MWP

# Civil Utilities Planning Report

## Cloonmore Regeneration LRD, Tralee, Co. Kerry

**On behalf of Tulfarris CG Ltd.**

**August 2023**

# Contents



# Figures



# Appendices

| Project No. | Doc. No. | Rev. | Date | Prepared By | Checked By | Approved By | Status |
|---|---|---|---|---|---|---|---|
| 23824 | 6009 | A | 25/08/2023 | G. Fitzgerald<br>S Moriarty | IB | IB | Final |
| | | | | | | | |
| | | | | | | | |

MWP, Engineering and Environmental Consultants
Address: Park House, Bessboro Road, Blackrock, Cork, T12 X251
www.mwp.ie

# 1. Introduction

Malachy Walsh and Partners (MWP) were commissioned by Tulfarris CG Ltd., to provide a design for the civil utilities serving the site namely, stormwater, foul water, water supply and public lighting in connection with a planning application for proposed large residential development at Cloonmore Regeneration LRD, Tralee, Co. Kerry. This report outlines the engineering design proposals for the elements described above relating to the planning application. The proposed development consists of 147 residential units (129 apartments and 18 Townhouses), new vehicular and pedestrian access from the newly developed Cloonmore Avenue, pedestrian and cycle access only from Boherbee road, shared open spaces, landscaping, drainage and all associated site development works. The design has been completed so that the current phase can function independently as well as easily integrating with Phase 2 of the Ballymullen Clash Link Road with a potential future access to the development at the southeast subject to agreement with Kerry County Council.

# 2. Site Location

The site is located to the southeast of Austin Stack's Park and Boherbee roundabout. University Hospital Kerry is located to the southeast of the site. See Figure 2-1 below for an aerial image of the site.

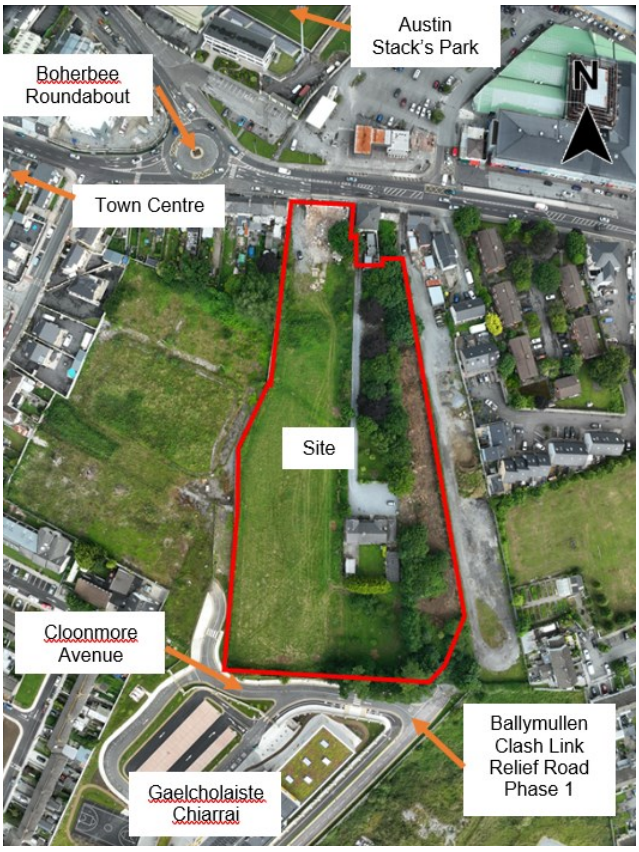



**Figure 2-1: Aerial Image of Site**

The site is relatively flat, levels on the site vary 8.116mOD on the east to 7.020mOD (AOD Above Ordnance Datum) on the west with the site slightly falling from east to west. The proposed site is currently part greenfield and

brownfield. The site area is approximately 1.55ha. The EPA records the presence of The Big River to the west of the site and the River Lee to the south of the site as shown in Figure 2-2. MWP were appointed to prepare a Civil Utilities Report with respect to this development.

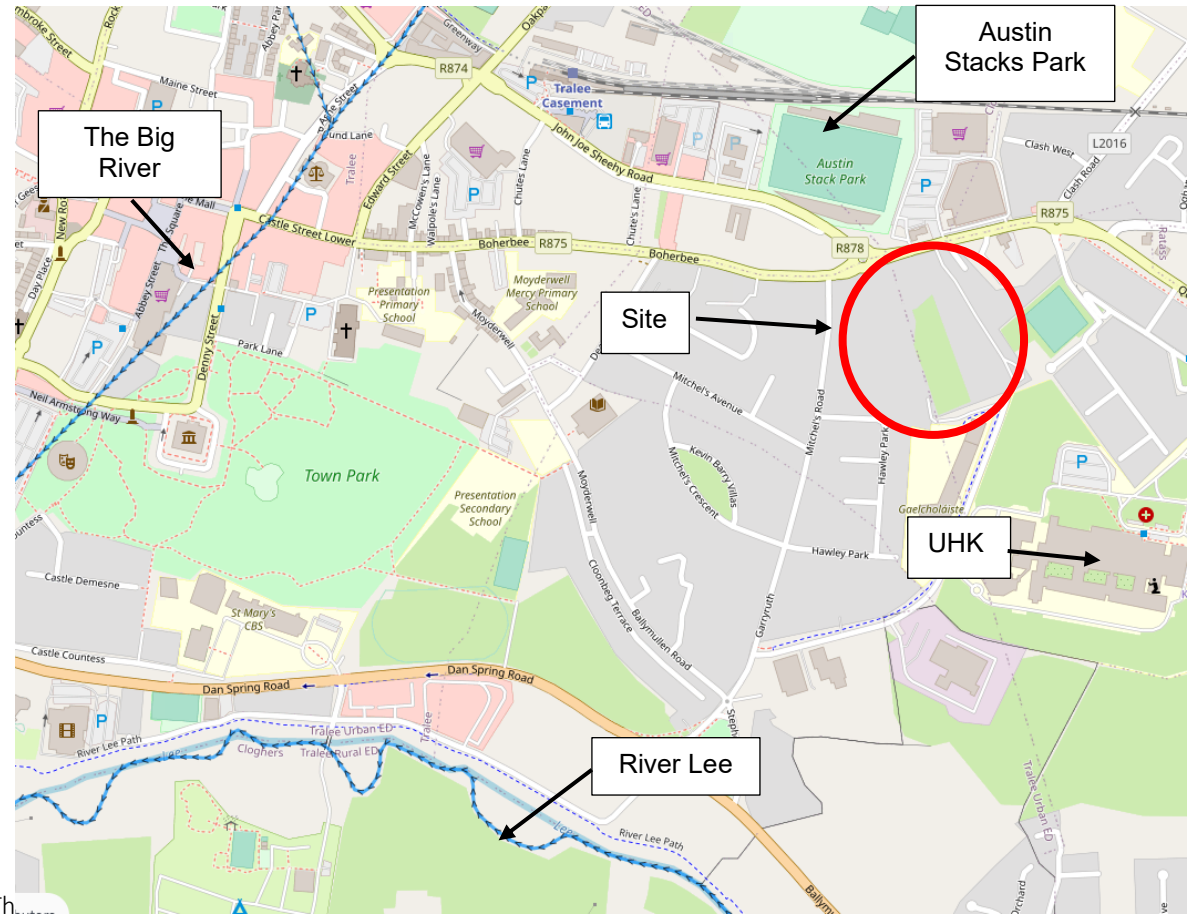



Figure 2-2: Water courses in vicinity of the site (EPA Maps)

## 3. Water Supply Proposals

A plan of the existing services present in the area is provided in the Confirmation of Feasibility (COF) shown in Appendix A. There is an existing connection to the site, but this is proposed to be replaced by the Works. There is an existing 150mm diameter uPVC watermains to the North of the site on the R875 Boherbee Road.

A Pre-connection enquiry was submitted to Irish Water for 145 residential units on the site. IW advised that connection is feasible subject to minor upgrades as per the COF attached in the Appendix A.

It is proposed to connect the proposed development to the existing watermains in the public road via a 150mm diameter connection. This connection will serve the residential units. A 150mm watermain is designed along the spine of the development. Branches of 110mm will serve routes with less than 100 residential units.

Refer to calculations in Appendix C for further information on predicted flow rates based on the Code of Practice by Irish Water. The proposed layout is shown in Appendix B.

# 4. Foul Water

The proposed development will be served by a gravity system which drains into the existing foul sewer network inside the western boundary of the site as per drawing 23824-MWP-00-00-DR-C-2100, attached in Appendix B.

Irish Water advised in their confirmation of feasibility for a 145-unit proposal that the connection is "feasible subject to upgrades (possibly)". No Upgrades identified at present, DAP for Tralee Town will be available early 2024 which may identify upgrades to the network."

A plan of the existing Irish Water services present in the area is provided in the COF attached in Appendix A. A 750mm diameter combined sewer is shown to pass through the site, the location of this sewer and manhole was confirmed on the topographical survey. A connection to this sewer will be made at a single point as shown. All details and designs will be in accordance with Irish Water Codes of Practice. A 5.0m wayleave is shown over this sewer along the full extents of the site. This sewer has influenced the design.

Calculations with predicted flow rates are shown in Appendix C using the Irish Water Code of Practice. The full Foul Water Design Report is attached in Appendix F.

# 5. Storm Water

As noted, there is an existing 750mm combined sewer running within the site boundary, and a 375mm pipe located along the R875 road to the north. Irish Water have stated in the COF attached in Appendix A that stormwater will not be accepted into this system from the proposed development. There are no immediate watercourses surrounding the site for discharge of storm water. Previous infiltration tests from December 2019 and recent testing in June 2023 show that the site has infiltration capacity. The infiltration testing results are attached in Appendix G.

Site investigations indicate subsoil's consist of sandy gravels to depth. These sandy gravels have been tested in accordance with BRE365, these tests indicate a high permeability K value up to $1.8x10^{-3}$ m/s. The results show good infiltration media indicating that infiltration on site is a viable method of removing surface water from the development. The infiltration testing is detailed in section 5.3.

A SuDS system with greater at source water quality characteristics is considered to be a more sustainable method of storm water control on this site. The permeability of the soil allows full infiltration to ground water. It is proposed to install a new storm water sewer system within the development. The design has been completed taking cognizance of the Greater Dublin Regional Code of Practice for Drainage Woks (GDSDS) and the CIRIA SUDS manual 2015.

The surface water drainage system will incorporate all hardstand areas including rainwater from the roofs of each of the apartment blocks and houses which will be discharged into a central carrier pipe located down the central spine corridor. Storm water runoff along the carriageway will be directed to a mixture of bioretention systems, tree pits and direct gully discharge. The system is designed to collect the stormwater runoff generated on the site and store it in underground cellular attenuation tanks, these tanks allow runoff to infiltrate naturally through the soil beneath and into the ground water.

## 5.1 Design Parameters

The storm and foul network for the site is designed using hydraulic modelling software WinDes Micro Drainage. Refer to Figure 5.1 for the parameters assumed for the Storm Network. All attenuation designs are based on the infiltration rates and locations highlighted in section 5.3. The M5-60 value 18.4 below is based on the rainfall return period data specific to the site location and is taken from the interactive map on WInDes. The ratio R value is calculated using the following formula:

R = M5 60 min/M5 2D

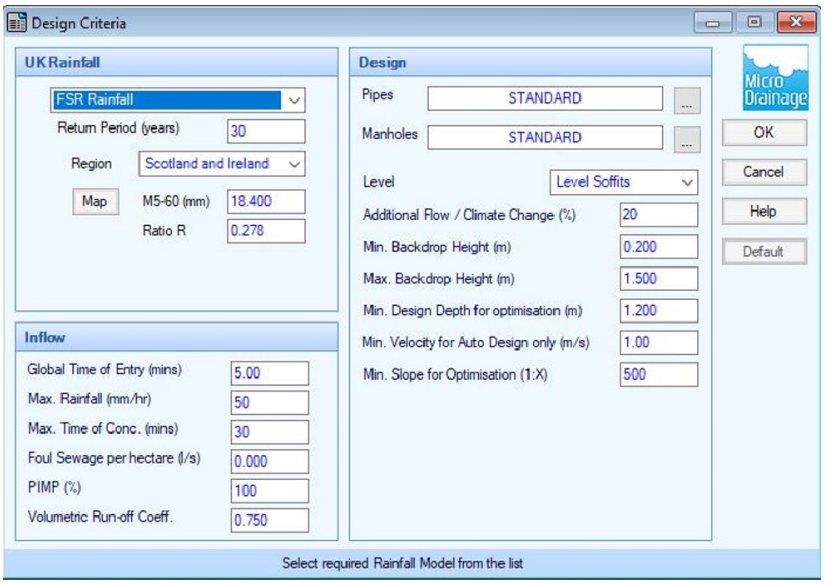



**Figure 5-1: Storm Water Design Parameters**

The storm drainage proposals incorporate the following elements;

- Sewers not surcharging in the 30-year event with 20% Climate Change
- Sewers not flooding in the 100-year event with 20% Climate Change.
- Class 1 Bypass Petrol Interceptors where runoff is collected from carriageway/parking areas.
- Sub-surface attenuation systems designed for storage of a 1 in 100-year storm plus 20% Climate Change.
- Interceptors (rain garden and tree pit) not taken into account in the 100 year event modelling.

The full Stormwater Design Report is attached in Appendix E. Surcharging can be seen occurring in the 30-year event. However, this is due to the attenuation systems working together and filling concurrently causing water to move upstream within the system. As can be seen by the flow/cap column of the pipe, the capacity of the pipes are greater than the predicted flow through them.

## 5.2 Suds Measures

The aim of these measures is to design the site drainage in a manner that mimics the natural drainage process for the site pre-development and reduce the impact of the development on the environment.

The SUDS measures selection process for this site were guided by the four pillars of SuDS which are Water Quantity, Water Quality, Biodiversity and Amenity. These prioritized the use of nature-based solutions with infiltration measures to promote groundwater discharge. This selection process took into account their practicability for use on the site and the constraints such as the topography and development layout so to create a SUDS Management Train.

The SUDS Management Train proposed for this site is evaluated the from the point where rain falls, through the conveyance network through to how it is discharged within the site. The following SUDS measures have been integrated into the drainage design.

### 5.2.1 Bioretention Systems/Rain Gardens

Rain gardens are a form of Bioretention system which allows runoff to collect on its surface before infiltrating through vegetation and underlying soils. An overflow system integrated within the rain gardens will ensure that any exceedance above the capacity of these will be diverted to the stormwater system.

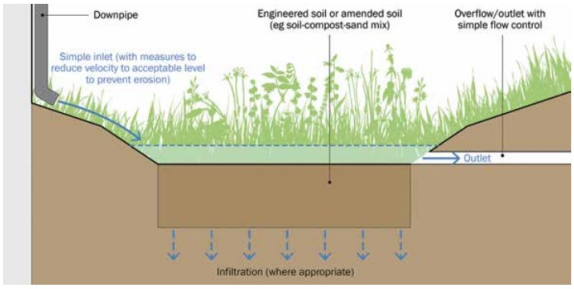



Figure 5-2 Raingarden with infiltration and overflow

The planting type chosen for within the rain garden be chosen that it includes the following characteristics;

- Suits the surrounding landscape
- Native species
- High drought tolerance
- Inundation tolerance
- Pollutant tolerance

All planting, backfilling and filter media will be in accordance with the recommendations of CIRIA C753.

### 5.2.2 Tree Pits

Tree pits have the ability to contribute to the storm water management strategy while also adding to the aesthetic value of the overall development. These can increase infiltration of the soil while also removing storm water through transpiration and interception.

Similar to the rain garden, it also provides an overflow to the piped collection system for exceedance events.

All planting, backfilling and filter media will be in accordance with the recommendations of CIRIA C753.

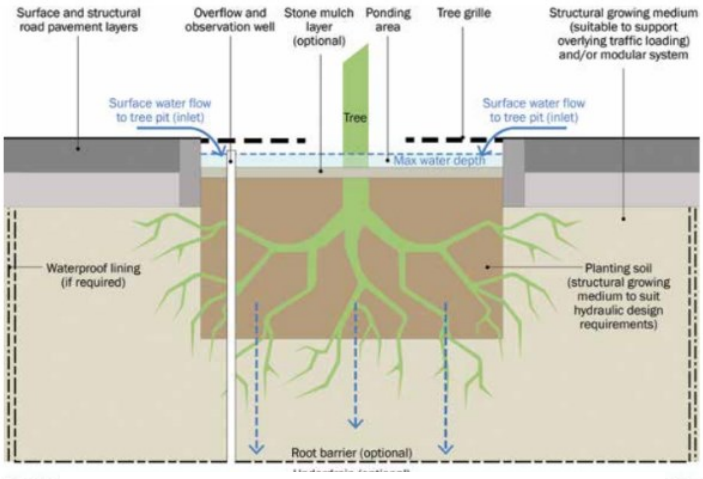



Figure 5-3 Tree Pit

### 5.2.3 Attenuation Storage Tanks

Cellular attenuation storage tanks have been chosen to maximise the allowable volume of water which can be stored on site, while also allowing infiltration to occur. The site will contain 6 separate tanks of varying volume which are hydraulically connected, allowing an extra safety measure in the event one isn't performing to its design capacity.

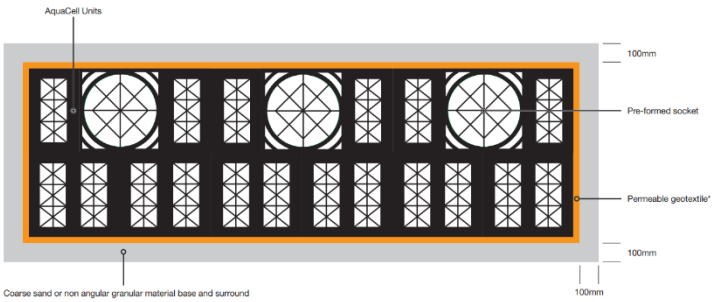



Figure 5-4 Attenuation Storage Tanks

Manholes immediately upstream and ownstream of the tanks will have catch pits in order to prevent silt building up within the tanks.

During soakaway testing pits encountered rock at a depth of 1.2 and 1.6m therefore attenuation tank invert levels will be limited to these depths. Attenuation tank systems require a minimum of 0.3m cover under landscaped areas. This gives a maximum allowable depth of storage of between 0.9 and 1.3m. This restriction in tank height means a larger surface area is required for storage.

Sizing of tanks are based on the 1 in 100 year storm event + 20% climate change factor. As a further conservative approach, any interception and infiltration occuring as a result of the use of bioretention systems and tree pits is disregarded in this event.

Infiltration rates have been designed based on the soakaway test results given in Appendix G.

## 5.3 BRE 365 Infiltration Testing

Infiltration Testing was carried out on the 15th of June 2023 by MWP. The testing was carried out in 3 of the proposed soakaway locations (see locations in yellow below). The 3 trial pits were filled with water and levels were taken at intervals. The following soil infiltration rates (m/s) were calculated in accordance with section 3.2 of the BRE 365 document. The infiltration calculations are attached in Appendix G.

Soakaway 1 = $6.9 \times 10^{-5}$ m/s

Soakaway 2 = $1.7 \times 10^{-5}$ m/s

Soakaway 3 = $1.8 \times 10^{-3}$ m/s

Infiltration testing was also carried out previously on this site on the 16th of December 2019 as part of a previous planning application. The soakaway tests were carried out on the western section of the site (see locations in red below). During the infiltration testing in December the site was noted as wet but subsoil conditions were dry. The winter infiltration rates are generally consistent with the summer results which indicates the site has suitable all year-round permeability. The following soil infiltration rates (m/s) were calculated in accordance with section 3.2 of the BRE 365 document. The infiltration calculations are attached in Appendix G.

Soakaway 4 = $3 \times 10^{-4}$ m/s

Soakaway 5 = $5.5 \times 10^{-5}$ m/s

Soakaway 6 = $7.5 \times 10^{-5}$ m/s

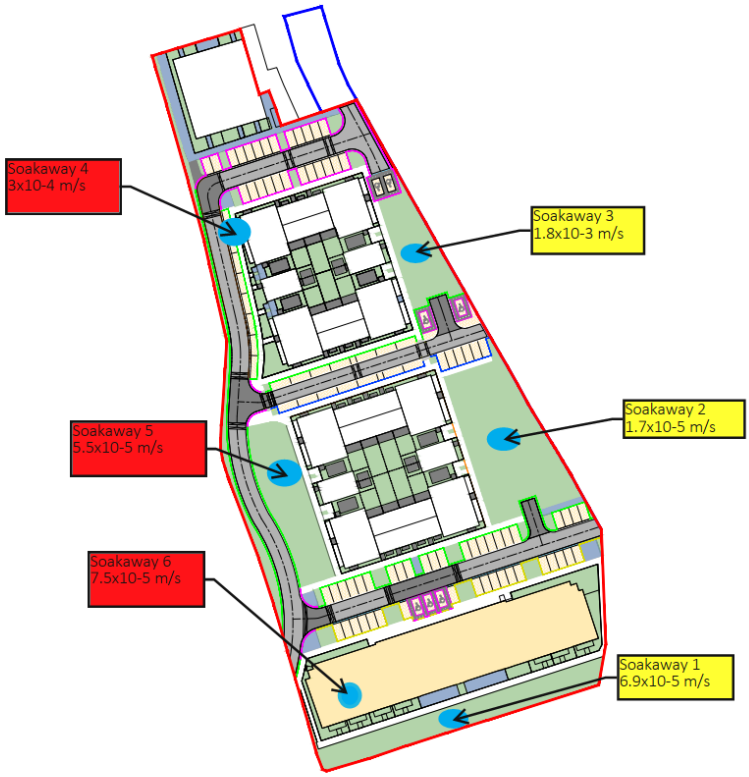



Figure 5-5: Infiltration Testing

# 6. Public Lighting

The public lighting scheme within the development was designed using the Philips LumiStreet Gen2Micro LED fittings mounted on 6m high galvanised steel columns. The scheme is designed to be a Class P3 and the lighting design complies with Kerry County Council public lighting policy. The Proposed Public Lighting Layout drawing for the site is in Appendix H.

# 7. Telecom and other Electrical services

The site will be serviced with an underground telecom network with ducting to each block of apartments. This will facilitate the installation of fibre optic services for each of the dwellings.

Television Services:

Each apartment block will have its own television distribution network and will be cabled to provide each apartment with the option of free-to-air and satellite subscription services. This will be done via a centralised television distribution hub and this will eliminate the need for each apartment to have individual satellite dishes.

ESB Services:

It is proposed to incorporate an ESB MV substation into the Block B apartment building. Separate underground ESB supplies will be routed from here to the other apartment buildings. All ESB services within the site will be underground.

Electric Vehicle (EV) Charging:

Ducting will be provided throughout the site to all carparking spaces to facilitate the installation of EV chargers. Information in relation to the proposed EV charging units has been provided in Appendix I.

# 8. Road Geometry

The vertical alignment of the roads within the site have been designed in accordance with the "DMURS" by the Department of Transport, Tourism and Sport and the Department of Housing, Planning and Local Government (2019). The gradients of side roads are limited to a maximum of 2% within 7m of a junction. A Stage 1 DMURS Access Road Safety Audit Report 23824-6005 has been carried out. All recommendations have been considered and the site layout has been updated accordingly as per the designers feedback form attached in the RSA Report. A Traffic and Transport Assessment (TTA) has also been carried out as required as required for submission to KCC. The findings show the proposed residential development would be sustainable on the basis of the existing Cloonmore Avenue and Ballymullen Clash Link Relief Road Phase 1. The future provision of Phase 2 of the Link Relief Road would not be warranted to sustain the proposed residential development, on the basis of the foregoing Assessment. Please refer to report 23824-6004-TTA for the full Traffic and Transport Assessment details.

The internal road layout of the estate has been subjected to a swept path analysis of a bin lorry and a fire engine. These drawings are included in Appendix J. This analysis demonstrates how the internal site layout permits the movement of these vehicles around it given the low design speeds and residential nature of the site.

# Appendix A

## Confirmation of Feasibility

# CONFIRMATION OF FEASIBILITY

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

Gearoid Fitzgerald

Reen Point
Blennerville
Tralee
Kerry
V92X2TK

29 May 2023

**Our Ref: CDS23003080 Pre-Connection Enquiry**
**Cloon Moore, ,, Tralee, Kerry**

Dear Applicant/Agent,

## We have completed the review of the Pre-Connection Enquiry.

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 145 unit(s) at Cloon Moore, ,, Tralee, Kerry, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection**
  - Feasible Subject to upgrades
  - In order to connect the proposed development an upgrade of the 100mm pipe to a 200mm is required up stream of the development (approximately 30m).
- **Wastewater Connection**
  - Feasible Subject to upgrades (Possibly)
  - No Stormwater will be accepted into the Wastewater Network, applicant to show at application stage how they intend to deal with Stormwater.
  - No Upgrades identified at present, DAP for Tralee Town will be available early 2024 which may identify upgrades to the network.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before the Development can be connected to

our network(s) you must submit a connection application and be granted and sign a connection agreement with Irish Water.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

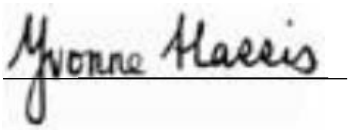
## Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Irish Water's Network(s)

**This letter is issued to provide information about the current feasibility of the proposed connection(s) to Irish Water's network(s). This is not a connection offer and capacity in Irish Water's network(s) may only be secured by entering into a connection agreement with Irish Water.**

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



**Yvonne Harris**
**Head of Customer Operations**

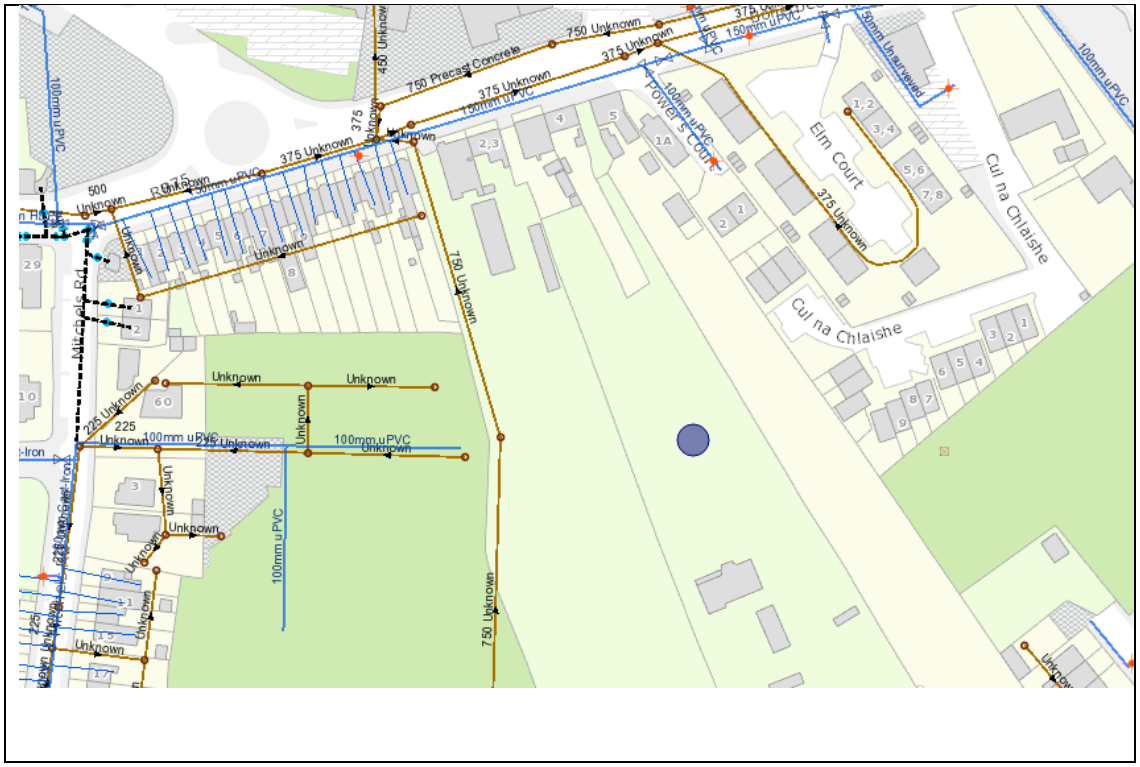
## Section A - What is important to know?

| What is important to know? | Why is this important? |
|---|---|
| **Do you need a contract to connect?** | • Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Irish Water's network(s).<br>• Before the Development can connect to Irish Water's network(s), you must submit a connection application and be granted and sign a connection agreement with Irish Water. |
| **When should I submit a Connection Application?** | • A connection application should only be submitted after planning permission has been granted. |
| **Where can I find information on connection charges?** | • Irish Water connection charges can be found at: https://www.water.ie/connections/information/charges/ |
| **Who will carry out the connection work?** | • All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*.<br>*Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works |
| **Fire flow Requirements** | • The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine.<br>• **What to do?** - Contact the relevant Local Fire Authority |
| **Plan for disposal of storm water** | • The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters.<br>• **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges. |
| **Where do I find details of Irish Water's network(s)?** | • Requests for maps showing Irish Water's network(s) can be submitted to: datarequests@water.ie |

| | |
|---|---|
| **What are the design requirements for the connection(s)?** | • The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Irish Water Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections |
| **Trade Effluent Licensing** | • Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended).<br>• More information and an application form for a Trade Effluent License can be found at the following link:<br>https://www.water.ie/business/trade-effluent/about/<br><br>**trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended) |

## Section B – Details of Irish Water's Network(s)

**The map included below outlines the current Irish Water infrastructure adjacent the Development:** To access Irish Water Maps email datarequests@water.ie



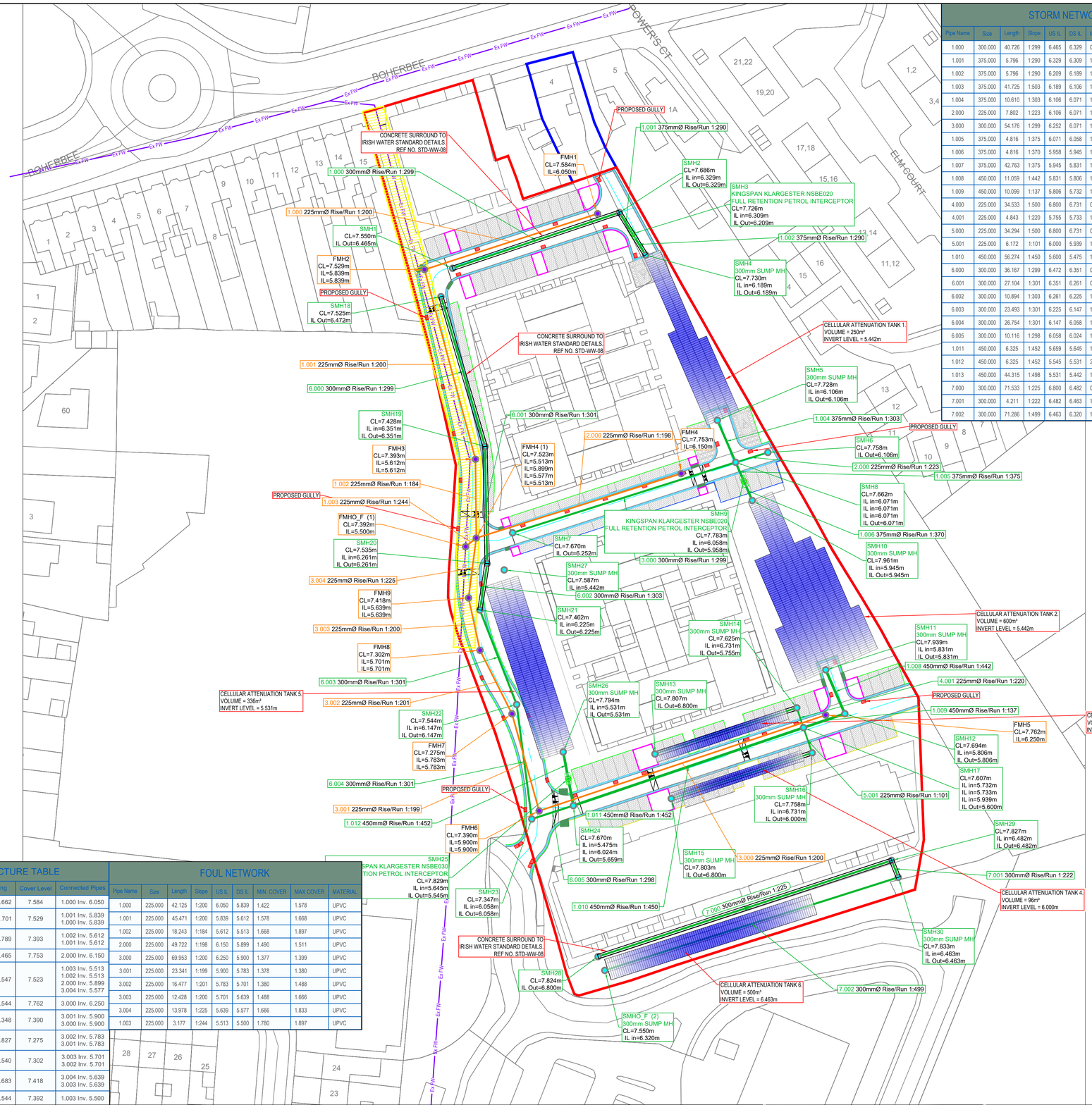

Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

**Note:** The information provided on the included maps as to the position of Irish Water's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Irish Water.

