGE

### 4.1 FOUL DRAINAGE DESIGN

Foul water calculations have been undertaken in accordance with British Water Code of Practice- Flows and Loads 4 (Table 4.1).

The calculations are based on:

- ~50 users in local community sports club

**Table 4.1 Peak Foul Flow Calculations**

| Source of Waste                                                     | Number of Users | Flow (l/day) | BOD (g) | Ammonia as N (g) |
|---------------------------------------------------------------------|-----------------|--------------|---------|------------------|
| Amenity Sites- local community sports club, e.g. rugby and football | 50              | 2000         | 1250    | 125              |

Foul water shall be connected to the existing drainage network by a series of 100 mm dia. pipes. A connection is proposed to an existing foul sewer serving the school and a neighbouring dwelling. The connection will be made in land owned by the rugby club.

Detailed design should account for gradients steeper than 1:80 if there is a WC connected upstream and 1:40 if there is not. This is to reduce the likelihood of blockages upstream of the packaged treatment plant and to comply with Building Regulations.

If a gravity connection can't be achieved, a foul water pumping station will be required.

The outline foul water drainage pipe runs are shown on RGP drawing 2026-0164-41, included in Appendix A.

## 5. CONCLUSIONS AND RECOMMENDATIONS

In consideration of the proposed Outline Drainage Strategy for the site the following conclusions and recommendations are made:

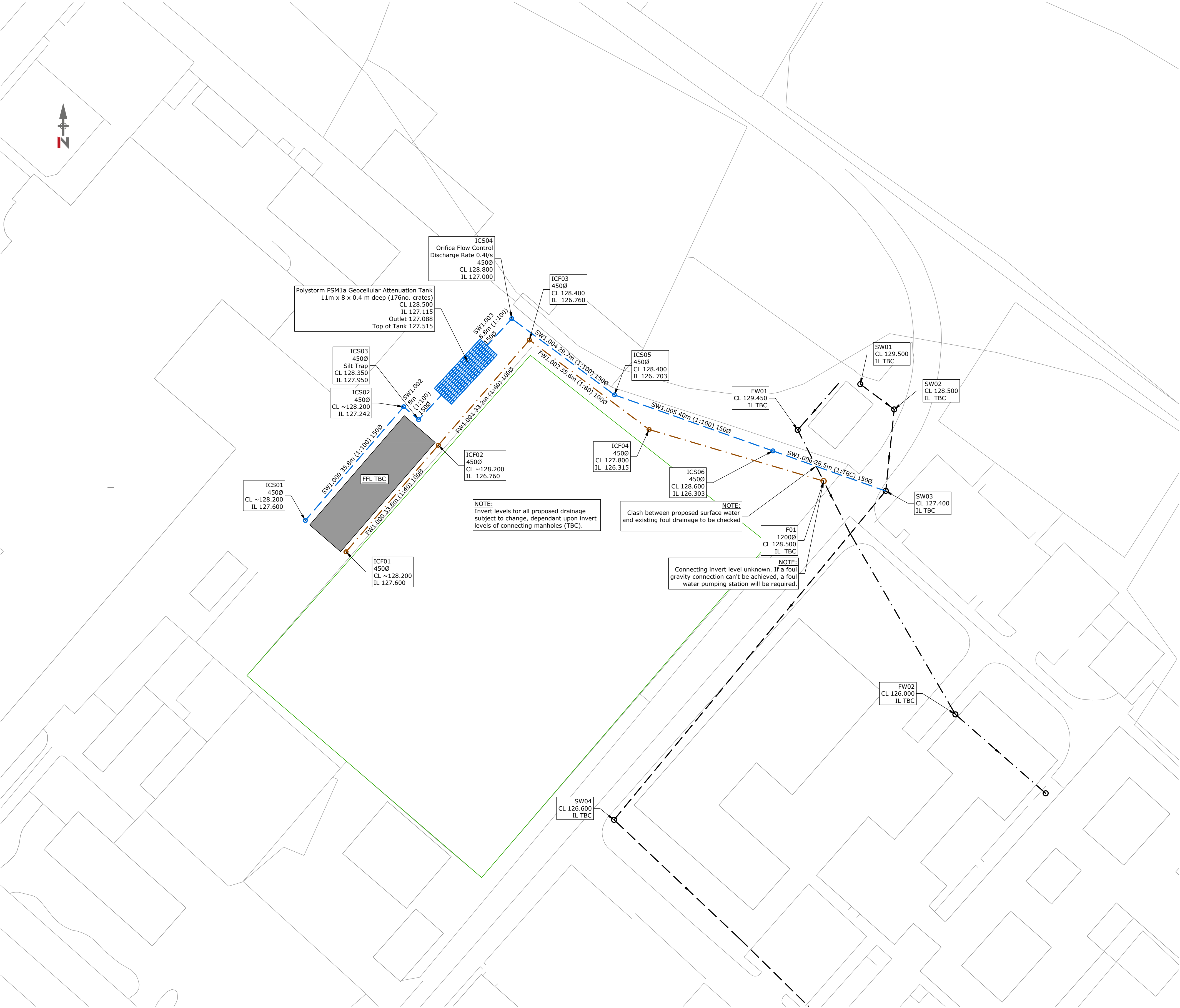
- Infiltration testing at the site has not returned suitable infiltration rates in the underlying strata to allow for the use of soakaways. An attenuation-based solution shall be progressed.
- There are no watercourses in the vicinity of the site, therefore, and in line with the SuDS drainage hierarchy surface water disposal shall be to an existing surface water sewer.
- It is proposed that the roof area for the changing rooms will drain via gravity through a network of pipes and chambers into a private geocellular attenuation tank.
- The attenuation tank shall measure 11 x 8 x 0.4 m deep providing a storage volume of ~34 m<sup>3</sup>.
- An orifice flow control device will limit discharge from the geocellular tank to the proposed downstream network at a rate of 0.4 l/s. Discharge shall be to the existing surface water network in to the east of the site.
- The discharge rate matches Greenfield Qbar rate to comply with the long-term storage approach.
- A new drainage network comprising of surface water disposal to a surface water sewer via geocellular attenuation tank will be installed with capacity to contain a Q100 + 50% climate change design storm.
- The drainage will remain private and will therefore be maintained by the site owners. A SuDS Operations & Maintenance Plan will be made available to the site owners detailing the requirements for future maintenance of the drainage system.
- Foul water shall be connected to the existing drainage network by a series of 100 mm dia. pipes. A connection is proposed to an existing foul sewer serving the school and a neighbouring dwelling. The connection will be made in land owned by the rugby club.

