

# Engineering Assessment Report

## Phase 2 of Proposed Residential Development at Southgreen, Co. Kildare

March 2026

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## Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
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Appendix A: Uisce Éireann Confirmation of Feasibility Letter

Appendix B: Surface Water Attenuation Models (FLOW Causeway)

Appendix C: RoadPlan Quality Audit

# 1. Introduction

This report has been prepared by Waterman Moylan Engineering Consultants, on behalf of the Client Pousterle Ltd, as part of a planning submission for a proposed 146 no. housing development and creche at the proposed Phase 2 Development at Southgreen, Kildare Town, Co. Kildare.

This report aims to provide a comprehensive overview of the engineering design criteria for the subject site at Southgreen, Co. Kildare.

Supplementary documentation referred to when compiling this report, includes:

- Uisce Éireann's Wastewater Code of Practice Rev 2 July 2020
- Uisce Éireann's Water Code of Practice Rev 2 July 2020
- Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 2, for New Developments
- The SuDS Manual (CIRIA C753)
- Kildare Town Local Area Plan 2023-2029
- Kildare County Development Plan 2023-2029
- Strategic Flood Risk Assessment of the Kildare County Development Plan 2023-2029
- Kildare Town Surface Water Study Stage 1 (November 2022)
- Kildare Town Surface Water Study Stage 2 (January 2023)
- Kildare County Council (KCC) Sustainable Drainage Systems (SuDS) Guidance Document.

# 2. Subject Site

## 2.1 Existing Site Location

The site is located at Southgreen Road, approximately c. 750m northwest of Kildare Town in Co. Kildare as shown in Figure 2-1 below. The site is bound by Southgreen Road to the west, open lands to the north, Old Road (L7016) to the east, and by the Internal Link Road (SILR) and South Green Phase 1 to the south.

The lands, which are currently in agricultural use, slope generally from west to east. The site area, and area of the redline boundary, is approximately c. 6.13 hectares (ha).

Refer to Waterman Moylan Drawing no. SOU-WMC-PH2-XX-DR-C-P0010 – Site Location Map for the precise site location and surrounding lands.

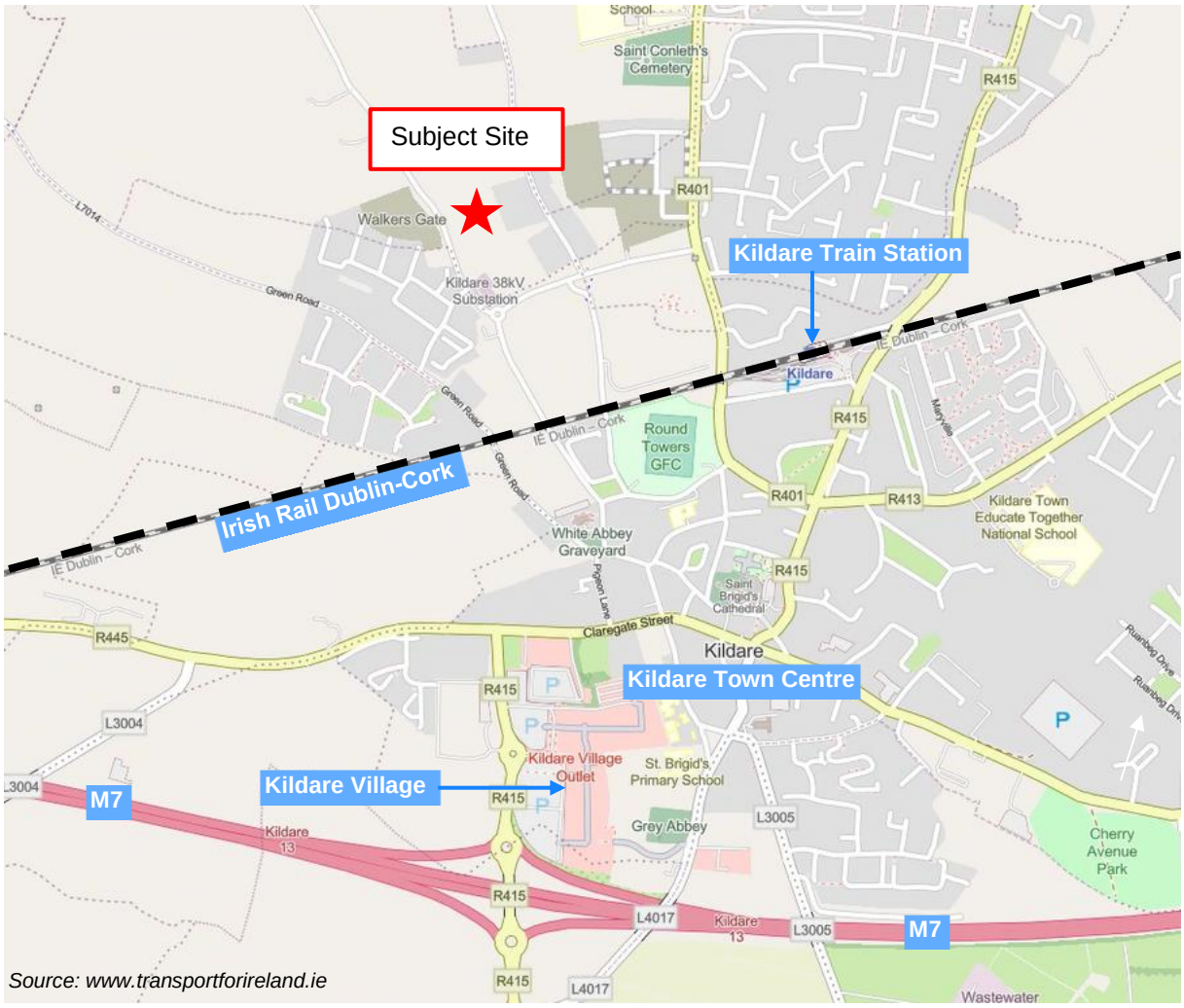



Figure 2-1: Site Location Map

An aerial view of the subject site can be seen in Figure 2-2, below.

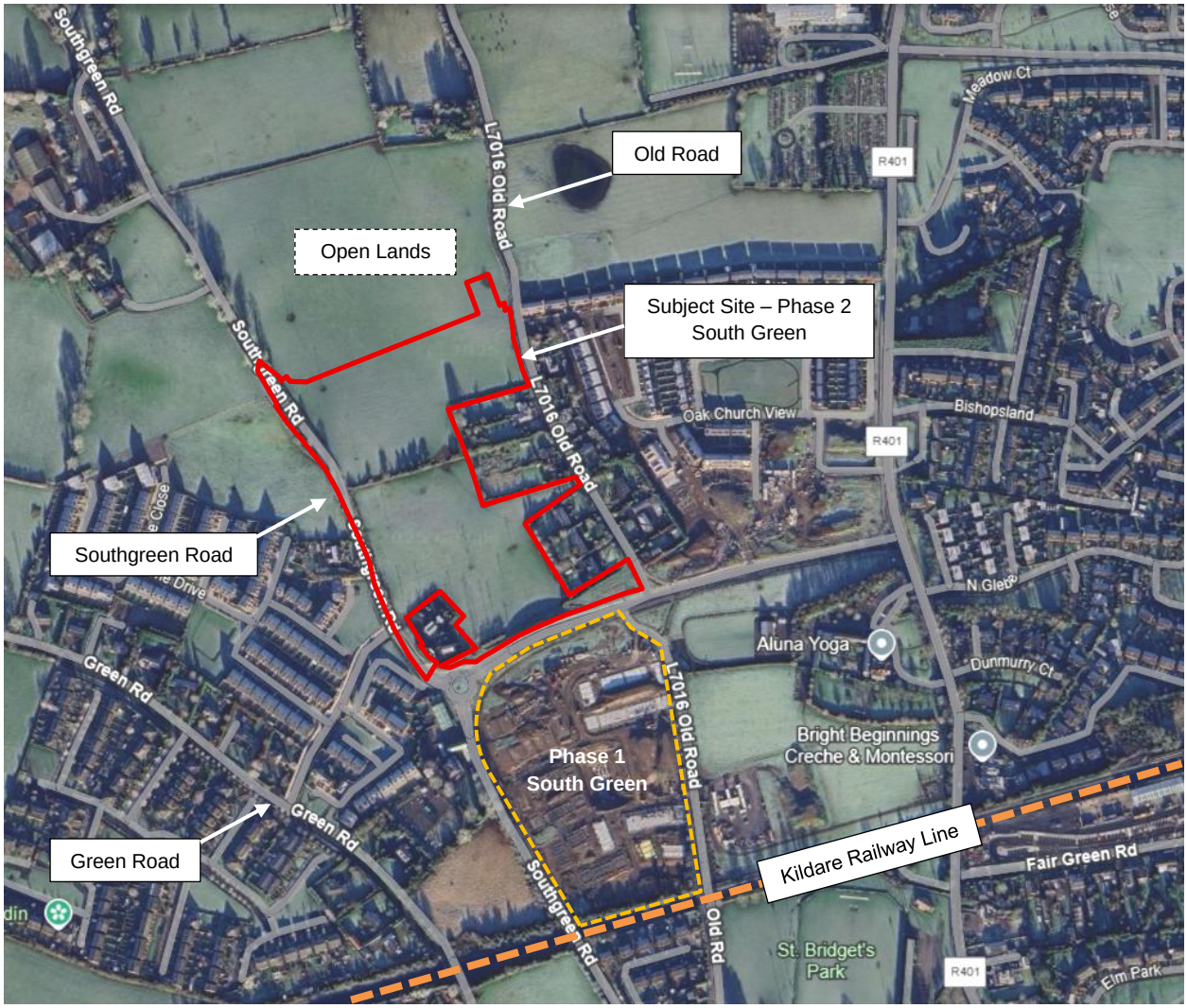



Figure 2-2: Aerial View of Subject Site (Google Maps)

## 2.2 Existing Site Description

The site has an area, and redline boundary, of c. 6.13 ha and is currently 100% greenfield. The site falls from west to east with a steep gradient of approximately 1 in 25, and less. The site is currently in greenfield condition and is used for agricultural purposes.

The existing topography consists of naturally high ground elevations along the western boundary of the site, with levels ranging from 111.19m OD Malin to 113.79m OD Malin. The site falls to the east where the lowest ground elevations are distributed, these levels range from 106.85m OD Malin to 104.03m OD Malin. The local high point on the site (113.79m OD Malin) is located in the northwest portion of the lands and the local low point (104.03m OD Malin) is located in the central far east area of the lands.

Refer to

Figure 2-3 for an illustration of the subject site and existing ground elevations within same.