Whilst every care has been taken in respect of the information on Irish Water's network(s), Irish Water assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Irish Water's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Irish Water's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

# Appendix B

## Proposed Storm, Foul and Watermain Layout




## STORM NETWORK

| Pipe Name | Size | Length | Slope | US IL | DS IL | MIN. COVER | MAX COVER | MATERIAL |
|---|---|---|---|---|---|---|---|---|
| 1.000 | 300.000 | 40.726 | 1:299 | 6.465 | 6.329 | 0.935 | 1.207 | UPVC |
| 1.001 | 375.000 | 5.796 | 1:290 | 6.329 | 6.309 | 1.170 | 1.230 | UPVC |
| 1.002 | 375.000 | 5.796 | 1:290 | 6.209 | 6.189 | 1.330 | 1.354 | UPVC |
| 1.003 | 375.000 | 41.725 | 1:503 | 6.189 | 6.106 | 1.354 | 1.434 | UPVC |
| 1.004 | 375.000 | 10.610 | 1:303 | 6.106 | 6.071 | 1.404 | 1.434 | UPVC |
| 2.000 | 225.000 | 7.802 | 1:223 | 6.106 | 6.071 | 1.478 | 1.540 | UPVC |
| 3.000 | 300.000 | 54.176 | 1:299 | 6.252 | 6.071 | 1.268 | 1.441 | UPVC |
| 1.005 | 375.000 | 4.816 | 1:375 | 6.071 | 6.058 | 1.404 | 1.537 | UPVC |
| 1.006 | 375.000 | 4.816 | 1:370 | 5.958 | 5.945 | 1.638 | 1.828 | UPVC |
| 1.007 | 375.000 | 42.763 | 1:375 | 5.945 | 5.831 | 1.828 | 1.920 | UPVC |
| 1.008 | 450.000 | 11.059 | 1:442 | 5.831 | 5.806 | 1.663 | 1.883 | UPVC |
| 1.009 | 450.000 | 10.099 | 1:137 | 5.806 | 5.732 | 1.650 | 1.663 | UPVC |
| 4.000 | 225.000 | 34.533 | 1:500 | 6.800 | 6.731 | 0.782 | 0.895 | UPVC |
| 4.001 | 225.000 | 4.843 | 1:220 | 5.755 | 5.733 | 1.758 | 1.762 | UPVC |
| 5.000 | 225.000 | 34.294 | 1:500 | 6.800 | 6.731 | 0.890 | 0.914 | UPVC |
| 5.001 | 225.000 | 6.172 | 1:101 | 6.000 | 5.939 | 1.556 | 1.646 | UPVC |
| 1.010 | 450.000 | 56.274 | 1:450 | 5.600 | 5.475 | 1.782 | 2.057 | UPVC |
| 6.000 | 300.000 | 36.167 | 1:299 | 6.472 | 6.351 | 0.903 | 0.927 | UPVC |
| 6.001 | 300.000 | 27.104 | 1:301 | 6.351 | 6.261 | 0.927 | 1.124 | UPVC |
| 6.002 | 300.000 | 10.894 | 1:303 | 6.261 | 6.225 | 1.087 | 1.124 | UPVC |
| 6.003 | 300.000 | 23.493 | 1:301 | 6.225 | 6.147 | 1.087 | 1.247 | UPVC |
| 6.004 | 300.000 | 26.754 | 1:301 | 6.147 | 6.058 | 1.139 | 1.247 | UPVC |
| 6.005 | 300.000 | 10.116 | 1:298 | 6.058 | 6.024 | 1.139 | 1.496 | UPVC |
| 1.011 | 450.000 | 6.325 | 1:452 | 5.659 | 5.645 | 1.786 | 1.959 | UPVC |
| 1.012 | 450.000 | 6.325 | 1:452 | 5.545 | 5.531 | 2.038 | 2.059 | UPVC |
| 1.013 | 450.000 | 44.315 | 1:498 | 5.531 | 5.442 | 1.872 | 2.038 | UPVC |
| 7.000 | 300.000 | 71.533 | 1:225 | 6.800 | 6.482 | 0.642 | 1.195 | UPVC |
| 7.001 | 300.000 | 4.211 | 1:222 | 6.482 | 6.463 | 1.195 | 1.220 | UPVC |
| 7.002 | 300.000 | 71.286 | 1:499 | 6.463 | 6.320 | 1.080 | 1.220 | UPVC |

## STORM STRUCTURE TABLE

| Structure Name | Easting | Northing | Cover Level | Connected Pipes |
|---|---|---|---|---|
| SMH1 | 484523.493 | 614326.018 | 7.550 | 1.000 Inv. 6.465 |
| SMH2 | 484562.113 | 614338.942 | 7.686 | 1.001 Inv. 6.329<br>1.000 Inv. 6.329 |
| SMH3 | 484565.158 | 614334.011 | 7.726 | 1.002 Inv. 6.209<br>1.001 Inv. 6.309 |
| SMH4 | 484568.204 | 614329.080 | 7.730 | 1.003 Inv. 6.189<br>1.002 Inv. 6.189 |
| SMH5 | 484584.822 | 614290.808 | 7.728 | 1.004 Inv. 6.106<br>1.003 Inv. 6.106 |
| SMH6 | 484596.506 | 614283.367 | 7.758 | 2.000 Inv. 6.106 |
| SMH7 | 484537.386 | 614264.762 | 7.670 | 3.000 Inv. 6.252 |
| SMH8 | 484589.048 | 614281.076 | 7.662 | 1.005 Inv. 6.071<br>1.004 Inv. 6.071<br>2.000 Inv. 6.071<br>3.000 Inv. 6.071 |
| SMH9 | 484590.967 | 614276.658 | 7.783 | 1.006 Inv. 5.958<br>1.005 Inv. 6.058 |
| SMH10 | 484592.885 | 614272.240 | 7.961 | 1.007 Inv. 5.945<br>1.006 Inv. 5.945 |
| SMH11 | 484609.917 | 614233.015 | 7.939 | 1.008 Inv. 5.831<br>1.007 Inv. 5.831 |
| SMH12 | 484614.322 | 614222.871 | 7.694 | 1.009 Inv. 5.806<br>1.008 Inv. 5.806 |
| SMH13 | 484570.357 | 614213.534 | 7.807 | 4.000 Inv. 6.800 |
| SMH14 | 484603.196 | 614224.215 | 7.625 | 4.001 Inv. 5.755<br>4.000 Inv. 6.731 |
| SMH15 | 484574.138 | 614203.193 | 7.803 | 5.000 Inv. 6.800 |
| SMH16 | 484606.753 | 614213.789 | 7.758 | 5.001 Inv. 6.000<br>5.000 Inv. 6.731 |
| SMH17 | 484604.758 | 614219.630 | 7.607 | 1.010 Inv. 5.600<br>1.009 Inv. 5.732<br>4.001 Inv. 5.733<br>5.001 Inv. 5.939 |
| SMH18 | 484520.813 | 614319.443 | 7.525 | 6.000 Inv. 6.472 |
| SMH19 | 484531.018 | 614284.746 | 7.428 | 6.001 Inv. 6.351<br>6.000 Inv. 6.351 |
| SMH20 | 484531.504 | 614257.646 | 7.535 | 6.002 Inv. 6.261<br>6.001 Inv. 6.261 |
| SMH21 | 484529.816 | 614246.884 | 7.462 | 6.003 Inv. 6.225<br>6.002 Inv. 6.225 |
| SMH22 | 484538.337 | 614224.991 | 7.544 | 6.004 Inv. 6.147<br>6.003 Inv. 6.147 |
| SMH23 | 484541.833 | 614198.466 | 7.347 | 6.005 Inv. 6.058<br>6.004 Inv. 6.058 |
| SMH24 | 484551.461 | 614201.570 | 7.670 | 1.011 Inv. 5.659<br>1.010 Inv. 5.475<br>6.005 Inv. 6.024 |
| SMH25 | 484550.288 | 614207.786 | 7.829 | 1.012 Inv. 5.545<br>1.011 Inv. 5.645 |
| SMH26 | 484549.115 | 614214.002 | 7.794 | 1.013 Inv. 5.531<br>1.012 Inv. 5.531 |
| SMH27 | 484535.456 | 614256.159 | 7.587 | 1.013 Inv. 5.442 |
| SMH28 | 484557.187 | 614166.615 | 7.824 | 7.000 Inv. 6.800 |
| SMH29 | 484625.167 | 614188.880 | 7.827 | 7.001 Inv. 6.482<br>7.000 Inv. 6.482 |
| SMH30 | 484626.702 | 614184.959 | 7.833 | 7.002 Inv. 6.463<br>7.001 Inv. 6.463 |
| SMHO_F (2) | 484558.750 | 614163.416 | 7.550 | 7.002 Inv. 6.320 |

## FOUL STRUCTURE TABLE

| Name | Easting | Northing | Cover Level | Connected Pipes |
|---|---|---|---|---|
| FMH1 | 484557.081 | 614338.662 | 7.584 | 1.000 Inv. 6.050 |
| FMH2 | 484517.000 | 614325.701 | 7.529 | 1.001 Inv. 5.839<br>1.000 Inv. 5.839 |
| FMH3 | 484528.802 | 614281.789 | 7.393 | 1.002 Inv. 5.612<br>1.001 Inv. 5.612 |
| FMH4 | 484576.412 | 614278.465 | 7.753 | 2.000 Inv. 6.150 |
| FMH4 (1) | 484528.981 | 614263.547 | 7.523 | 1.003 Inv. 5.513<br>1.002 Inv. 5.513<br>2.000 Inv. 5.899<br>3.004 Inv. 5.577 |
| FMH5 | 484609.880 | 614222.544 | 7.762 | 3.000 Inv. 6.250 |
| FMH6 | 484543.542 | 614200.348 | 7.390 | 3.001 Inv. 5.900<br>3.000 Inv. 5.900 |
| FMH7 | 484537.258 | 614222.827 | 7.275 | 3.002 Inv. 5.783<br>3.001 Inv. 5.783 |
| FMH8 | 484529.840 | 614237.540 | 7.302 | 3.003 Inv. 5.701<br>3.002 Inv. 5.701 |
| FMH9 | 484527.197 | 614249.683 | 7.418 | 3.004 Inv. 5.639<br>3.003 Inv. 5.639 |
| FMHO_F (1) | 484526.516 | 614261.544 | 7.392 | 1.003 Inv. 5.500 |

## FOUL NETWORK

| Pipe Name | Size | Length | Slope | US IL | DS IL | MIN. COVER | MAX COVER | MATERIAL |
|---|---|---|---|---|---|---|---|---|
| 1.000 | 225.000 | 42.125 | 1:200 | 6.050 | 5.839 | 1.422 | 1.578 | UPVC |
| 1.001 | 225.000 | 45.471 | 1:200 | 5.839 | 5.612 | 1.578 | 1.668 | UPVC |
| 1.002 | 225.000 | 18.243 | 1:184 | 5.612 | 5.513 | 1.668 | 1.897 | UPVC |
| 2.000 | 225.000 | 49.722 | 1:198 | 6.150 | 5.899 | 1.490 | 1.511 | UPVC |
| 3.000 | 225.000 | 69.953 | 1:200 | 6.250 | 5.900 | 1.377 | 1.399 | UPVC |
| 3.001 | 225.000 | 23.341 | 1:199 | 5.900 | 5.783 | 1.378 | 1.380 | UPVC |
| 3.002 | 225.000 | 16.477 | 1:201 | 5.783 | 5.701 | 1.380 | 1.488 | UPVC |
| 3.003 | 225.000 | 12.428 | 1:200 | 5.701 | 5.639 | 1.488 | 1.666 | UPVC |
| 3.004 | 225.000 | 13.978 | 1:225 | 5.639 | 5.577 | 1.666 | 1.833 | UPVC |
| 1.003 | 225.000 | 3.177 | 1:244 | 5.513 | 5.500 | 1.780 | 1.897 | UPVC |

## NOTES

GENERAL NOTES

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER
3. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE
4. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM.
5. DRAWINGS ARE NOT TO BE SCALED

LEGEND

- SITE BOUNDARY
- SITE OWNERSHIP BOUNDARY
- PROPOSED FOUL DRAIN
- PROPOSED FOUL MANHOLE
- PROPOSED STORM DRAIN
- PROPOSED STORM MANHOLE
- EXISTING COMBINED DRAIN
- PROPOSED ATTENUATION TANK
- PROPOSED PETROL INTERCEPTOR
- WAYLEAVE
- PROPOSED GULLY
- PROPOSED BIORETENTION RAIN GARDEN

**NOTE**

ALL ATTENUATION SYSTEMS ARE CONNECTED TO ENHANCE INFILTRATION POTENTIAL TO ALL ELEVATIONS AND RETURN PERIOD

**NOTE**

FOR BIORETENTION RAIN GARDEN DETAILS REFER TO DRAWING 23824-MWP-00-00-DR-C-2105

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 10.08.23 | ISSUED FOR INFORMATION | R.H | I.B |

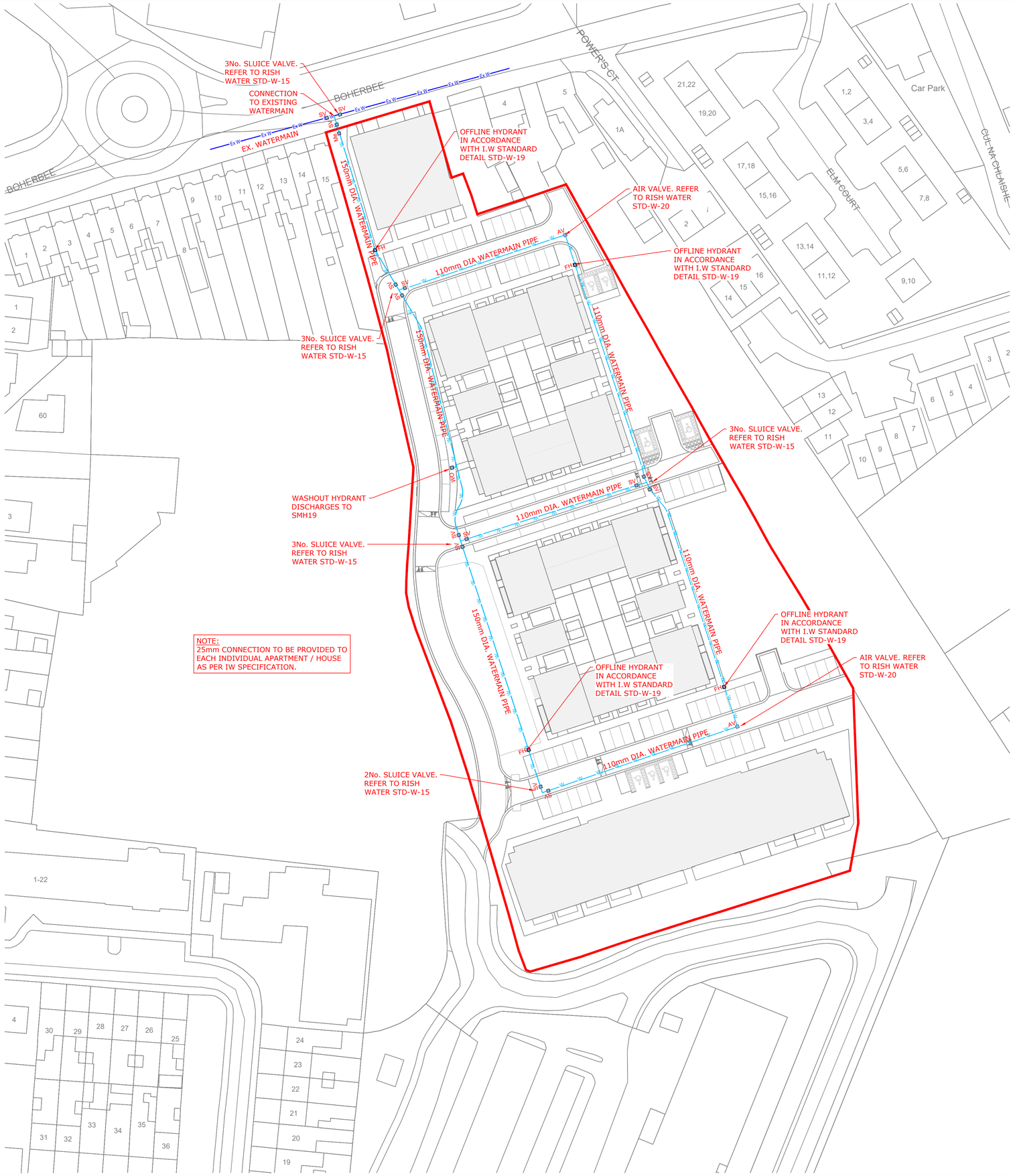
MWP
ENGINEERING AND ENVIRONMENTAL CONSULTANTS
CORK | TRALEE | LONDON | LIMERICK
mwp.ie

PROJECT: CLOONMORE REGENERATION LRD, TRALEE, Co.KERRY

CLIENT: TULFARRIS CG LTD

TITLE: PROPOSED COMBINED DRAINAGE LAYOUT

| DRAWN: | CHECKED: | APPROVED: |
|---|---|---|
| RH | GF | IB |
| PROJECT NUMBER: 23824 | DATE: 10/08/2023 | SCALE @ A1: 1:500 |
| STATUS DESCRIPTION: FOR INFORMATION | | STATUS: S2 |
| DRAWING NUMBER: 23824 - MWP - 00 - 00 - DR - C - 2100 | | REV: P01 |




PROPOSED WATERMAIN LAYOUT
SCALE: 1:500

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
3. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.
4. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM.
5. DRAWINGS ARE NOT TO BE SCALED.

WATERMAIN LEGEND:

- Ex W — Ex W — EXISTING WATERMAIN
- W — W — W — NEW 150mm DIA WATERMAIN PIPE (UNO)
- W — W — W — NEW 110mm DIA WATERMAIN PIPE (UNO)
- FH — IRISH WATER APPROVED FIRE HYDRANT
- WO — IRISH WATER APPROVED WASHOUT HYDRANT
- SV — IRISH WATER APPROVED SLUICE VALVE
- AV — IRISH WATER APPROVED AIR VALVE
- Me — IRISH WATER APPROVED METER

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 25-08-23 | ISSUE FOR PLANNING | O.B. | I.B. |

PROJECT:
CLOONMOORE REGENERATION LRD,
TRALEE, Co. KERRY.

TITLE:
WATERMAIN LAYOUT

CLIENT:
TULFARRIS CG LTD

MWP
ENGINEERING AND ENVIRONMENTAL CONSULTANTS
CORK | TRALEE | LONDON | LIMERICK
mwp.ie

| DRAWN: | CHECKED: | APPROVED: |
|---|---|---|
| O.B. | G.F. | I.B. |
| PROJECT NUMBER: | DATE: | SCALE @ A1: |
| 23824 | 25/08/2023 | 1:500 |

STATUS DESCRIPTION: FOR INFORMATION — STATUS: S2

DRAWING NUMBER: 23824 - MWP - 00 - 00 - DR - C - 2104 — REV: P01

# Appendix C

## Water Mains and Foul Calculations for the site

# Irish Water Preconnection Application Form Calculations

**Site Details**

Address: Cloonmore, Co. Kerry

Calculations based on current phase only.

**Watermains**

Occupancy Levels

| | No. | Occupancy | Total | |
|---|---|---|---|---|
| Number of Houses | 145 | 2.7 | 391.5 | Persons |
| | | | 392 | Persons |

2.7 Assumed Occupancy Level
Source: Irish Water Code of Practice for Water

| | | |
|---|---|---|
| Average Usage | 58800 | l/day |
| | 0.681 | l/s |
| Average Day/ Peak Week Demand | 0.851 | l/s |
| Peak Demand | 4.253 | l/s |

Average Daily usage 150 l/person/day

1.25 times average daily domestic demand
5 times average day/peak week demand
Source: Irish Water Code of Practice for Water

**Wastewater**

Hydraulic Load

| | | |
|---|---|---|
| Dry Weather Flow | 64670 | l/day |
| | 0.748 | l/s |
| Design Foul Flow | 4.491 | l/s |

Dry Weather Flow 446 l/dwelling/day
Source: Irish Water Code of Practice for Wastewater
Domestic Wastwater peak factor 6
Source: Irish Water Code of Practice for Wastewater

Surface Water Allowance

| | | |
|---|---|---|
| Gross Site Area | 1.55 | ha |
| Catchment Area | 0.023 | ha |
| Intensity | 8 | mm/hr |
| Volumetric Runoff Coefficent Cv | 0.9 | - |
| | 1.300 | - |
| Flow | 0.605 | l/s |

| | | |
|---|---|---|
| Design Flow | 5.096 | l/s |

Buildings, Hardstanding and grass. Area from Architect
1.5% of Gross Site Area
Slopes less than 2% present and 100% AEP event

# Appendix D

## Maintenance Plan and Schedule for Storm Drainage Infrastructure

MWP

# Maintenance Plan and Schedule for Storm Drainage Infrastructure

## Cloonmore Regeneration LRD, Tralee, Co. Kerry

**On behalf of Tulfarris CG Ltd.**

**August 2023**

# Contents



# Figures



# Appendices

| Project No. | Doc. No. | Rev. | Date | Prepared By | Checked By | Approved By | Status |
|---|---|---|---|---|---|---|---|
| 23824 | 6010 | A | 10/08/2022 | G Fitzgerald<br>A O Donnell | IB | IB | Final |
| | | | | | | | |
| | | | | | | | |

MWP, Engineering and Environmental Consultants
Address: Park House, Bessboro Road, Blackrock, Cork, T12 X251
www.mwp.ie

# 1. Introduction

MWP were commissioned by Tulfarris CG Ltd. to provide a design for the civil utilities serving the site namely, stormwater, foul water, public lighting, and water supply in connection with a planning application for proposed Residential Development at Cloonmore, Tralee, Co. Kerry. The document outlines the design intent for the plan and schedule for the future maintenance of the site drainage infrastructure to mitigate against the risk of flooding on the public road and the site in the interest of amenity and traffic safety.

## 1.1 Location and Proposed Development

The site is located to the south of Austin Stack's Park and within the townland of Boherbee to the east of Tralee Town Center. University Hospital Kerry is located to the southwest of the site. See Figure 1-1 below for an aerial image of the site. The site is relatively flat, levels on the site vary 8.116mOD on the east to 7.020mOD (AOD Above Ordnance Datum) on the west with the site generally falling from east to west. The proposed development is currently predominantly a greenfield site. The site area is approximately 1.55ha. The site is located to the east of Tralee town centre. The figure below shows the proposed site within the land parcel. MWP were appointed to prepare a maintenance plan and schedule with respect to this development.

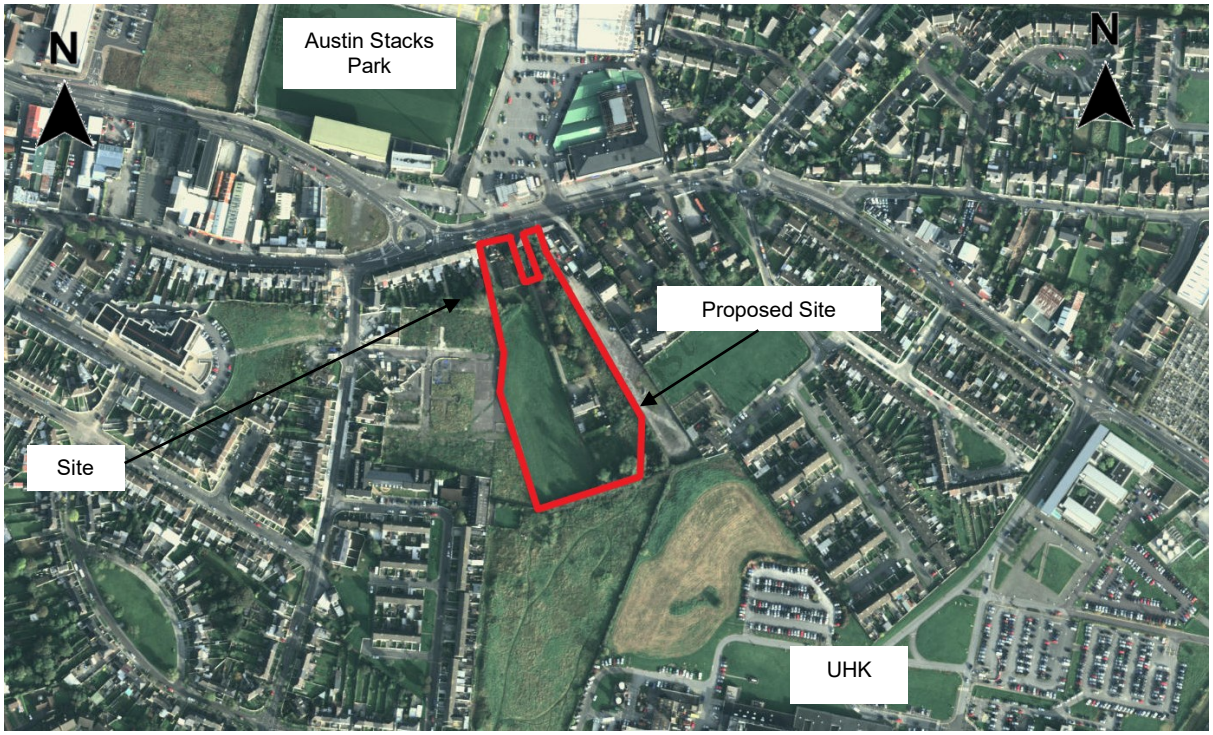



**Figure 1-1: Aerial Image of Proposed Site**

# 2. Recommended Maintenance

All elements of the drainage system should be inspected following a major storm event. Maintenance should be carrying out in tandem with the specification outlined by the manufacturer and be conducted to whichever is the most onerous. When carrying out maintenance, it is essential that a record of inspection and maintenance on all elements is kept and updated when required. A proposed template to record the maintenance and inspections conducted on the site can be found in Appendix A. Product sheets for the critical elements for the storm sewer are provided in Appendix B.