## 6. REFERENCES

- [1] Ministry of Housing, Communities and Local Government, National Planning Policy Framework, July 2018.
- [2] Ministry of Housing, Communities and Local Government, Planning Practice Guidance to the National Planning Policy Framework, June 2025
- [3] British Geological Survey, December 2025 (<http://mapapps2.bgs.ac.uk/geoindex/home.html>)
- [4] Land Information System (LANDIS)- Soilscales viewer, Accessed June 2026 (<http://www.landis.org.uk/soilscales>)
- [5] Defra Magic Maps, December 2026 (<https://magic.defra.gov.uk/MagicMap.aspx>)
- [6] Environment Agency Spatial Data Catalogue, WMS Links, June 2026. (<http://environment.data.gov.uk/ds/catalogue/#/catalogue>)
- [7] CIRIA, The SuDS Manual, Report C753, 2015.
- [8] BS8582:2013, Code of Practice for Surface Water Management, November 2013.
- [9] DEFRA/EA, Rainfall Runoff Management for Developments, SC030219, October 2013.
- [10] CIRIA, Designing for Exceedance in Urban Drainage – Good Practice, Report C635, London, 2006.
- [11] Centre for Ecology and Hydrology, Flood Estimation Handbook, Vols. 1 – 5 & FEH CD-ROM 3, 2009.
- [12] Institute of Hydrology, Flood Studies Report, Volume 1, Hydrological Studies, 1993.
- [13] Institute of Hydrology, Flood Studies Supplementary Report No 14 – Review of Regional Growth Curves, August 1983.
- [14] Marshall & Bayliss, 1994. Flood Estimation for Small Catchments, Report No. 124 (IoH 124), Institute of Hydrology.
- [15] Department for Environment, Food and Rural Affairs, Non-Statutory Technical Standards for Sustainable Drainage Systems, March 2015
- [16] Water UK, Design and Construction Guidance for Foul & Surface Water Sewers Offered for Adoption Under the Code for Adoption Agreements for Water and Sewage Companies Operating Wholly or Mainly in England, Approved Version 2.0, March 2020

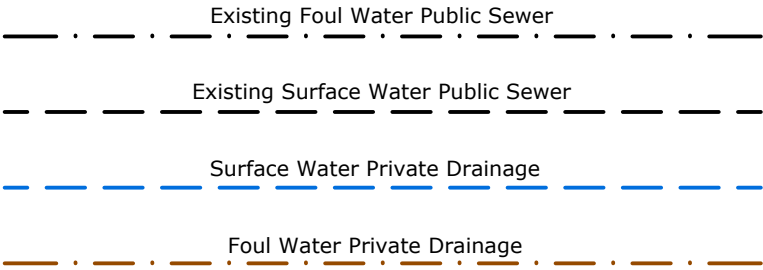
APPENDIX A

DRAINAGE LAYOUT PLAN



- General
1. This drawing should not be scaled - use figured dimensions only. If in doubt, ask.
  2. All dimensions are in millimetres unless stated otherwise.
  3. This drawing is to be read in conjunction with all relevant Architects drawings as well as all other drawings by RG Parkins (refer to RG Parkins drawing register).
  4. The Contractor is responsible for verifying all dimensions on site prior to commencing works.
  5. Any specified proprietary products are to be installed in strict accordance with manufacturers guidelines. No specified product should be substituted without gaining approval from RG Parkins.

Drainage Key  
Scale 1:500



| Rev                            | Description | Date | Revised by | Checked by | Approved |
|--------------------------------|-------------|------|------------|------------|----------|
| Issue Purpose: <b>Planning</b> |             |      |            |            |          |
| Do not scale from this drawing |             |      |            |            |          |

R G PARKINS

Kendal | 01539 729393    Lancaster | 01524 32548

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Project:Hensingham ARLFC, Whitehaven

Drawing Title:Proposed Outline Drainage Strategy

Scale @ A1:1:500

Drawn by:RHG

Project No:2026-0164

BIM No:

First Issue:15/06/2026

Checked by:OS

Drawing No:41

Office of Origin:Kendal

Approved:OS

Rev:

APPENDIX B

GROUND INVESTIGATION

|                                                                                                                         |                  |                         |                       |
|-------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------|-----------------------|
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|                                                                                                                         |                  | Calc by<br>RHG          | Check by              |
|                                                                                                                         | Hensingham ARLFC | Date<br>08/06/2026      | Revised               |

|                      |     |
|----------------------|-----|
| <b>TRIAL PIT NO.</b> | TP1 |
| <b>GROUND LEVEL</b>  | N/A |

**PERCOLATION TEST RESULTS AND SOIL INFILTRATION ASSESSMENT**

**TEST NO.:** Pit 1

**TEST DEPTH:**

1000 mm Below Ground Level (BGL)