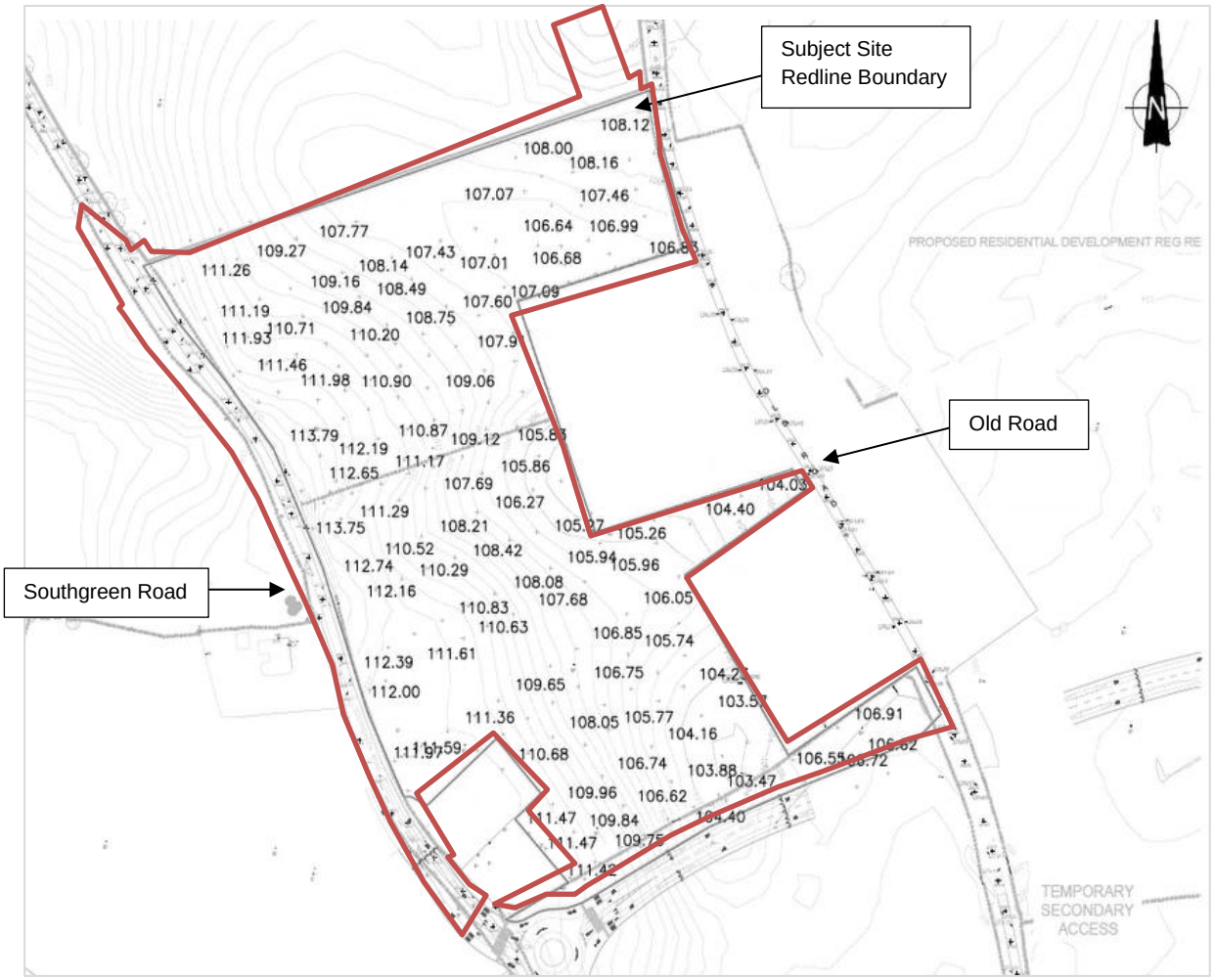



Figure 2-3: Subject Site Topography and Spot Elevations

## 2.3 Land Use – Zoning

According to Map 11. Land Use Zoning retrieved from the Kildare Town Local Area Plan (LAP) 2023-2029 Appendix Maps; the subject lands are zoned as $C_{P2}$, with 'C' denoting lands zoned for 'Phase 2 New Residential' developments. The current zoning map has taken effect from December of 2023 and will be valid until December of 2029.

The objective of this land use zoning, as taken from the Kildare Town LAP (2023-2029) is as follows:

*"To protect future development lands from inappropriate forms of development which would impede the sequential expansion and consolidation of the town in terms of providing for new residential development for future plans."*

Refer to Figure 2-4 for an extract of the Land—Use Zoning Map of Kildare Town and the subject lands.

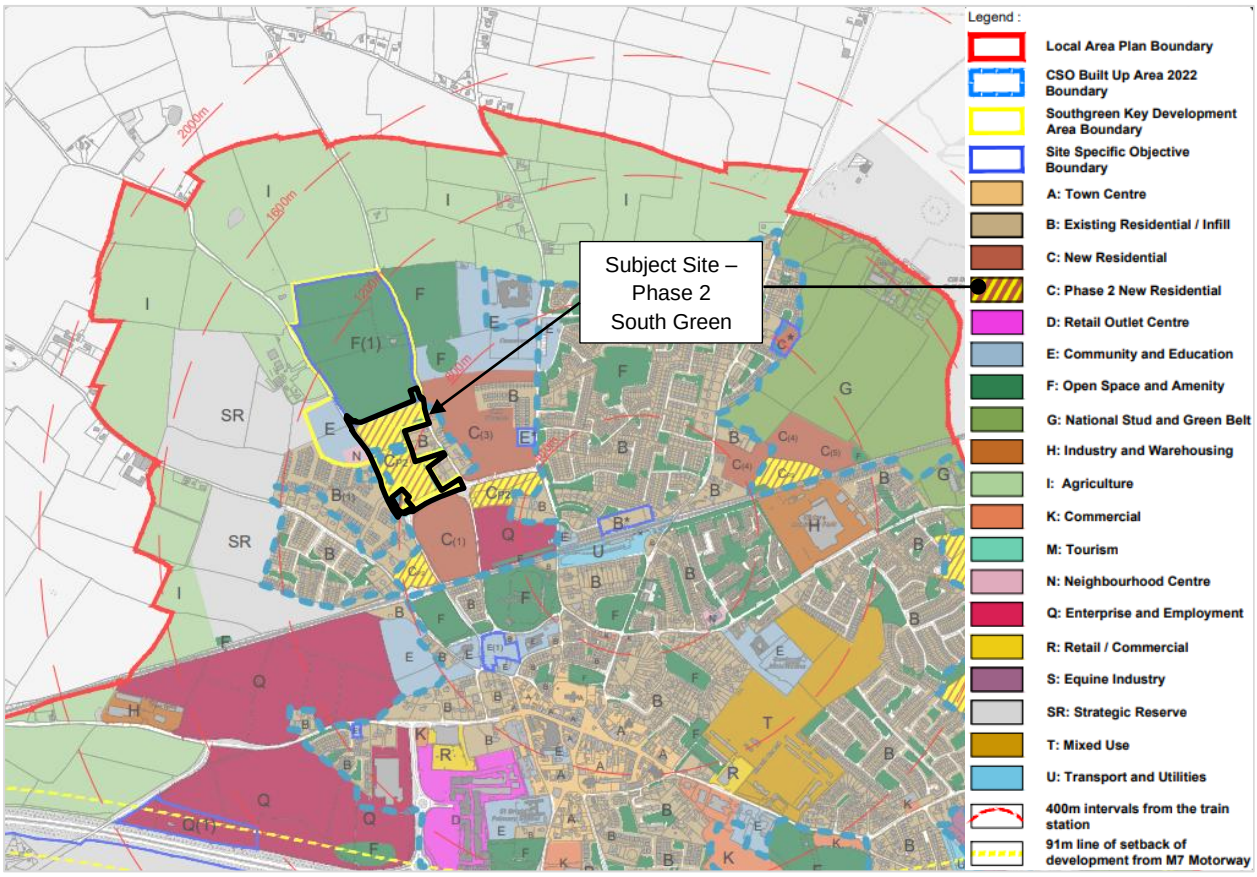



Figure 2-4: Extract of Land-Use Zoning Map (Kildare LAP Map 11.1)

## 2.4 Southgreen Key Development Area

As per the Kildare Town LAP (2023-2029), the Southgreen area falls under a design strategy seeking to implement the '10-minute settlement'. The following is extracted from Section 11.2 of the Kildare LAP:

"*The design strategy seeks to implement the '10-minute settlement' principle by providing for a range of complementary land uses (residential, open space and employment) within walkable distance of a centrally located neighbourhood centre and adjacent primary school site (see Figure 11-3). The neighbourhood centre will front onto a landscaped civic plaza which will provide a focal point for the expanding Southgreen area, imparting a sense of legibility and identity to residents and visitors alike. Crucially, the design framework incorporates key links and connections to future urban expansion lands to the west, which are zoned SR: Strategic Reserve in the Plan*."

Figure 11-3 of the Kildare Town LAP shows the Southgreen key development area design framework as intended and has been extracted to Figure 2-5, below. As per Figure 2-5, the subject lands are earmarked for several residential blocks, local routes, and strategic open spaces with a large open space proposed directly north of the subject lands. According to the Kildare Town LAP, the large quantum of strategic open space will provide for the long-term sporting and recreational of the growing community in Southgreen and also for the wider settlement. The indicative design / framework illustrates a layout of playing fields, five-aside pitches, and a playground.

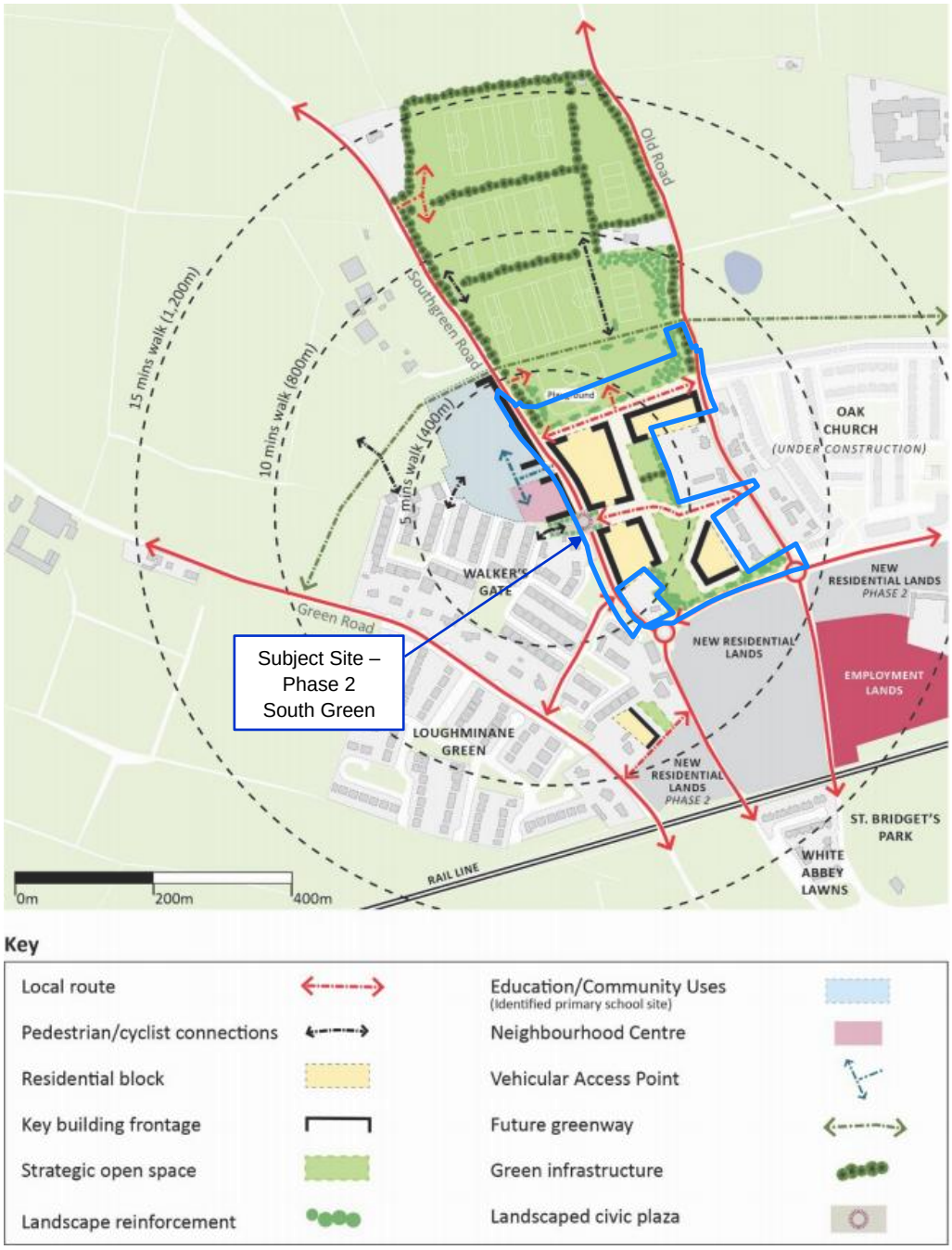



Figure 2-5: Southgreen Key Development Area Design Framework (Kildare Town LAP)

## 2.5 Proposed Development

Pousterle Limited intend to apply for permission for development of a Large - Scale Residential Development (LRD) on a site of approx. 6.13 ha at Southgreen Road, Kildare, Co. Kildare. The site is generally bounded to the north by agricultural fields; to the south by the recently constructed Southern Internal Link Road; to the west by Southgreen Road and an existing Electricity Station; and to the east by Old Road and existing residential properties.