## 2.1 Storm Drains

It is recommended all storm drains are cleaned every 6 months. Further recommendation is shown below:

| Maintenance Schedule | Required Action | Typical Frequency |
|---|---|---|
| Routine Maintenance | Inspection | Monthly |
| | Litter/debris removal | Monthly or as required |
| Occasional Maintenance | Sediment removal – silt build-up should be removed | Every 6 months |
| Remedial Maintenance | Repair (as a result of damage or vandalism) | As required |

## 2.2 Kingspan Klargester Bypass Separators

Kingspan Klargester recommends checking the oil levels after the first 3 months. This will give an indication on when the separators should be maintained.

## 2.3 Operation & Maintenance requirements for attenuation storage tanks as per CIRIA C753 – SuDS Manual 2015 & Wavin Aquacell O&M Manual

| Maintenance Schedule | Required Action | Typical Frequency |
|---|---|---|
| Regular Maintenance | Inspect and identify areas that are not operating correctly. Take action where required | Monthly for 3 months. Yearly thereafter. |
| | Remove debris from catchment surface. (where it may cause risk to performance.) | Monthly |
| | For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary. | Annually |
| | Remove sediment from pre-treatment structures, isolation rows, and/ or internal forebays | Annually, or as required |
| Remedial Maintenance | Repair/rehabilitate inlets, outlet, overflows and vents | As required. |

| | | |
|---|---|---|
| Monitoring | Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed | Annually & following large storms |
| | Survey inside of system for sediment build-up and remove if necessary | Every 6 months or as required. |

## 2.4 Operation & Maintenance requirements for silt traps as per CIRIA C753 – SuDS Manual 2015

| Maintenance Schedule | Required Action | Typical Frequency |
|---|---|---|
| Routine Maintenance | Inspection | Monthly |
| | Litter/debris removal | Monthly or as required |
| Occasional Maintenance | Sediment removal – silt stores should be emptied | Every 6 months |
| Remedial Maintenance | Repair (as a result of damage or vandalism) | As required |

## 2.5 Operation & Maintenance requirements for hydro brakes as per CIRIA C753 – SuDS Manual 2015

Maintenance should be carrying out in tandem with the specification outlined by the manufacturer. As a general guide, the following requirements should be met:

| Maintenance Schedule | Required Action | Typical Frequency |
|---|---|---|
| Routine Maintenance | Inspection | Monthly |
| | Litter/debris removal | Monthly or as required |
| Occasional Maintenance | Sediment removal – silt stores should be emptied | Every 6 months |
| Remedial Maintenance | Repair (as a result of damage or vandalism) | As required |

## 2.6 External drainage system – Drainage adjacent to road

The drainage system should be inspected regularly to coincide with the aforementioned specification. A general guideline is shown below:

| Maintenance Schedule | Required Action | Typical Frequency |
|---|---|---|
| Routine Maintenance | Inspection | Monthly |
| | Litter/debris removal | Monthly or as required |
| Occasional Maintenance | Sediment removal – silt stores should be emptied | Every 6 months |
| Remedial Maintenance | Repair (as a result of damage or vandalism) | As required |

# Appendix A

## Proposed Maintenance and Inspection Schedule Record Sheet

| Date | Item Inspected/ Maintained | Inspection/ Maintenance Type | Comment on condition of Item prior to the Works and detail of what works were performed | Inspected/Maintained by: |
|---|---|---|---|---|
| | | | | |
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# Appendix B

## Product Data Sheets

# 015319
NSBE010-NSBE125 Class 1 Bypass Separator
Installation & Maintenance Guidelines

Kingspan Environmental Service Contact Numbers:

GB: 0844 846 0500
NI: 028 3025 4077
IRL: 048 3025 4077

## Enclosed Documents

| | |
|---|---|
| **DS1155** | **NSBE010-NSBE030 Class 1 Bypass Separators** |
| **DS1254** | **NSBE036 Class 1 Bypass Separator** |
| **DS1224** | **NSBE040 & NSBE050 Class 1 Bypass Separators** |
| **DS1225** | **NSBE075-NSBE125 Class 1 Bypass Separators** |

| Issue | Description | Date |
|---|---|---|
| 04 | CC1180 Introduction of NSBE036 | May 2014 |

# HEALTH & SAFETY

**These warnings are provided in the interest of safety. You must read them carefully before installing or using the equipment.**

It is important that this document is retained with the equipment for future reference. Should the equipment be transferred to a new owner, always ensure that all relevant documents are supplied in order that the new owner can be acquainted with the functioning of the equipment and the relevant warnings.

Installation should only be carried out by a suitably experienced contractor, following these guidelines.

We recommend the use of a dust mask and gloves when cutting GRP components.

Electrical work should be carried out by a qualified electrician.

Contaminated surface water can contain substances harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.

Access covers should be selected with reference to the location of the unit and traffic loads to be accommodated. These are not (normally) part of the Separator supply.

When covers are removed precautions must be taken against personnel falling into the unit.

Should you wish to inspect the operation of the equipment, please observe all necessary precautions, including those listed below, which apply to maintenance procedures.

Ensure that you are familiar with the safe working areas and accesses. Ensure that the working area is adequately lit.

Take care to maintain correct posture, particularly when lifting. Use appropriate lifting equipment when necessary. Keep proper footing and balance at all times. Avoid any sharp edges.

### OIL ALARM SYSTEMS

PPG3 requires that the oil level alarm be fitted, tested and commissioned by a competent Installer. This is to ensure that the excessive oil probe is calibrated correctly, raising an alarm when 90% of the recommended maximum oil storage volume is reached. Should the oil level alarm fail to provide an early warning, excessive oil could pass through the separator, thus polluting the environment. This could result in substantial cleanup costs and legal action being taken under the water resources act 1991.

### MAINTENANCE

The correct ongoing maintenance is essential for the proper operation of the equipment. Operators who rely on oil level alarms to prompt them to service separators between maintenance intervals run the risk of polluting should the alarms not work, hence the ongoing functional assessment of the oil alarm systems is fundamental if pollution incidents are to be avoided.

The removal of sediment and retained oil/grease should be carried out by a contractor holding the relevant permits to transport and dispose of such waste. The contractor must refer to the guidelines in this document.

**CONTENTS**

CE

Kingspan Environmental
College Road North
Aston Clinton
Aylesbury
Buckinghamshire
HP22 5EW
United Kingdom

13

En 858 : Separator systems for light liquids

GRP Glass Reinforced Plastic Tank

Bypass Separators NSB003 - NSB150

Class 1

| | |
|---|---|
| Watertightness | Passed |
| Structural Testing | Passed |
| Hydraulic Efficiency | Passed |

# 1 Introduction

1.1.1 These Guidelines represent Best Practice for the installation of the above Separator Units. Many years of specialist experience has led to the successful installation of thousands of separator units. It must be noted, however, that these Guidelines are necessarily of a general nature. It is the responsibility of others to verify that they are appropriate for the specific ground conditions and in-service loads of each installation. Similarly, any information or advice given by our employees or agents regarding the design of an installation must be verified by a qualified specialist (e.g. Civil engineering consultant).

1.1.2 For guidance of Separator selection and application, please refer to the most recent issue of Environment Agency Guidelines pollution prevention guidelines No. 3 (PPG3).and BS En 858

### 1.2 Handling & Storage

1.2.1 Care must be taken to ensure that units are not damaged during delivery and handling on site. Please take care and place unit so that it cannot fall and become damaged

1.2.2 The design requirements of these products will frequently mean that the centre of gravity of the unit is “offset”. Care must therefore be taken to ensure that the unit is stable when lifting. Rainwater may also collect inside units, particularly if they have been stored on site prior to installation, adding weight and increasing instability. Check units before lifting and pump out any excess water.

1.2.3 When lifting units, use webbing slings of a suitable specification. Do not use chains.

1.2.4 A suitable spreader bar should be used to ensure that units are stable and that loads are evenly distributed during lifting. When lifting separators, a spreader bar should be used where the slings would otherwise be at an angle > 30 degrees to the vertical.

1.2.5 Lifting equipment should be selected by taking into account the unit weight, length and the distance of lift required on site.

1.2.6 We accept no responsibility for the selection of lifting equipment.

1.2.7 Whenever units are stored or moved on site, ensure that the storage location is free of rock, debris and any sharp objects, which may damage the unit. The units must be placed on ground, which is flat, and level and the unit orientated onto its side with even support. Do not roll separators.

### 1.3 Site Planning

The following points should be considered before installation of the equipment:

1.3.1 The discharge must have the consent of the relevant Environmental Regulator.

1.3.2 The installation should have Planning and Building Control approval.

1.3.3 Consider installing flow cut-off valves to isolate the separator in an emergency or during site cleaning operations. See Environment Agency Guidelines PPG3.

1.3.4 We will fit a tube to receive the alarm probe. This tube provides protection and ensures that the probe is positioned at the correct level to sense the oil build up. The tube design and probe level setting assumes the use of our standard oil alarm system and may not be suitable for other alarm supplier’s equipment. The probe tube may be fitted either within the neck or within the body of the unit. It should be extended to ground level when fitted in the body of the tank and you should make provision to extend the tube to the required height before backfilling. Consult the alarm supplier’s instructions for their detailed fitting installation instructions.

1.3.5 Consider venting of the unit. Comply with local regulations. In the UK, comply with the following regulations. For Petrol Stations: Health and Safety Guidance Note 41 (HS(G)41). For other applications: BS8301: 1985 (obsolescent) BS EN 752 Building Drainage. Adequate ventilation should be provided to the separator. The ventilation pipe should be as short as is practicable and be terminated not less than 2.5m above paving nor less than 1m above the head of an openable window or other opening into a building within a horizontal distance of 3m. Each neck should be vented independently, we advise against joining these below ground prior to their rising as vent stacks.

1.3.6 Consider installation of a sampling point downstream of the separator. There is no suitable facility to effectively sample the wastewater from inside the unit.

1.3.7 Uncontaminated run off such as roof water should be excluded from separators. (EA Guidelines PPG3.)

1.3.8 Ground conditions and water table level should be assessed. If the water table will be above the base of the units at any time of the year, adequate concrete backfill must be provided to avoid flotation. In poorly draining ground, consideration should also be given to the likelihood of flotation due to surface water collecting in the backfill, and an appropriate installation method devised to avoid this.

1.3.9 If the discharge is to a soakaway, a porosity test should be carried out as part of the assessment of suitability for sub-soil drainage.

1.3.10 The separator must be installed at a level, which will allow connection to the incoming drain and a free discharge at the system outlet. The water table must be below the discharge outlet.

1.3.11 Do not install the unit deeper than necessary, ensure that you purchase extension shaft kits. The minimum invert depth of the unit is shown on the customer drawing.

1.3.12 Adequate access must be provided for routine maintenance. Vehicles should not be permitted within a distance equal to the depth of the unit, unless suitable structural protection is provided to the installation.

1.3.13 There must be at least 1 metre of clear, level ground all around the access covers to allow for routine maintenance.

1.3.14 It is essential that a mains water supply is accessible for routine cleansing and refilling after removal of waste material and liquid.

1.3.15 Provide electrical supply for alarm system.

1.3.16 Installation should only be carried out by suitably qualified and experienced contractors in accordance with current Health and Safety Regulations. Electrical work should be carried out by a qualified electrician, working to the latest edition of IEE wiring regulations.

1.3.17 This unit is designed to operate with gravity in and out flows. The unit is not designed to operate with a pumped influent.

# 2 Installation

### 2.1 Installation – General

2.1.1 When units are installed in unstable ground conditions where movement of the surrounding material and/or unit may occur, the connecting pipework should be designed to minimise the risk of damage from differential movement of the unit(s) and/or surrounding material.

2.1.2 For separators with burial depths greater than 1000mm from cover level to the top of the unit, specific site conditions should be taken into consideration and the backfill designed to bear any loads which may be applied during and after installation to prevent the tank being subjected to these loads.

2.1.3 The excavation must be deep enough to provide bedding and cover depth as determined by the type of surface pavement and loading. Asphalt and concrete pads should extend a minimum of 300mm horizontally beyond the unit in all directions.

2.1.4 In situations where the excavation will not maintain a vertical wall, it will be necessary to shore up the sidewalks of the excavation with suitable trench sheets and bracing systems to maintain a vertical wall from the bottom to the top of the excavation. DO NOT completely remove the shoring system until the backfilling is complete, but before the concrete fully hardens.

2.1.5 In areas where the water table is above the bottom of the excavation and/or the excavation is liable to flood, the excavation should be dewatered using suitable pumping equipment and this should continue until the installation is complete.

2.1.6 During installation care must be taken to ensure that the body of the unit is uniformly supported so that point loads through the unit are avoided.

2.1.7 The concrete Specification is not a site specific installation design.

| GENERAL CONCRETE SPECIFICATION<br>IN ACCORDANCE WITH BS EN 206-1 ( BS 8500-1) | | |
|---|---|---|
| TYPE OF MIX | | (DC) DESIGN |
| PERMITTED TYPE OF CEMENT | | BS 12 (OPC): BS 12 (RHPC): BS 4027 (SRPC) |
| PERMITTED TYPE OF AGGREGATE<br>(coarse & fine) | | BS 882 |
| NOMINAL MAXIMUM SIZE OF AGGREGATE | | 20 mm |
| GRADES: C25 /30<br>C25 /30<br>C16 /20 | | REINFORCED & ABOVE GROUND WITH HOLDING DOWN BOLTS<br>REINFORCED (EG. FOR HIGH WATER TABLE)<br>UNREINFORCED (NORMAL CONDITIONS) |
| MINIMUM CEMENT CONTENT | C30<br>C20 | 270 - 280 Kg/M$^3$<br>220 - 230 Kg/M$^3$ |
| SLUMP CLASS | | S1 (25mm) |
| RATE OF SAMPLING | | READY MIX CONCRETE SHOULD BE SUPPLIED COMPLETE WITH APPROPRIATE DELIVERY TICKET IN ACCORDANCE WITH BS EN 12350-1 |
| NOTE: STANDARD MIXES SHOULD NOT BE USED WHERE SULPHATES OR OTHER AGGRESSIVE CHEMICALS EXIST IN GROUND WATER | | |

### 2.2 Separator Installation

2.2.1 Excavate a hole of sufficient length and width to accommodate the tank and a minimum 225mm concrete surround and to a depth, which allows for the burial depth of the unit plus concrete base slab and haunch.

2.2.2 Construct a suitable concrete base slab appropriate to site conditions. Ensure that the slab is flat and level.

2.2.3 When the concrete base slab has set enough to support the installed load, add a concrete haunch so as to provide even support under the unit and then lower the unit onto the haunch using suitable webbing slings and lifting equipment.

2.2.4 **Pour no more than 300-mm depth of clean water into the unit, avoiding shock loads. For units with more than one chamber, add water to each chamber simultaneously. DO NOT OVERFILL; the unit is not designed to hold water whilst unsupported.**

2.2.5 **Place concrete backfill to approximately 300mm depth under and to the sides of the tank ensuring good compaction to remove voids. DO NOT use vibrating pokers. Continue adding concrete backfill, simultaneously keeping the internal water level no more than 200 mm above the backfill level at all times, until the backfill is just below the underside of the outlet drain, giving sufficient room to connect the inlet and outlet pipework.**

2.2.6 Connect inlet and outlet drains and vent pipes when safe access to the backfill can be gained.

### 2.3 Pipework Connections

2.3.1 In all cases, ensure that the outlet pipework level is maintained for correct operation. (Unless specified on the order, the fall across the unit will be as per the customer drawings).

2.3.2 Small units are generally fitted with **PVCu spigots** to both the outlet and the inlet.

2.3.3 Connect using the same size PVCu socket or a suitable reducer.

2.3.4 Larger units are generally fitted with **Our GRP** manufactured sockets.

2.3.5 The connecting pipework should be pushed into the socket. Ensure that the seal is secure and watertight before backfilling the pipe.

2.3.6 Alternatively, proprietary **flex seal couplings** can be obtained to fit over the outside of the site pipework and the outside of the GRP socket. When using this connection method, please be aware that the outside GRP laminate is not perfectly regular and that you may need to use a sealant on the outside diameter of the GRP. Take care not to over tighten the coupling when connecting to the GRP and ensure that the seal is secure before backfilling the pipe. Drawing 403144 provides the ID of our Bypass GRP sockets. The OD is variable, as the wall thickness can be up to 15-20 mm. If purchasing a flexseal coupling for use with clay /concrete, we suggest that a size 110 mm larger than the ID is selected.

### 2.4 Oil Level Alarm Neck Fitting

2.4.1 We will fit a tube to receive the oil alarm probe. This provides protection and ensures that the probe is positioned at the correct level to sense oil build up.

2.4.2 See alarm supplier information and ensure that the probe is placed within the tube and can be accessed from ground level.

2.4.3 Continue backfilling with concrete over the tank body to the required level. Build up a shell of concrete, minimum 225mm thick, around the access shaft(s). Temporarily strut the access shaft to avoid distortion.

2.4.4 Where we supply an extension shaft to meet a deeper invert requirement, a coalescer extension tube will be required. When fitting, ensure that the tube is extended to just below the surface so that the coalescer can easily be removed. Remove the coalescer from the unit before adding the extension tube. When refitting, ensure that the coalescer is correctly inserted and fully pushed into the base fitting. This is important and you must ensure that the coalescer is correctly located before putting the unit in to operation. Reattach the bracket to the extended neck so it lines up with the hole in the coalescer.

2.4.5 It is advisable to seal the joints on the extension shafts (particularly on sites with high ground water) with proprietary sealant or by GRP lamination. Temporarily strut the extension neck(s) to avoid distortion during back filling. Where more than one neck section is required to suit a deep invert, consider back-filling section by section. If the extension neck is too long, it can be trimmed using a fine-toothed saw. The original fixing hole bolting the coalescer to the neck should be sealed.

2.4.6 Ensure that the vent socket if cut out, is replaced elsewhere. The maximum recommended inlet invert is 2000mm (using 500mm long extension sections). If you are installing a unit deeper than this then you must make your own arrangements for removing and replacing the coalescer. Consideration must be given to the depth of lift involved.

2.4.7 Continue back-filling, ensuring minimum 225mm concrete thickness around the access shaft/ extension neck and alarm access tube (as applicable).

2.4.8 Mains powered Alarm Systems. See alarm suppliers installation instructions. Lay 82mm diameter PVCu underground ducting between the alarm panel location and the alarm probe position. The ducting should be 500mm below ground level and fitted with a drawstring for later cable insertion. Any changes of direction should be by long radius bend. If necessary, drill a suitable hole in the access shaft adjacent to the alarm probe terminal box, to accept the ducting and seal.

2.4.9 In traffic areas a suitable top slab must be constructed. The top slab should bear on a suitable foundation to prevent superimposed loads being transmitted to the unit and access shafts. Loads applied to covers and frames must bear on the top slab, not the access shaft.

2.4.10 The unit should be filled with clean water up to the invert level of the outlet pipe. Ensure the unit identification is placed/ marked inside the neck for future information. The unit is now ready for use.

### 2.5 Alarm Installation

2.5.1 Install the alarm probe and control panel, as per the Suppliers Alarm Installation Guidelines. Ensure that the probe is positioned correctly for the required storage of oil. The table below indicates the maximum volume of oil to be stored and the depth of floating oil expected in the separation chamber.

| Unit | Required Minimum Oil Storage volumes in litres | Max. (100%)Depth of floating oil (Static) |
|---|---|---|
| NSBE010 | 150 litres | 320mm |
| NSBE015 | 225 litres | 335mm |
| NSBE020 | 300 litres | 335mm |
| NSBE025 | 375 litres | 385mm |
| NSBE030 | 450 litres | 385mm |
| NSBE036 | 540 litres | 250mm |
| NSBE040 | 600 litres | 420mm |
| NSBE050 | 750 litres | 430mm |
| NSBE075 | 1125 litres | 430mm |
| NSBE100 | 1500 litres | 435mm |
| NSBE125 | 1875 litres | 435mm |

# 3 Operation

3.1.1 The unit is sized on treating a defined area and rainfall (5 mm/hour) EN.858 Part 1 and using the factor provided in the Environment agency guidelines PPG3. (0.0018 = 6.5mm/hr) The unit will treat the entire flow i.e. NSBE015 will treat a flow of 15 litres per second. If the flow is greater than this then the excess flow will bypass the main treatment chamber. A NSBE015 unit will work in bypass mode over 15 and up to 150 litres per second. Flows in excess of this will back up on to the site. During a storm, the rain falls and flushes any surface debris, silt or oil into the tank. This first flush, up to the maximum rated flow is fully treated. As the severity of the storm increases, so does the rate of flow increase. The liquid entering the separator after the first flush tends to be cleaner and so, in lower risk applications, is allowed to bypass the oil separation chamber for directly discharge.

3.1.2 The bypass unit has three chambers. The entire flow up to the units listed flow rating is fully treated and passes through all chambers. (E.g. NSBE015 treats 15 litres per second.)

3.1.3 Flows in excess of this rating will bypass the separation chamber and the liquid passes untreated to the outlet chamber.

3.1.4 The first chamber will accumulate silt and grit. The maximum volume that can be retained is the rating x 100 e.g. a NSBE015 is capable of holding 1500 litres of silt.

3.1.5 The second / separating chamber is sized to separate oil at the rated flow rate and to accumulate the required oil storage volume. A NSBE015 maximum oil storage volume is 225 litres. An oil probe should be positioned to detect the accumulation of oil when there is no or low flow conditions. The probe should be positioned so that the alarm operates at 90% of the rated oil storage volume.

3.1.6 In bypass flow conditions, the flow moves directly from the inlet to the outlet chamber avoiding the separating chamber.

3.1.7 Separators are purchased as Class 1 units. Class 1 Bypass Separators are fitted with a removable coalescer which also includes media to further improve the discharge quality. The coalescer media requires maintenance.

3.1.8 Bypass Class 1 Separators are not effective for the removal of soluble or emulsified pollutants such as oil/detergent mixes found in vehicle wash effluents. With permission such discharges should be drained to the foul sewer. Consult our technical department for Separation equipment to meet these applications.

# 4 Maintenance

### 4.1 Waste Removal and Servicing

4.1.1 Separated light liquid **must** be removed from separator when the oil capacity has been reached.

4.1.2 An oil level alarm system is available for purchase which gives warning when the separated light liquid/water interface level reaches 90% of the maximum recommended oil storage volume.

4.1.3 Separators should be inspected at least every six months or more frequently if experience dictates. A log should be maintained detailing the depth of oil found, any oil volume removed and any silt removal or cleaning carried out. A specimen maintenance log is included in the appendices.

4.1.4 Every site is different, in respect to the amount and type of silt generated by the drain design and installation. Frequently, the construction programme itself generates large and perhaps unusual quantities of silt and grit. We do recommend that following the initial installation, an inspection of the separator contents be made to check that building rubble has not entered the unit. Further inspections at 3 and 6 months should be made so as to be able to assess the volumes of silt and oil accumulated. The inspection and emptying programme can then be defined following the first 6 months site experience. We recommend leaving a maximum interval between inspections of 6 months.

4.1.5 Alarm probes should be removed and cleaned with water whenever waste material is removed from the separator. Please note the alarm may alert until the liquid level is replaced.

4.1.6 **Separator waste is a "special waste" under the terms of The Waste Management Code of Practice. The Code imposes a duty of care on the waste producer to ensure that the Cleansing contractor is registered with the Environment Agency and that the final disposal of the waste is to a licensed facility.**

4.1.7 You should consider the purchase of a maintenance service, which includes bi-annual inspections, removal of oil and silt, cleaning of the alarm probe and cleaning or replacement of the coalescer (where appropriate).

### 4.2 Waste Removal Procedure – Oil & Silt

4.2.1 **Oil can only be effectively removed when there is no flow entering the unit. Isolate the unit and prevent flow from entering. Always remove the oil before attempting to remove the coalescer. If this is not done, when the coalescer is withdrawn the oil can coat the media surface and when replaced the oil may be forced through the media, contaminating the effluent.**

4.2.2 Remove the access cover and lower the desludging hose in to the separation chamber. Draw off the surface oil.

4.2.3 If removing the silt, lower the desludge hose to the base of the tank and empty the contents of the chamber. Ensure that you access and clean both the inlet and the separation compartments.

4.2.4 Remove the alarm probe, if fitted, clean with water and replace.

4.2.5 Consider the period of time that the coalescer has been installed and consider removing and inspecting (cleaning or replacing) the coalescer media. If removed, ensure that it is correctly replaced and secured into position. Replace the access covers. It is best to lower the water level to aid re-fitting.

4.2.6 Re-fill the separator with clean water up to the outlet level.

4.2.7 If an alarm is fitted, it will display an alarm condition until the separator is re-filled. Check alarm operation when unit full.

### 4.3 Checking the Coalescer Assembly

4.3.1 Coalescers, where fitted, may be cleaned periodically to maintain efficiency. Coalescers should be checked following a major incident and replaced if necessary. Please contact us if you wish to purchase the coalescer media.

4.3.2 Identify the type and size of separator (shown on labels inside the access neck).

4.3.3 Assemblies weighing less than 25 Kg may be removed by hand. Heavier assemblies should be lifted by mechanical means. Any lifting device employed must be capable of lifting:

4.3.3.a In excess of the maximum assembly weight.

4.3.3.b The assembly completely out of the access shaft.

4.3.3.c Giving a smooth and controlled lift.

4.3.3.d Swinging the assembly to one side clear of the access shaft.

| Unit | Dry Weight (Kg) | Wet Weight (Kg) | Silted Weight (Kg) | Number Within unit | Replacement Media Part No. |
|---|---|---|---|---|---|
| NSBE010 | 5.7 kg | ≈50 kg | ≈60 kg | 1 | 402862 |
| NSBE015 | 6.2 kg | ≈55 kg | ≈65 kg | 1 | 402864 |
| NSBE020 | 6.2 kg | ≈55 kg | ≈65 kg | 1 | 402864 |
| NSBE025 | 12.0 kg | ≈65 kg | ≈75 kg | 1 | 402866 |
| NSBE030 | 12.0 kg | ≈65 kg | ≈75 kg | 1 | 402866 |
| NSBE036 | 14.0 kg | ≈65 kg | ≈75 kg | 1 | 402718 |
| NSBE040 | 21.0 kg | ≈100 kg | ≈200 kg | 1 | 402885 |
| NSBE050 | 21.0 kg | ≈100 kg | ≈200 kg | 1 | 402885 |
| NSBE075 | 21.0 kg | ≈100 kg | ≈200 kg | 2 | 402885 |
| NSBE100 | 21.0 kg | ≈100 kg | ≈200 kg | 2 | 402885 |
| NSBE125 | 21.0 kg | ≈100 kg | ≈200 kg | 3 | 402885 |

4.3.4 Ensure that the area around the access shaft is clear and that there is space to place the assembly once removed. If space is not available it will be necessary to support the assembly over the access shaft. e.g. by scaffold poles and platform.

4.3.5 Only remove the access cover when necessary to remove the assembly. Do not leave the access shaft uncovered and unattended.

**4.4 Removing the coalescer assembly.**

4.4.1 Undo and remove the bracket which secures the coalescer to the access shaft.

4.4.2 Lift the assembly with a smooth and steady motion. Coalescers will become lighter as water drains from the exposed media. Allow the water to drain completely. Assemblies blocked with fine silt may be very heavy.

4.4.3 Fully extract the assembly and set it down adjacent to the access shaft.

**4.5 Cleaning the coalescer assembly/ Media Replacement.**

4.5.1 Hose down the assembly using clean water at normal pressure. If the media is heavily contaminated with oil and silt, it may not be possible to clean it effectively by hosing. Do not allow untreated cleaning water to pass out of the unit. Continue hosing until the water runs clear.

4.5.2 To replace the media, undo the banding. Slide media off the core tube and slide new media on. Ensure all the apertures on the core tube are covered by the media. Re-secure or replace banding. Consider replacing media and banding every two years.

**4.6 Replacing the coalescer assembly.**

4.6.1 Position it over the access shaft.

4.6.2 Lower the assembly steadily into the access shaft ensuring that the end locates within the sump at the bottom of the tank. Re-secure the bracket.

4.6.3 Replace the access cover.

# 5 Emergencies

5.1.1 At sites where there is a high risk of spillage, spill kits containing drain seals, absorbent materials, disposal containers and other appropriate equipment should be held. In the event of a spillage on site, the material should be contained, (if a spill kit is not available, sand or soil may be used) and the Environment Agency notified immediately using the appropriate emergency hotline number listed in the Agency Guideline PPG3. Year 2011 **- 0800 80 70 60**

# 6 Warranty

The company will replace or, at its option, properly repair without charge any goods which are found to be defective and which cause failure in normal circumstances of use **within a period of twelve months from the date of delivery.**

This warranty is conditional upon:

(a) the Buyer notifying the Company of any claim within Seven days of the failure becoming discernible.