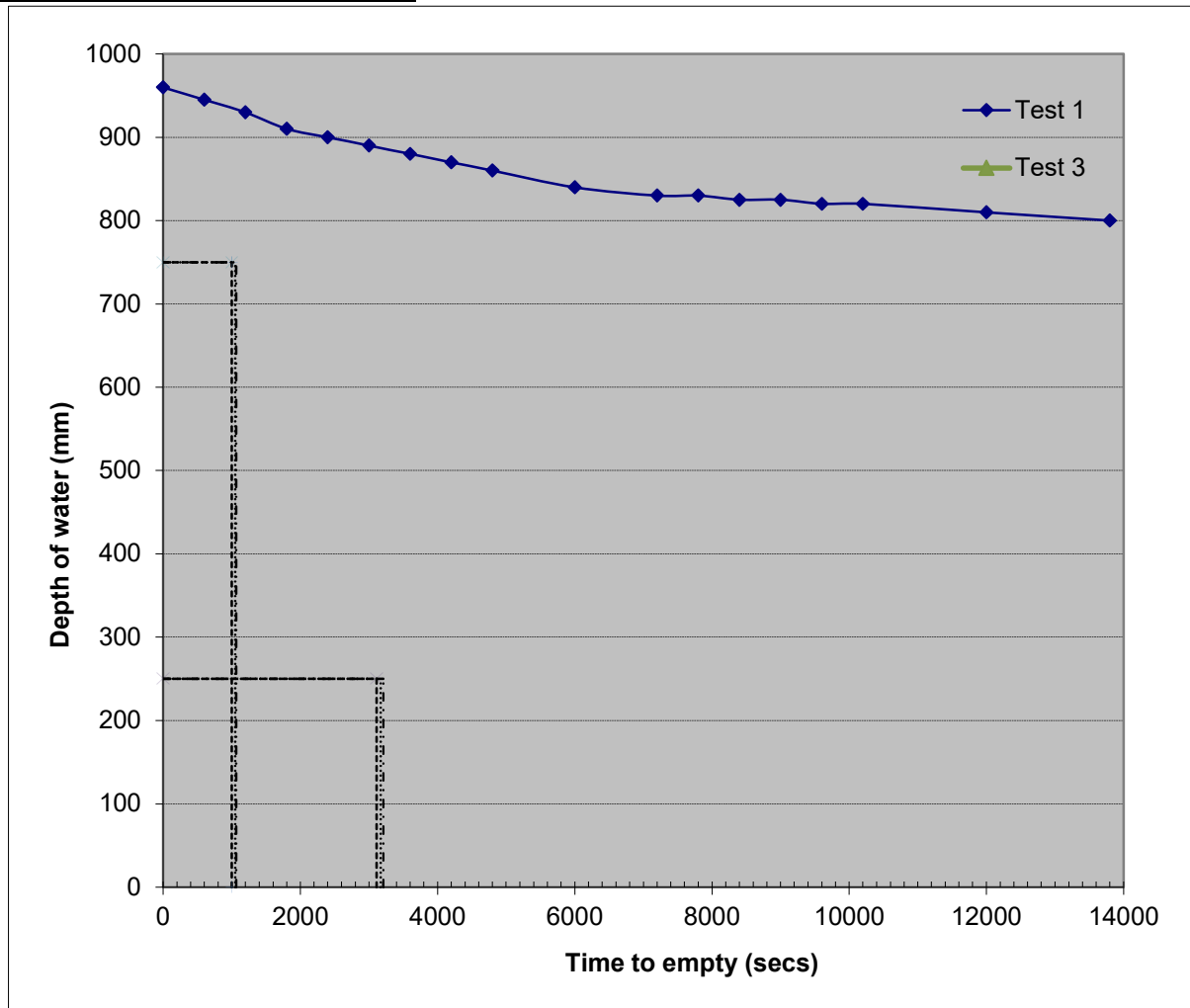
**TEST HOLE SIZE:**

|                |      |    |
|----------------|------|----|
| Width          | 1000 | mm |
| Length         | 1000 | mm |
| Depth of hole  | 1000 | mm |
| Depth of water | 1000 | mm |

**MONITORING RESULTS:**

|        | Recorded Time |         |         | Total Time | Depth of water (mm) |     |
|--------|---------------|---------|---------|------------|---------------------|-----|
|        | Hours         | Minutes | Seconds | Seconds    |                     |     |
| Test 1 | 11            | 31      |         | 0          | 960                 | 40  |
|        | 11            | 41      |         | 600        | 945                 | 55  |
|        | 11            | 51      |         | 1200       | 930                 | 70  |
|        | 12            | 1       |         | 1800       | 910                 | 90  |
|        | 12            | 11      |         | 2400       | 900                 | 100 |
|        | 12            | 21      |         | 3000       | 890                 | 110 |
|        | 12            | 31      |         | 3600       | 880                 | 120 |
|        | 12            | 41      |         | 4200       | 870                 | 130 |
|        | 12            | 51      |         | 4800       | 860                 | 140 |
|        | 13            | 11      |         | 6000       | 840                 | 160 |
|        | 13            | 31      |         | 7200       | 830                 | 170 |
|        | 13            | 41      |         | 7800       | 830                 | 170 |
|        | 13            | 51      |         | 8400       | 825                 | 175 |
|        | 14            | 1       |         | 9000       | 825                 | 175 |
|        | 14            | 11      |         | 9600       | 820                 | 180 |
|        | 14            | 21      |         | 10200      | 820                 | 180 |
|        | 14            | 51      |         | 12000      | 810                 | 190 |
|        | 15            | 21      |         | 13800      | 800                 | 200 |
|        |               |         |         |            |                     |     |

## TP2 PERCOLATION TEST RESULTS



## SOIL INFILTRATION RATE ASSESSMENT:

$$V_{p75-25} = 0.5 \text{ m}^3$$

$$A_{p50} = 3 \text{ m}^2$$

Time for the outflow between 75% and 25% effective depth:

| TEST | Drain time between 750mm and 250 mm depth | Soil Infiltration rate |           |
|------|-------------------------------------------|------------------------|-----------|
|      | secs                                      | k (m/s)                | Vp (s/mm) |
| 1    |                                           |                        | #DIV/0!   |
|      |                                           |                        |           |
|      |                                           |                        |           |