The proposed development will consist of:

- The construction of a new residential scheme of 146 no. residential units ranging in height from 1-3 storeys as follows:
    - 136 no. houses (7 no. 2 bed units; 102 no. 3 bed units; and 27 no. 4 bed units) in a mixture of bungalow, detached, semi-detached, and terrace style units ranging in height from 1 – 2 storeys.
    - 10 no. duplex apartment units (5 no. 1 beds, 3 no. 2 beds, and 2 no. 3 beds) in new Block A ranging in height from 2-3 storeys
- Each residential unit will be afforded with private open space in the form of a front/rear/side garden for houses or terrace / balconies for duplex apartment units.
- The provision of a new creche facility (approx. 161 sq m GFA) and associated areas of external open space (approx. 60 sq m) located at Block A.
- Public open space (approx. 6,992 sq m) is proposed in the form of 2 no. new large public open space areas within the site (approx. 3,046 sq m and 3,946 sq m respectively).
- Communal open space (approx. 82 sq m) is proposed adjacent to Block A.
- A total of 321 no. car parking spaces (305 no. for residential units and 16 no. for the creche facility) are provided. This provision includes 2 no. accessible spaces and 17 no. visitor spaces.
- A total of 527 no. cycle parking spaces (517 no. for residential units and 10 no. for the creche facility) are provided. This provision includes 75 no. visitor spaces. Resident cycle parking is proposed in the form of secure bicycle store enclosures to the front of terraced units; on curtilage spaces to the rear of units with side access; and a bicycle store for apartment units located within Block A. Visitor parking is proposed in the form of Sheffield stands.
- The development shall be served via 2 no. new vehicular access points from Southgreen Road. An additional private vehicular access point is proposed via Old Road to service 1 no. new bungalow (4 no. bed residential unit). Provision is also made for future vehicular access via Southgreen Road to serve the open space and amenity zoned lands to the north of the main development site.
- Pedestrian and Cyclist access is also proposed via Southgreen Road and via a new secondary access point from the Southern Internal Link Road to the south of the site and Old Road to the east of the site.
- Upgrades/widening to Southgreen Road including the provision of 2 no. directional single lane cycle tracks and pedestrian footpaths on either side of the Southgreen Road, together with amendments to the existing cycle tracks and footpaths on Southgreen Road north of Southern Internal Link Road are proposed.
- A new pedestrian/cycle link is also delivered to the north of the main development site connecting South Green Road to Old Road.
- The associated site and infrastructural works include provision for an ESB Sub Station; water services; foul and surface water drainage and connections; attenuation proposals; permeable paving; all landscaping works; boundary treatment; PV/Solar Panels; internal roads and footpaths; waste storage areas, all electrical services and all associated site development works.

# 3. Foul Water Drainage

## 3.1 Introduction

The surrounding area in Kildare is serviced by Uisce Éireann with foul water infrastructure.

A Pre-Connection Enquiry (PCE) form with the proposed developments foul water demand requirements was submitted by Waterman Moylan to Uisce Éireann in December of 2024. A response in the form of a Confirmation of Feasibility (COF) Letter, with ref. CDS24010462, was received from Uisce Éireann on the 7th of February 2025. The COF stated the following regarding the foul water drainage connection for the proposed development of 150 no. residential units (schedule of accommodation at the time):

"*Feasible without infrastructure upgrade by Uisce Éireann.*

- *Proposed connection to Uisce Éireann network is via Phase 1 of Southgreen Development Zone, south of the site. All the relevant Phase 1 wastewater infrastructure must be completed, of adequate capacity and connected to Dunmurray Road Pumping station, prior the connection*."

A second COF was sought prior to the Stage 2A submission to Kildare County Council. The COF received on 12 August 2025", for a total of 170 no. residential units, and advised the following:

"*Feasible without infrastructure upgrade by Uisce Éireann".*

A third COF was sought prior to planning submission to Kildare County Council. The COF received on 16 February 2026", for a total of 146 no. residential units and creche, and advised the following:

*Feasible without infrastructure upgrade by Uisce Éireann.*

- *Proposed connection to Uisce Éireann network is via Phase 1 of Southgreen Development Zone, south of the site. All the relevant Phase 1 wastewater infrastructure must be completed, of adequate capacity and connected to Dunmurray Road Pumping station, prior the connection*."

This Confirmation of Feasibility is attached in Appendix A.

## 3.2 Existing Foul Drainage

The Dunmurry Rd Wastewater Pump Station (WWPS) is located southeast of the subject site. The WWPS was constructed to accommodate foul flows from future development within the LAP lands north and west of the WWPS (including the subject site).

Existing foul drainage infrastructure information, location of manholes, cover levels, and invert levels, have been sourced from available Uisce Éireann QGIS data, the Uisce Éireann COF Letter, and available as-built information from the approved Phase 1 Southgreen development.

As part of the currently under construction South Green Phase 1 development, located directly south of the subject site, a 450mm diameter foul spine sewer will be installed to facilitate the foul connection for the Phase 2 subject site. Presently, an existing short segment of 450mm foul sewer is located below the road bisecting Phases 1 and 2, built to facilitate the foul connection between the phases. The short segment of foul sewer has an upstream manhole, located in Phase 2, with ref. no. F4-AS-BUILT, that has a cover level of 105.497 OD Malin and an invert level of 103.759 OD Malin, and a downstream manhole located in Phase 1 with a corresponding cover level of 107.421 OD Malin and an invert level of 103.621 OD Malin.

Refer to Figure 3-1 for an indicative illustration of the existing 450mm spine foul sewer and proposed connection point from the subject development to the existing 450mm foul segment.

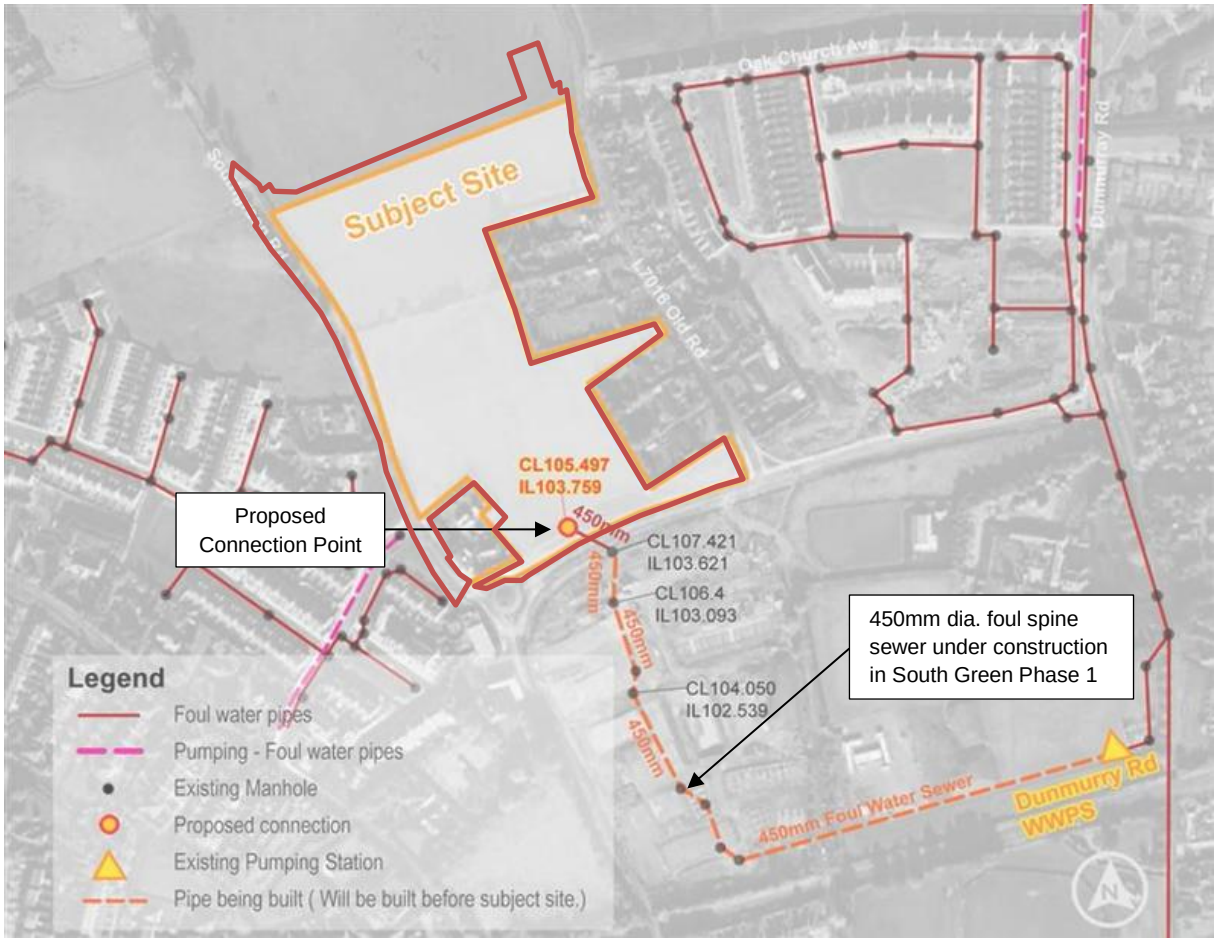



Figure 3-1 Indicative Sketch - Existing Foul Water Network

## 3.3 Existing Network Capacity

The ultimate outfall of the LAP lands foul sewer is the Kildare Town Wastewater Treatment Plant (WWTP) located south of the subject site. The WWTP was upgraded in 2013 to facilitate capacity expansion from 10,000 PE (population equivalent) to 28,000 PE.

Following the WWTP upgrades for the town of Kildare the following works were undertaken:

- Upgrading and integrating the existing foul / combined sewers.
- Constructing 3 no. new pumping stations, one of which incorporates storage.
- Installing approximately 3.2km of new sewers and rising mains.

According to the Central Statistics Office (CSO) Census, the town of Kildare had a population of 10,302 in the year 2022. According to the Kildare Town LAP, and based on the 2022 CSO data, the population and housing targets for the Plan (2023-20029) offers a population target of 11,682 persons estimated to the end of 2029. The WWTP offers a total capacity of 28,000 PE, which corresponds to an approximate available surplus capacity 16,318 PE (53% surplus capacity) above the estimated total population of 11,682 in 2029. There is theoretically more than adequate capacity in the public foul water network to accommodate the subject development.

Uisce Eireann publish an annual register of Wastewater Treatment Capacity on a County-by-County basis. The most recent register was published in December 2024 and reports that there is available capacity in

the Kildare Town WWTP. Refer to Figure 3-2 for an extract of the register available online from water.ie. A “Green” indication of available capacity signals spare capacity in the system. However, it should be noted that according to Uisce Eireann this register provides wastewater treatment capacity information only and does not provide an indication of network capacity.

Final confirmation of capacity within the network is given in an Uisce Eireann COF Letter.

| Region | County | Settlement | Wastewater Treatment Plant (WWTP) | Reg # | Indication of Available Capacity | WWTP Project Planned/Underway |
|---|---|---|---|---|---|---|
| EM | Kildare | Droichead Nua | ULLVSS WWTP Osberstown | D0002 | • Green | |
| EM | Kildare | Naas | ULLVSS WWTP Osberstown | D0002 | • Green | |
| EM | Kildare | Celbridge | LLVSS WWTP Leixlip | D0004 | • Green | |
| EM | Kildare | Leixlip | LLVSS WWTP Leixlip | D0004 | • Green | |
| EM | Kildare | Maynooth | LLVSS WWTP Leixlip | D0004 | • Green | |
| EM | Kildare | Athy | Athy WWTP | D0003 | • Green | |
| EM | Kildare | Kildare | Kildare Town WWTP | D0178 | • Green | |

Figure 3-2: Uisce Eireann Wastewater Treatment Capacity Register (Dec 2024)

## 3.4 Future Development of Lands

According to the Kildare Town Local Area Plan (LAP), the lands located to the north and northwest of the subject development are designated for future development. Currently, these lands are zoned for educational, and community uses, a neighbourhood centre, and active green space. However, it is possible that a significant portion of these lands may also be proposed for residential development.

Based on the total area available, it is estimated that up to 2,100 no. residential units could potentially be accommodated. As a preliminary estimate, these future developments could generate an additional daily wastewater load of approximately 952 m³/day, corresponding to a projected population of 6,345 persons.

These figures are indicative only and are intended to provide an estimate of the potential additional future flows that may need to be accommodated within the public foul drainage system. Accounting for the potential future development and population of the lands to the north and northwest, the WWTP capacity of 28,000 PE remains more than sufficient to serve the overall population.

The foul water network required to serve these future developments will need to be designed as part of the Phase 2 subject development, ensuring connectivity to the system at the northern boundary of the Phase 2 subject lands. As such, a 375mm diameter spine sewer is proposed as part of the subject development.