(b) the Company being allowed a reasonable opportunity to inspect the goods so as to confirm that they are defective.

(c) the goods not having been modified, mishandled or misused and being used strictly in accordance with any relevant instructions issued by the Company.

The Company's liability under this Clause is limited to the repair or replacement of the defective goods, and does not cover costs of transport, installation or associated site costs, if applicable.

The Company's liability to replace or repair the goods is in lieu of and excludes all other warranties and conditions, and in particular (but without limitation) the Company shall have no liability of any kind for consequential loss or damage.

For any further advice, please us.

A warranty form is included in this package, to register your unit for warranty. Please complete ALL sections of the form, and return it at your earliest convenience.

# *SEPARATOR MAINTENANCE LOG*

Site address/location .....

.....

Separator location .....

.....

Type of separator .....

Nominal Flow .....

Total capacity .....

| Inspection/ Maintenance Date | Comments | Waste Volumes Removed (if appropriate) |
|---|---|---|
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PRODUCT INFORMATION SHEET

# AquaCell Plus-R

## Description

Plus has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas

## Technical specification

| | | | |
|---|---|---|---|
| **Cat code** | 6LB250 | **Void ratio** | 95% |
| **Colour** | Black | **Material** | Recycled PP |
| **Dimensions** | 1m x 0.5m x 0.4m | **Vertical loading** | 70.2 tonnes/m$^2$ (702 kN/m$^2$) |
| **Weight** | 12.7kg | **Lateral loading** | 15.1 tonnes/m$^2$ (151 kN/m$^2$) |
| **Storage volume** | 190 litres | | |

## Maximum installation depths

| **Typical soil type** | **Maximum depth of installation – to base of units (m)[1]** | | | | |
|---|---|---|---|---|---|
| | **Soil weight kN/m$^3$** | **Angle of internal friction φ (degrees)[2, 3]** | **Landscaped areas** | **Vehicle mass <9 tonnes[4, 5]** | **Vehicle mass <44 tonnes** |
| Over consolidated stiff clay | 20 | 24 | 4.67 | 4.42 | 4.17 |
| Silty sandy clay | 19 | 26 | 5.03 | 4.78 | 4.53 |
| Loose sand and gravel | 18 | 30 | 5.86 | 5.61 | 5.36 |
| Medium dense sand and gravel | 19 | 34 | 6.87 | 6.62 | 6.37 |
| Dense sand and gravel | 20 | 38 | 7.82 | 7.57 | 7.30 |

## Minimum cover depths

| | **Landscaped areas** | **Car parks with vehicle mass <3 tonnes[5]** | **Car parks with vehicle mass <9 tonnes** | **Car parks with vehicle mass <12 tonnes** | **Low speed roads with vehicle mass <60 tonnes** |
|---|---|---|---|---|---|
| **Minimum cover depth (m)** | 0.30 | 0.50 | 0.69 | 0.81 | 1.30 |

1. Without groundwater present below base of units – AquaCell Plus-R may be used where groundwater is present, contact Wavin for technical advice.
2. Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.
3. The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.
4. Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).
5. This category should be used when considering landscaped areas that may be trafficked by ride on mowers.

Assumptions made:
- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil


Orders
0844 856 5152

Technical Advice
0844 856 5165

Email
technical.design@wavin.co.uk

Website
aquacell.wavin.co.uk

# Appendix E

## Storm Water Design Report

## STORM SEWER DESIGN by the Modified Rational Method

### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

| | | | |
|---|---|---|---|
| Return Period (years) | 30 | PIMP (%) | 100 |
| M5-60 (mm) | 18.400 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.278 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| Maximum Time of Concentration (mins) | 30 | Min Design Depth for Optimisation (m) | 1.200 |
| Foul Sewage (l/s/ha) | 0.000 | Min Vel for Auto Design only (m/s) | 1.00 |
| Volumetric Runoff Coeff. | 0.750 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Soffits

### Network Design Table for Storm

« - Indicates pipe capacity < flow

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 40.726 | 0.136 | 299.5 | 0.181 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.001 | 5.796 | 0.020 | 289.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.002 | 5.796 | 0.020 | 289.8 | 0.018 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.003 | 41.725 | 0.083 | 502.7 | 0.007 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.004 | 10.610 | 0.035 | 303.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S2.000 | 7.802 | 0.035 | 222.9 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S3.000 | 54.176 | 0.181 | 299.3 | 0.172 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.005 | 4.816 | 0.013 | 370.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |

### Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 50.00 | 5.75 | 6.465 | 0.181 | 0.0 | 0.0 | 0.0 | 0.90 | 63.9 | 24.5 |
| S1.001 | 50.00 | 5.84 | 6.329 | 0.181 | 0.0 | 0.0 | 0.0 | 1.06 | 117.0 | 24.5 |
| S1.002 | 50.00 | 5.93 | 6.209 | 0.199 | 0.0 | 0.0 | 0.0 | 1.06 | 117.0 | 26.9 |
| S1.003 | 50.00 | 6.80 | 6.189 | 0.206 | 0.0 | 0.0 | 0.0 | 0.80 | 88.5 | 27.9 |
| S1.004 | 50.00 | 6.97 | 6.106 | 0.206 | 0.0 | 0.0 | 0.0 | 1.04 | 114.4 | 27.9 |
| S2.000 | 50.00 | 5.15 | 6.106 | 0.000 | 0.0 | 0.0 | 0.0 | 0.87 | 34.7 | 0.0 |
| S3.000 | 50.00 | 6.00 | 6.252 | 0.172 | 0.0 | 0.0 | 0.0 | 0.90 | 63.9 | 23.3 |
| S1.005 | 50.00 | 7.06 | 6.071 | 0.378 | 0.0 | 0.0 | 0.0 | 0.94 | 103.3 | 51.2 |

## Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.006 | 4.816 | 0.013 | 370.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.007 | 42.763 | 0.114 | 375.1 | 0.032 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.008 | 11.059 | 0.025 | 442.4 | 0.044 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.009 | 10.099 | 0.074 | 136.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S4.000 | 34.533 | 0.069 | 500.5 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S4.001 | 4.843 | 0.022 | 220.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.000 | 34.294 | 0.069 | 497.0 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.001 | 6.172 | 0.061 | 101.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.010 | 56.274 | 0.074 | 760.5 | 0.187 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S6.000 | 36.167 | 0.121 | 298.9 | 0.076 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S6.001 | 27.104 | 0.090 | 301.2 | 0.031 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S6.002 | 10.894 | 0.036 | 302.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S6.003 | 23.493 | 0.078 | 301.2 | 0.047 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S6.004 | 26.754 | 0.089 | 300.6 | 0.008 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S6.005 | 10.116 | 0.034 | 297.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.011 | 6.325 | 0.014 | 451.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.012 | 6.325 | 0.014 | 451.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |

## Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.006 | 50.00 | 7.14 | 5.958 | 0.378 | 0.0 | 0.0 | 0.0 | 0.94 | 103.3 | 51.2 |
| S1.007 | 50.00 | 7.91 | 5.945 | 0.410 | 0.0 | 0.0 | 0.0 | 0.93 | 102.7 | 55.6 |
| S1.008 | 50.00 | 8.10 | 5.831 | 0.454 | 0.0 | 0.0 | 0.0 | 0.96 | 152.7 | 61.5 |
| S1.009 | 50.00 | 8.20 | 5.806 | 0.454 | 0.0 | 0.0 | 0.0 | 1.74 | 276.5 | 61.5 |
| S4.000 | 50.00 | 6.00 | 6.800 | 0.000 | 0.0 | 0.0 | 0.0 | 0.58 | 23.0 | 0.0 |
| S4.001 | 50.00 | 6.09 | 5.755 | 0.000 | 0.0 | 0.0 | 0.0 | 0.88 | 34.9 | 0.0 |
| S5.000 | 50.00 | 5.99 | 6.800 | 0.000 | 0.0 | 0.0 | 0.0 | 0.58 | 23.1 | 0.0 |
| S5.001 | 50.00 | 6.06 | 6.000 | 0.000 | 0.0 | 0.0 | 0.0 | 1.30 | 51.7 | 0.0 |
| S1.010 | 50.00 | 9.49 | 5.733 | 0.642 | 0.0 | 0.0 | 0.0 | 0.73 | 116.0 | 86.9 |
| S6.000 | 50.00 | 5.67 | 6.472 | 0.076 | 0.0 | 0.0 | 0.0 | 0.90 | 63.9 | 10.3 |
| S6.001 | 50.00 | 6.17 | 6.351 | 0.107 | 0.0 | 0.0 | 0.0 | 0.90 | 63.7 | 14.5 |
| S6.002 | 50.00 | 6.37 | 6.261 | 0.107 | 0.0 | 0.0 | 0.0 | 0.90 | 63.5 | 14.5 |
| S6.003 | 50.00 | 6.80 | 6.225 | 0.153 | 0.0 | 0.0 | 0.0 | 0.90 | 63.7 | 20.8 |
| S6.004 | 50.00 | 7.30 | 6.147 | 0.162 | 0.0 | 0.0 | 0.0 | 0.90 | 63.7 | 21.9 |
| S6.005 | 50.00 | 7.49 | 6.058 | 0.162 | 0.0 | 0.0 | 0.0 | 0.91 | 64.1 | 21.9 |
| S1.011 | 50.00 | 9.60 | 5.659 | 0.803 | 0.0 | 0.0 | 0.0 | 0.95 | 151.1 | 108.8 |
| S1.012 | 50.00 | 9.71 | 5.545 | 0.803 | 0.0 | 0.0 | 0.0 | 0.95 | 151.1 | 108.8 |

## Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.013 | 44.315 | 0.089 | 497.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.014 | 29.291 | 0.293 | 100.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S7.000 | 71.533 | 0.318 | 224.9 | 0.150 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S7.001 | 4.211 | 0.019 | 221.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S7.002 | 71.286 | 0.143 | 498.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |

## Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.013 | 50.00 | 10.52 | 5.531 | 0.803 | 0.0 | 0.0 | 0.0 | 0.90 | 143.8 | 108.8 |
| S1.014 | 50.00 | 11.01 | 7.200 | 0.803 | 0.0 | 0.0 | 0.0 | 1.00 | 17.8« | 108.8 |
| S7.000 | 50.00 | 6.14 | 6.800 | 0.150 | 0.0 | 0.0 | 0.0 | 1.04 | 73.8 | 20.3 |
| S7.001 | 50.00 | 6.21 | 6.482 | 0.150 | 0.0 | 0.0 | 0.0 | 1.05 | 74.4 | 20.3 |
| S7.002 | 50.00 | 8.89 | 7.500 | 0.150 | 0.0 | 0.0 | 0.0 | 0.44 | 7.8« | 20.3 |

## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | 7.550 | 1.085 | Open Manhole | 1200 | S1.000 | 6.465 | 300 | | | | |
| S2 | 7.686 | 1.357 | Open Manhole | 1350 | S1.001 | 6.329 | 375 | S1.000 | 6.329 | 300 | |
| S3 | 7.726 | 1.517 | Open Manhole | 1350 | S1.002 | 6.209 | 375 | S1.001 | 6.309 | 375 | 100 |
| S4 | 7.730 | 1.541 | Open Manhole | 1350 | S1.003 | 6.189 | 375 | S1.002 | 6.189 | 375 | |
| S5 | 7.728 | 1.622 | Open Manhole | 1350 | S1.004 | 6.106 | 375 | S1.003 | 6.106 | 375 | |
| S6 | 7.758 | 1.652 | Open Manhole | 1200 | S2.000 | 6.106 | 225 | | | | |
| S7 | 7.670 | 1.418 | Open Manhole | 1200 | S3.000 | 6.252 | 300 | | | | |
| S8 | 7.662 | 1.591 | Open Manhole | 1350 | S1.005 | 6.071 | 375 | S1.004 | 6.071 | 375 | |
| | | | | | | | | S2.000 | 6.071 | 225 | |
| | | | | | | | | S3.000 | 6.071 | 300 | |
| S9 | 7.783 | 1.825 | Open Manhole | 1350 | S1.006 | 5.958 | 375 | S1.005 | 6.058 | 375 | 100 |
| S10 | 7.961 | 2.016 | Open Manhole | 1350 | S1.007 | 5.945 | 375 | S1.006 | 5.945 | 375 | |
| S11 | 7.939 | 2.108 | Open Manhole | 1350 | S1.008 | 5.831 | 450 | S1.007 | 5.831 | 375 | |
| S12 | 7.694 | 1.888 | Open Manhole | 1350 | S1.009 | 5.806 | 450 | S1.008 | 5.806 | 450 | |
| S13 | 7.807 | 1.007 | Open Manhole | 1200 | S4.000 | 6.800 | 225 | | | | |
| S14 | 7.625 | 1.870 | Open Manhole | 1200 | S4.001 | 5.755 | 225 | S4.000 | 6.731 | 225 | 976 |
| S15 | 7.803 | 1.003 | Open Manhole | 1200 | S5.000 | 6.800 | 225 | | | | |
| S16 | 7.758 | 1.758 | Open Manhole | 1200 | S5.001 | 6.000 | 225 | S5.000 | 6.731 | 225 | 731 |
| S17 | 7.607 | 1.875 | Open Manhole | 1350 | S1.010 | 5.733 | 450 | S1.009 | 5.732 | 450 | |
| | | | | | | | | S4.001 | 5.733 | 225 | |
| | | | | | | | | S5.001 | 5.939 | 225 | |
| S18 | 7.525 | 1.053 | Open Manhole | 1200 | S6.000 | 6.472 | 300 | | | | |
| S19 | 7.428 | 1.077 | Open Manhole | 1200 | S6.001 | 6.351 | 300 | S6.000 | 6.351 | 300 | |
| S20 | 7.535 | 1.274 | Open Manhole | 1200 | S6.002 | 6.261 | 300 | S6.001 | 6.261 | 300 | |
| S21 | 7.462 | 1.237 | Open Manhole | 1200 | S6.003 | 6.225 | 300 | S6.002 | 6.225 | 300 | |
| S22 | 7.544 | 1.397 | Open Manhole | 1200 | S6.004 | 6.147 | 300 | S6.003 | 6.147 | 300 | |
| S23 | 7.347 | 1.289 | Open Manhole | 1200 | S6.005 | 6.058 | 300 | S6.004 | 6.058 | 300 | |
| S24 | 7.670 | 2.011 | Open Manhole | 1350 | S1.011 | 5.659 | 450 | S1.010 | 5.659 | 450 | |
| | | | | | | | | S6.005 | 6.024 | 300 | 215 |
| S25 | 7.829 | 2.284 | Open Manhole | 1350 | S1.012 | 5.545 | 450 | S1.011 | 5.645 | 450 | 100 |
| S26 | 7.794 | 2.263 | Open Manhole | 1350 | S1.013 | 5.531 | 450 | S1.012 | 5.531 | 450 | |
| S27 | 7.587 | 2.145 | Open Manhole | 1350 | S1.014 | 7.200 | 150 | S1.013 | 5.442 | 450 | |
| S | 7.274 | 0.367 | Open Manhole | 0 | | OUTFALL | | S1.014 | 6.907 | 150 | |
| S28 | 7.824 | 1.024 | Open Manhole | 1200 | S7.000 | 6.800 | 300 | | | | |
| S29 | 7.827 | 1.345 | Open Manhole | 1200 | S7.001 | 6.482 | 300 | S7.000 | 6.482 | 300 | |
| S30 | 7.833 | 1.370 | Open Manhole | 1200 | S7.002 | 7.500 | 150 | S7.001 | 6.463 | 300 | |
| S | 7.550 | 0.193 | Open Manhole | 0 | | OUTFALL | | S7.002 | 7.357 | 150 | |

## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S1 | 484523.493 | 614326.018 | 484523.493 | 614326.018 | Required | |
| S2 | 484562.113 | 614338.942 | 484562.113 | 614338.942 | Required | |
| S3 | 484565.158 | 614334.011 | 484565.158 | 614334.011 | Required | |
| S4 | 484568.204 | 614329.080 | 484568.204 | 614329.080 | Required | |
| S5 | 484584.822 | 614290.808 | 484584.822 | 614290.808 | Required | |
| S6 | 484596.506 | 614283.367 | 484596.506 | 614283.367 | Required | |
| S7 | 484537.386 | 614264.762 | 484537.386 | 614264.762 | Required | |
| S8 | 484589.048 | 614281.076 | 484589.048 | 614281.076 | Required | |
| S9 | 484590.967 | 614276.658 | 484590.967 | 614276.658 | Required | |
| S10 | 484592.885 | 614272.240 | 484592.885 | 614272.240 | Required | |
| S11 | 484609.917 | 614233.015 | 484609.917 | 614233.015 | Required | |
| S12 | 484614.322 | 614222.871 | 484614.322 | 614222.871 | Required | |
| S13 | 484570.357 | 614213.534 | 484570.357 | 614213.534 | Required | |
| S14 | 484603.196 | 614224.215 | 484603.196 | 614224.215 | Required | |
| S15 | 484574.138 | 614203.193 | 484574.138 | 614203.193 | Required | |

## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S16 | 484606.753 | 614213.789 | 484606.753 | 614213.789 | Required | |
| S17 | 484604.758 | 614219.630 | 484604.758 | 614219.630 | Required | |
| S18 | 484520.813 | 614319.443 | 484520.813 | 614319.443 | Required | |
| S19 | 484531.018 | 614284.746 | 484531.018 | 614284.746 | Required | |
| S20 | 484531.504 | 614257.646 | 484531.504 | 614257.646 | Required | |
| S21 | 484529.816 | 614246.884 | 484529.816 | 614246.884 | Required | |
| S22 | 484538.337 | 614224.991 | 484538.337 | 614224.991 | Required | |
| S23 | 484541.833 | 614198.466 | 484541.833 | 614198.466 | Required | |
| S24 | 484551.461 | 614201.570 | 484551.461 | 614201.570 | Required | |
| S25 | 484550.288 | 614207.786 | 484550.288 | 614207.786 | Required | |
| S26 | 484549.115 | 614214.002 | 484549.115 | 614214.002 | Required | |
| S27 | 484535.456 | 614256.159 | 484535.456 | 614256.159 | Required | |
| S | 484527.985 | 614284.482 | | | No Entry | |
| S28 | 484557.187 | 614166.615 | 484557.187 | 614166.615 | Required | |
| S29 | 484625.167 | 614188.880 | 484625.167 | 614188.880 | Required | |

## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S30 | 484626.702 | 614184.959 | 484626.702 | 614184.959 | Required |  |
| S | 484558.750 | 614163.416 | | | No Entry |  |

## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | o | 300 | S1 | 7.550 | 6.465 | 0.785 | Open Manhole | 1200 |
| S1.001 | o | 375 | S2 | 7.686 | 6.329 | 0.982 | Open Manhole | 1350 |
| S1.002 | o | 375 | S3 | 7.726 | 6.209 | 1.142 | Open Manhole | 1350 |
| S1.003 | o | 375 | S4 | 7.730 | 6.189 | 1.166 | Open Manhole | 1350 |
| S1.004 | o | 375 | S5 | 7.728 | 6.106 | 1.247 | Open Manhole | 1350 |
| S2.000 | o | 225 | S6 | 7.758 | 6.106 | 1.427 | Open Manhole | 1200 |
| S3.000 | o | 300 | S7 | 7.670 | 6.252 | 1.118 | Open Manhole | 1200 |
| S1.005 | o | 375 | S8 | 7.662 | 6.071 | 1.216 | Open Manhole | 1350 |
| S1.006 | o | 375 | S9 | 7.783 | 5.958 | 1.450 | Open Manhole | 1350 |
| S1.007 | o | 375 | S10 | 7.961 | 5.945 | 1.641 | Open Manhole | 1350 |
| S1.008 | o | 450 | S11 | 7.939 | 5.831 | 1.658 | Open Manhole | 1350 |
| S1.009 | o | 450 | S12 | 7.694 | 5.806 | 1.438 | Open Manhole | 1350 |
| S4.000 | o | 225 | S13 | 7.807 | 6.800 | 0.782 | Open Manhole | 1200 |
| S4.001 | o | 225 | S14 | 7.625 | 5.755 | 1.645 | Open Manhole | 1200 |
| S5.000 | o | 225 | S15 | 7.803 | 6.800 | 0.778 | Open Manhole | 1200 |
| S5.001 | o | 225 | S16 | 7.758 | 6.000 | 1.533 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | 40.726 | 299.5 | S2 | 7.686 | 6.329 | 1.057 | Open Manhole | 1350 |
| S1.001 | 5.796 | 289.8 | S3 | 7.726 | 6.309 | 1.042 | Open Manhole | 1350 |
| S1.002 | 5.796 | 289.8 | S4 | 7.730 | 6.189 | 1.166 | Open Manhole | 1350 |
| S1.003 | 41.725 | 502.7 | S5 | 7.728 | 6.106 | 1.247 | Open Manhole | 1350 |
| S1.004 | 10.610 | 303.1 | S8 | 7.662 | 6.071 | 1.216 | Open Manhole | 1350 |
| S2.000 | 7.802 | 222.9 | S8 | 7.662 | 6.071 | 1.366 | Open Manhole | 1350 |
| S3.000 | 54.176 | 299.3 | S8 | 7.662 | 6.071 | 1.291 | Open Manhole | 1350 |
| S1.005 | 4.816 | 370.5 | S9 | 7.783 | 6.058 | 1.350 | Open Manhole | 1350 |
| S1.006 | 4.816 | 370.5 | S10 | 7.961 | 5.945 | 1.641 | Open Manhole | 1350 |
| S1.007 | 42.763 | 375.1 | S11 | 7.939 | 5.831 | 1.733 | Open Manhole | 1350 |
| S1.008 | 11.059 | 442.4 | S12 | 7.694 | 5.806 | 1.438 | Open Manhole | 1350 |
| S1.009 | 10.099 | 136.5 | S17 | 7.607 | 5.732 | 1.425 | Open Manhole | 1350 |
| S4.000 | 34.533 | 500.5 | S14 | 7.625 | 6.731 | 0.669 | Open Manhole | 1200 |
| S4.001 | 4.843 | 220.1 | S17 | 7.607 | 5.733 | 1.649 | Open Manhole | 1350 |
| S5.000 | 34.294 | 497.0 | S16 | 7.758 | 6.731 | 0.802 | Open Manhole | 1200 |
| S5.001 | 6.172 | 101.2 | S17 | 7.607 | 5.939 | 1.443 | Open Manhole | 1350 |

## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.010 | o | 450 | S17 | 7.607 | 5.733 | 1.424 | Open Manhole | 1350 |
| S6.000 | o | 300 | S18 | 7.525 | 6.472 | 0.753 | Open Manhole | 1200 |
| S6.001 | o | 300 | S19 | 7.428 | 6.351 | 0.777 | Open Manhole | 1200 |
| S6.002 | o | 300 | S20 | 7.535 | 6.261 | 0.974 | Open Manhole | 1200 |
| S6.003 | o | 300 | S21 | 7.462 | 6.225 | 0.937 | Open Manhole | 1200 |
| S6.004 | o | 300 | S22 | 7.544 | 6.147 | 1.097 | Open Manhole | 1200 |
| S6.005 | o | 300 | S23 | 7.347 | 6.058 | 0.989 | Open Manhole | 1200 |
| S1.011 | o | 450 | S24 | 7.670 | 5.659 | 1.561 | Open Manhole | 1350 |
| S1.012 | o | 450 | S25 | 7.829 | 5.545 | 1.834 | Open Manhole | 1350 |
| S1.013 | o | 450 | S26 | 7.794 | 5.531 | 1.813 | Open Manhole | 1350 |
| S1.014 | o | 150 | S27 | 7.587 | 7.200 | 0.237 | Open Manhole | 1350 |
| S7.000 | o | 300 | S28 | 7.824 | 6.800 | 0.724 | Open Manhole | 1200 |
| S7.001 | o | 300 | S29 | 7.827 | 6.482 | 1.045 | Open Manhole | 1200 |
| S7.002 | o | 150 | S30 | 7.833 | 7.500 | 0.183 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.010 | 56.274 | 760.5 | S24 | 7.670 | 5.659 | 1.561 | Open Manhole | 1350 |
| S6.000 | 36.167 | 298.9 | S19 | 7.428 | 6.351 | 0.777 | Open Manhole | 1200 |
| S6.001 | 27.104 | 301.2 | S20 | 7.535 | 6.261 | 0.974 | Open Manhole | 1200 |
| S6.002 | 10.894 | 302.6 | S21 | 7.462 | 6.225 | 0.937 | Open Manhole | 1200 |
| S6.003 | 23.493 | 301.2 | S22 | 7.544 | 6.147 | 1.097 | Open Manhole | 1200 |
| S6.004 | 26.754 | 300.6 | S23 | 7.347 | 6.058 | 0.989 | Open Manhole | 1200 |
| S6.005 | 10.116 | 297.5 | S24 | 7.670 | 6.024 | 1.346 | Open Manhole | 1350 |
| S1.011 | 6.325 | 451.8 | S25 | 7.829 | 5.645 | 1.734 | Open Manhole | 1350 |
| S1.012 | 6.325 | 451.8 | S26 | 7.794 | 5.531 | 1.813 | Open Manhole | 1350 |
| S1.013 | 44.315 | 497.9 | S27 | 7.587 | 5.442 | 1.695 | Open Manhole | 1350 |
| S1.014 | 29.291 | 100.0 | S | 7.274 | 6.907 | 0.217 | Open Manhole | 0 |
| S7.000 | 71.533 | 224.9 | S29 | 7.827 | 6.482 | 1.045 | Open Manhole | 1200 |
| S7.001 | 4.211 | 221.6 | S30 | 7.833 | 6.463 | 1.070 | Open Manhole | 1200 |
| S7.002 | 71.286 | 498.5 | S | 7.550 | 7.357 | 0.043 | Open Manhole | 0 |

## Free Flowing Outfall Details for Storm

| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---|---|---|---|---|---|---|
| S1.014 | S | 7.274 | 6.907 | 0.000 | 0 | 0 |

## Free Flowing Outfall Details for Storm

| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---|---|---|---|---|---|---|
| S7.002 | S | 7.550 | 7.357 | 0.000 | 0 | 0 |

## Simulation Criteria for Storm

| | | | |
|---|---|---|---|
| Volumetric Runoff Coeff | 0.750 | Additional Flow - % of Total Flow | 0.000 |
| Areal Reduction Factor | 1.000 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start (mins) | 0 | Inlet Coeffiecient | 0.800 |
| Hot Start Level (mm) | 0 | Flow per Person per Day (l/per/day) | 0.000 |
| Manhole Headloss Coeff (Global) | 0.500 | Run Time (mins) | 60 |
| Foul Sewage per hectare (l/s) | 0.000 | Output Interval (mins) | 1 |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 6 |
| Number of Online Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | Scotland and Ireland | Cv (Winter) | 0.840 |
| M5-60 (mm) | 18.400 | Storm Duration (mins) | 30 |
| Ratio R | 0.278 | | |

## Storage Structures for Storm

### Cellular Storage Manhole: S5, DS/PN: S1.004

Invert Level (m) 5.442 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00180 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00180

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 250.0 | 250.0 | 1.100 | 0.0 | 360.0 |
| 1.000 | 250.0 | 360.0 | | | |

### Cellular Storage Manhole: S11, DS/PN: S1.008

Invert Level (m) 5.442 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00002 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00002

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 600.0 | 600.0 | 1.100 | 0.0 | 710.0 |
| 1.000 | 600.0 | 710.0 | | | |

### Cellular Storage Manhole: S14, DS/PN: S4.001

Invert Level (m) 5.775 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 80.0 | 0.0 | 1.201 | 0.0 | 0.0 |
| 1.200 | 80.0 | 0.0 | | | |

### Cellular Storage Manhole: S16, DS/PN: S5.001

Invert Level (m) 6.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 80.0 | 0.0 | 1.201 | 0.0 | 0.0 |
| 1.200 | 80.0 | 0.0 | | | |

### Cellular Storage Manhole: S27, DS/PN: S1.014

Invert Level (m) 5.442 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00002 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00002

## Cellular Storage Manhole: S27, DS/PN: S1.014

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 336.0 | 336.0 | 1.100 | 0.0 | 436.0 |
| 1.000 | 336.0 | 436.0 | | | |

## Cellular Storage Manhole: S30, DS/PN: S7.002

Invert Level (m) 6.463 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00007 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00007

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 250.0 | 250.0 | 1.100 | 0.0 | 360.0 |
| 1.000 | 250.0 | 360.0 | | | |

## 1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 0.800 |
| Manhole Headloss Coeff (Global) | 0.500 | Flow per Person per Day (l/per/day) | 0.000 |
| Foul Sewage per hectare (l/s) | 0.000 | | |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 6 |
| Number of Online Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.278 |
| Region | Scotland and Ireland | Cv (Summer) | 0.750 |
| M5-60 (mm) | 18.400 | Cv (Winter) | 0.840 |

| | | | |
|---|---|---|---|
| Margin for Flood Risk Warning (mm) | 100.0 | DVD Status | OFF |
| Analysis Timestep | Fine | Inertia Status | OFF |
| DTS Status | ON | | |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 1, 30, 100 |
| Climate Change (%) | 20, 20, 20 |

WARNING: Half Drain Time has not been calculated as the structure is too full.