## DESIGN INFILTRATION RATE:

$$k = 0.0E+00 \text{ m/s} \quad 0.000$$

$$Vp = \#DIV/0! \text{ s/mm}$$

|                                                                                                                         |                  |                         |                       |
|-------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------|-----------------------|
| <b>R G PARKINS</b><br>97 King Street   Lancaster   LA1 1RH<br>Tel:01524 32548<br>Email: office@rgparkinslancaster.co.uk |                  | Job Number<br>2026-0164 | Page Number<br>1 of 3 |
|                                                                                                                         |                  | Calc by<br>RHG          | Check by              |
|                                                                                                                         | Hensingham ARLFC | Date<br>08/06/2026      | Revised               |

|                      |     |
|----------------------|-----|
| <b>TRIAL PIT NO.</b> | TP2 |
| <b>GROUND LEVEL</b>  | N/A |

**PERCOLATION TEST RESULTS AND SOIL INFILTRATION ASSESSMENT**

**TEST NO.:** Pit 2

**TEST DEPTH:**

1000 mm Below Ground Level (BGL)

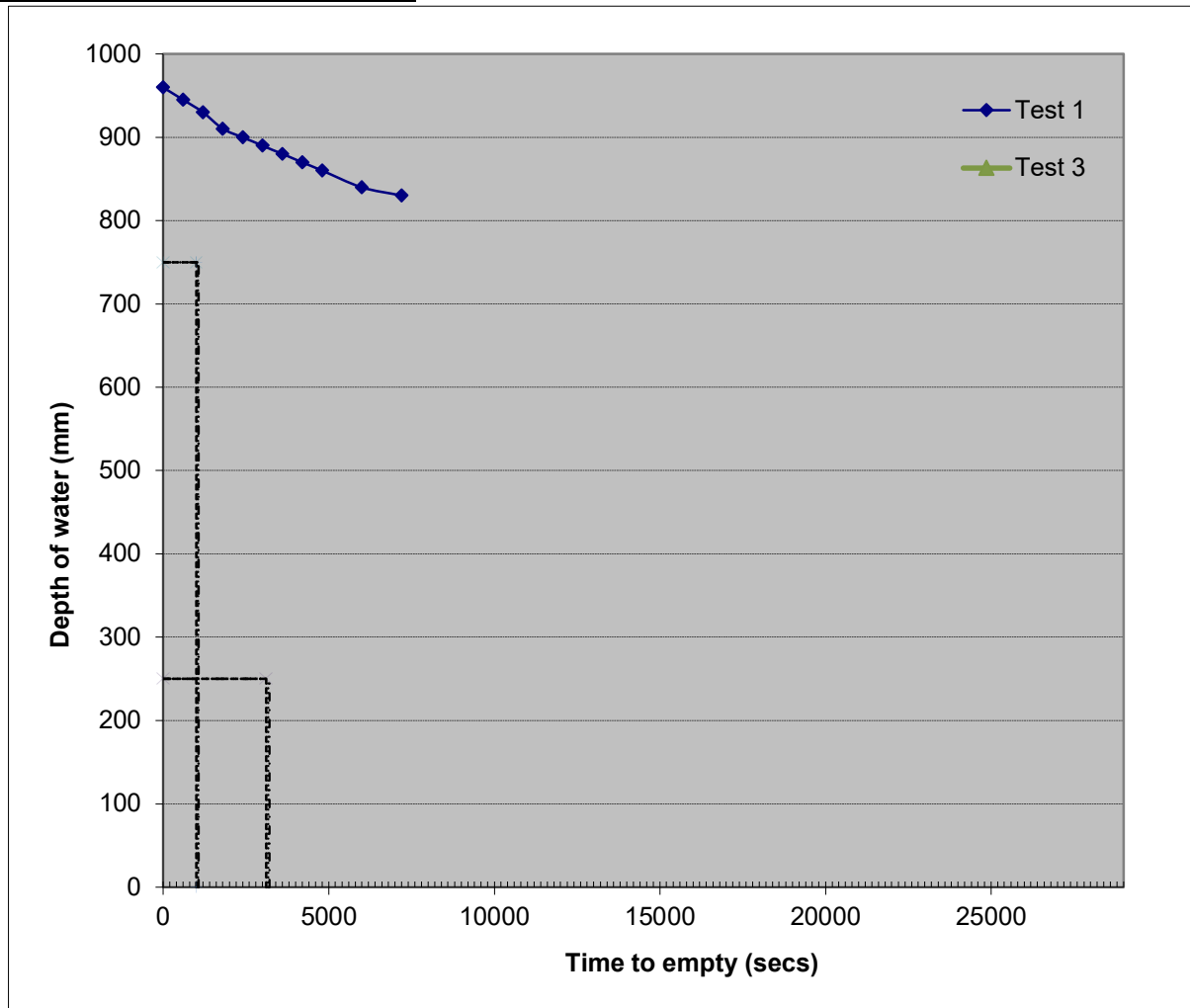
**TEST HOLE SIZE:**

|                |      |    |
|----------------|------|----|
| Width          | 1000 | mm |
| Length         | 1000 | mm |
| Depth of hole  | 1000 | mm |
| Depth of water | 1000 | mm |

**MONITORING RESULTS:**

|        | Recorded Time |         |         | Total Time | Depth of water (mm) |     |
|--------|---------------|---------|---------|------------|---------------------|-----|
|        | Hours         | Minutes | Seconds | Seconds    |                     |     |
| Test 1 | 1             | 55      |         | 0          | 980                 | 20  |
|        | 2             | 5       |         | 600        | 970                 | 30  |
|        | 2             | 15      |         | 1200       | 960                 | 40  |
|        | 2             | 25      |         | 1800       | 960                 | 40  |
|        | 2             | 35      |         | 2400       | 955                 | 45  |
|        | 2             | 45      |         | 3000       | 950                 | 50  |
|        | 2             | 55      |         | 3600       | 950                 | 50  |
|        | 3             | 5       |         | 4200       | 945                 | 55  |
|        | 3             | 15      |         | 4800       | 945                 | 55  |
|        | 3             | 25      |         | 5400       | 940                 | 60  |
|        | 10            | 0       |         | 29100      | 880                 | 120 |
|        |               |         |         |            |                     |     |
|        |               |         |         |            |                     |     |
|        |               |         |         |            |                     |     |
|        |               |         |         |            |                     |     |