## 3.5 Proposed Foul Drainage Network and Calculations

It is proposed to connect the subject site’s foul drainage into the existing 450 mm diameter gravity foul network south of the site, currently being constructed as part of the South Green Phase 1 development. The connection will be made at the existing foul water manhole located on the south of the subject site with ref. F4-AS-BUILT. The proposed connection point is indicated in Figure 3-1.

The spine sewer to be laid in a north-south direction through the subject site will be 375mm in diameter laid at a slope of 1:300 to cater for potential future development of the lands to the north and northwest of the subject development.

The subject site's proposed foul network will ultimately outfall at the Kildare Wastewater Treatment Plant (WWTP) located c. 1.6 km from the site. The Kildare WWTP, as mentioned, has a current capacity of 28,000 Population Equivalent (P.E).

Refer to Waterman Moylan Drawing no. SOU-WMC-PH2-XX-DR-C-P0200 - *Proposed Drainage Layout* for the proposed foul drainage layout.

Based on the Uisce Éireann Code of Practice, the peak foul flow from the proposed development will be as outlined in Table 3-1.

Table 3-1: Calculation of Proposed Foul Water Flow

| Description | No. of Units | Flow (ℓ/h/day) | Population per Unit | Infiltration Factor | Total Discharge (ℓ/d) |
|---|---|---|---|---|---|
| Residential Development | 146 no. | 150 | 2.7 | 1.1 | 65,043 |
| Creche | 1 no. (48 Persons) | 90 | 48 | 1.1 | 4,752 |

| Calculation of Proposed Peak Foul Flow | | |
|---|---|---|
| Total Daily Discharge (from above table) | 69,795 | ℓ/d |
| Dry Weather Flow (DWF) | 0.81 | ℓ/s |
| **Peak Foul Flow (= 6 x DWF)** | **4.86** | **ℓ/s** |

The total dry weather flow generated from the proposed development is 0.81 ℓ/s and the peak foul water flow generated from the development is calculated as 4.86 ℓ/s, with a proposed outfall from the development as 1 no. 375 mm diameter pipe laid at a minimum gradient of 1:300.

The outfall pipe has a capacity of 115 ℓ/s and is thus adequate to cater for the proposed development and future developments discharge of foul flows.

## 3.6 Foul Drainage Network Design

Foul water sewers will consist of uPVC or concrete socket and spigot pipes (to IS 6) and will lay strictly in accordance with the Uisce Éireann Code of Practice for Wastewater Infrastructure and requirements for taking charge.

The design of the subject site's foul water drainage network will incorporate 150 mm and 225 mm diameter pipes and a 375mm diameter spine sewer. The installation of these pipes will adhere to the requirements outlined in Uisce Éireann's Wastewater Standards and Code of Practice.

# 4. Surface Water Drainage

## 4.1 Introduction

The 6.13 ha subject site is entirely greenfield, with no civil services currently installed within its boundaries. The surface water management strategy for the proposed development has been prepared with reference to the Kildare Town Local Area Plan and related surface water addendum documents, the Greater Dublin Strategic Drainage Study (GDSDS), and the Kildare County Council (KCC) Sustainable Drainage Systems (SuDS) Guidance Document.

The surface water management strategy has been carefully developed to incorporate nature-based Sustainable Urban Drainage Systems (SuDS) features throughout the site. These elements are integrated into the overall drainage network to facilitate natural attenuation, promote infiltration, and support water quality improvements. Features such as swales, permeable paving, bio-retention tree pits, above ground detention basins and below ground infiltration attenuation areas have been strategically located across the development to manage runoff at source, reduce flow rates, and mimic the site's natural hydrological processes. This approach not only addresses surface water quantity and quality but also enhances local biodiversity and contributes positively to the site's visual and ecological character.

## 4.2 Hydrology and Flood Risk

According to a Surface Water Study undertaken by RPS and commissioned by KCC, the subject lands are located within the Tully Stream watercourse catchment, and, historically drained in a west-east and north-south direction to the Tully Stream located c. 2 km south, which is further south of the M7 located in Tully. The Tully Stream ultimately discharges into the River Barrow. Upgrades to the overall Kildare Town surface water networks have taken place to reroute runoff along the M7, however, and not under the M7 towards the Tully Stream.

The Kildare Town Local Area Plan 2023-2029 – Strategic Flood Risk Assessment (SFRA) indicates no areas in the town of Kildare are at risk of flooding from coastal or fluvial sources and that the town in its entirety is within Flood Zone C. The assessment does however identity specific areas in the town which are at risk of pluvial flooding (i.e. flooding caused by high intensity overland rainfall). These identified areas as outlined in Map 10.2 of the Kildare Town LAP (2023-2029) Appendix A Maps, require a site-specific flood risk assessment at development management stage.

Refer to Figure 4-1 below for an extract of this map. As can be seen from the below figure, a portion (northeast corner) of the subject lands is identified as a development at risk of pluvial flooding and as such will require a site-specific flood risk assessment. Flood risk at the subject lands is discussed in detail within the Waterman Moylan Flood Risk Assessment, submitted as part of this application under a separate cover.

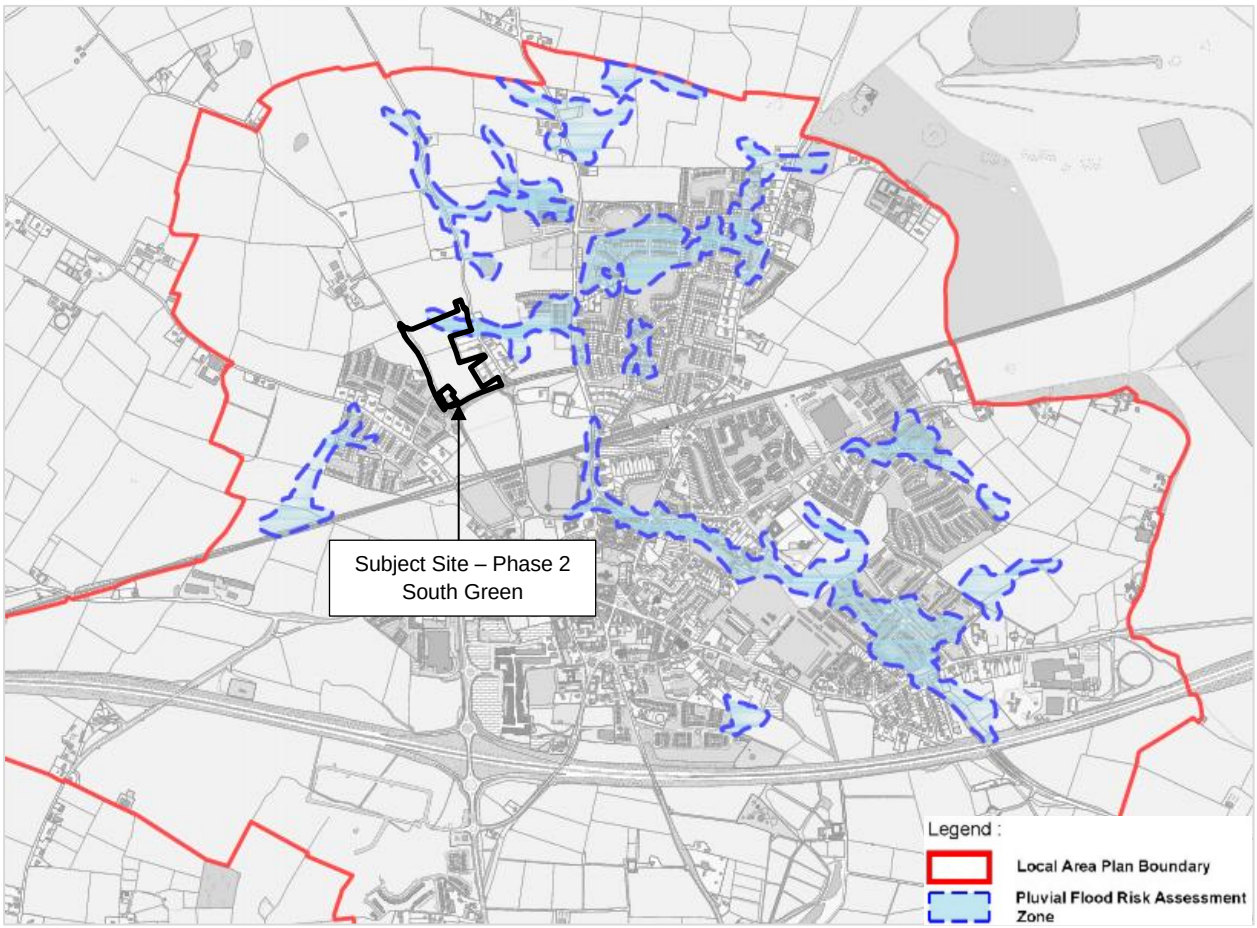



Figure 4-1: Areas requiring a Strategic Flood Risk Assessment due to Potential Pluvial Flooding

## 4.3 Stage 1 and 2 Surface Water Study (Kildare County Council)

A detailed Stage 1 and Stage 2 Surface Water Study was commissioned by Kildare County Council (KCC) and undertaken by RPS for the town of Kildare. The Stage 2 Surface Water Study was completed in February of 2023. The studies identify sustainable surface water management strategies for the town of Kildare with particular focus on prioritising nature-based solutions where possible, designating areas where surface water can be managed, identifying opportunities for inclusion of additional surface water attenuation facilities, identifying where existing infrastructure connections are located and where future systems can outfall to, and considering the amenity potential and value for any surface water solution within the town of Kildare.

Kildare Town was divided into 6 no. surface water subcatchment areas within the study for individual assessment. The subject lands are located within surface water subcatchment no. 5. Figure 11 from the Stage 2 Surface Water Study, extracted to Figure 4-2 below, shows the extent and assessment of subcatchment no. 5.

The study outlines its own reference system to zoned lands within the town of Kildare, different to that of the Kildare LAP Land Use Zoning Map. The reference system uses alphabetic identifiers for each zoned area called ‘Site ID’s”. According to the study the zoned sites are as follows:

- H - Southgreen (5.73 Ha) – zoned employment

- I - West of Dunmurray Road (5.73 Ha) – zoned residential
- K - West of Old Road (4.53 Ha) – zoned residential
- O - Between Old Road and South Green Road (11.59 Ha) – zoned residential

The subject lands are located within the residential Site “O”. Figure 4-2 illustrates Site O by dark hatching and the subject lands are shown in the figure by the blue dashed outline.

According to the study the subject lands have been earmarked for the surface water runoff to discharge at a Potential Nature-Based Management Area (NBMA). The location of these management areas can be seen by blue flower icons shown in Figure 4-2. The management area for which the subject lands is proposed to drain is an existing pond located northeast of the site.

The subject lands are not located directly adjacent to the designated NBMA, and third-party lands lie between the subject site and the NBMA to both the north and east. As such, it is not feasible to design a direct connection from the proposed development’s surface water network to the NBMA without either obtaining third-party consent or undertaking a detailed surface water drainage design for the intervening lands.