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow |
|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Winter | 1 | +20% | 100/15 Summer | | |
| S1.001 | S2 | 15 Winter | 1 | +20% | | | |
| S1.002 | S3 | 15 Winter | 1 | +20% | | | |
| S1.003 | S4 | 15 Winter | 1 | +20% | | | |
| S1.004 | S5 | 10080 Winter | 1 | +20% | | | |
| S2.000 | S6 | 15 Winter | 1 | +20% | 100/5760 Winter | | |
| S3.000 | S7 | 15 Winter | 1 | +20% | 100/15 Summer | | |
| S1.005 | S8 | 15 Winter | 1 | +20% | | | |
| S1.006 | S9 | 15 Winter | 1 | +20% | 100/5760 Winter | | |
| S1.007 | S10 | 15 Winter | 1 | +20% | 100/5760 Winter | | |
| S1.008 | S11 | 10080 Winter | 1 | +20% | 100/5760 Winter | | |
| S1.009 | S12 | 10080 Winter | 1 | +20% | 30/8640 Winter | 100/8640 Summer | |
| S4.000 | S13 | 15 Summer | 1 | +20% | | | |
| S4.001 | S14 | 10080 Winter | 1 | +20% | 30/2160 Winter | | |
| S5.000 | S15 | 15 Summer | 1 | +20% | | | |
| S5.001 | S16 | 15 Summer | 1 | +20% | 30/7200 Winter | | |

## 1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | | 6.609 | -0.156 | 0.000 | 0.45 | | | 26.6 | OK |
| S1.001 | S2 | | 6.483 | -0.221 | 0.000 | 0.35 | | | 26.1 | OK |
| S1.002 | S3 | | 6.369 | -0.215 | 0.000 | 0.38 | | | 28.3 | OK |
| S1.003 | S4 | | 6.344 | -0.220 | 0.000 | 0.36 | | | 29.1 | OK |
| S1.004 | S5 | | 6.021 | -0.460 | 0.000 | 0.00 | | | 0.0 | OK |
| S2.000 | S6 | | 6.203 | -0.128 | 0.000 | 0.01 | | | 0.3 | OK |
| S3.000 | S7 | | 6.390 | -0.162 | 0.000 | 0.41 | | | 24.8 | OK |
| S1.005 | S8 | | 6.204 | -0.242 | 0.000 | 0.27 | | | 21.0 | OK |
| S1.006 | S9 | | 6.091 | -0.242 | 0.000 | 0.27 | | | 20.9 | OK |
| S1.007 | S10 | | 6.075 | -0.245 | 0.000 | 0.26 | | | 24.6 | OK |
| S1.008 | S11 | | 5.978 | -0.303 | 0.000 | 0.02 | | | 2.0 | OK |
| S1.009 | S12 | | 5.983 | -0.273 | 0.000 | 0.01 | | | 2.1 | OK |
| S4.000 | S13 | | 6.800 | -0.225 | 0.000 | 0.00 | | | 0.0 | OK |
| S4.001 | S14 | | 5.979 | -0.001 | 0.000 | 0.02 | | | 0.4 | OK |
| S5.000 | S15 | | 6.800 | -0.225 | 0.000 | 0.00 | | | 0.0 | OK |
| S5.001 | S16 | | 6.000 | -0.225 | 0.000 | 0.00 | | | 0.0 | OK |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| S1.000 | S1 | |
| S1.001 | S2 | |
| S1.002 | S3 | |
| S1.003 | S4 | |
| S1.004 | S5 | |
| S2.000 | S6 | |
| S3.000 | S7 | |
| S1.005 | S8 | |
| S1.006 | S9 | |
| S1.007 | S10 | |
| S1.008 | S11 | |
| S1.009 | S12 | |
| S4.000 | S13 | |
| S4.001 | S14 | |
| S5.000 | S15 | |
| S5.001 | S16 | |

## 1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow |
|---|---|---|---|---|---|---|---|
| S1.010 | S17 | 10080 Winter | 1 | +20% | 30/7200 Winter | 100/8640 Summer | |
| S6.000 | S18 | 15 Winter | 1 | +20% | | | |
| S6.001 | S19 | 15 Winter | 1 | +20% | | | |
| S6.002 | S20 | 15 Winter | 1 | +20% | | | |
| S6.003 | S21 | 15 Winter | 1 | +20% | | | |
| S6.004 | S22 | 15 Winter | 1 | +20% | | | |
| S6.005 | S23 | 15 Winter | 1 | +20% | 100/5760 Winter | | |
| S1.011 | S24 | 10080 Winter | 1 | +20% | 30/4320 Winter | | |
| S1.012 | S25 | 10080 Winter | 1 | +20% | 30/2160 Winter | | |
| S1.013 | S26 | 10080 Winter | 1 | +20% | 1/10080 Winter | | |
| S1.014 | S27 | 10080 Winter | 1 | +20% | | | |
| S7.000 | S28 | 10080 Winter | 1 | +20% | 30/4320 Winter | | |
| S7.001 | S29 | 10080 Winter | 1 | +20% | 1/2880 Winter | | |
| S7.002 | S30 | 10080 Winter | 1 | +20% | | | |

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|
| S1.010 | S17 | | 5.984 | -0.199 | 0.000 | 0.02 | | | 2.5 |
| S6.000 | S18 | | 6.562 | -0.210 | 0.000 | 0.19 | | | 11.2 |
| S6.001 | S19 | | 6.455 | -0.196 | 0.000 | 0.26 | | | 14.8 |
| S6.002 | S20 | | 6.378 | -0.183 | 0.000 | 0.29 | | | 14.6 |
| S6.003 | S21 | | 6.348 | -0.177 | 0.000 | 0.35 | | | 19.7 |
| S6.004 | S22 | | 6.271 | -0.176 | 0.000 | 0.35 | | | 20.3 |
| S6.005 | S23 | | 6.190 | -0.168 | 0.000 | 0.40 | | | 20.3 |
| S1.011 | S24 | | 5.981 | -0.128 | 0.000 | 0.02 | | | 2.1 |
| S1.012 | S25 | | 5.983 | -0.012 | 0.000 | 0.02 | | | 2.4 |
| S1.013 | S26 | | 5.985 | 0.004 | 0.000 | 0.02 | | | 2.2 |
| S1.014 | S27 | | 5.984 | -1.366 | 0.000 | 0.00 | | | 0.0 |
| S7.000 | S28 | | 6.968 | -0.132 | 0.000 | 0.01 | | | 0.5 |
| S7.001 | S29 | | 6.968 | 0.186 | 0.000 | 0.01 | | | 0.5 |
| S7.002 | S30 | | 6.968 | -0.682 | 0.000 | 0.00 | | | 0.0 |

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.010 | S17 | OK | |
| S6.000 | S18 | OK | |
| S6.001 | S19 | OK | |
| S6.002 | S20 | OK | |
| S6.003 | S21 | OK | |
| S6.004 | S22 | OK | |
| S6.005 | S23 | OK | |
| S1.011 | S24 | OK | |

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.012 | S25 | OK | |
| S1.013 | S26 | SURCHARGED | |
| S1.014 | S27 | OK | |
| S7.000 | S28 | OK | |
| S7.001 | S29 | SURCHARGED | |
| S7.002 | S30 | OK | |

## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 0.800 |
| Manhole Headloss Coeff (Global) | 0.500 | Flow per Person per Day (l/per/day) | 0.000 |
| Foul Sewage per hectare (l/s) | 0.000 | | |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 6 |
| Number of Online Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.278 |
| Region | Scotland and Ireland | Cv (Summer) | 0.750 |
| M5-60 (mm) | 18.400 | Cv (Winter) | 0.840 |

| | | | |
|---|---|---|---|
| Margin for Flood Risk Warning (mm) | 100.0 | DVD Status | OFF |
| Analysis Timestep | Fine | Inertia Status | OFF |
| DTS Status | ON | | |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 1, 30, 100 |
| Climate Change (%) | 20, 20, 20 |

WARNING: Half Drain Time has not been calculated as the structure is too full.

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow |
|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Winter | 30 | +20% | 100/15 Summer | | |
| S1.001 | S2 | 15 Winter | 30 | +20% | | | |
| S1.002 | S3 | 15 Winter | 30 | +20% | | | |
| S1.003 | S4 | 15 Winter | 30 | +20% | | | |
| S1.004 | S5 | 10080 Winter | 30 | +20% | | | |
| S2.000 | S6 | 15 Winter | 30 | +20% | 100/5760 Winter | | |
| S3.000 | S7 | 15 Winter | 30 | +20% | 100/15 Summer | | |
| S1.005 | S8 | 15 Winter | 30 | +20% | | | |
| S1.006 | S9 | 10080 Winter | 30 | +20% | 100/5760 Winter | | |
| S1.007 | S10 | 10080 Winter | 30 | +20% | 100/5760 Winter | | |
| S1.008 | S11 | 10080 Winter | 30 | +20% | 100/5760 Winter | | |
| S1.009 | S12 | 10080 Winter | 30 | +20% | 30/8640 Winter | 100/8640 Summer | |
| S4.000 | S13 | 15 Summer | 30 | +20% | | | |
| S4.001 | S14 | 10080 Winter | 30 | +20% | 30/2160 Winter | | |
| S5.000 | S15 | 15 Summer | 30 | +20% | | | |
| S5.001 | S16 | 10080 Winter | 30 | +20% | 30/7200 Winter | | |

## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | | 6.727 | -0.038 | 0.000 | 0.98 | | | 58.4 |
| S1.001 | S2 | | 6.579 | -0.125 | 0.000 | 0.78 | | | 57.9 |
| S1.002 | S3 | | 6.474 | -0.110 | 0.000 | 0.83 | | | 62.2 |
| S1.003 | S4 | | 6.442 | -0.122 | 0.000 | 0.79 | | | 63.8 |
| S1.004 | S5 | | 6.269 | -0.212 | 0.000 | 0.03 | | | 2.7 |
| S2.000 | S6 | | 6.274 | -0.057 | 0.000 | 0.01 | | | 0.4 |
| S3.000 | S7 | | 6.487 | -0.065 | 0.000 | 0.91 | | | 55.2 |
| S1.005 | S8 | | 6.274 | -0.172 | 0.000 | 0.57 | | | 43.9 |
| S1.006 | S9 | | 6.269 | -0.064 | 0.000 | 0.04 | | | 3.1 |
| S1.007 | S10 | | 6.269 | -0.051 | 0.000 | 0.04 | | | 3.3 |
| S1.008 | S11 | | 6.270 | -0.011 | 0.000 | 0.10 | | | 9.0 |
| S1.009 | S12 | | 6.324 | 0.068 | 0.000 | 0.04 | | | 7.3 |
| S4.000 | S13 | | 6.800 | -0.225 | 0.000 | 0.00 | | | 0.0 |
| S4.001 | S14 | | 6.270 | 0.290 | 0.000 | 0.05 | | | 1.3 |
| S5.000 | S15 | | 6.800 | -0.225 | 0.000 | 0.00 | | | 0.0 |
| S5.001 | S16 | | 6.270 | 0.045 | 0.000 | 0.04 | | | 1.3 |

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.000 | S1 | OK | |
| S1.001 | S2 | OK | |
| S1.002 | S3 | OK | |
| S1.003 | S4 | OK | |
| S1.004 | S5 | OK | |
| S2.000 | S6 | OK | |
| S3.000 | S7 | OK | |
| S1.005 | S8 | OK | |
| S1.006 | S9 | OK | |
| S1.007 | S10 | OK | |
| S1.008 | S11 | OK | |
| S1.009 | S12 | SURCHARGED | |
| S4.000 | S13 | OK | |
| S4.001 | S14 | SURCHARGED | |
| S5.000 | S15 | OK | |
| S5.001 | S16 | SURCHARGED | |

## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow |
|---|---|---|---|---|---|---|---|
| S1.010 | S17 | 10080 Winter | 30 | +20% | 30/7200 Winter | 100/8640 Summer | |
| S6.000 | S18 | 15 Winter | 30 | +20% | | | |
| S6.001 | S19 | 15 Winter | 30 | +20% | | | |
| S6.002 | S20 | 15 Winter | 30 | +20% | | | |
| S6.003 | S21 | 15 Winter | 30 | +20% | | | |
| S6.004 | S22 | 15 Winter | 30 | +20% | | | |
| S6.005 | S23 | 10080 Winter | 30 | +20% | 100/5760 Winter | | |
| S1.011 | S24 | 10080 Winter | 30 | +20% | 30/4320 Winter | | |
| S1.012 | S25 | 10080 Winter | 30 | +20% | 30/2160 Winter | | |
| S1.013 | S26 | 10080 Winter | 30 | +20% | 1/10080 Winter | | |
| S1.014 | S27 | 10080 Winter | 30 | +20% | | | |
| S7.000 | S28 | 10080 Winter | 30 | +20% | 30/4320 Winter | | |
| S7.001 | S29 | 10080 Winter | 30 | +20% | 1/2880 Winter | | |
| S7.002 | S30 | 10080 Winter | 30 | +20% | | | |

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|
| S1.010 | S17 | | 6.315 | 0.132 | 0.000 | 0.07 | | | 7.2 |
| S6.000 | S18 | | 6.611 | -0.161 | 0.000 | 0.42 | | | 25.0 |
| S6.001 | S19 | | 6.521 | -0.130 | 0.000 | 0.59 | | | 33.8 |
| S6.002 | S20 | | 6.461 | -0.100 | 0.000 | 0.68 | | | 34.2 |
| S6.003 | S21 | | 6.435 | -0.090 | 0.000 | 0.81 | | | 45.8 |
| S6.004 | S22 | | 6.356 | -0.091 | 0.000 | 0.81 | | | 46.7 |
| S6.005 | S23 | | 6.289 | -0.069 | 0.000 | 0.02 | | | 0.9 |
| S1.011 | S24 | | 6.290 | 0.181 | 0.000 | 0.07 | | | 7.3 |
| S1.012 | S25 | | 6.298 | 0.303 | 0.000 | 0.07 | | | 7.1 |
| S1.013 | S26 | | 6.297 | 0.316 | 0.000 | 0.05 | | | 6.8 |
| S1.014 | S27 | | 6.296 | -1.054 | 0.000 | 0.00 | | | 0.0 |
| S7.000 | S28 | | 7.296 | 0.196 | 0.000 | 0.01 | | | 0.9 |
| S7.001 | S29 | | 7.296 | 0.514 | 0.000 | 0.02 | | | 0.8 |
| S7.002 | S30 | | 7.296 | -0.354 | 0.000 | 0.00 | | | 0.0 |

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.010 | S17 | SURCHARGED | |
| S6.000 | S18 | OK | |
| S6.001 | S19 | OK | |
| S6.002 | S20 | OK | |
| S6.003 | S21 | OK | |
| S6.004 | S22 | OK | |
| S6.005 | S23 | OK | |
| S1.011 | S24 | SURCHARGED | |

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.012 | S25 | SURCHARGED | |
| S1.013 | S26 | SURCHARGED | |
| S1.014 | S27 | OK | |
| S7.000 | S28 | SURCHARGED | |
| S7.001 | S29 | SURCHARGED | |
| S7.002 | S30 | OK | |

## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 0.800 |
| Manhole Headloss Coeff (Global) | 0.500 | Flow per Person per Day (l/per/day) | 0.000 |
| Foul Sewage per hectare (l/s) | 0.000 | | |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 6 |
| Number of Online Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.278 |
| Region | Scotland and Ireland | Cv (Summer) | 0.750 |
| M5-60 (mm) | 18.400 | Cv (Winter) | 0.840 |

| | | | |
|---|---|---|---|
| Margin for Flood Risk Warning (mm) | 100.0 | DVD Status | OFF |
| Analysis Timestep | Fine | Inertia Status | OFF |
| DTS Status | ON | | |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 1, 30, 100 |
| Climate Change (%) | 20, 20, 20 |

WARNING: Half Drain Time has not been calculated as the structure is too full.

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow |
|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Winter | 100 | +20% | 100/15 Summer | | |
| S1.001 | S2 | 15 Winter | 100 | +20% | | | |
| S1.002 | S3 | 15 Winter | 100 | +20% | | | |
| S1.003 | S4 | 15 Winter | 100 | +20% | | | |
| S1.004 | S5 | 10080 Winter | 100 | +20% | | | |
| S2.000 | S6 | 10080 Winter | 100 | +20% | 100/5760 Winter | | |
| S3.000 | S7 | 15 Winter | 100 | +20% | 100/15 Summer | | |
| S1.005 | S8 | 10080 Winter | 100 | +20% | | | |
| S1.006 | S9 | 10080 Winter | 100 | +20% | 100/5760 Winter | | |
| S1.007 | S10 | 10080 Winter | 100 | +20% | 100/5760 Winter | | |
| S1.008 | S11 | 10080 Winter | 100 | +20% | 100/5760 Winter | | |
| S1.009 | S12 | 10080 Winter | 100 | +20% | 30/8640 Winter | 100/8640 Summer | |
| S4.000 | S13 | 15 Summer | 100 | +20% | | | |
| S4.001 | S14 | 8640 Winter | 100 | +20% | 30/2160 Winter | | |
| S5.000 | S15 | 15 Summer | 100 | +20% | | | |
| S5.001 | S16 | 10080 Winter | 100 | +20% | 30/7200 Winter | | |

## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | | 6.858 | 0.093 | 0.000 | 1.27 | | | 75.4 |
| S1.001 | S2 | | 6.630 | -0.074 | 0.000 | 1.00 | | | 74.4 |
| S1.002 | S3 | | 6.584 | 0.000 | 0.000 | 1.05 | | | 78.6 |
| S1.003 | S4 | | 6.500 | -0.064 | 0.000 | 0.99 | | | 80.0 |
| S1.004 | S5 | | 6.349 | -0.132 | 0.000 | 0.02 | | | 1.4 |
| S2.000 | S6 | | 6.350 | 0.019 | 0.000 | 0.00 | | | 0.0 |
| S3.000 | S7 | | 6.639 | 0.087 | 0.000 | 1.17 | | | 70.6 |
| S1.005 | S8 | | 6.350 | -0.096 | 0.000 | 0.03 | | | 2.3 |
| S1.006 | S9 | | 6.352 | 0.019 | 0.000 | 0.03 | | | 2.3 |
| S1.007 | S10 | | 6.353 | 0.033 | 0.000 | 0.03 | | | 2.5 |
| S1.008 | S11 | | 6.354 | 0.073 | 0.000 | 0.12 | | | 11.0 |
| S1.009 | S12 | | 6.615 | 0.359 | 0.000 | 0.04 | | | 7.4 |
| S4.000 | S13 | | 6.800 | -0.225 | 0.000 | 0.00 | | | 0.0 |
| S4.001 | S14 | | 6.375 | 0.395 | 0.000 | 0.07 | | | 1.8 |
| S5.000 | S15 | | 6.800 | -0.225 | 0.000 | 0.00 | | | 0.0 |
| S5.001 | S16 | | 6.374 | 0.149 | 0.000 | 0.05 | | | 1.8 |

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.000 | S1 | SURCHARGED | |
| S1.001 | S2 | OK | |
| S1.002 | S3 | OK | |
| S1.003 | S4 | OK | |
| S1.004 | S5 | OK | |
| S2.000 | S6 | SURCHARGED | |
| S3.000 | S7 | SURCHARGED | |
| S1.005 | S8 | OK | |
| S1.006 | S9 | SURCHARGED | |
| S1.007 | S10 | SURCHARGED | |
| S1.008 | S11 | SURCHARGED | |
| S1.009 | S12 | SURCHARGED | |
| S4.000 | S13 | OK | |
| S4.001 | S14 | SURCHARGED | |
| S5.000 | S15 | OK | |
| S5.001 | S16 | SURCHARGED | |

## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow |
|---|---|---|---|---|---|---|---|
| S1.010 | S17 | 10080 Winter | 100 | +20% | 30/7200 Winter | 100/8640 Summer | |
| S6.000 | S18 | 15 Winter | 100 | +20% | | | |
| S6.001 | S19 | 15 Winter | 100 | +20% | | | |
| S6.002 | S20 | 15 Winter | 100 | +20% | | | |
| S6.003 | S21 | 15 Winter | 100 | +20% | | | |
| S6.004 | S22 | 15 Winter | 100 | +20% | | | |
| S6.005 | S23 | 10080 Winter | 100 | +20% | 100/5760 Winter | | |
| S1.011 | S24 | 10080 Winter | 100 | +20% | 30/4320 Winter | | |
| S1.012 | S25 | 10080 Winter | 100 | +20% | 30/2160 Winter | | |
| S1.013 | S26 | 8640 Winter | 100 | +20% | 1/10080 Winter | | |
| S1.014 | S27 | 10080 Winter | 100 | +20% | | | |
| S7.000 | S28 | 10080 Winter | 100 | +20% | 30/4320 Winter | | |
| S7.001 | S29 | 10080 Winter | 100 | +20% | 1/2880 Winter | | |
| S7.002 | S30 | 10080 Winter | 100 | +20% | | | |

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|
| S1.010 | S17 | | 6.559 | 0.376 | 0.000 | 0.07 | | | 7.0 |
| S6.000 | S18 | | 6.635 | -0.137 | 0.000 | 0.55 | | | 32.5 |
| S6.001 | S19 | | 6.568 | -0.083 | 0.000 | 0.74 | | | 42.5 |
| S6.002 | S20 | | 6.523 | -0.038 | 0.000 | 0.81 | | | 40.9 |
| S6.003 | S21 | | 6.496 | -0.029 | 0.000 | 0.99 | | | 55.7 |
| S6.004 | S22 | | 6.432 | -0.015 | 0.000 | 0.96 | | | 55.0 |
| S6.005 | S23 | | 6.394 | 0.036 | 0.000 | 0.02 | | | 1.1 |
| S1.011 | S24 | | 6.393 | 0.284 | 0.000 | 0.07 | | | 7.2 |
| S1.012 | S25 | | 6.430 | 0.435 | 0.000 | 0.07 | | | 7.3 |
| S1.013 | S26 | | 6.430 | 0.449 | 0.000 | 0.06 | | | 7.5 |
| S1.014 | S27 | | 6.409 | -0.941 | 0.000 | 0.00 | | | 0.0 |
| S7.000 | S28 | | 7.446 | 0.346 | 0.000 | 0.01 | | | 1.0 |
| S7.001 | S29 | | 7.446 | 0.664 | 0.000 | 0.02 | | | 1.0 |
| S7.002 | S30 | | 7.446 | -0.204 | 0.000 | 0.00 | | | 0.0 |

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.010 | S17 | SURCHARGED | |
| S6.000 | S18 | OK | |
| S6.001 | S19 | OK | |
| S6.002 | S20 | OK | |
| S6.003 | S21 | OK | |
| S6.004 | S22 | OK | |
| S6.005 | S23 | SURCHARGED | |
| S1.011 | S24 | SURCHARGED | |

## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.012 | S25 | SURCHARGED | |
| S1.013 | S26 | SURCHARGED | |
| S1.014 | S27 | OK | |
| S7.000 | S28 | SURCHARGED | |
| S7.001 | S29 | SURCHARGED | |
| S7.002 | S30 | OK | |

# Appendix F

## Foul Water Design Report

## FOUL SEWERAGE DESIGN

### Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

| | | | |
|---|---|---|---|
| Industrial Flow (l/s/ha) | 0.00 | Add Flow / Climate Change (%) | 0 |
| Industrial Peak Flow Factor | 0.00 | Minimum Backdrop Height (m) | 0.200 |
| Flow Per Person (l/per/day) | 150.00 | Maximum Backdrop Height (m) | 1.500 |
| Persons per House | 3.00 | Min Design Depth for Optimisation (m) | 1.200 |
| Domestic (l/s/ha) | 0.00 | Min Vel for Auto Design only (m/s) | 0.75 |
| Domestic Peak Flow Factor | 6.00 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Soffits

### Network Design Table for Foul - Main

| PN | Length (m) | Fall (m) | Slope (1:X) | Area (ha) | Houses | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F1.000 | 42.125 | 0.211 | 199.6 | 0.000 | 32 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F1.001 | 45.471 | 0.227 | 200.3 | 0.000 | 1 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F1.002 | 19.784 | 0.099 | 199.8 | 0.000 | 0 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F2.000 | 50.189 | 0.251 | 200.0 | 0.000 | 31 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F3.000 | 69.966 | 0.350 | 199.9 | 0.000 | 82 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F3.001 | 23.341 | 0.117 | 199.5 | 0.000 | 0 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F3.002 | 16.477 | 0.082 | 200.9 | 0.000 | 1 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F3.003 | 12.428 | 0.062 | 200.5 | 0.000 | 0 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F3.004 | 12.453 | 0.062 | 200.9 | 0.000 | 0 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |
| F1.003 | 2.524 | 0.013 | 194.2 | 0.000 | 0 | 0.0 | 1.500 | o | 225 | Pipe/Conduit | |

### Network Results Table

| PN | US/IL (m) | Σ Area (ha) | Σ Base Flow (l/s) | Σ Hse | Add Flow (l/s) | P.Dep (mm) | P.Vel (m/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| F1.000 | 6.050 | 0.000 | 0.0 | 32 | 0.0 | 27 | 0.36 | 0.81 | 32.2 | 1.0 |
| F1.001 | 5.839 | 0.000 | 0.0 | 33 | 0.0 | 28 | 0.36 | 0.81 | 32.2 | 1.0 |
| F1.002 | 5.612 | 0.000 | 0.0 | 33 | 0.0 | 28 | 0.37 | 0.81 | 32.2 | 1.0 |
| F2.000 | 6.150 | 0.000 | 0.0 | 31 | 0.0 | 27 | 0.36 | 0.81 | 32.2 | 1.0 |
| F3.000 | 6.250 | 0.000 | 0.0 | 82 | 0.0 | 43 | 0.48 | 0.81 | 32.2 | 2.6 |
| F3.001 | 5.900 | 0.000 | 0.0 | 82 | 0.0 | 43 | 0.48 | 0.81 | 32.3 | 2.6 |
| F3.002 | 5.783 | 0.000 | 0.0 | 83 | 0.0 | 43 | 0.48 | 0.81 | 32.1 | 2.6 |
| F3.003 | 5.701 | 0.000 | 0.0 | 83 | 0.0 | 43 | 0.48 | 0.81 | 32.2 | 2.6 |
| F3.004 | 5.639 | 0.000 | 0.0 | 83 | 0.0 | 43 | 0.48 | 0.81 | 32.1 | 2.6 |
| F1.003 | 5.513 | 0.000 | 0.0 | 147 | 0.0 | 57 | 0.58 | 0.82 | 32.7 | 4.6 |

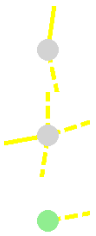
## Manhole Schedules for Foul - Main

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F1 | 7.584 | 1.534 | Open Manhole | 1200 | F1.000 | 6.050 | 225 | | | | |
| F2 | 7.529 | 1.690 | Open Manhole | 1200 | F1.001 | 5.839 | 225 | F1.000 | 5.839 | 225 | |
| F3 | 7.393 | 1.781 | Open Manhole | 1200 | F1.002 | 5.612 | 225 | F1.001 | 5.612 | 225 | |
| F4 | 7.753 | 1.603 | Open Manhole | 1200 | F2.000 | 6.150 | 225 | | | | |
| F5 | 7.762 | 1.512 | Open Manhole | 1200 | F3.000 | 6.250 | 225 | | | | |
| F6 | 7.390 | 1.490 | Open Manhole | 1200 | F3.001 | 5.900 | 225 | F3.000 | 5.900 | 225 | |
| F7 | 7.275 | 1.492 | Open Manhole | 1200 | F3.002 | 5.783 | 225 | F3.001 | 5.783 | 225 | |
| F8 | 7.302 | 1.601 | Open Manhole | 1200 | F3.003 | 5.701 | 225 | F3.002 | 5.701 | 225 | |
| F9 | 7.418 | 1.779 | Open Manhole | 1200 | F3.004 | 5.639 | 225 | F3.003 | 5.639 | 225 | |
| F4 | 7.523 | 2.010 | Open Manhole | 1200 | F1.003 | 5.513 | 225 | F1.002 | 5.513 | 225 | |
| | | | | | | | | F2.000 | 5.899 | 225 | 386 |
| | | | | | | | | F3.004 | 5.577 | 225 | 64 |
| F | 7.486 | 1.986 | Open Manhole | 0 | | OUTFALL | | F1.003 | 5.500 | 225 | |

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| F1 | 484557.081 | 614338.662 | 484557.081 | 614338.662 | Required | |
| F2 | 484517.000 | 614325.701 | 484517.000 | 614325.701 | Required | |
| F3 | 484528.802 | 614281.789 | 484528.802 | 614281.789 | Required | |
| F4 | 484576.795 | 614277.313 | 484576.795 | 614277.313 | Required | |
| F5 | 484610.084 | 614221.969 | 484610.084 | 614221.969 | Required | |
| F6 | 484543.542 | 614200.348 | 484543.542 | 614200.348 | Required | |
| F7 | 484537.258 | 614222.827 | 484537.258 | 614222.827 | Required | |
| F8 | 484529.840 | 614237.540 | 484529.840 | 614237.540 | Required | |