## TP2 PERCOLATION TEST RESULTS



## SOIL INFILTRATION RATE ASSESSMENT:

$$V_{p75-25} = 0.5 \text{ m}^3$$

$$A_{p50} = 3 \text{ m}^2$$

Time for the outflow between 75% and 25% effective depth:

| TEST | Drain time between 750mm and 250 mm depth | Soil Infiltration rate |           |
|------|-------------------------------------------|------------------------|-----------|
|      | secs                                      | k (m/s)                | Vp (s/mm) |
| 1    |                                           |                        | #DIV/0!   |
|      |                                           |                        |           |
|      |                                           |                        |           |

## DESIGN INFILTRATION RATE:

$$k = 0.0E+00 \text{ m/s}$$

$$Vp = \#DIV/0! \text{ s/mm}$$

0.000

APPENDIX C

DRAINAGE CALCULATIONS

GREENFIELD CALCULATIONS

CAUSEWAY FLOW MODEL RESULTS

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

## Project details

|               |                                         |
|---------------|-----------------------------------------|
| Date          | <input type="text" value="08/06/2026"/> |
| Calculated by | <input type="text" value="RHG"/>        |
| Reference     | <input type="text" value="2026-0164"/>  |
| Model version | <input type="text" value="2.2.3"/>      |

## Location

|               |                                               |
|---------------|-----------------------------------------------|
| Site name     | <input type="text" value="Hensingham ARLFC"/> |
| Site location | <input type="text"/>                          |



|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Site easting (British National Grid)  | <input type="text" value="299300"/> |
| Site northing (British National Grid) | <input type="text" value="517238"/> |

## Site details

|                      |                                    |    |
|----------------------|------------------------------------|----|
| Total site area (ha) | <input type="text" value="0.035"/> | ha |
|----------------------|------------------------------------|----|

# Greenfield runoff

## Method

Method

FEH statistical (2025)

## FEH statistical (2025)

|                                   | My value         | Map value        |
|-----------------------------------|------------------|------------------|
| SAAR9120 (mm)                     | <div>1321</div>  | mm               |
| BFIHOST19scaled                   | <div>0.424</div> |                  |
| QMed-QBar conversion              | <div>1.075</div> | <div>1.075</div> |
| QMed (l/s)                        | <div>0.4</div>   | l/s              |
| QBar (FEH statistical 2025) (l/s) | <div>0.4</div>   | l/s              |

## Growth curve factors

|                        | My value        | Map value     |
|------------------------|-----------------|---------------|
| Hydrological region    | <div>10</div>   | <div>10</div> |
| 1 year growth factor   | <div>0.87</div> |               |
| 2 year growth factor   | <div>0.93</div> |               |
| 10 year growth factor  | <div>1.38</div> |               |
| 30 year growth factor  | <div>1.7</div>  |               |
| 100 year growth factor | <div>2.08</div> |               |
| 200 year growth factor | <div>2.37</div> |               |

## Results

|                           |                        |     |
|---------------------------|------------------------|-----|
| Method                    | FEH statistical (2025) |     |
| Flow rate 1 year (l/s)    | <div>0.4</div>         | l/s |
| Flow rate 2 year (l/s)    | <div>0.4</div>         | l/s |
| Flow rate 10 years (l/s)  | <div>0.6</div>         | l/s |
| Flow rate 30 years (l/s)  | <div>0.7</div>         | l/s |
| Flow rate 100 years (l/s) | <div>0.9</div>         | l/s |
| Flow rate 200 years (l/s) | <div>1.0</div>         | l/s |

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

### Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com/) (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

## Design Settings

|                       |        |                                      |               |                                    |       |
|-----------------------|--------|--------------------------------------|---------------|------------------------------------|-------|
| Rainfall Methodology  | FEH-22 | Maximum Time of Concentration (mins) | 30.00         | Preferred Cover Depth (m)          | 1.200 |
| Return Period (years) | 100    | Maximum Rainfall (mm/hr)             | 50.0          | Include Intermediate Ground        | ✓     |
| Additional Flow (%)   | 50     | Minimum Velocity (m/s)               | 1.00          | Enforce best practice design rules | ✓     |
| CV                    | 1.000  | Connection Type                      | Level Soffits |                                    |       |
| Time of Entry (mins)  | 5.00   | Minimum Backdrop Height (m)          | 0.200         |                                    |       |

## Adoptable Manhole Type

| Max Width (mm) | Diameter (mm) | Max Width (mm) | Diameter (mm) | Max Width (mm) | Diameter (mm) | Max Width (mm) | Diameter (mm) |
|----------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|
| 374            | 1200          | 499            | 1350          | 749            | 1500          | 900            | 1800          |

>900 Link+900 mm

| Max Depth (m) | Diameter (mm) | Max Depth (m) | Diameter (mm) |
|---------------|---------------|---------------|---------------|
| 1.500         | 1050          | 99.999        | 1200          |

## Nodes

| Name      | Area (ha) | T of E (mins) | Cover Level (m) | Diameter (mm) | Easting (m) | Northing (m) | Depth (m) |
|-----------|-----------|---------------|-----------------|---------------|-------------|--------------|-----------|
| 1         | 0.018     | 5.00          | 128.200         | 450           | 299254.361  | 517259.014   | 0.600     |
| 2         | 0.017     | 5.00          | 128.450         | 450           | 299277.784  | 517286.068   | 1.208     |
| 3         |           |               | 128.350         | 450           | 299281.343  | 517282.986   | 1.155     |
| Inlet     |           |               | 128.500         |               | 299286.934  | 517288.737   | 1.385     |
| Outlet    |           | 5.00          | 128.500         |               | 299297.916  | 517300.372   | 1.412     |
| 4-Orifice |           |               | 128.800         | 450           | 299304.115  | 517306.604   | 1.800     |
| 5         |           |               | 128.400         | 450           | 299328.000  | 517288.907   | 1.697     |
| 6         |           |               | 128.600         | 450           | 299365.712  | 517275.573   | 2.297     |
| SW03      |           |               | 127.400         | 1200          | 299392.595  | 517266.068   | 1.382     |