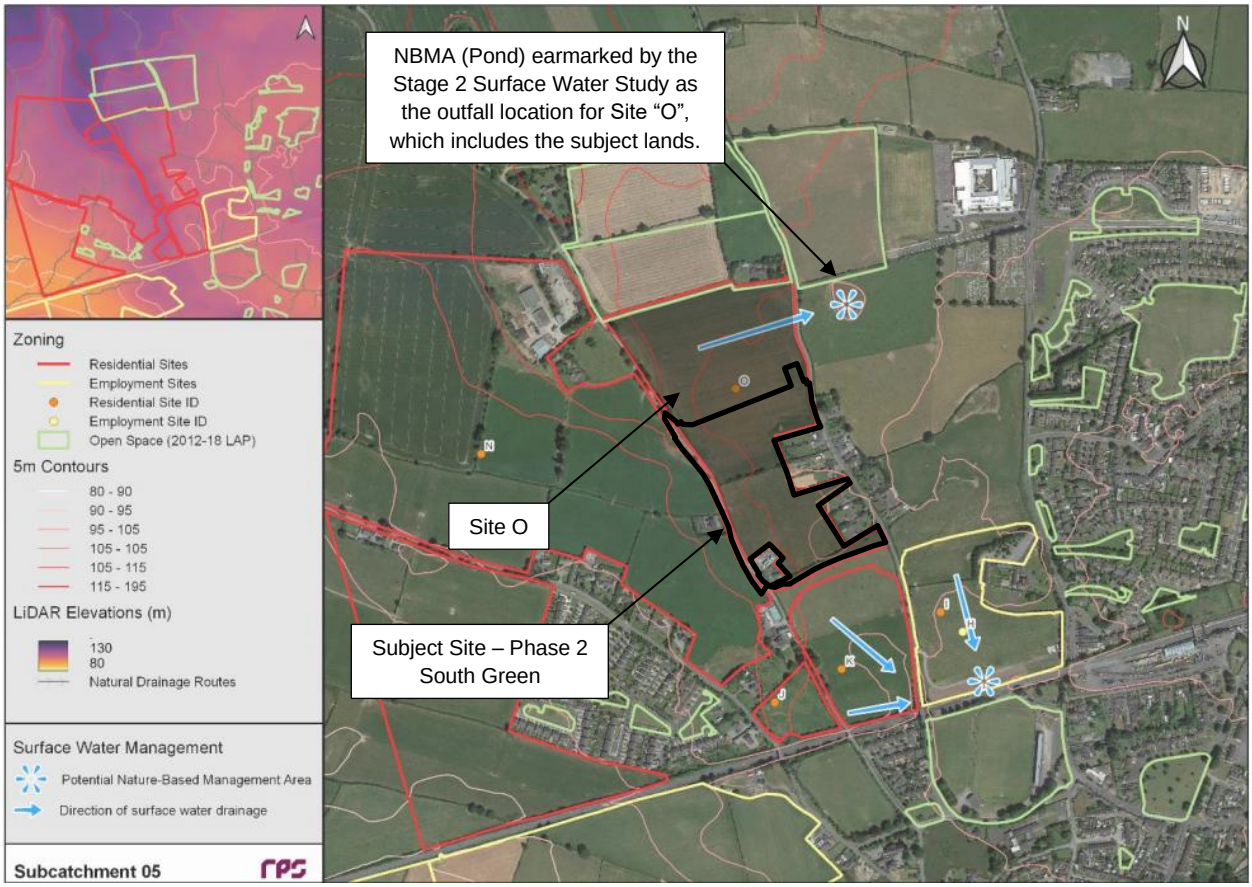



Figure 4-2: Subcatchment 05 (Stage 2 Surface Water Study, KCC)

It is noted that this zoning strategy aligns with the Kildare LAP that has zoned the subject lands as *Phase 2 - New Residential* (refer to Figure 2-4 for details).

## 4.4 Existing Surface Water Drainage

According to the available Uisce Éireann QGIS database, no existing surface water infrastructure is present near the subject lands. According to the Stage 1 Surface Water Study, the majority of areas in the vicinity of the subject lands north of the Kildare Railway Line discharge surface water to the ground via infiltration with lands south of the railway discharging to the ground, to a combined network discharging to the Tully stream, or via discharging to the M7 surface water network.

## 4.5 Hydrogeological Investigation

A detailed hydrogeological investigation of the subject lands was undertaken by Verde in December 2025. The Hydrogeological Report with reference S45476 provides a comprehensive understanding of the groundwater system within the lands. The Verde Report is included as part of this subject application under a separate cover.

Borehole tests were undertaken at the proposed attenuation areas within the subject development, refer to Figure 4-3 for an extract of the test locations map taken from the Verde Hydrogeological Report.

According to the Verde Report the permeability can be summarised as "*Overall, it can be seen from the permeability tests that the subsoils at the proposed SuDS location have permeability rates which are considered moderate within the silty, sandy, GRAVEL subsoils of the regionally important Curragh West sand and gravel aquifer. Moderate vulnerability includes a wide range of permeability values (1 x $10^{-4}$ m/s down to about 1 x $10^{-8}$ m/s) (WFD Strive Programme 2007-2013).*"

In general, the upper 4-5 m soils below ground level (BGL) were found to be low permeability silty / gravelly CLAY with soils below 4-5 m BGL found to be silty, sandy GRAVELS with proven permeability. Essentially, permeability only becomes viable once the gravel horizon is intercepted. A summary of the permeability rates measured and assumed for the attenuation areas is included below:

Table 4-1: Permeability Rates of Attenuation Areas

| Attenuation Area | Borehole Test ID | Permeability Rate | First Permeable Stratum |
|---|---|---|---|
| Catchment A (South) | BH03 | 30L added, no head achieved, water drained immediately. A moderate infiltration rate of 1x$10^{-5}$ m/s used (confirmed by Verde to be appropriate). | Clayey, very sandy GRAVEL from 3.9 m BGL to 6.8 m BGL. Soakaway base to be set at ≥4 m BGL within the gravel layer. |
| Catchment B (Central) | BH02 | 30L added, no head achieved, water drained immediately. A moderate infiltration rate of 1x$10^{-5}$ m/s used (confirmed by Verde to be appropriate). | Loose, moist, very sandy / silty GRAVEL from 4.9 m BGL to 8.4 m BGL. Soakaway base to be set at ≥5m BGL. |
| Catchment C (North) | BH04 | 4.27 x $10^{-7}$ m/s | Gravel from ~4.0 m BGL down to >20 m BGL. Soakaway base to be set at ≥5 m BGL. |

Based on the Report findings summarised in the above table, the infiltration systems to be used in Catchments A, B, and C will be required to be installed at depths of ≥4 m BGL, ≥5 m BGL, and ≥5 m BGL respectively to allow for infiltration into the surrounding GRAVEL layer. A summary of the required soakaway base levels is included below for ease of reference:

Table 4-2: Proposed Infiltration / Soakaway Installation Levels

| Attenuation Area | Borehole ID | Existing Ground Level | Infiltration System Base Level |
|---|---|---|---|
| Catchment A (South) | BH03 | 105.0 m OD Malin | 101.0 m OD Malin [≥4 m BGL] |
| Catchment B (Central) | BH02 | 110.0 m OD Malin | 105.0 m OD Malin [≥5 m BGL] |
| Catchment C (North) | BH04 | 105.5 m OD Malin | 100.5 m OD Malin [≥5 m BGL] |

It is further proposed to set the base of the systems 1000mm into the underlaying gravel layer to facilitate further infiltration into the surrounding gravel.

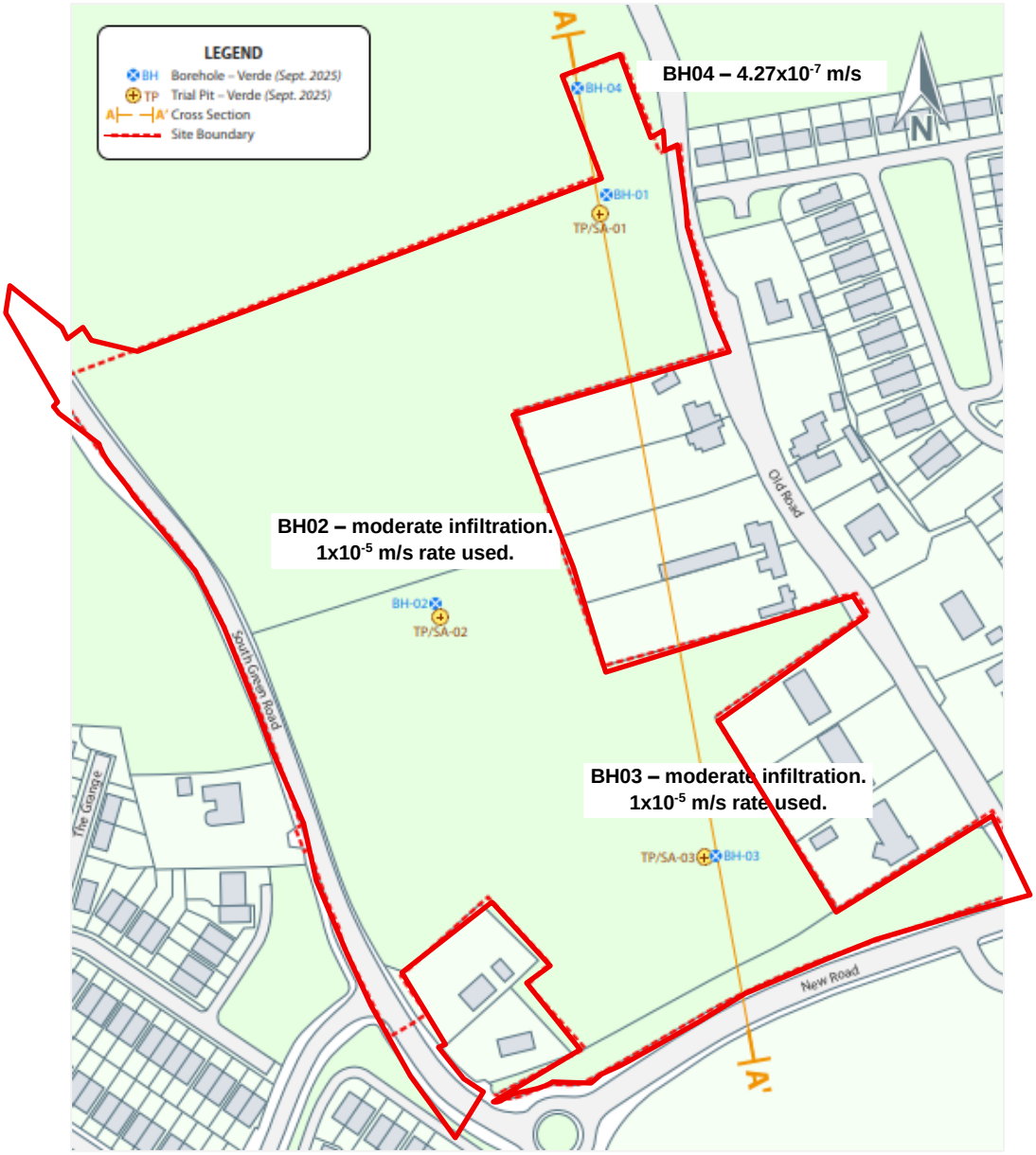



Figure 4-3: Verde Borehole Test Locations

## 4.6 Existing Flow Route Analysis

Expanding on Chapter 2.2 of this report, the topography of the site includes steeply sloped lands, generally from west to east, with a small portion of the northeast corner of the lands sloping from northeast to southwest. Refer to Figure 4-4 for a map of the subject lands showing the proposed site layout, natural contours, a selection of existing spot elevations, and arrows indicating the slope direction of the existing lands. It is noted that the arrows also represent the existing flow route analysis of the lands (the natural path of rainfall runoff falling on the subject lands).

Two key aspects of designing levels for the proposed development (designed road levels and finished floor levels) include analysing the natural contours of the site to minimise cut-and-fill operations as far as practically possible, i.e. working with the natural slopes of the land, and, ensuring positive drainage, i.e. designing roads to allow for efficient surface water runoff, avoiding low points that may cause ponding, and ensuring appropriate exceedance flow routes through the development in the event of a flood.

Surface water catchments are designed based on the proposed flow paths generated within the development as a result of the designed levels and on the proposed location of the attenuation areas within green spaces. The proposed site levels have been designed to incorporate flood routing / exceedance flow overland within the internal roads network, conveying the rainfall runoff external to the site and away from proposed residential dwellings and structures in the event of an extreme rainfall event. Based on the flow paths through the development, 4 no. surface water catchments are proposed for the subject lands, as discussed in the following section.