## Manhole Schedules for Foul - Main

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| F9 | 484527.197 | 614249.683 | 484527.197 | 614249.683 | Required | |
| F4 | 484528.997 | 614262.006 | 484528.997 | 614262.006 | Required | |
| F | 484526.516 | 614261.544 | | | No Entry | |



## PIPELINE SCHEDULES for Foul - Main

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| F1.000 | o | 225 | F1 | 7.584 | 6.050 | 1.309 | Open Manhole | 1200 |
| F1.001 | o | 225 | F2 | 7.529 | 5.839 | 1.465 | Open Manhole | 1200 |
| F1.002 | o | 225 | F3 | 7.393 | 5.612 | 1.556 | Open Manhole | 1200 |
| F2.000 | o | 225 | F4 | 7.753 | 6.150 | 1.378 | Open Manhole | 1200 |
| F3.000 | o | 225 | F5 | 7.762 | 6.250 | 1.287 | Open Manhole | 1200 |
| F3.001 | o | 225 | F6 | 7.390 | 5.900 | 1.265 | Open Manhole | 1200 |
| F3.002 | o | 225 | F7 | 7.275 | 5.783 | 1.267 | Open Manhole | 1200 |
| F3.003 | o | 225 | F8 | 7.302 | 5.701 | 1.376 | Open Manhole | 1200 |
| F3.004 | o | 225 | F9 | 7.418 | 5.639 | 1.554 | Open Manhole | 1200 |
| F1.003 | o | 225 | F4 | 7.523 | 5.513 | 1.785 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| F1.000 | 42.125 | 199.6 | F2 | 7.529 | 5.839 | 1.465 | Open Manhole | 1200 |
| F1.001 | 45.471 | 200.3 | F3 | 7.393 | 5.612 | 1.556 | Open Manhole | 1200 |
| F1.002 | 19.784 | 199.8 | F4 | 7.523 | 5.513 | 1.785 | Open Manhole | 1200 |
| F2.000 | 50.189 | 200.0 | F4 | 7.523 | 5.899 | 1.399 | Open Manhole | 1200 |
| F3.000 | 69.966 | 199.9 | F6 | 7.390 | 5.900 | 1.265 | Open Manhole | 1200 |
| F3.001 | 23.341 | 199.5 | F7 | 7.275 | 5.783 | 1.267 | Open Manhole | 1200 |
| F3.002 | 16.477 | 200.9 | F8 | 7.302 | 5.701 | 1.376 | Open Manhole | 1200 |
| F3.003 | 12.428 | 200.5 | F9 | 7.418 | 5.639 | 1.554 | Open Manhole | 1200 |
| F3.004 | 12.453 | 200.9 | F4 | 7.523 | 5.577 | 1.721 | Open Manhole | 1200 |
| F1.003 | 2.524 | 194.2 | F | 7.486 | 5.500 | 1.761 | Open Manhole | 0 |

### Free Flowing Outfall Details for Foul - Main

| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---|---|---|---|---|---|---|
| F1.003 | F | 7.486 | 5.500 | 0.000 | 0 | 0 |

## Simulation Criteria for Foul - Main

| | | | |
|---|---|---|---|
| Volumetric Runoff Coeff | 0.750 | Additional Flow - % of Total Flow | 0.000 |
| Areal Reduction Factor | 1.000 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start (mins) | 0 | Inlet Coeffiecient | 0.800 |
| Hot Start Level (mm) | 0 | Flow per Person per Day (l/per/day) | 0.000 |
| Manhole Headloss Coeff (Global) | 0.500 | Run Time (mins) | 60 |
| Foul Sewage per hectare (l/s) | 0.000 | Output Interval (mins) | 1 |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 0 |
| Number of Online Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | Scotland and Ireland | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.100 | Storm Duration (mins) | 30 |
| Ratio R | 0.279 | | |

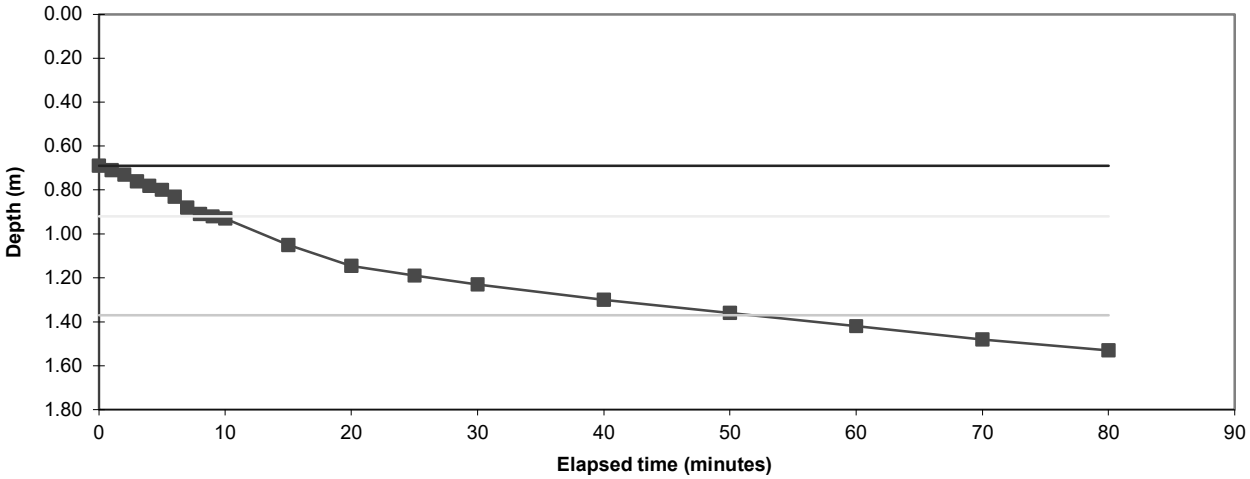
# Appendix G

## BRE 365 Infiltration Testing

# Soakaway Test

| | | | | | |
|---|---|---|---|---|---|
| Trial Pit No: | 1 | Test No: | 1 | Date: | 02/08/2023 |
| Length (m): | 1.50 | Datum height: | | 0.00 | m agl |
| Width (m): | 0.95 | Granular infill: | None | | |
| Depth (m): | 1.60 | Porosity of infill: | 1 | | (assumed) |

| Elapsed time (minutes) | Water Depth (m below datum) | Elapsed time (minutes) | Water Depth (m below datum) |
|---|---|---|---|
| 0 | 0.69 | 30 | 1.23 |
| 1 | 0.71 | 40 | 1.30 |
| 2 | 0.73 | 50 | 1.36 |
| 3 | 0.76 | 60 | 1.42 |
| 4 | 0.78 | 70 | 1.48 |
| 5 | 0.80 | 80 | 1.53 |
| 6 | 0.83 | | |
| 7 | 0.88 | | |
| 8 | 0.91 | | |
| 9 | 0.92 | | |
| 10 | 0.93 | | |
| 15 | 1.05 | | |
| 20 | 1.15 | | |
| 25 | 1.19 | | |




| | | | |
|---|---|---|---|
| Start water depth for analysis (mbgl): | 0.69 | | |
| 75% effective depth (mbgl): | 0.92 | Elapsed time (mins): | 9.0 |
| 50% effective depth (mbgl): | 1.15 | | |
| 25% effective depth (mbgl): | 1.37 | Elapsed time (mins): | 51.7 |
| Base of soakage zone (mbgl): | 1.60 | | |

| | |
|---|---|
| Volume outflow between 75% and 25% effective depth (m3): | 0.641 |
| Mean surface area of outflow ($m^2$): | 3.63 |
| (side area at 50% effective depth + base area) | |
| Time for outflow between 75% and 25% effective depth (mins): | 42.7 |

| **Soil infiltration rate (m/s):** | **6.9E-5** |
|---|---|

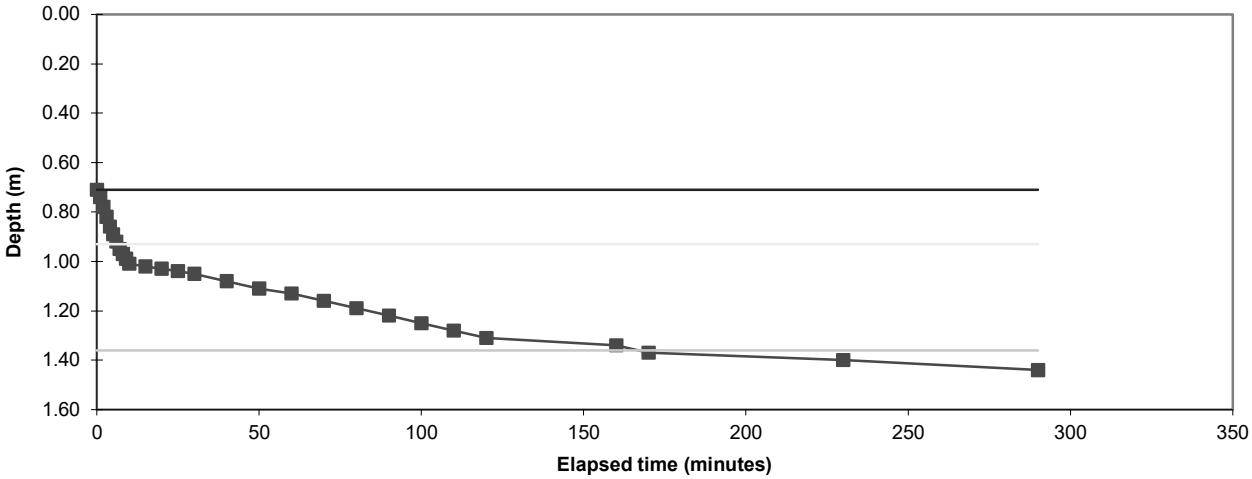
Remarks Results processed following BRE 365 (2007).

| Notes: | Project | Cloonmore Regeneration LRD | Figure |
|---|---|---|---|
| Water depths measured below ground level | Project No. | 23824 | |
| | Carried out by | MWP | |

# Soakaway Test

| | | | | | |
|---|---|---|---|---|---|
| Trial Pit No: | 2 | Test No: | 1 | Date: | 02/08/2023 |
| Length (m): | 1.30 | Datum height: | | 0.00 | m agl |
| Width (m): | 0.95 | Granular infill: | None | | |
| Depth (m): | 1.58 | Porosity of infill: | 1 | | (assumed) |

| Elapsed time (minutes) | Water Depth (m below datum) | Elapsed time (minutes) | Water Depth (m below datum) |
|---|---|---|---|
| 0 | 0.71 | 30 | 1.05 |
| 1 | 0.74 | 40 | 1.08 |
| 2 | 0.78 | 50 | 1.11 |
| 3 | 0.82 | 60 | 1.13 |
| 4 | 0.86 | 70 | 1.16 |
| 5 | 0.89 | 80 | 1.19 |
| 6 | 0.92 | 90 | 1.22 |
| 7 | 0.95 | 100 | 1.25 |
| 8 | 0.97 | 110 | 1.28 |
| 9 | 0.99 | 120 | 1.31 |
| 10 | 1.01 | 160 | 1.34 |
| 15 | 1.02 | 170 | 1.37 |
| 20 | 1.03 | 230 | 1.40 |
| 25 | 1.04 | 290 | 1.44 |




| | | | |
|---|---|---|---|
| Start water depth for analysis (mbgl): | 0.71 | | |
| 75% effective depth (mbgl): | 0.93 | Elapsed time (mins): | 6.3 |
| 50% effective depth (mbgl): | 1.15 | | |
| 25% effective depth (mbgl): | 1.36 | Elapsed time (mins): | 166.7 |
| Base of soakage zone (mbgl): | 1.58 | | |

| | |
|---|---|
| Volume outflow between 75% and 25% effective depth (m3): | 0.531 |
| Mean surface area of outflow ($m^2$): | 3.17 |
| (side area at 50% effective depth + base area) | |
| Time for outflow between 75% and 25% effective depth (mins): | 160.4 |

| **Soil infiltration rate (m/s):** | **1.7E-5** |
|---|---|

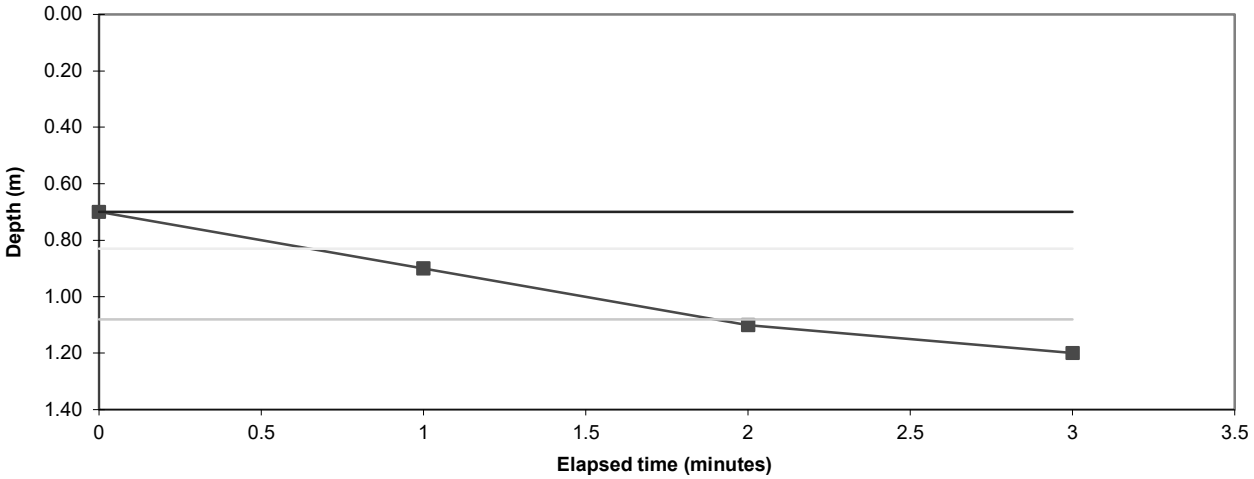
Remarks Results processed following BRE 365 (2007).

| Notes: | Project | Cloonmore Regeneration LRD | Figure |
|---|---|---|---|
| Water depths measured below ground level | Project No. | 23824 | |
| | Carried out by | MWP | |

# Soakaway Test

| | | | | | |
|---|---|---|---|---|---|
| Trial Pit No: | 3 | Test No: | 1 | Date: | 02/08/2023 |
| Length (m): | 1.40 | Datum height: | | 0.00 | m agl |
| Width (m): | 0.95 | Granular infill: | None | | |
| Depth (m): | 1.20 | Porosity of infill: | 1 | | (assumed) |

| Elapsed time (minutes) | Water Depth (m below datum) | Elapsed time (minutes) | Water Depth (m below datum) |
|---|---|---|---|
| 0 | 0.70 | | |
| 1 | 0.90 | | |
| 2 | 1.10 | | |
| 3 | 1.20 | | |




| | | | |
|---|---|---|---|
| Start water depth for analysis (mbgl): | 0.70 | | |
| 75% effective depth (mbgl): | 0.83 | Elapsed time (mins): | 0.7 |
| 50% effective depth (mbgl): | 0.95 | | |
| 25% effective depth (mbgl): | 1.08 | Elapsed time (mins): | 1.9 |
| Base of soakage zone (mbgl): | 1.20 | | |

| | |
|---|---|
| Volume outflow between 75% and 25% effective depth (m3): | 0.333 |
| Mean surface area of outflow ($m^2$): | 2.51 |
| (side area at 50% effective depth + base area) | |
| Time for outflow between 75% and 25% effective depth (mins): | 1.2 |

| **Soil infiltration rate (m/s):** | **1.8E-3** |
|---|---|

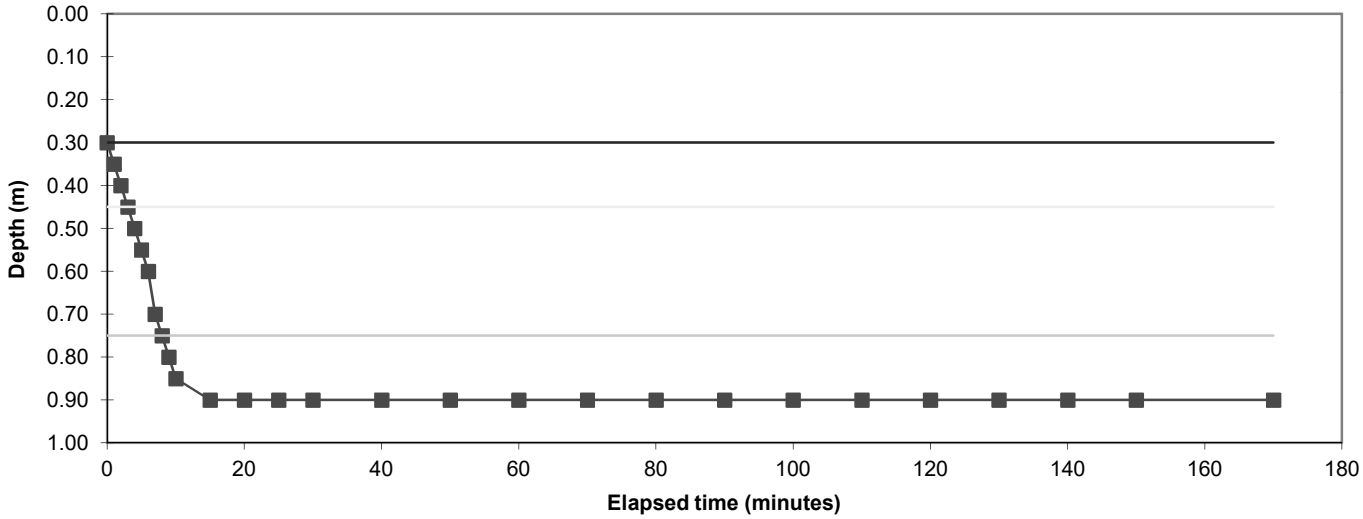
Remarks Results processed following BRE 365 (2007).

| Notes: | Project | Cloonmore Regeneration LRD | Figure |
|---|---|---|---|
| Water depths measured below ground level | Project No. | 23824 | |
| | Carried out by | MWP | |

# Soakaway Test

| | | | | | |
|---|---|---|---|---|---|
| Trial Pit No: | 1 | Test No: | 1 | Date: | 16/12/2019 |
| Length (m): | 2.00 | Datum height: | | 0.00 | m agl |
| Width (m): | 0.30 | Granular infill: | None | | |
| Depth (m): | 0.90 | Porosity of infill: | 1 | (assumed) | |

| Elapsed time (minutes) | Water Depth (m below datum) | Elapsed time (minutes) | Water Depth (m below datum) |
|---|---|---|---|
| 0 | 0.30 | 30 | 0.90 |
| 1 | 0.35 | 40 | 0.90 |
| 2 | 0.40 | 50 | 0.90 |
| 3 | 0.45 | 60 | 0.90 |
| 4 | 0.50 | 70 | 0.90 |
| 5 | 0.55 | 80 | 0.90 |
| 6 | 0.60 | 90 | 0.90 |
| 7 | 0.70 | 100 | 0.90 |
| 8 | 0.75 | 110 | 0.90 |
| 9 | 0.80 | 120 | 0.90 |
| 10 | 0.85 | 130 | 0.90 |
| 15 | 0.90 | 140 | 0.90 |
| 20 | 0.90 | 150 | 0.90 |
| 25 | 0.90 | 170 | 0.90 |




| | | | |
|---|---|---|---|
| Start water depth for analysis (mbgl): | 0.30 | | |
| 75% effective depth (mbgl): | 0.45 | Elapsed time (mins): | 3.0 |
| 50% effective depth (mbgl): | 0.60 | | |
| 25% effective depth (mbgl): | 0.75 | Elapsed time (mins): | 8.0 |
| Base of soakage zone (mbgl): | 0.90 | | |

| | |
|---|---|
| Volume outflow between 75% and 25% effective depth (m3): | 0.180 |
| Mean surface area of outflow ($m^2$): | 1.98 |
| (side area at 50% effective depth + base area) | |
| Time for outflow between 75% and 25% effective depth (mins): | 5.0 |

| | |
|---|---|
| **Soil infiltration rate (m/s):** | **3.0E-4** |

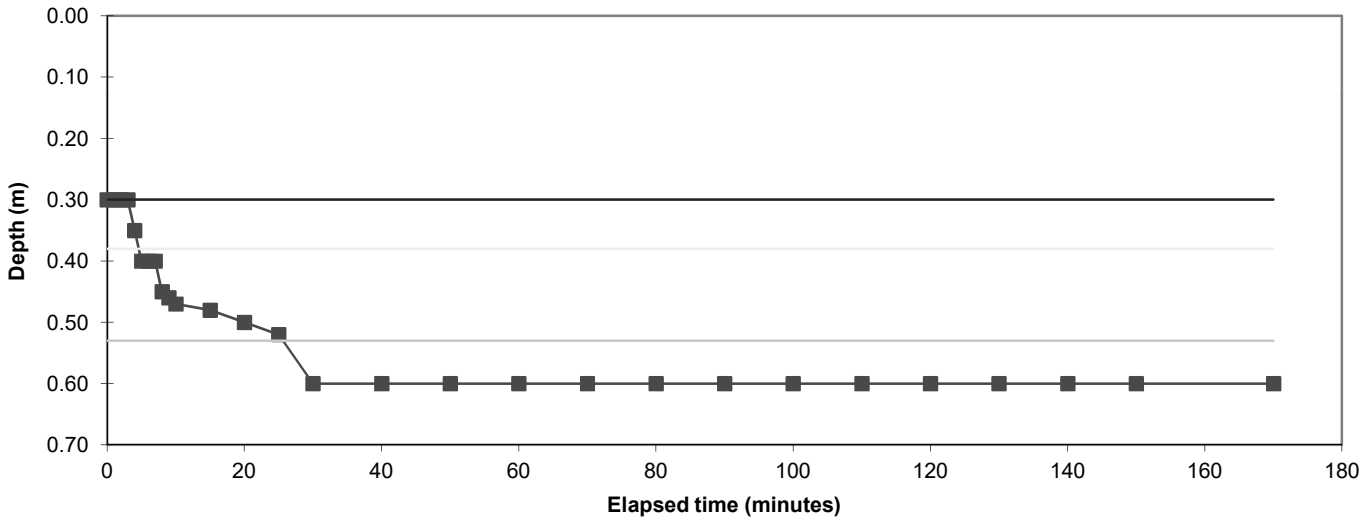
Remarks: Results processed following BRE 365 (2007).

| | | |
|---|---|---|
| Notes: Water depths measured below ground level | Project: Clonmore Housing<br>Project No.<br>Carried out for: MWP | Figure<br>Sheet 1 of 1 |

# Soakaway Test

| | | | | | |
|---|---|---|---|---|---|
| Trial Pit No: | 2 | Test No: | 1 | Date: | 17/12/2019 |
| Length (m): | 1.90 | | Datum height: | 0.00 | m agl |
| Width (m): | 0.30 | | Granular infill: | None | |
| Depth (m): | 0.60 | | Porosity of infill: | 1 | (assumed) |

| Elapsed time (minutes) | Water Depth (m below datum) | Elapsed time (minutes) | Water Depth (m below datum) |
|---|---|---|---|
| 0 | 0.30 | 30 | 0.60 |
| 1 | 0.30 | 40 | 0.60 |
| 2 | 0.30 | 50 | 0.60 |
| 3 | 0.30 | 60 | 0.60 |
| 4 | 0.35 | 70 | 0.60 |
| 5 | 0.40 | 80 | 0.60 |
| 6 | 0.40 | 90 | 0.60 |
| 7 | 0.40 | 100 | 0.60 |
| 8 | 0.45 | 110 | 0.60 |
| 9 | 0.46 | 120 | 0.60 |
| 10 | 0.47 | 130 | 0.60 |
| 15 | 0.48 | 140 | 0.60 |
| 20 | 0.50 | 150 | 0.60 |
| 25 | 0.52 | 170 | 0.60 |




| | | | |
|---|---|---|---|
| Start water depth for analysis (mbgl): | 0.30 | | |
| 75% effective depth (mbgl): | 0.38 | Elapsed time (mins): | 4.6 |
| 50% effective depth (mbgl): | 0.45 | | |
| 25% effective depth (mbgl): | 0.53 | Elapsed time (mins): | 25.6 |
| Base of soakage zone (mbgl): | 0.60 | | |

| | |
|---|---|
| Volume outflow between 75% and 25% effective depth (m3): | 0.086 |
| Mean surface area of outflow ($m^2$): | 1.23 |
| (side area at 50% effective depth + base area) | |
| Time for outflow between 75% and 25% effective depth (mins): | 21.0 |

| | |
|---|---|
| **Soil infiltration rate (m/s):** | **5.5E-5** |

Remarks: Results processed following BRE 365 (2007).

Notes:
Water depths measured below ground level

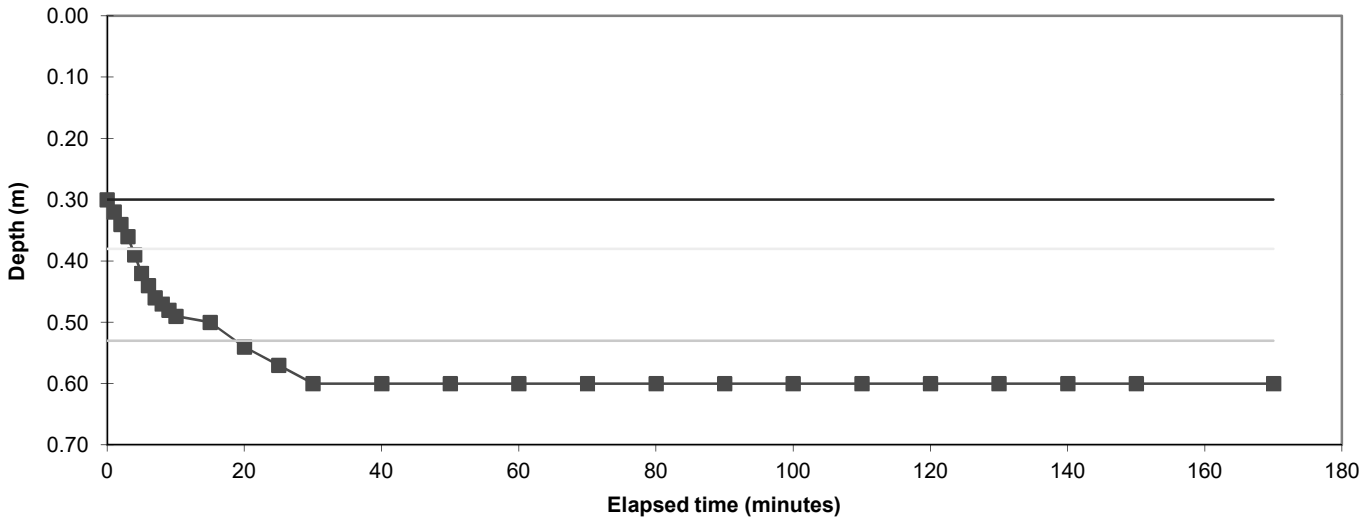
Project: Clonmore Housing
Project No.
Carried out for: MWP

Figure

# Soakaway Test

| | | | | | |
|---|---|---|---|---|---|
| Trial Pit No: | 3 | Test No: | 1 | Date: | 16/12/2019 |
| Length (m): | 1.50 | | Datum height: | 0.00 | m agl |
| Width (m): | 0.30 | | Granular infill: | None | |
| Depth (m): | 0.60 | | Porosity of infill: | 1 | (assumed) |

| Elapsed time (minutes) | Water Depth (m below datum) | Elapsed time (minutes) | Water Depth (m below datum) |
|---|---|---|---|
| 0 | 0.30 | 30 | 0.60 |
| 1 | 0.32 | 40 | 0.60 |
| 2 | 0.34 | 50 | 0.60 |
| 3 | 0.36 | 60 | 0.60 |
| 4 | 0.39 | 70 | 0.60 |
| 5 | 0.42 | 80 | 0.60 |
| 6 | 0.44 | 90 | 0.60 |
| 7 | 0.46 | 100 | 0.60 |
| 8 | 0.47 | 110 | 0.60 |
| 9 | 0.48 | 120 | 0.60 |
| 10 | 0.49 | 130 | 0.60 |
| 15 | 0.50 | 140 | 0.60 |
| 20 | 0.54 | 150 | 0.60 |
| 25 | 0.57 | 170 | 0.60 |




| | | | |
|---|---|---|---|
| Start water depth for analysis (mbgl): | 0.30 | | |
| 75% effective depth (mbgl): | 0.38 | Elapsed time (mins): | 3.7 |
| 50% effective depth (mbgl): | 0.45 | | |
| 25% effective depth (mbgl): | 0.53 | Elapsed time (mins): | 18.8 |
| Base of soakage zone (mbgl): | 0.60 | | |

| | |
|---|---|
| Volume outflow between 75% and 25% effective depth (m3): | 0.068 |
| Mean surface area of outflow ($m^2$): (side area at 50% effective depth + base area) | 0.99 |
| Time for outflow between 75% and 25% effective depth (mins): | 15.1 |