## Links

| Name  | US Node   | DS Node   | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|-------|-----------|-----------|------------|-------------|-----------|-----------|----------|-------------|----------|---------------|--------------|
| 1.000 | 1         | 2         | 35.785     | 0.600       | 127.600   | 127.242   | 0.358    | 100.0       | 150      | 5.59          | 50.0         |
| 1.001 | 2         | 3         | 4.708      | 0.600       | 127.242   | 127.195   | 0.047    | 100.0       | 150      | 5.67          | 50.0         |
| 1.002 | 3         | Inlet     | 8.021      | 0.600       | 127.195   | 127.115   | 0.080    | 100.0       | 150      | 5.80          | 50.0         |
| 1.003 | Outlet    | 4-Orifice | 8.790      | 0.600       | 127.088   | 127.000   | 0.088    | 100.0       | 150      | 5.15          | 50.0         |
| 1.004 | 4-Orifice | 5         | 29.727     | 0.600       | 127.000   | 126.703   | 0.297    | 100.0       | 150      | 5.64          | 50.0         |
| 1.005 | 5         | 6         | 40.000     | 0.600       | 126.703   | 126.303   | 0.400    | 100.0       | 150      | 6.30          | 50.0         |
| 1.006 | 6         | SW03      | 28.514     | 0.600       | 126.303   | 126.018   | 0.285    | 100.0       | 150      | 6.78          | 50.0         |

| Name  | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|-------|-----------|-----------|------------|--------------|--------------|-------------|--------------------|----------------|--------------------|
| 1.000 | 1.005     | 17.8      | 4.9        | 0.450        | 1.058        | 0.018       | 0.0                | 54             | 0.858              |
| 1.001 | 1.005     | 17.8      | 9.5        | 1.058        | 1.005        | 0.035       | 0.0                | 78             | 1.022              |
| 1.002 | 1.005     | 17.8      | 9.5        | 1.005        | 1.235        | 0.035       | 0.0                | 78             | 1.022              |
| 1.003 | 1.005     | 17.8      | 0.0        | 1.262        | 1.650        | 0.000       | 0.0                | 0              | 0.000              |
| 1.004 | 1.005     | 17.8      | 0.0        | 1.650        | 1.547        | 0.000       | 0.0                | 0              | 0.000              |
| 1.005 | 1.005     | 17.8      | 0.0        | 1.547        | 2.147        | 0.000       | 0.0                | 0              | 0.000              |
| 1.006 | 1.005     | 17.8      | 0.0        | 2.147        | 1.232        | 0.000       | 0.0                | 0              | 0.000              |

## Pipeline Schedule

| Link  | Length<br>(m) | Slope<br>(1:X) | Dia<br>(mm) | Link<br>Type | US CL<br>(m) | US IL<br>(m) | US Depth<br>(m) | DS CL<br>(m) | DS IL<br>(m) | DS Depth<br>(m) |
|-------|---------------|----------------|-------------|--------------|--------------|--------------|-----------------|--------------|--------------|-----------------|
| 1.000 | 35.785        | 100.0          | 150         | Circular     | 128.200      | 127.600      | 0.450           | 128.450      | 127.242      | 1.058           |
| 1.001 | 4.708         | 100.0          | 150         | Circular     | 128.450      | 127.242      | 1.058           | 128.350      | 127.195      | 1.005           |
| 1.002 | 8.021         | 100.0          | 150         | Circular     | 128.350      | 127.195      | 1.005           | 128.500      | 127.115      | 1.235           |
| 1.003 | 8.790         | 100.0          | 150         | Circular     | 128.500      | 127.088      | 1.262           | 128.800      | 127.000      | 1.650           |
| 1.004 | 29.727        | 100.0          | 150         | Circular     | 128.800      | 127.000      | 1.650           | 128.400      | 126.703      | 1.547           |
| 1.005 | 40.000        | 100.0          | 150         | Circular     | 128.400      | 126.703      | 1.547           | 128.600      | 126.303      | 2.147           |
| 1.006 | 28.514        | 100.0          | 150         | Circular     | 128.600      | 126.303      | 2.147           | 127.400      | 126.018      | 1.232           |

| Link  | US<br>Node | Dia<br>(mm) | Node<br>Type | MH<br>Type | DS<br>Node | Dia<br>(mm) | Node<br>Type | MH<br>Type |
|-------|------------|-------------|--------------|------------|------------|-------------|--------------|------------|
| 1.000 | 1          | 450         | Manhole      | Adoptable  | 2          | 450         | Manhole      | Adoptable  |
| 1.001 | 2          | 450         | Manhole      | Adoptable  | 3          | 450         | Manhole      | Adoptable  |
| 1.002 | 3          | 450         | Manhole      | Adoptable  | Inlet      |             | Junction     |            |
| 1.003 | Outlet     |             | Junction     |            | 4-Orifice  | 450         | Manhole      | Adoptable  |
| 1.004 | 4-Orifice  | 450         | Manhole      | Adoptable  | 5          | 450         | Manhole      | Adoptable  |
| 1.005 | 5          | 450         | Manhole      | Adoptable  | 6          | 450         | Manhole      | Adoptable  |
| 1.006 | 6          | 450         | Manhole      | Adoptable  | SW03       | 1200        | Manhole      | Adoptable  |

## Manhole Schedule

| Node | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                           | Link  | IL<br>(m) | Dia<br>(mm) |     |
|------|----------------|-----------------|-----------|--------------|-------------|---------------------------------------------------------------------------------------|-------|-----------|-------------|-----|
| 1    | 299254.361     | 517259.014      | 128.200   | 0.600        | 450         |  |       |           |             |     |
|      |                |                 |           |              |             | 0                                                                                     | 1.000 | 127.600   | 150         |     |
| 2    | 299277.784     | 517286.068      | 128.450   | 1.208        | 450         |  | 1     | 1.000     | 127.242     | 150 |
|      |                |                 |           |              |             | 0                                                                                     | 1.001 | 127.242   | 150         |     |