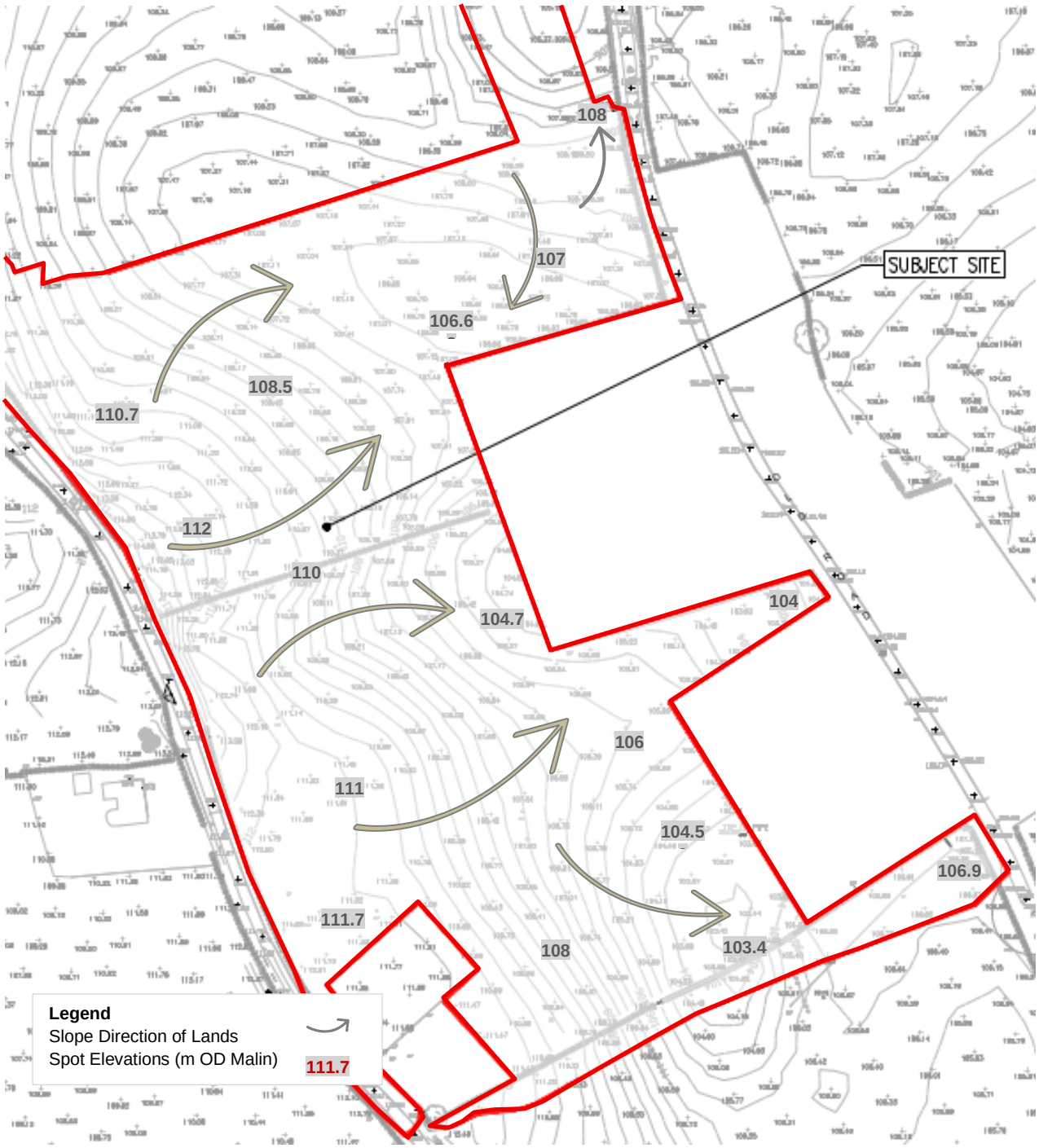



Figure 4-4: Existing Ground Contours of the Subject Lands (Existing Flow Route Analysis)

## 4.7 Proposed Surface Water Catchments

Due to the site topography and the location of the strategic open green space areas, 4 no. surface water sub-catchments have been designed for the subject development. The total area of the subject lands is c. 58,700 $m^2$ of which 53,244 $m^2$ represents the total surface water catchment area of the proposed development. The details of the 4 no. sub-catchments are included below:

- Catchment A – South

The catchment has a total area of 14,805 $m^2$ and is proposed to discharge into an infiltration attenuation system located at the southeast green space area of the development. The total impermeable area of this catchment is 6,860 $m^2$ correlating to a percent hardstanding of 46%.

Catchment A drains the southern portion of the development, draining c. 28% of the subject lands' surface water catchment area.

- Catchment B1 – Central

The catchment has a total area of 22,621 $m^2$ and is proposed to discharge into an infiltration attenuation system located at the central green space area of the development. This infiltration system is technically located within a different catchment, Catchment B2. The total impermeable area of this catchment is 13,710 $m^2$ correlating to a percent hardstanding of 61%.

Catchment B1 drains the majority of the central and northwest portion of the development, draining c. 42% of the subject lands' surface water catchment area.

- Catchment B2 – Central

The catchment has a total area of 6,985 $m^2$ and is proposed to discharge into an above ground retention basin located at the central green space area of the development. The total impermeable area of this catchment is 3,920 m2 correlating to a percent hardstanding of 56%.

Catchment B2 drains the east central portion of the development, draining c. 13% of the subject lands' surface water catchment area.

- Catchment C – North

The catchment has a total area of 8,833 $m^2$ and is proposed to discharge into an infiltration attenuation system located at the southeast green space area of the development. The total impermeable area of this catchment is 5,050 $m^2$ correlating to a % hardstanding of 57%.

Catchment C drains the northeast portion of the development, draining c. 17% of the subject lands' surface water catchment area.

Refer to Figure 4-5 for an illustration of the extent of the 4 no. surface water sub-catchments.

It is noted that the eastern dwelling, located to the north-east of the southern catchment area, is situated on lands that slope steeply from west to east. Due to the nature of the local topography and the limited corridor available between units for the installation of public services, surface water runoff from this dwelling will be managed via a private soakaway located within the curtilage of the dwelling.

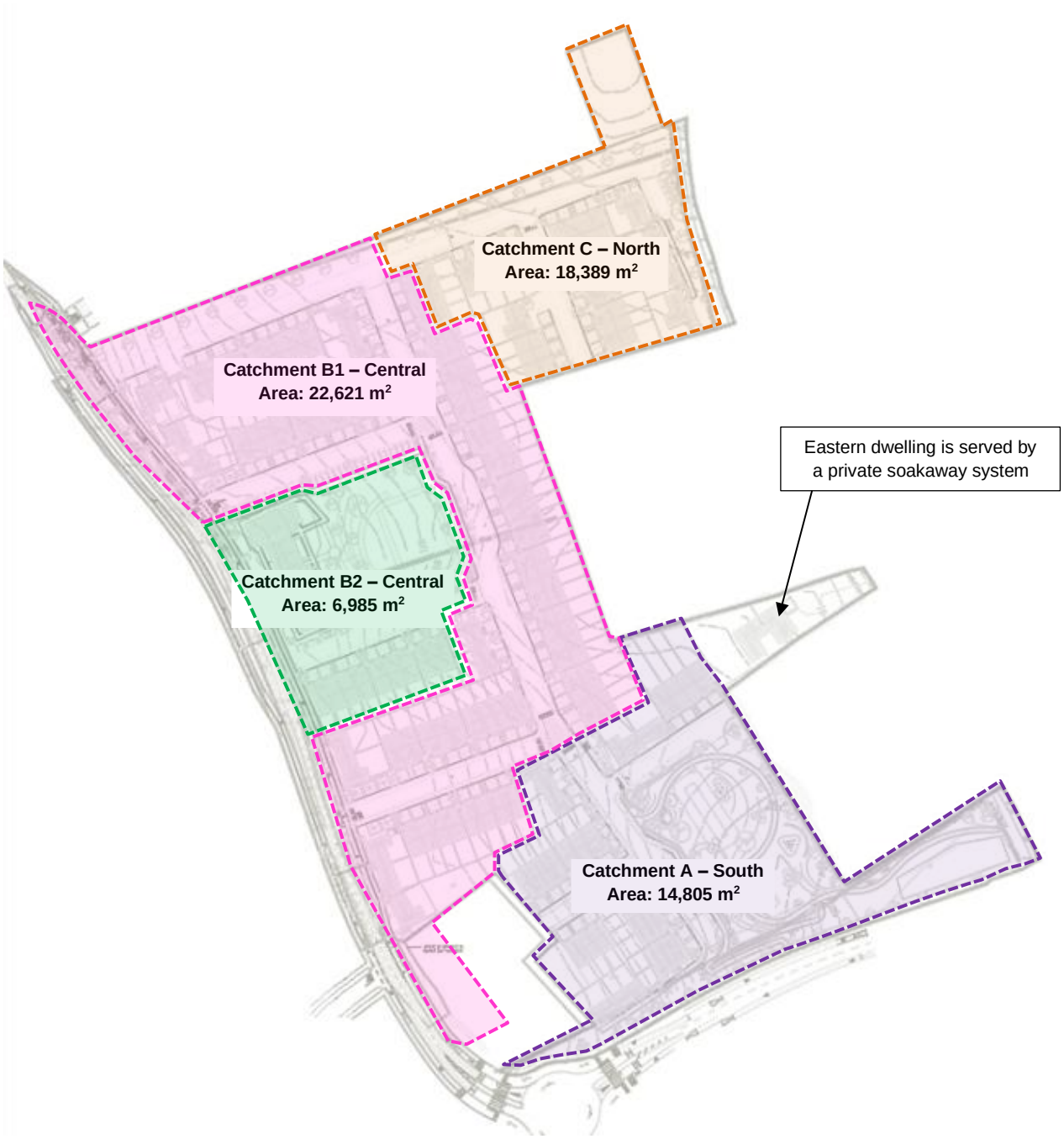



Figure 4-5: Subject Site Surface Water Sub-Catchments, Contours, & Spot Elevations

## 4.8 Proposed Surface Water Drainage Strategy

It is proposed, similar to Phase 1 South Green, to discharge surface water from the subject site to the ground via. Infiltration. It is proposed to incorporate 3 no. infiltration attenuation systems. 1 no. system per open green space area. Above ground detention basins are proposed at all infiltration attenuation systems.

The above-ground detention basin and the below-ground infiltration area located within the central portion of the subject development receive runoff from different surface water catchments.

The above-ground detention basin, situated within Surface Water Catchment B2, provides surface water storage for Catchment B2, which comprises the central open green space, the crèche, apartment units, several residential dwellings, and a small section of roadway.

The below-ground infiltration area, although also located within Surface Water Catchment B2, provides surface water storage for Catchment B1, which is the largest surface water catchment within the subject development.

By allowing surface water to naturally percolate into the soil as the main surface water attenuation strategy, this strategy not only mimics the pre-development hydrological cycle but also significantly reduces runoff volumes, lowers flood risk, and supports groundwater recharge. Given Kildare Town's geology and the increasing emphasis on sustainable development, prioritising infiltration to ground as the main surface water attenuation method offers a low-impact, long-term solution that enhances local resilience to climate change while promoting biodiversity and water quality improvements. This nature-based approach aligns with national SuDS guidance and Kildare's commitment to environmental stewardship.

The attenuation systems are sized to accommodate the extreme 1-in-100-year storm event with 30% climate change and 10% urban creep allowances included, as per KCC requirements. The final design of the infiltration systems is informed by and reflects the findings of hydrogeological investigation undertaken for the subject lands.

As mentioned, it is proposed that the surface water runoff for the development will be intercepted, collected, slowed, and attenuated through the use of nature-based rainwater management and SuDS features. The SuDS features proposed for the subject site are summarised below:

- Permeable paving at private parking / driveways.
- Bio-retention tree pits used in strategic public areas within landscaping and adjacent to hardstanding areas such as the internal roads network.
- Swales located adjacent to footpaths or the internal roads network to collect rainfall runoff from same.
- Above ground attenuation basins for each sub-catchment to facilitate above ground rainfall storage.
- Below ground infiltration systems for each sub-catchment to facilitate infiltration to ground.

These SuDS features will also add value to the biodiversity potential of the development.

The images taken from the KCC Sustainable Drainage Systems Guidance document, shown below in Figure 4-6, illustrate already constructed robust and aesthetically pleasing nature-based solutions in the form of permeable surfacing at car parking spaces / driveways and a well-established detention basin in a public open space.



Figure 4-6: Constructed Permeable Paving and Detention Basin (KCC SuDS Guidance Document)

The flow of rainfall runoff both overland and within the surface water network to the relevant discharge points (infiltration systems), which represents the modified flow analysis, is indicatively illustrated in Figure 4-7, below.