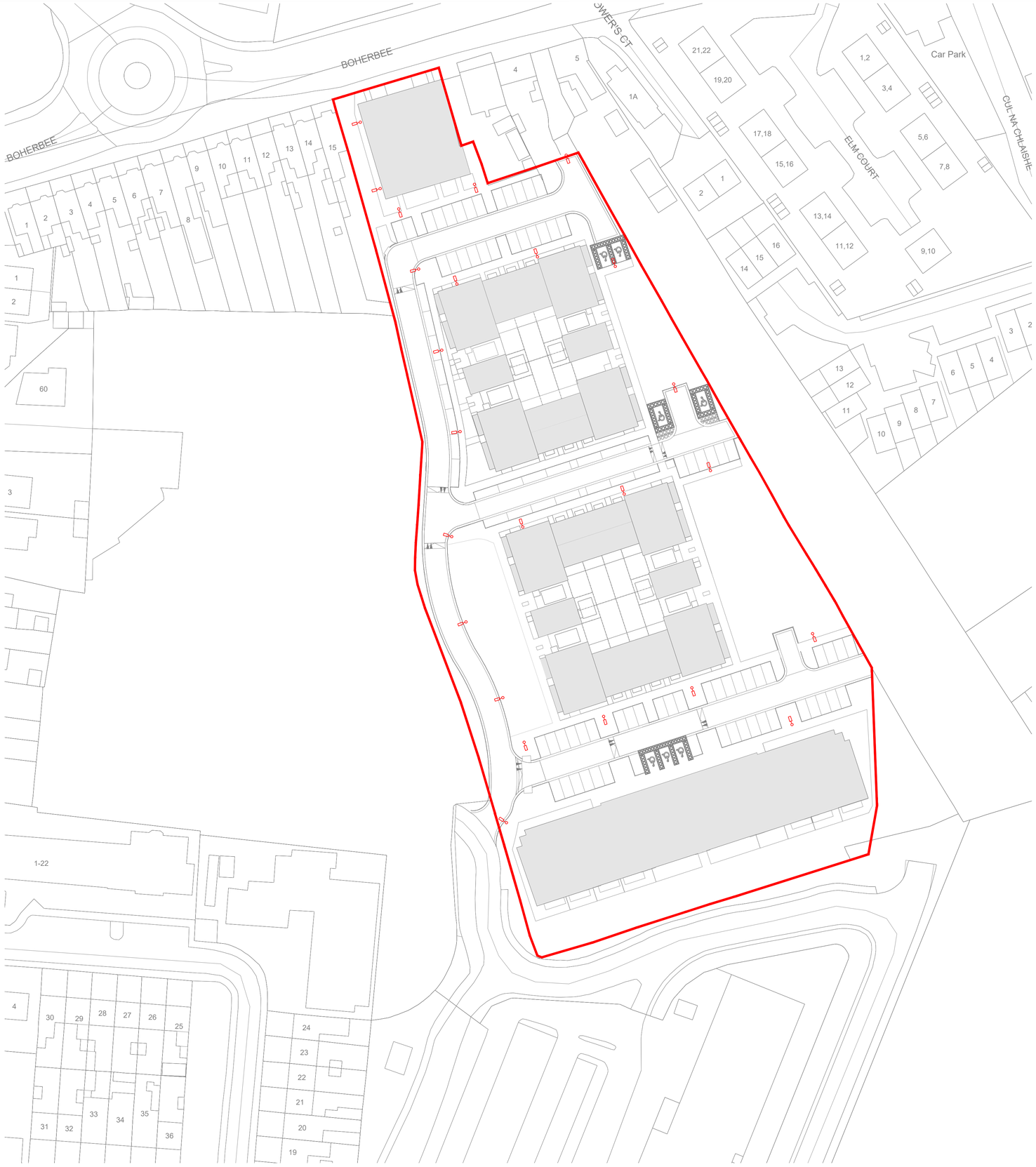
| | |
|---|---|
| **Soil infiltration rate (m/s):** | **7.5E-5** |

Remarks: Results processed following BRE 365 (2007).

| | | |
|---|---|---|
| Notes: Water depths measured below ground level | Project: Clonmore Housing<br>Project No.<br>Carried out for: MWP | Figure<br>Sheet 1 of 1 |

# Appendix H

## Proposed Public Lighting Layout

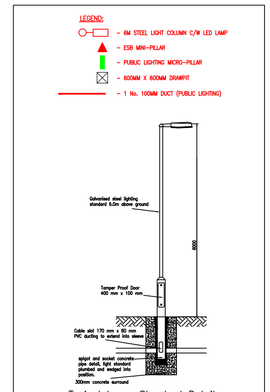



PROPOSED SIGHT DISTANCE PLAN LAYOUT
SCALE: 1:500

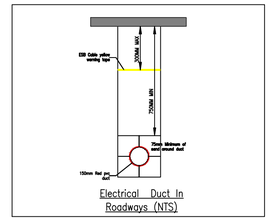
NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
3. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.
4. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM.
5. DRAWINGS ARE NOT TO BE SCALED.

PUBLIC LIGHTING LEGEND:




Typical Lamp Standard Detail
(NOT TO SCALE)




Electrical Duct In Roadways (NTS)

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 29-08-23 | ISSUE FOR PLANNING | J.K. | I.B. |

PROJECT:
CLOONMORE REGENERATION LRD,
TRALEE, Co. KERRY.

TITLE:
PUBLIC LIGHTING LAYOUT

CLIENT:
TULFARRIS CG LTD

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ENGINEERING AND ENVIRONMENTAL CONSULTANTS
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mwp.ie

| DRAWN: | CHECKED: | APPROVED: |
|---|---|---|
| O.B. | J.K. | I.B. |
| PROJECT NUMBER: | DATE: | SCALE @ A1: |
| 23824 | 25/08/2023 | 1:500 |

| STATUS DESCRIPTION: | STATUS: |
|---|---|
| FOR INFORMATION | S2 |

| DRAWING NUMBER: | REV: |
|---|---|
| 23824 - MWP - 00 - 00 - DR - E - 9001 | P01 |

# Appendix I

## EV Charging Information

EC CHARGING
powering e-mobility
www.eccharging.com

# 10 Years Dedicated to Charge Point Manufacture

# BUSINESS AND FLEET EV CHARGING

## PROFESSIONAL AC DOUBLE OUTLET CHARGING



Professional double outlet charging units suitable for wall or ground mounting and available for both single and three phase connection, with an output range from 3kW to 22kW
RFID card or mobile phone app access, with on-line monitoring facility for charge point management and billing purposes
Open Charge Point Protocol (OCPP) v1.6 compliant, which enables connection to open public/private charging networks.
Dynamic load balancing enables the management and sharing of available power.

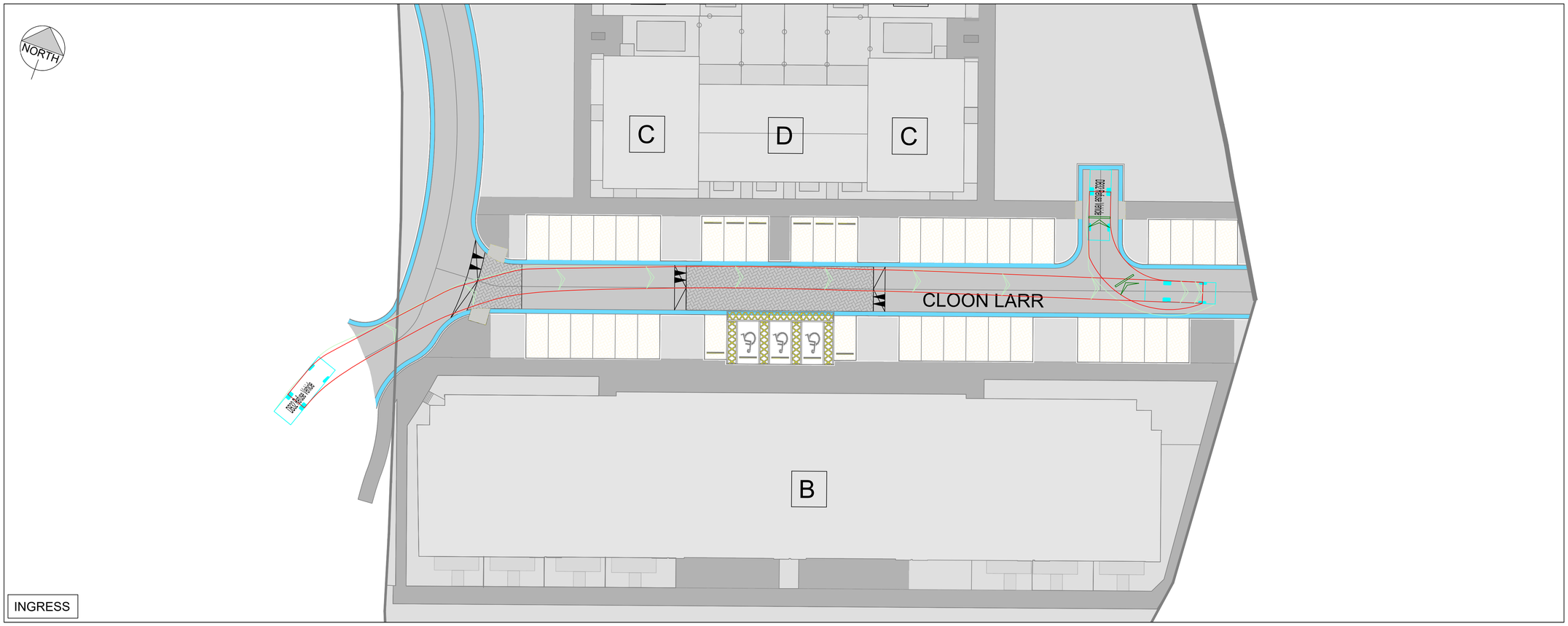

| | |
|---|---|
| DIMENSIONS (WALL UNIT) | H 570 D 180 W 320 (MM) |
| DIMENSIONS (PEDESTAL UNIT) | H 1200 D 200 W 300 (MM) |
| ENERGY METER | MID APPROVED |
| MAINS CONNECTION | 230V TO 400V 50Hz |
| CHARGING OUTPUT | 3kW TO 22kW AC (single/three phase) |
| CURRENT PROTECTION | RCD TYPE A 40A MCB TYPE B 40A |
| SOCKET | TYPE 2 EV SOCKETS |
| OPERATING TEMPERATURE | -20 DEG C TO +55 DEG C |
| CHARGEPOINT PROTOCOL | OCPP V1.6 |
| STANDARDS | IEC62196-2 IEC61851 (1) (22) |
| PROTECTION | IP55 PROTECTED |
| OUTER CASING | STAINLESS STEEL CASING |
| COMMUNICATION | GSM GPRS INTEGRATED |


## Contact

EC CHARGING Unit 6 Knockmitten Business Park, Knockmitten, Dublin 12, Ireland.
Ireland. T: +353 (0)1 4604358. E: sales@eccharging.com W: www.eccharging.com
UK: T: +44(0)7733 483881 E: james@eccharging.com

# Appendix J

## Swept Path Analysis

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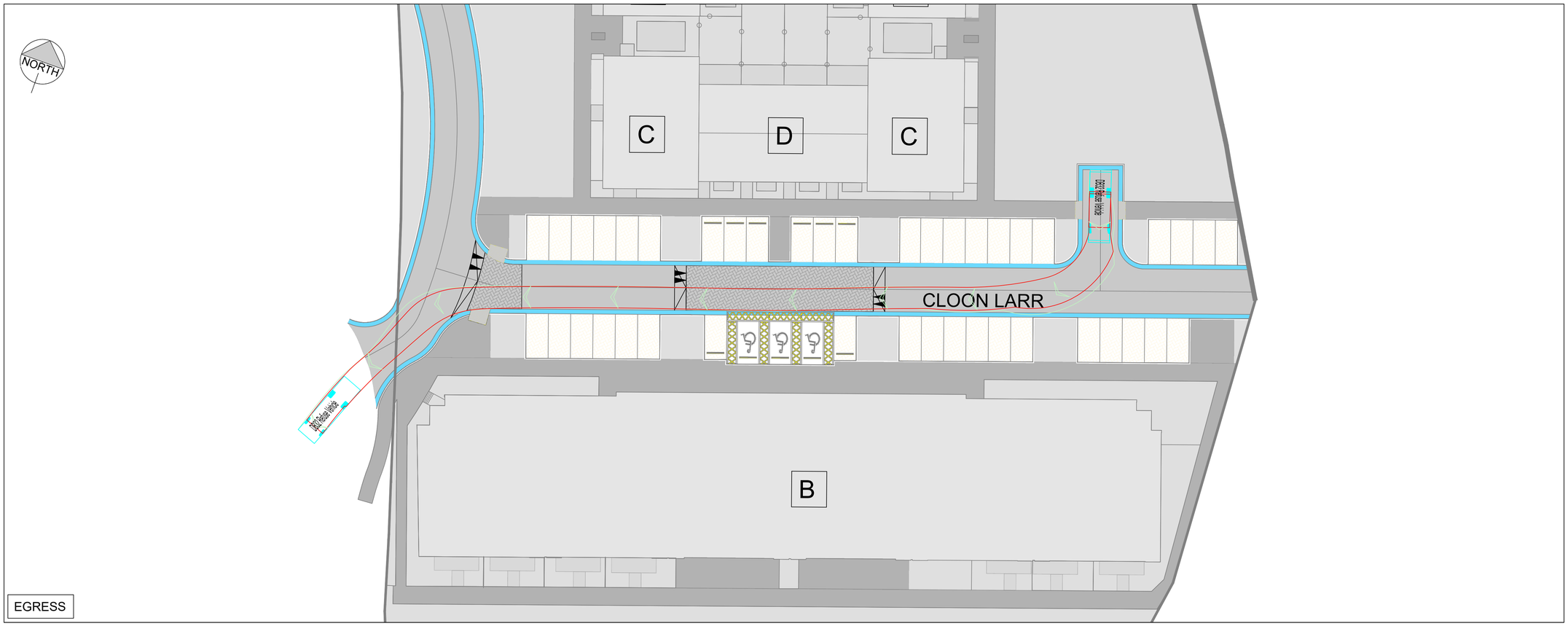


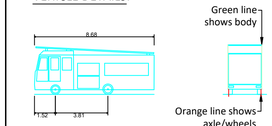

EGRESS



SWEPT PATH ANALYSIS (SPA) LEGEND

- EXTENT OF BODY OUTLINE
- EXTENT OF WHEELBASE FOOTPRINT
- EXTENT OF LOAD OUTLINE
- EXTENT OF VEHICLE OUTLINE
- EXISTING ROAD
- PROPOSED ROAD
- CONCRETE APRON

VEHICLE DETAILS:




DB32 Fire Appliance

| | |
|---|---|
| Overall Length | 8.680m |
| Overall Width | 2.180m |
| Overall Body Height | 3.452m |
| Min Body Ground Clearance | 0.337m |
| Max Track Width | 2.121m |
| Lock-to-lock time | 6.00s |
| Curb to Curb Turning Radius | 7.910m |

Design speed 5kph for all Forward movements
Design speed 2.5kph for all Reverse movements

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 28.08.23 | ISSUED FOR INFORMATION | JH | IB |

PROJECT:
CLOONMORE REGENERATION LRD,TRALEE

TITLE:
AUTO TRACKING - FIRE APPLIANCE
SHEET 1 OF 3

CLIENT:
TULFARRIS CG LTD

MWP
ENGINEERING AND ENVIRONMENTAL CONSULTANTS
CORK | TRALEE | LONDON | LIMERICK
mwp.ie

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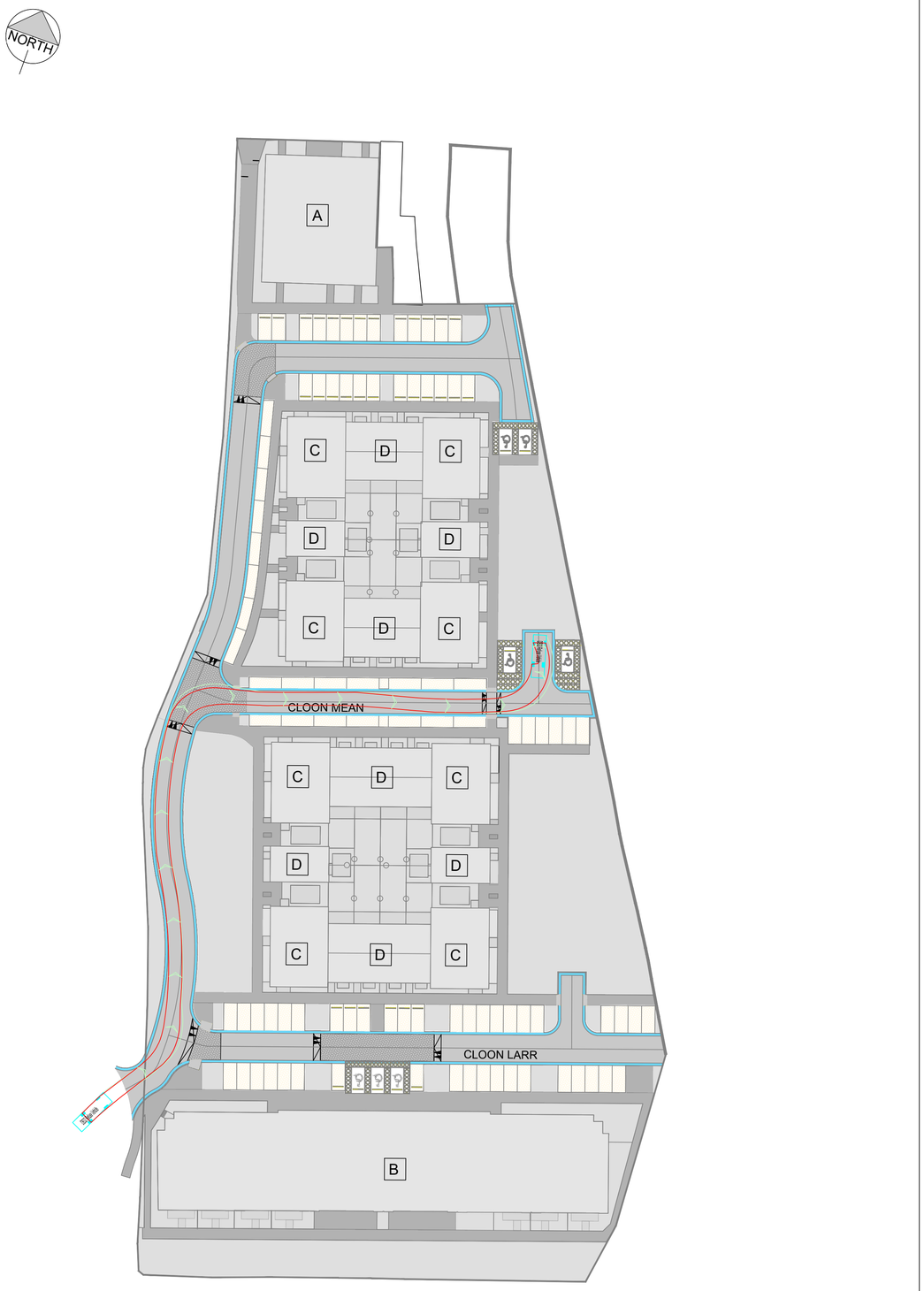
|---|---|---|
| J.H. | G.F. | I.B. |
| PROJECT NUMBER: | DATE: | SCALE @ A1: |
| 23824 | AUG.2023 | 1:250 |

| STATUS DESCRIPTION | STATUS: |
|---|---|
| FOR INFORMATION | S2 |

| DRAWING NUMBER: | REV: |
|---|---|
| 23824 - MWP - 00 - 00 - DR - C - 0400 | P01 |

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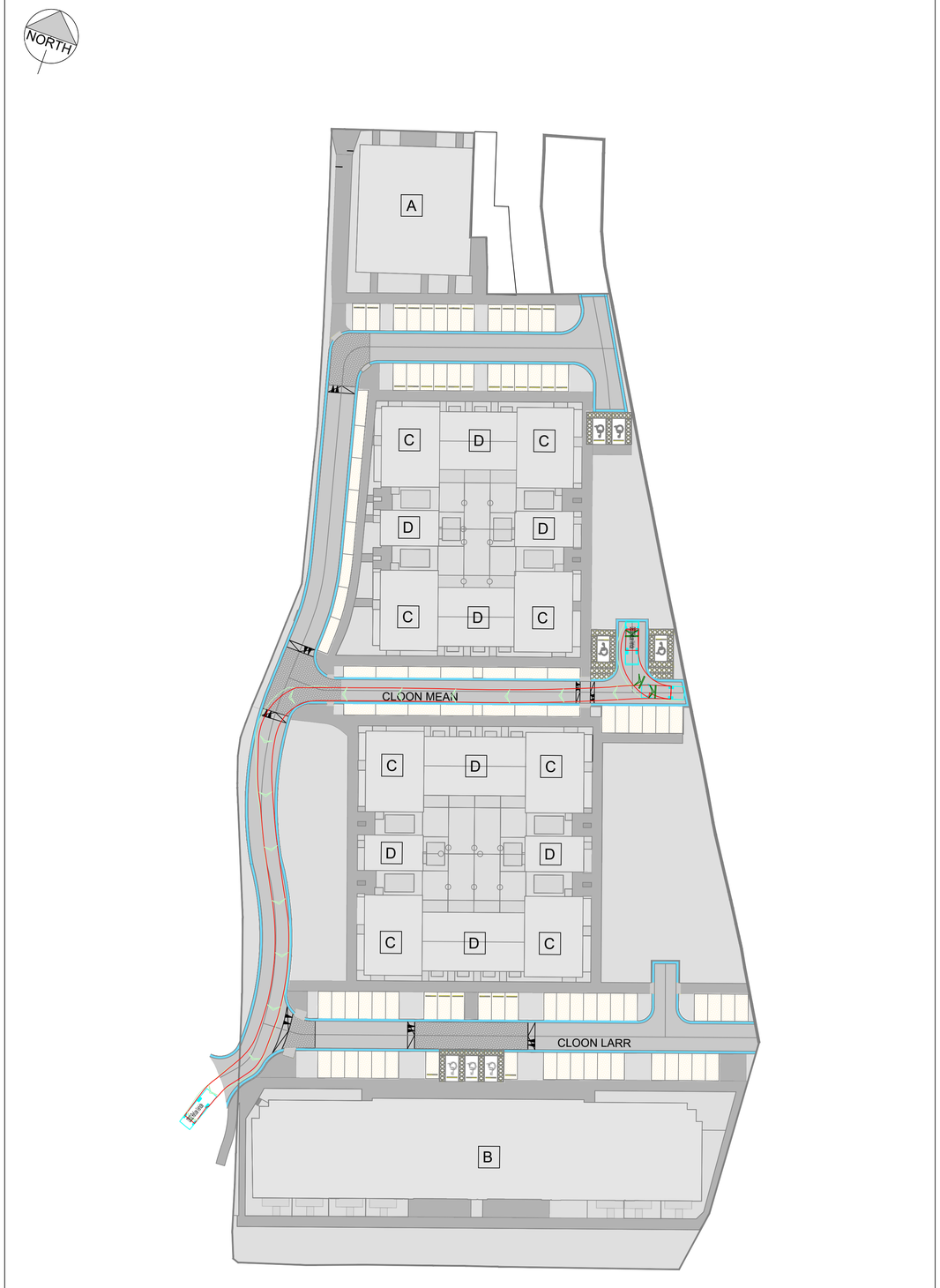


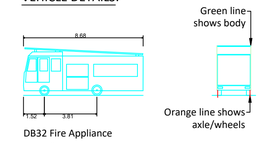

EGRESS



SWEPT PATH ANALYSIS (SPA) LEGEND

- EXTENT OF BODY OUTLINE
- EXTENT OF WHEELBASE FOOTPRINT
- EXTENT OF LOAD OUTLINE
- EXTENT OF VEHICLE OUTLINE
- EXISTING ROAD
- PROPOSED ROAD
- CONCRETE APRON

VEHICLE DETAILS:




DB32 Fire Appliance

| | |
|---|---|
| Overall Length | 8.680m |
| Overall Width | 2.180m |
| Overall Body Height | 3.452m |
| Min Body Ground Clearance | 0.337m |
| Max Track Width | 2.121m |
| Lock-to-lock time | 6.00s |
| Curb to Curb Turning Radius | 7.910m |

Design speed 5kph for all Forward movements
Design speed 2.5kph for all Reverse movements

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 28.08.23 | ISSUED FOR INFORMATION | JH | IB |

PROJECT:
CLOONMORE REGENERATION LRD,TRALEE

TITLE:
AUTO TRACKING - FIRE APPLIANCE
SHEET 2 OF 3

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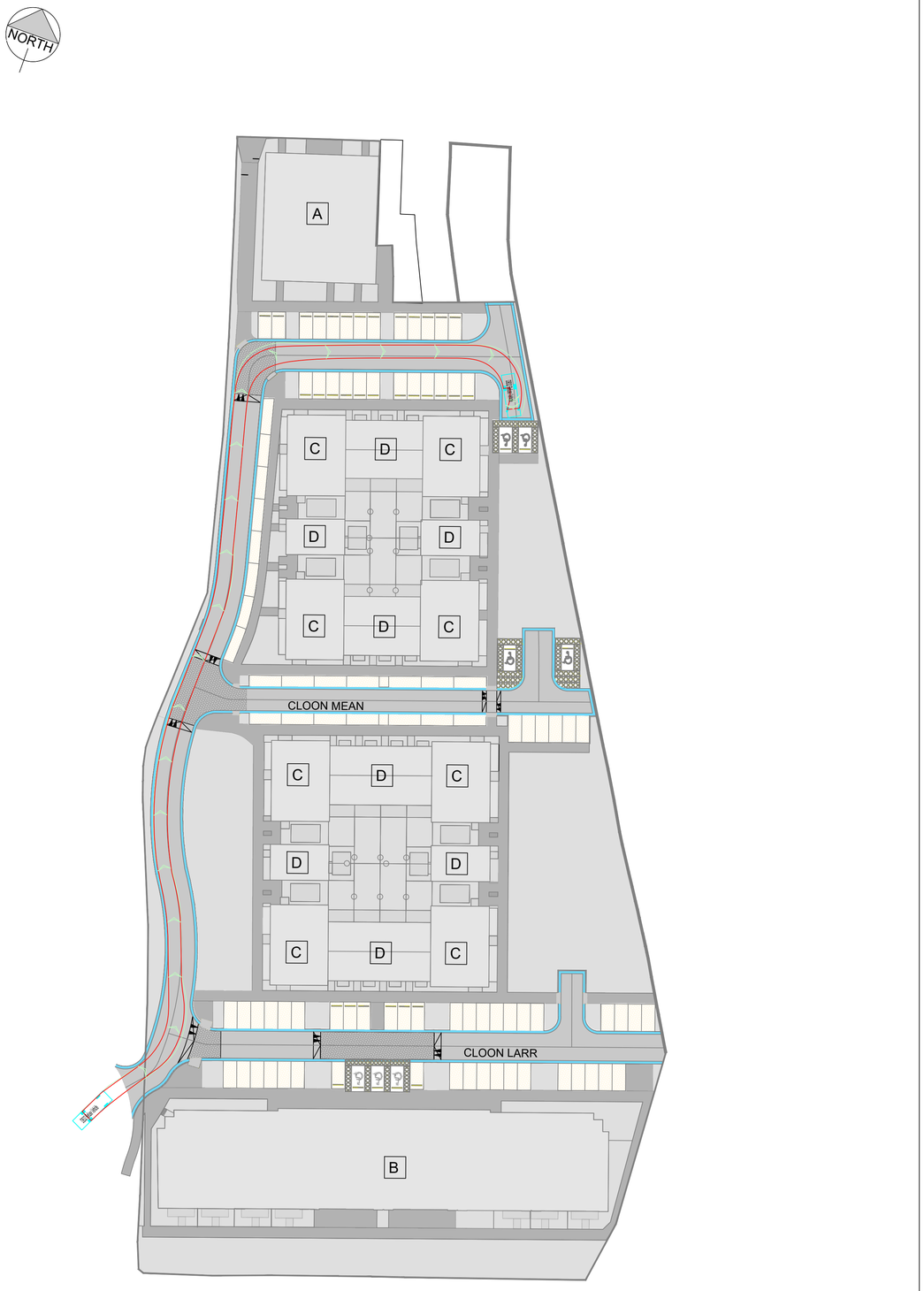
| J.H. | G.F. | I.B. |
| PROJECT NUMBER: | DATE: | SCALE @ A1: |
| 23824 | AUG.2023 | 1:500 |
| STATUS DESCRIPTION: | | STATUS: |
| FOR INFORMATION | | S2 |
| DRAWING NUMBER: | | REV: |
| 23824 - MWP - 00 - 00 - DR - C - 0401 | | P01 |