## Manhole Schedule

| Node      | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                           | Link    | IL<br>(m) | Dia<br>(mm) |
|-----------|----------------|-----------------|-----------|--------------|-------------|---------------------------------------------------------------------------------------|---------|-----------|-------------|
| 3         | 299281.343     | 517282.986      | 128.350   | 1.155        | 450         |    | 1 1.001 | 127.195   | 150         |
|           |                |                 |           |              |             |                                                                                       | 0 1.002 | 127.195   | 150         |
| Inlet     | 299286.934     | 517288.737      | 128.500   | 1.385        |             |    | 1 1.002 | 127.115   | 150         |
|           |                |                 |           |              |             |                                                                                       |         |           |             |
| Outlet    | 299297.916     | 517300.372      | 128.500   | 1.412        |             |    |         |           |             |
|           |                |                 |           |              |             |                                                                                       | 0 1.003 | 127.088   | 150         |
| 4-Orifice | 299304.115     | 517306.604      | 128.800   | 1.800        | 450         |    | 1 1.003 | 127.000   | 150         |
|           |                |                 |           |              |             |                                                                                       | 0 1.004 | 127.000   | 150         |
| 5         | 299328.000     | 517288.907      | 128.400   | 1.697        | 450         |    | 1 1.004 | 126.703   | 150         |
|           |                |                 |           |              |             |                                                                                       | 0 1.005 | 126.703   | 150         |
| 6         | 299365.712     | 517275.573      | 128.600   | 2.297        | 450         |  | 1 1.005 | 126.303   | 150         |
|           |                |                 |           |              |             |                                                                                       | 0 1.006 | 126.303   | 150         |
| SW03      | 299392.595     | 517266.068      | 127.400   | 1.382        | 1200        |  | 1 1.006 | 126.018   | 150         |

## Simulation Settings

|                      |          |                   |          |                            |      |                         |   |
|----------------------|----------|-------------------|----------|----------------------------|------|-------------------------|---|
| Rainfall Methodology | FEH-22   | Winter CV         | 1.000    | Drain Down Time (mins)     | 240  | Check Discharge Rate(s) | x |
| Rainfall Events      | Singular | Analysis Speed    | Detailed | Additional Storage (m³/ha) | 20.0 | Check Discharge Volume  | x |
| Summer CV            | 1.000    | Skip Steady State | x        | Starting Level (m)         |      |                         |   |

## Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) | Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 2                     | 0                     | 0                     | 0                     | 100                   | 50                    | 0                     | 0                     |
| 30                    | 45                    | 0                     | 0                     |                       |                       |                       |                       |

## Node 4-Orifice Online Orifice Control

|                          |   |                  |         |                   |       |                       |       |
|--------------------------|---|------------------|---------|-------------------|-------|-----------------------|-------|
| Flap Valve               | x | Invert Level (m) | 127.000 | Design Flow (l/s) | 0.4   | Discharge Coefficient | 0.600 |
| Replaces Downstream Link | x | Design Depth (m) | 0.400   | Diameter (m)      | 0.017 |                       |       |

## Node Outlet Flow through Pond Storage Structure

|                             |         |                           |         |                          |        |
|-----------------------------|---------|---------------------------|---------|--------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Porosity                  | 0.95    | Main Channel Length (m)  | 11.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 127.088 | Main Channel Slope (1:X) | 400.0  |
| Safety Factor               | 2.0     | Time to half empty (mins) |         | Main Channel n           | 0.060  |

## Inlets

Inlet

| Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) |
|-----------|-----------|---------------|-----------|-----------|---------------|-----------|-----------|---------------|
| 0.000     | 88.0      | 88.0          | 0.400     | 88.0      | 101.3         | 0.401     | 0.0       | 101.3         |

**Results for 2 year Critical Storm Duration. Lowest mass balance: 99.27%**

| Node Event        | US Node   | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|-----------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute summer  | 1         | 10          | 127.642   | 0.042     | 3.1          | 0.0317        | 0.0000     | OK         |
| 15 minute summer  | 2         | 11          | 127.308   | 0.065     | 5.9          | 0.0289        | 0.0000     | OK         |
| 15 minute summer  | 3         | 11          | 127.258   | 0.063     | 5.8          | 0.0100        | 0.0000     | OK         |
| 720 minute summer | Inlet     | 480         | 127.183   | 0.068     | 1.2          | 0.0000        | 0.0000     | OK         |
| 720 minute summer | Outlet    | 480         | 127.183   | 0.095     | 1.2          | 0.0000        | 0.0000     | OK         |
| 720 minute summer | 4-Orifice | 480         | 127.183   | 0.183     | 0.9          | 0.0291        | 0.0000     | SURCHARGED |
| 720 minute summer | 5         | 480         | 126.716   | 0.013     | 0.2          | 0.0020        | 0.0000     | OK         |
| 720 minute summer | 6         | 480         | 126.316   | 0.013     | 0.2          | 0.0020        | 0.0000     | OK         |
| 720 minute summer | SW03      | 480         | 126.031   | 0.012     | 0.2          | 0.0000        | 0.0000     | OK         |

| Link Event (Upstream Depth) | US Node   | Link              | DS Node   | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-----------------------------|-----------|-------------------|-----------|---------------|----------------|----------|---------------|--------------------|
| 15 minute summer            | 1         | 1.000             | 2         | 3.0           | 0.535          | 0.170    | 0.2027        |                    |
| 15 minute summer            | 2         | 1.001             | 3         | 5.8           | 0.810          | 0.329    | 0.0340        |                    |
| 15 minute summer            | 3         | 1.002             | Inlet     | 5.9           | 1.554          | 0.330    | 0.0327        |                    |
| 720 minute summer           | Inlet     | Flow through Pond | Outlet    | 1.2           | 0.009          | 0.002    | 6.7518        |                    |
| 720 minute summer           | Outlet    | 1.003             | 4-Orifice | 0.9           | 0.173          | 0.050    | 0.1289        |                    |
| 720 minute summer           | 4-Orifice | 1.004             | 5         | 0.2           | 0.358          | 0.014    | 0.0207        |                    |
| 720 minute summer           | 5         | 1.005             | 6         | 0.2           | 0.358          | 0.014    | 0.0278        |                    |
| 720 minute summer           | 6         | 1.006             | SW03      | 0.2           | 0.358          | 0.014    | 0.0198        | 11.7               |

**Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 99.31%**

| Node Event        | US Node   | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|-----------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute summer  | 1         | 10          | 127.675   | 0.075     | 9.0          | 0.0567        | 0.0000     | OK         |
| 15 minute summer  | 2         | 11          | 127.384   | 0.142     | 17.4         | 0.0628        | 0.0000     | OK         |
| 720 minute winter | 3         | 660         | 127.356   | 0.161     | 1.9          | 0.0256        | 0.0000     | SURCHARGED |
| 720 minute winter | Inlet     | 660         | 127.356   | 0.241     | 2.9          | 0.0000        | 0.0000     | OK         |
| 720 minute winter | Outlet    | 660         | 127.356   | 0.268     | 2.7          | 0.0000        | 0.0000     | SURCHARGED |
| 720 minute winter | 4-Orifice | 660         | 127.356   | 0.356     | 0.8          | 0.0565        | 0.0000     | SURCHARGED |
| 720 minute winter | 5         | 675         | 126.718   | 0.015     | 0.4          | 0.0023        | 0.0000     | OK         |
| 720 minute winter | 6         | 675         | 126.318   | 0.015     | 0.4          | 0.0023        | 0.0000     | OK         |
| 720 minute winter | SW03      | 675         | 126.033   | 0.015     | 0.4          | 0.0000        | 0.0000     | OK         |

| Link Event (Upstream Depth) | US Node   | Link              | DS Node   | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-----------------------------|-----------|-------------------|-----------|---------------|----------------|----------|---------------|--------------------|
| 15 minute summer            | 1         | 1.000             | 2         | 8.9           | 0.674          | 0.500    | 0.4636        |                    |
| 15 minute summer            | 2         | 1.001             | 3         | 17.0          | 1.056          | 0.959    | 0.0755        |                    |
| 720 minute winter           | 3         | 1.002             | Inlet     | 2.9           | 0.700          | 0.165    | 0.1412        |                    |
| 720 minute winter           | Inlet     | Flow through Pond | Outlet    | 2.7           | 0.007          | 0.003    | 21.2058       |                    |
| 720 minute winter           | Outlet    | 1.003             | 4-Orifice | 0.8           | 0.110          | 0.044    | 0.1547        |                    |
| 720 minute winter           | 4-Orifice | 1.004             | 5         | 0.4           | 0.397          | 0.020    | 0.0264        |                    |
| 720 minute winter           | 5         | 1.005             | 6         | 0.4           | 0.397          | 0.020    | 0.0355        |                    |
| 720 minute winter           | 6         | 1.006             | SW03      | 0.4           | 0.398          | 0.020    | 0.0253        | 15.9               |

**Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.27%**

| Node Event         | US Node   | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|--------------------|-----------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute summer   | 1         | 10          | 127.687   | 0.087     | 11.5         | 0.0660        | 0.0000     | OK         |
| 1440 minute summer | 2         | 1020        | 127.481   | 0.239     | 2.4          | 0.1054        | 0.0000     | SURCHARGED |
| 1440 minute summer | 3         | 1020        | 127.481   | 0.286     | 2.3          | 0.0455        | 0.0000     | SURCHARGED |
| 1440 minute summer | Inlet     | 1020        | 127.481   | 0.366     | 2.5          | 0.0000        | 0.0000     | OK         |
| 1440 minute summer | Outlet    | 1020        | 127.481   | 0.393     | 1.7          | 0.0000        | 0.0000     | SURCHARGED |
| 1440 minute summer | 4-Orifice | 1020        | 127.481   | 0.481     | 0.9          | 0.0764        | 0.0000     | SURCHARGED |
| 1440 minute summer | 5         | 1020        | 126.719   | 0.016     | 0.4          | 0.0025        | 0.0000     | OK         |
| 1440 minute summer | 6         | 1020        | 126.319   | 0.016     | 0.4          | 0.0025        | 0.0000     | OK         |
| 1440 minute summer | SW03      | 1020        | 126.034   | 0.016     | 0.4          | 0.0000        | 0.0000     | OK         |

| Link Event (Upstream Depth) | US Node   | Link              | DS Node   | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-----------------------------|-----------|-------------------|-----------|---------------|----------------|----------|---------------|--------------------|
| 15 minute summer            | 1         | 1.000             | 2         | 11.4          | 0.720          | 0.640    | 0.5043        |                    |
| 1440 minute summer          | 2         | 1.001             | 3         | 2.3           | 0.613          | 0.131    | 0.0829        |                    |
| 1440 minute summer          | 3         | 1.002             | Inlet     | 2.5           | 0.699          | 0.143    | 0.1412        |                    |
| 1440 minute summer          | Inlet     | Flow through Pond | Outlet    | 1.7           | 0.007          | 0.002    | 31.3527       |                    |
| 1440 minute summer          | Outlet    | 1.003             | 4-Orifice | 0.9           | 0.133          | 0.049    | 0.1547        |                    |
| 1440 minute summer          | 4-Orifice | 1.004             | 5         | 0.4           | 0.416          | 0.023    | 0.0294        |                    |
| 1440 minute summer          | 5         | 1.005             | 6         | 0.4           | 0.416          | 0.023    | 0.0396        |                    |
| 1440 minute summer          | 6         | 1.006             | SW03      | 0.4           | 0.417          | 0.023    | 0.0282        | 30.7               |