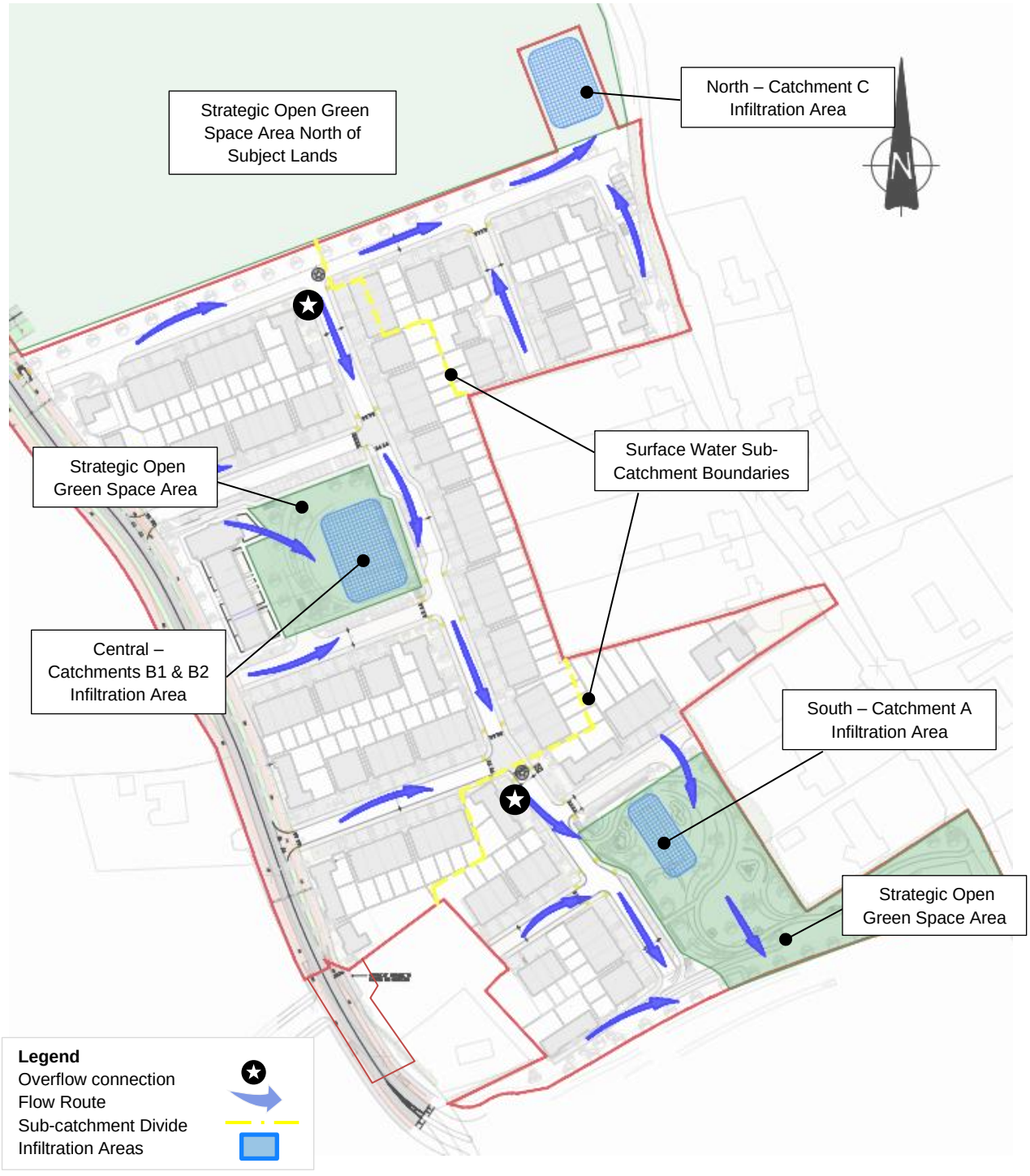



Figure 4-7: Indicative Sketch of Surface Water Flow Paths in Sub-Catchments (Modified Flow Analysis)

As discussed in Chapter 4.3 of this report, the Stage 2 Surface Water Study commissioned by KCC identifies an existing pond located northeast of the development as the nominated Nature-Based Management Area (NBMA) for Site O, within which the subject lands are located.

The primary method of rainfall runoff treatment for the proposed development is infiltration to ground. It is proposed that flood volumes up to and including the 1-in-100-year storm event, with an additional 30%

allowance for climate change, will be managed entirely through infiltration. The system will provide online storage through a combination of swales, permeable paving, bio-retention tree pits, detention basins, and infiltration systems, all designed to accommodate the full long-term storage volume required for the site.

2 no. overflow pipes will be provided between:

- The Southern Catchment A and Central Catchment B1;
- The Central Catchment B1 and the Northern Catchment C.

The overflow pipes are proposed to provide additional resilience in the event of a storm exceeding the design capacity of the surface water network. The 2 no. connections will operate as a below-ground relief mechanism, distinct from above-ground controlled exceedance routes, connecting the entirety of the surface water network and allowing runoff to flow northwards towards the existing pond and the area of the proposed NBMA. It is noted however that the subject lands are not located adjacent to the NBMA and third party ownership lands are located between the subject lands and the NBMA. As such, it is not possible to design a direct connection into the NBMA. Refer to Figure 4-7 for the location of the overflow connections between the sub-catchment, represented by a circle/star symbol.

## 4.9 Surface Water Calculations

It is proposed to discharge the subject developments surface water runoff to the ground via. infiltration within 3 no. attenuation systems, 1 no. per sub-catchment. As no surface water runoff from the subject development is proposed to be discharged into a public watercourse or network, the pre-development or Greenfield Run-off Rate for the subject lands is not applicable to the surface water design. The rainfall runoff will discharge into the underlying soils at the natural infiltration rate.

## 4.10 Proposed Surface Water Storage

### 4.10.1 Introduction

Where infiltration is feasible - long-term storage is achieved by allowing water to soak into the ground, providing a sustainable and low-impact drainage solution in line with SuDS best practices.

Long-term storage through infiltration to ground represents the most sustainable and preferred approach to surface water management on this site, aligning with both Kildare County Council's SuDS policies and the GDSDS principles. By allowing runoff to mimic natural drainage pathways and infiltrate locally, infiltration systems provide a direct link to the hydrological cycle, reducing runoff volumes at source, protecting water quality, and recharging groundwater.

Unlike more engineered solutions, infiltration removes the need for long-term reliance on downstream infrastructure and supports the "source control first" philosophy central to both Kildare's and the GDSDS's SuDS hierarchy. In essence, where ground conditions allow, infiltration is not only the most sustainable option - it is the most resilient, cost-effective, and future-proofed strategy for managing surface water in a changing climate.

The subject development's surface water strategy has been designed with long-term storage as the primary attenuation method.

### 4.10.2 Required Storage Volume

The total area of the catchment, including roads, roofs, parking, footpaths, and green areas, is approximately 5.87 ha, with a net hardstanding contributing area of 2.95 ha, which equates to c. 50% hardstanding area. The contributing impermeable areas are shown in Table 4-4Table 4-4.

It is proposed, in accordance with the recommendations of the Greater Dublin Strategic Drainage Study, that the 1-in-100-year critical design storm will be used for stormwater volumetric calculations (to establish on-site storage required) with a 30% additional allowance for climate change and 10% allowance for creep.

According to the FLOW model (Causeway software) of the full site's surface water attenuation storage, the site requires a total storage volume of c. 2,771 $m^3$ surface water for the critical storm event. Of the total storage volume, each sub-catchment requires the following volumes:

Table 4-3: Surface Water Attenuation Storage Required per Sub-Catchment

| Sub-Catchment Identifier | Storage Volume Required ($m^3$) |
|---|---|
| Sub-Catchment A (Southern Catchment) | 585 $m^3$ |
| Sub-Catchment B1 (Central Catchment) | 1,115 $m^3$ |
| Sub-Catchment B2 (West Central Catchment) | 315 |
| Sub-Catchment C (Northern Catchment) | 756 $m^3$ |
| **Total Surface Water Attenuation Storage Required** | **2,771 $m^3$** |

Refer to Appendix B for the surface water model including the attenuation storage requirements, completed using FLOW (Causeway) Software, for the subject development.

### 4.10.3 Total Impermeable Areas

The impermeable area of the subject site is calculated by multiplying the contributing area type receiving rainfall with the respective runoff coefficient. The impermeable areas calculated for the subject development overall can be found in Table 4-4 with the impermeable areas per sub-catchment shown in Table 4-5, below.

Table 4-4: Contributing Impermeable Areas within the Subject Development

| Contributing Area Type | Contributing Area ($m^2$) | Runoff Coefficient | Impermeable Area ($m^2$) |
|---|---|---|---|
| Green Spaces | 24,980 | 0.2 | 4,996 |
| Roads | 6,400 | 0.9 | 5,760 |
| Footpaths | 3,130 | 0.9 | 2,817 |
| Parking court/Permeable surfacing | 3,400 | 0.9 | 3,060 |
| Roof | 12,950 | 1.0 | 12,950 |
| **Total Impermeable Area** | | | **29,583 $m^2$** |

Table 4-5: Contributing Impermeable Areas within each Sub-Catchment

| Sub-Catchment Identifier | Contributing Area (m2) | % Hardstanding |
|---|---|---|
| Sub-Catchment A (Southern Catchment) | 6,860 $m^2$ | 46 % |
| Sub-Catchment B1 (Central Catchment) | 13,710 $m^2$ | 61 % |
| Sub-Catchment B2 (West Central Catchment) | 3,920 $m^2$ | 56 % |
| Sub-Catchment C (Northern Catchment) | 5,050 $m^2$ | 57 % |
| **Total Impermeable Area** | **30,535 $m^2$** | |

SuDS features are designed to intercept, store, slow, filter, and infiltrate runoff from these impermeable areas with the aim of:

- Reducing flood risk;
- Improving water quality;
- Encouraging groundwater recharge, and;
- Enhancing biodiversity and amenity.

The SuDS features proposed for the 4 no. Catchments of the subject development are discussed below.

### 4.10.4 Description of Proposed SuDS Features

The SuDS features proposed within the subject development are discussed below:

Permeable surfacing / paving

Permeable paving is proposed for the private parking areas / driveways to manage surface water runoff directly from these hard surfaces and from the residential dwellings roofs to reduce the risk of flooding. Downpipe collector drains can be routed from the roof gutters to connect into the below ground permeable paving driveways as an additional treatment process before discharging to the surface water mainline.

The storage layer of the permeable paving system has a depth of 350 mm and a void ratio of 0.4, meaning 40% of the storage volume consists of void spaces, allowing for effective water retention. This storage layer facilitates the management of stormwater by providing temporary detention, which helps to reduce peak runoff and promote gradual infiltration.

Bio-retention tree pits

Bio-detention tree pits are proposed adjacent to the internal roads network and footpath arrangements in the subject development. This SuDS feature will capture surface water runoff from the adjacent road and/or footpath, filtering and slowing the surface water within the pit before conveying it to the mainline network and attenuation storage area within each sub-catchment. The pits have been located within the public realm.

This SUDS feature is designed as 1m in depth, 1m in width & length, and has an associated voids ratio of 0.4.

Swales

A swale is a shallow, vegetated, linear depression designed to convey, store, and treat surface water runoff from adjacent impermeable surfaces such as roads, car parks, and footpaths. In line with KCC's SuDS principles, swales provide an effective means of managing runoff close to source while delivering water quality, quantity, and biodiversity benefits.

Swales are typically grass-lined or planted with low-maintenance, native vegetation, allowing for infiltration of surface water into the ground where soil conditions permit, or conveyance to downstream SuDS features such as the proposed detention basins and attenuation areas.

Above Ground Detention/Retention Basins

A detention basin is a normally dry vegetated depression designed to temporarily store surface water runoff during rainfall events and release it at a controlled rate to downstream systems. Unlike infiltration systems, detention basins do not typically allow water to soak into the ground, but instead attenuate flows and provide time for sedimentation and pollutant removal before discharge.

An above ground detention basin is proposed in Catchment A (southern catchment) and Catchment C (northern catchment), located above the proposed infiltration areas. Where feasible, surface water runoff will be conveyed above ground directly into the detention basin. For runoff that enters the subsurface attenuation system, an open-grated manhole will be incorporated at the interface between the detention basin and infiltration area. This will allow exceedance flows during extreme storm events to discharge above ground, providing an additional overflow route from the infiltration system.

The above-ground basin located within Catchment B2 will technically operate as a retention basin rather than a detention basin. During the 1-in-1-year design storm, a small volume of surface water will be stored within the basin, corresponding to an approximate maximum water depth of 87 mm.

Infiltration Areas

An infiltration area is a subsurface or surface feature designed to temporarily store surface water runoff and allow it to infiltrate directly into the underlying ground, thereby reducing runoff volumes, attenuating peak flows, and supporting groundwater recharge.

In accordance with Ireland's SuDS guidance, infiltration systems are most effective when located close to the runoff source and are particularly suited to developments with permeable or moderately permeable soils, and where groundwater levels and contamination risks are suitably low.