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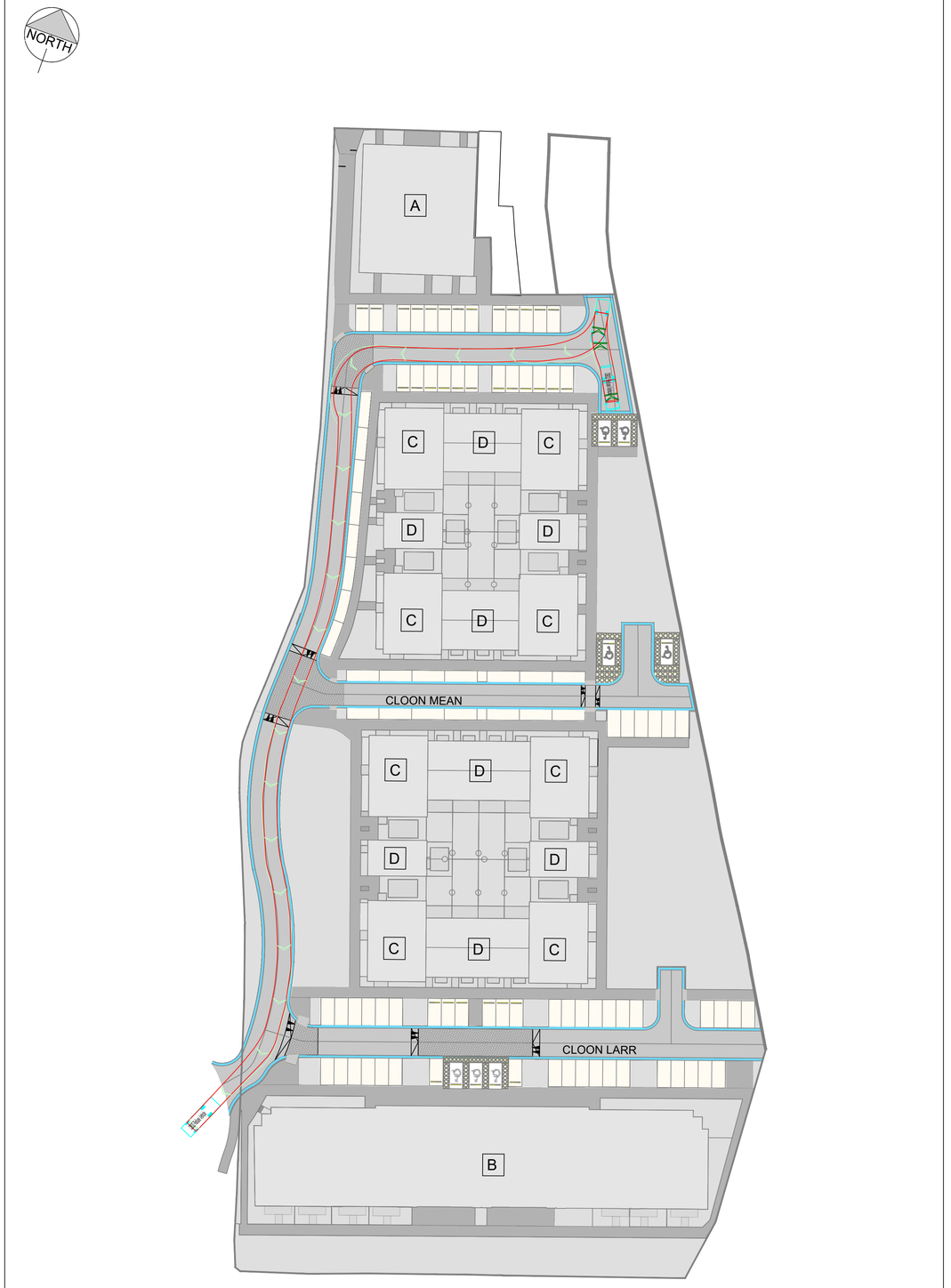


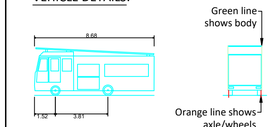

EGRESS



SWEPT PATH ANALYSIS (SPA) LEGEND

- EXTENT OF BODY OUTLINE
- EXTENT OF WHEELBASE FOOTPRINT
- EXTENT OF LOAD OUTLINE
- EXTENT OF VEHICLE OUTLINE
- EXISTING ROAD
- PROPOSED ROAD
- CONCRETE APRON

VEHICLE DETAILS:




DB32 Fire Appliance

| | |
|---|---|
| Overall Length | 8.680m |
| Overall Width | 2.180m |
| Overall Body Height | 3.452m |
| Min Body Ground Clearance | 0.337m |
| Max Track Width | 2.121m |
| Lock-to-lock time | 6.00s |
| Curb to Curb Turning Radius | 7.910m |

Design speed 5kph for all Forward movements
Design speed 2.5kph for all Reverse movements

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 28.08.23 | ISSUED FOR INFORMATION | JH | IB |

PROJECT:
CLOONMORE REGENERATION LRD,TRALEE

TITLE:
AUTO TRACKING - FIRE APPLIANCE
SHEET 3 OF 3

CLIENT:
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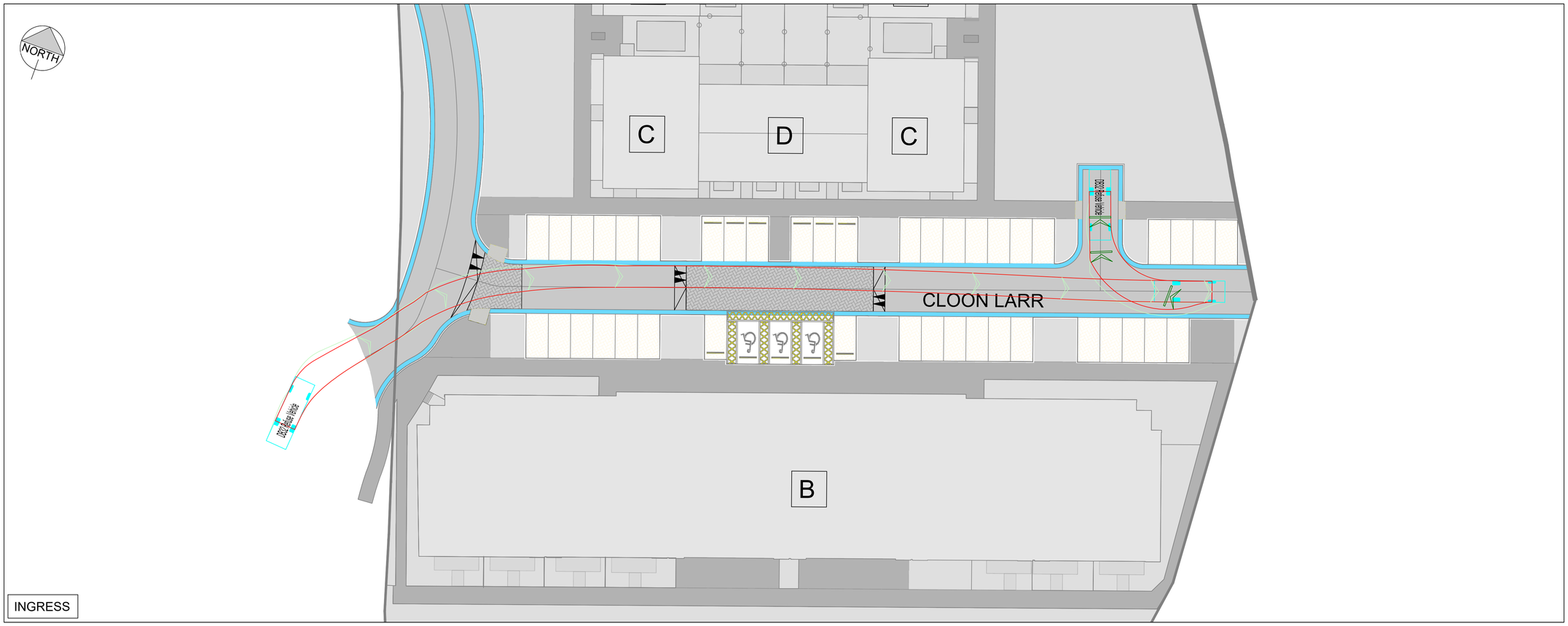
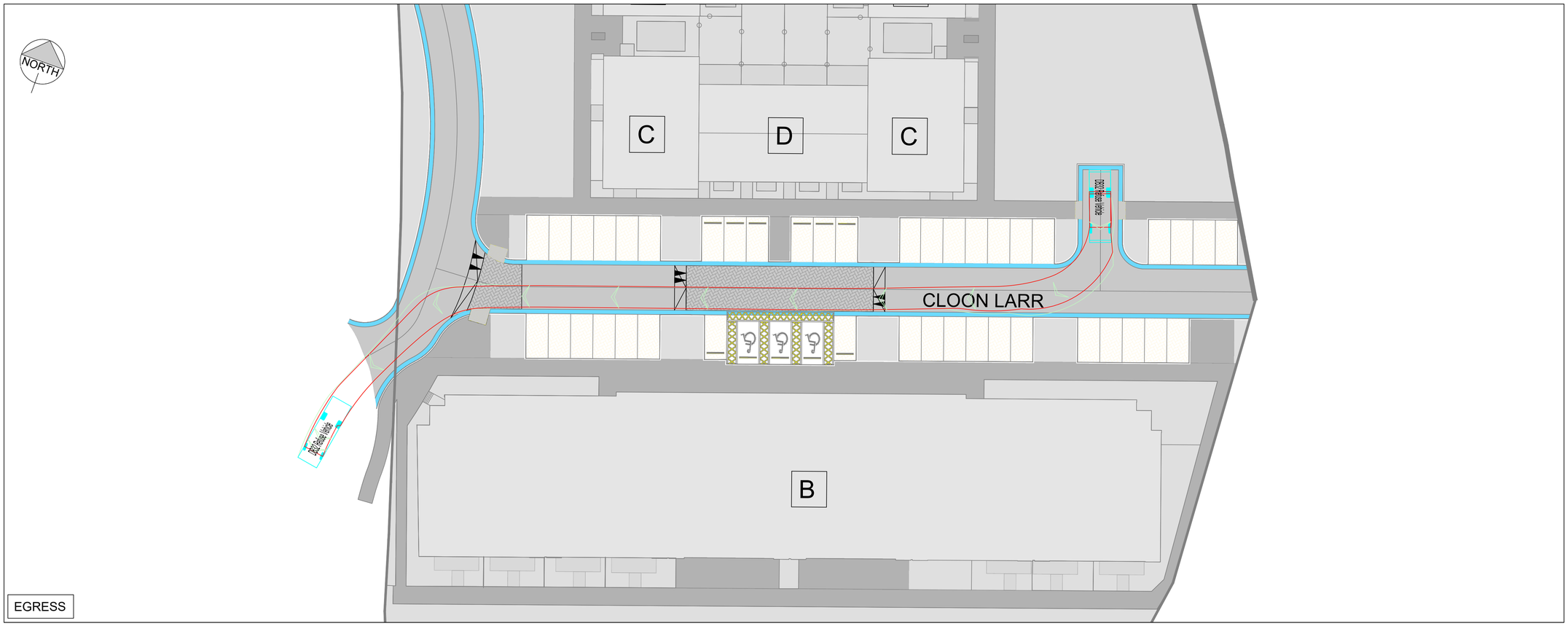
|---|---|---|
| J.H. | G.F. | I.B. |
| PROJECT NUMBER: | DATE: | SCALE @ A1: |
| 23824 | AUG.2023 | 1:500 |
| STATUS DESCRIPTION: | | STATUS: |
| FOR INFORMATION | | S2 |
| DRAWING NUMBER: | | REV: |
| 23824 - MWP - 00 - 00 - DR-C- 0402 | | P01 |



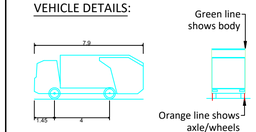






SWEPT PATH ANALYSIS (SPA) LEGEND

- EXTENT OF BODY OUTLINE
- EXTENT OF WHEELBASE FOOTPRINT
- EXTENT OF LOAD OUTLINE
- EXTENT OF VEHICLE OUTLINE
- EXISTING ROAD
- PROPOSED ROAD
- CONCRETE APRON

VEHICLE DETAILS:




DB32 Refuse Vehicle

| | |
|---|---|
| Overall Length | 7.900m |
| Overall Width | 2.400m |
| Overall Body Height | 3.183m |
| Min Body Ground Clearance | 0.388m |
| Max Track Width | 2.400m |
| Lock-to-lock time | 6.00s |
| Curb to Curb Turning Radius | 9.625m |

Design speed 5kph for all Forward movements
Design speed 2.5kph for all Reverse movements

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 28.08.23 | ISSUED FOR INFORMATION | JH | IB |

PROJECT:
CLOONMORE DEVELOPMENT, TRALEE

TITLE:
AUTO TRACKING - REFUSE VEHICLE
SHEET 1 OF 3

CLIENT:
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| DRAWN: | CHECKED: | APPROVED: |
|---|---|---|
| J.H. | G.F. | I.B. |
| PROJECT NUMBER: | DATE: | SCALE @ A1: |
| 23824 | AUG.2023 | 1:250 |

| STATUS DESCRIPTION | STATUS: |
|---|---|
| FOR INFORMATION | S2 |

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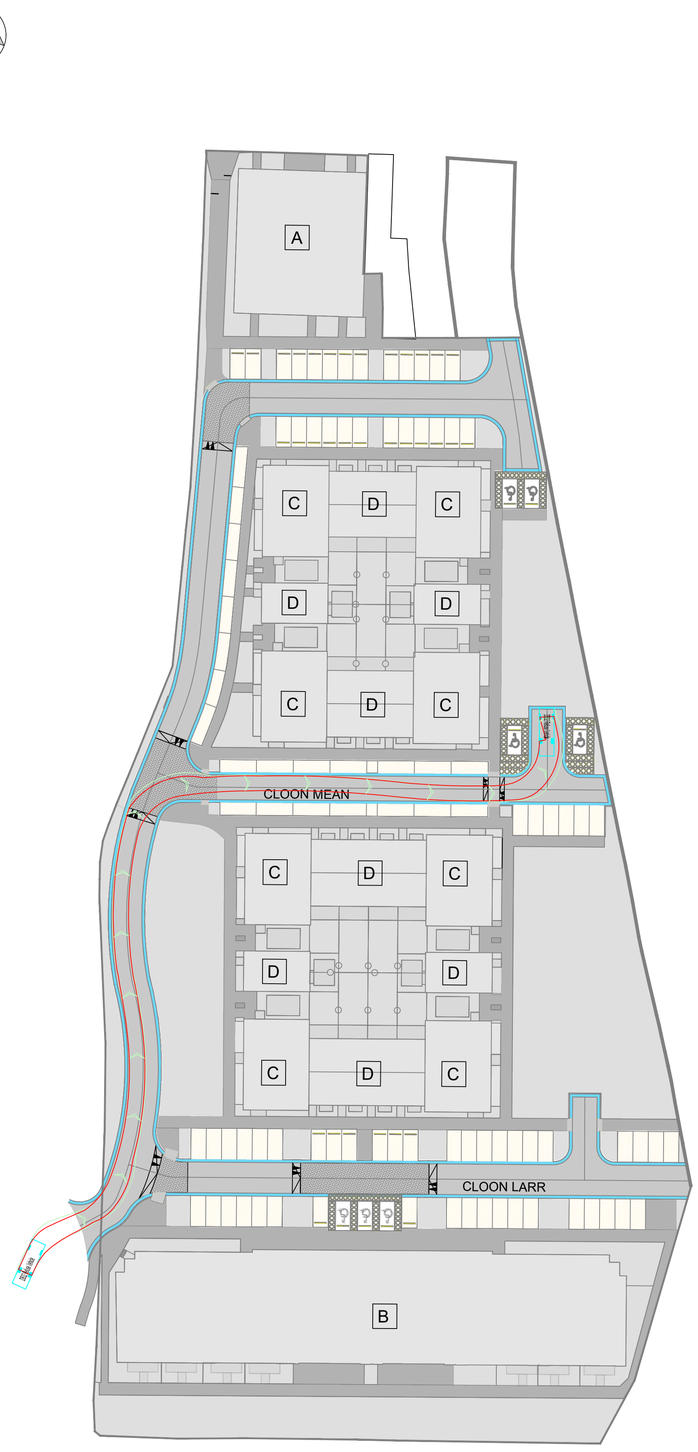
| 23824 - MWP - 00 - 00 - DR - C - 0403 | P01 |

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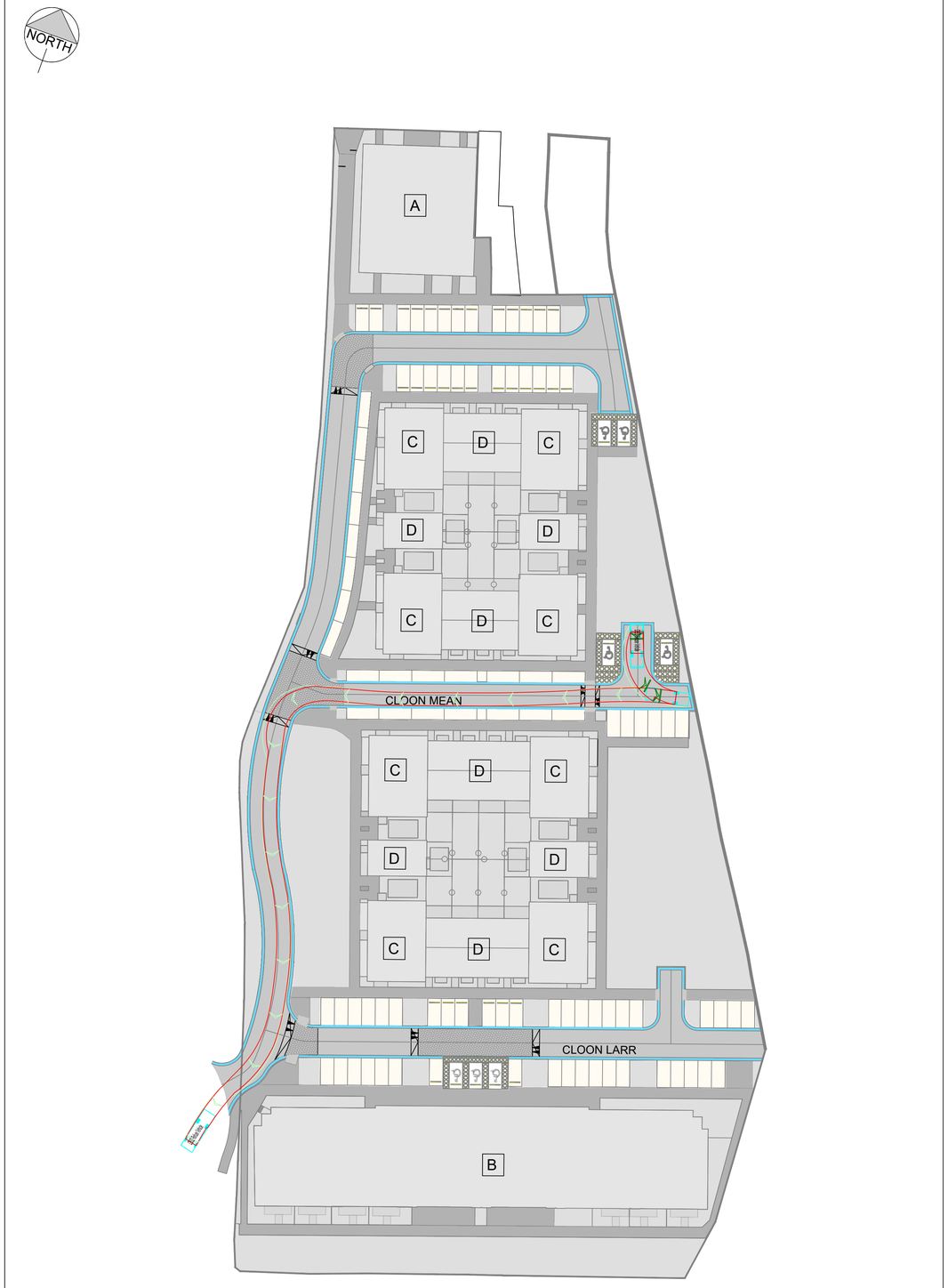


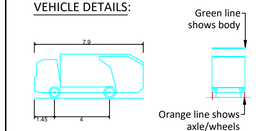

EGRESS



SWEPT PATH ANALYSIS (SPA) LEGEND

- EXTENT OF BODY OUTLINE
- EXTENT OF WHEELBASE FOOTPRINT
- EXTENT OF LOAD OUTLINE
- EXTENT OF VEHICLE OUTLINE
- EXISTING ROAD
- PROPOSED ROAD
- CONCRETE APRON

VEHICLE DETAILS:




DB32 Refuse Vehicle

| | |
|---|---|
| Overall Length | 7.900m |
| Overall Width | 2.400m |
| Overall Body Height | 3.183m |
| Min Body Ground Clearance | 0.388m |
| Max Track Width | 2.400m |
| Lock-to-lock time | 6.00s |
| Curb to Curb Turning Radius | 9.625m |

Design speed 5kph for all Forward movements
Design speed 2.5kph for all Reverse movements

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 28.08.23 | ISSUED FOR INFORMATION | JH | IB |

PROJECT:
CLOONMORE DEVELOPMENT, TRALEE

TITLE:
AUTO TRACKING - REFUSE VEHICLE
SHEET 2 OF 3

CLIENT:
TULFARRIS CG LTD

MWP
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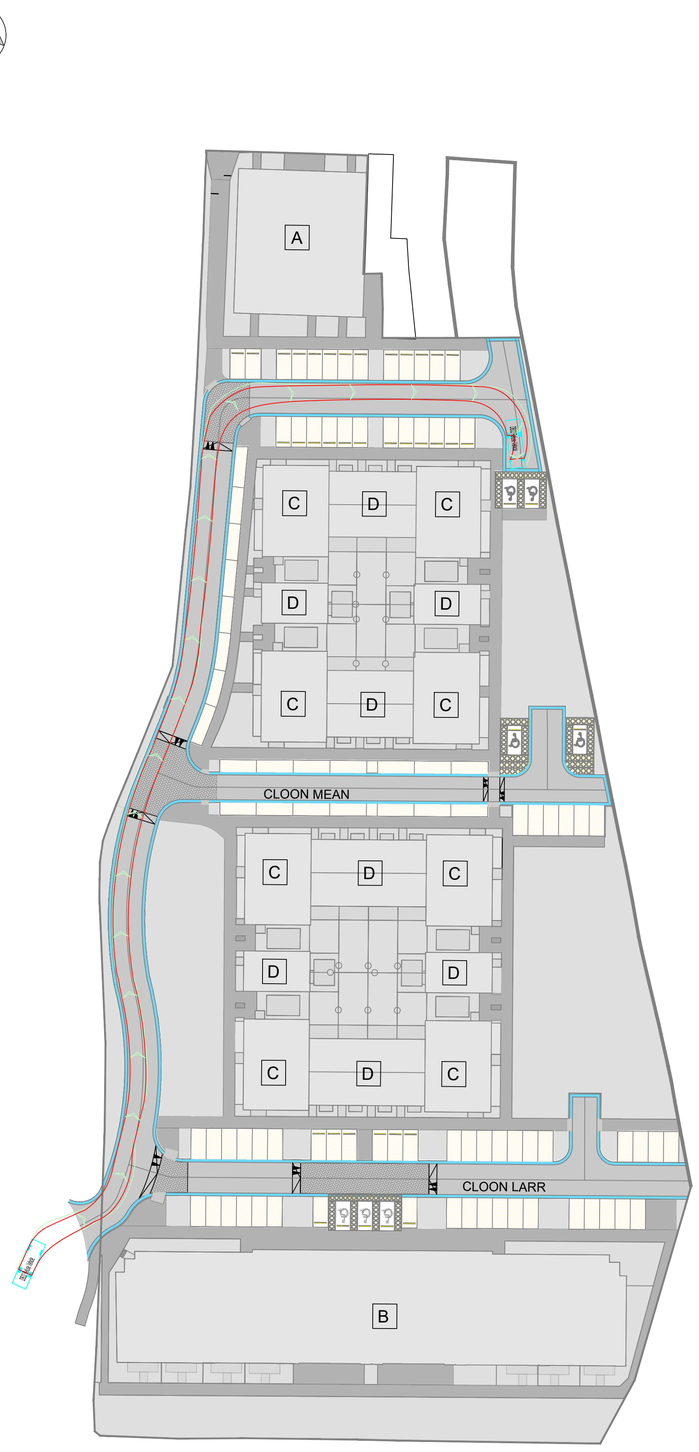
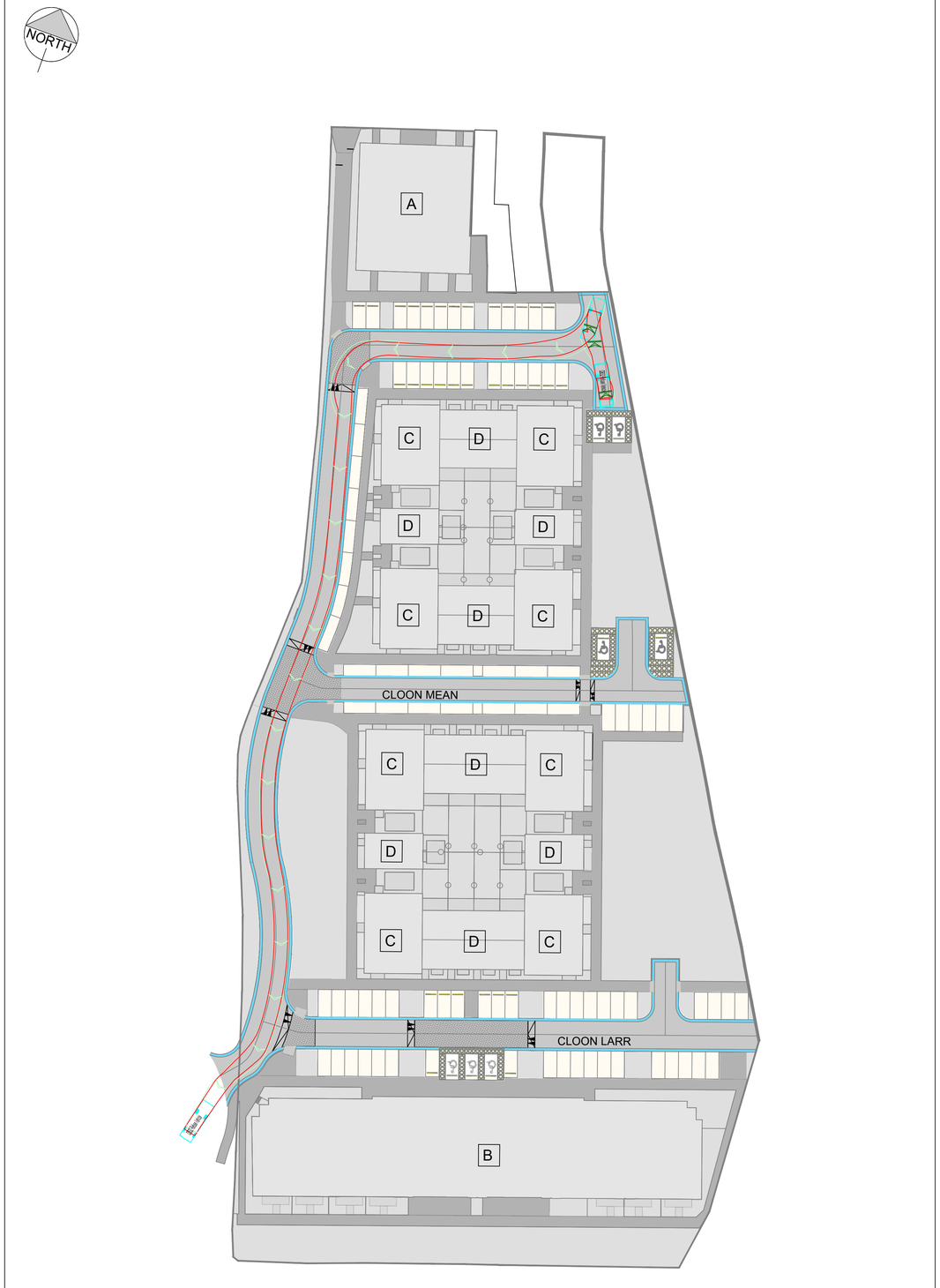
|---|---|---|
| J.H. | G.F. | I.B. |
| PROJECT NUMBER: | DATE: | SCALE @ A1: |
| 23824 | AUG.2023 | 1:500 |

| STATUS DESCRIPTION | STATUS: |
|---|---|
| FOR INFORMATION | S2 |

| DRAWING NUMBER: | REV: |
|---|---|
| 23824 - MWP - 00 - 00 - DR-C- 0404 | P01 |




INGRESS



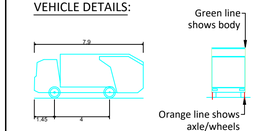

EGRESS



SWEPT PATH ANALYSIS (SPA) LEGEND

- EXTENT OF BODY OUTLINE
- EXTENT OF WHEELBASE FOOTPRINT
- EXTENT OF LOAD OUTLINE
- EXTENT OF VEHICLE OUTLINE
- EXISTING ROAD
- PROPOSED ROAD
- CONCRETE APRON

VEHICLE DETAILS:




DB32 Refuse Vehicle

| | |
|---|---|
| Overall Length | 7.900m |
| Overall Width | 2.400m |
| Overall Body Height | 3.183m |
| Min Body Ground Clearance | 0.388m |
| Max Track Width | 2.400m |
| Lock-to-lock time | 6.00s |
| Curb to Curb Turning Radius | 9.625m |

Design speed 5kph for all Forward movements
Design speed 2.5kph for all Reverse movements

| REV | DATE | DESCRIPTION | BY | APP |
|---|---|---|---|---|
| P01 | 28.08.23 | ISSUED FOR INFORMATION | JH | IB |

PROJECT:
CLOONMORE DEVELOPMENT, TRALEE

TITLE:
AUTO TRACKING - REFUSE VEHICLE
SHEET 3 OF 3

CLIENT:
TULFARRIS CG LTD

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