The final design of the infiltration systems will be informed by and reflect the findings of this investigation.

### 4.10.5 SuDS Features Proposed per Sub-Catchment

The SuDS features proposed for Catchments A, B1, B2, and C, are summarised in the tables to follow.

SuDS within Catchment A (Southern Catchment)

Table 4-6: Southern Catchment A - Details of Proposed SuDS Features

| **Southern Catchment A** | | | | | |
|---|---|---|---|---|---|
| SUDS feature | Types of Contributing Areas | SUDS Feature Area ($m^2$) | Voids ratio | Depth (m) | Storage provided ($m^3$) |
| Permeable paving | Private driveways and residential roofs | 510 $m^2$ | 0.4 | 0.35 | 71 $m^3$ (c.53 $m^3$)** |
| Bio-Retention Tree Pits | Roads, footpaths, green space areas | 4 $m^2$ | 0.4 | 1.00 | 1.6 $m^3$ |
| Swales | Footpaths, roads, green space areas | 85 $m^2$ | 0.4 | 1.00 | 34 $m^3$ |
| Detention Basin | Road, footpaths, roofs, green space areas | - | 1.0 | 1.00 | 250 $m^3$ |
| Infiltration Area | Road, footpaths, roofs, green space areas | - | 0.95 | 2.00 | 340 $m^3$ |
| Total Storage Provided in Catchment A | | | | | 679 $m^3$ |

**Note **** In reality, the storage offered by the permeable paving will be c. 0.75 x (total potential) due to the 1:40 slope of this SuDS feature.

Southern Catchment A requires a total attenuation storage volume of 605 $m^3$; this volume is achieved through the use of the above SuDS features which offer a total of 679 $m^3$ of storage.

The details of the proposed SuDS features within Catchment B1 are discussed below.

SuDS within Catchment B1 (Central Catchment)

Table 4-7: Central Catchment B1 - Details of Proposed SuDS Features

| **Central Catchment B1** | | | | | |
|---|---|---|---|---|---|
| SUDS feature | Types of Contributing Areas | SUDS Feature Area ($m^2$) | Voids ratio | Depth (m) | Storage provided ($m^3$) |
| Permeable paving | Private driveways and residential roofs | 809 $m^2$ | 0.4 | 0.35 | 113 $m^3$ (c. 85 $m^3$)** |
| Bio-Retention Tree Pits | Roads, footpaths, green space areas | 11 $m^2$ | 0.4 | 1.00 | 4.4 $m^3$ |
| Swale | Footpaths, roads, green space areas | 105 $m^2$ | 0.4 | 1.00 | 42.0 $m^3$ |
| Infiltration Area | Road, footpaths, roofs, green space areas | - | 0.95 | 2.00 | 930.0 $m^3$ |
| Total Storage Provided in Catchment B | | | | | 1,089 $m^3$ |

Central Catchment B requires a total attenuation storage volume of 1,059 $m^3$; this volume is achieved through the use of the above SuDS features which offer a total of 1,089 $m^3$ of storage.

The details of the proposed SuDS features within Catchment B2 are discussed below.

SuDS within Catchment B2 (West Central Catchment)

Table 4-8: Central Catchment B2 - Details of Proposed SuDS Features

| **Central Catchment B2** | | | | | |
|---|---|---|---|---|---|
| SUDS feature | Types of Contributing Areas | SUDS Feature Area ($m^2$) | Voids ratio | Depth (m) | Storage provided ($m^3$) |
| Permeable paving | Private driveways and residential roofs | 324 $m^2$ | 0.4 | 0.35 | 45 $m^3$ (c. 31 $m^3$)** |
| Retention Basin | Road, footpaths, roofs, green space areas | - | 1.0 | 0.50 | 300.0 $m^3$ |
| Total Storage Provided in Catchment B | | | | | 345 $m^3$ |

Central Catchment B2 requires a total attenuation storage volume of 315 $m^3$; this volume is achieved through the use of the above SuDS features which offer a total of 345 $m^3$ of storage.

The details of the proposed SuDS features within Catchment C are discussed below.

SuDS within Catchment C (Northern Catchment)

Table 4-9: Northern Catchment C - Details of Proposed SuDS Features

| **Northern Catchment C** | | | | | |
|---|---|---|---|---|---|
| Permeable paving | Private driveways and residential roofs | 215 $m^2$ | 0.4 | 0.35 | 30 $m^3$ (c. 23 $m^3$)** |
| Swales | Footpaths, roads, green space areas | 45 $m^2$ | 0.4 | 1.00 | 18 $m^3$ |
| Detention Basin | Road, footpaths, roofs, green space areas | - | 1.00 | 1.00 | 315 $m^3$ |
| Infiltration Area | Road, footpaths, roofs, green space areas | - | 0.95 | 2.20 | 422 $m^3$ |
| Total Storage Provided in Catchment C | | | | | 785 $m^3$ |

Northern Catchment C requires a total attenuation storage volume of 756 $m^3$; this volume is achieved through the use of the above SuDS features which offer a total of 785 $m^3$ of storage

Further details pertaining to the attenuation areas proposed in each Catchment is discussed below.

### 4.10.6 Attenuation Areas per Catchment

Southern Catchment A

- Above Ground Detention Basin Details

An above ground detention basin is proposed within the open green space area located at the southeast corner of the proposed development. The basin has a bottom of bank level of 105.5 m OD Malin and a top of bank level of 106.5 m OD Malin; the basin is 1.0 m in depth.

The total above ground storage volume provided by the basin is c. 250 $m^3$. The basin has side slopes of 1:4 and has been designed to ensure the top of water level (T.W.L) is at least 500 mm below the adjacent finished floor levels of the residential units. During the 1-in-100-year flood event (including 30% climate change), the T.W.L reaches 106.49 m OD Malin.

The lowest adjacent FFL in the catchment is 107.175 m, resulting in the highest flood water level being 685 mm below the lowest FFL.

The basin is located within an open green space amenity area and floods with up to 227 $m^3$ of rainfall runoff during the extreme 1-in-100-year storm event with 30% climate change.

- Below Ground Infiltration Area

An infiltration trench system is proposed below the Southern Catchment A detention basin. The mainline surface water network will connect into the infiltration system before discharging into the above ground detention basin via. an open grate manhole, during extreme storm events. Where possible, runoff will be brought overland and into the above ground detention basin directly.

The infiltration system is designed with 3 no. trenches, 2m deep, 2m wide, and 22m in length each. The porosity of this system is taken as 96%. The base of the system is proposed to be laid 500mm into the gravel layer to allow for additional infiltration from the base and sides.

The infiltration system holds 254 $m^3$ of runoff during the extreme 1-in-100-year flood event including 30% for climate change.

Central Catchment B1

- Below Ground Infiltration Area

An infiltration trench system is proposed within the central open green space (and below the Catchment B2 retention basin).

The mainline surface water network from Catchment B1 will connect into the infiltration system below ground.

The infiltration system is designed with 5 no. trenches, 2.6m deep, 2.4m wide, and 30m in length each. The porosity of this system is taken as 96% and the soil infiltration rate taken as $1x10^{-5}$ m/s, as per Verde's recommendation. The base of the system is proposed to be laid 1000mm into the gravel layer to allow for additional infiltration from the base and sides.

The infiltration system holds c.898 $m^3$ of runoff during the extreme 1-in-100-year flood event including 30% for climate change.

Central Catchment B2

- Above Ground Retention Basin Details

An above ground retention basin is proposed within the open green space area of the proposed development. The basin has a bottom of bank level of 108.50 m OD Malin and a top of bank level of 109.00 m OD Malin; the basin is 0.5 m in depth. Where possible, runoff will be brought overland and into the above ground detention basin directly.

The total above ground storage volume provided by the basin is c. 300 $m^3$. The basin has side slopes of 1:4 and has been designed to ensure the top of water level (T.W.L) is at least 500 mm below the adjacent finished floor levels of the residential units. During the 1-in-100-year flood event, the T.W.L reaches 108.98 m OD Malin.

The lowest adjacent FFL in the catchment is 109.75 m, resulting in the highest flood water level being 770 mm below the lowest FFL.

The basin is located is located within an open green space amenity area and floods with up to 272 $m^3$ of rainfall runoff during the extreme 1-in-100-year storm event with 30% climate change.

Northern Catchment C

- Above Ground Detention Basin Details

An above ground detention basin is proposed within the future strategic green open space area north of the development, at the northeast corner to the site. The basin has a bottom of bank level of 105.0 m OD Malin and a top of bank level of 106.0 m OD Malin, the basin is 1.0 m in depth.

The total above ground storage volume provided by the basin is c. 318 $m^3$. The basin has side slopes of 1:4 and has been designed to ensure the top of water level (T.W.L) is at least 500 mm below the adjacent finished floor levels of the residential units. During the 1-in-100-year flood event, the T.W.L reaches 105.72 m OD Malin.

The lowest adjacent FFL in the catchment is 106.95 m, resulting in the highest flood water level being 1.23 m below the lowest FFL.

The basin is located is located within an area earmarked for future open green space amenity and floods with up to 300 $m^3$ of rainfall runoff during the extreme 1-in-100-year storm event with 30% climate change.

- Below Ground Infiltration Area

An infiltration trench system is proposed below the Northern Catchment C detention basin.

The mainline surface water network will connect into the infiltration system before discharging into the above ground detention basin via. an open grate manhole, during extreme storm events. Where possible, runoff will be brought overland and into the above ground detention basin directly.

The infiltration system is designed with 5 no. trenches, 2.2m deep, 2m wide, and 20m in length each. The porosity of this system is taken as 96% and the soil infiltration rate taken as $4.27x10^{-7}$ m/s, as per Verde's findings. The base of the system is proposed to be laid 1000mm into the gravel layer to allow for additional infiltration from the base and sides.

The infiltration system holds 422 $m^3$ of runoff during the extreme 1-in-100-year flood event including 30% for climate change.

### 4.10.7 Summary of Surface Water Storage Provided in Attenuation Areas

A summary of the surface water storage provided in each of the attenuation areas during the extreme 1-in-100-year storm event (including 30% climate change) is included below:

Table 4-10: Storage Volume Provided during the 1-in-100-year extreme storm event

| Sub-Catchment | Detention/Retention Basin | Infiltration System | Total |
|---|---|---|---|
| Southern Catchment A | 250 $m^3$ | 254 $m^3$ | 504 $m^3$ |
| Central Catchment B1 | | 898 $m^3$ | 898 $m^3$ |
| Central Catchment B2 | 300 $m^3$ | | 300 $m^3$ |
| Northern Catchment C | 318 $m^3$ | 422 $m^3$ | 740 $m^3$ |
| **Total Storage Provided** | | | **2,442 $m^3$** |

Thus, the total surface water storage provided by the above ground detention/retention basins and the below ground infiltration systems throughout the subject development is 2,442 $m^3$.

Refer to Waterman Moylan Drawing no. SOU-WMC-PH2-XX-DR-C-P0200 for the proposed drainage layout.

Refer to Appendix B for the surface water model including the attenuation storage calculation, completed using FLOW (Causeway) Software, for Catchments A, B1, B2 & C within the subject development.

## 4.11 Surface Water Network Design

Calculations for pipe sizes and gradients are based on surface water runoff from hardstanding areas such as the cycle tracks, storage containers, access road, the parking areas, and footpaths, using the Rational Method for surface water design (Bilhams Formula), with a storm return period (N) of 5 years.

Strict separation of surface water and wastewater will be implemented within the development. Drains will be laid in such a manner as to minimise the risk of inadvertent connection of waste pipes to the surface water system.

Surface water local drains will be a minimum of 150mm dia. and generally will consist of PVC (to IS 153) or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the requirements of Kildare County Council.

Pipe capacities and velocities have been calculated using the Colebrook-White formula with a roughness coefficient (Ks) of 0.6 mm.

# 5. SUDS Design

## 5.1 SUDS Assessment

As per Kildare County Council guidelines surface water and SUDS will be managed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 2, for New Developments and CIRIA documents. These documents specify that surface water run-off is to be managed as close to its source as possible. The following section outlines the SUDS strategy and maintenance for the subject site.

Sustainable Urban Drainage Systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban stormwater drainage practices that typically consisted of piping run-off of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality, and amenity issues are collectively referred to as SUDS. They are typically made up of one or more structures, built to manage surface water run-off by using nature-based solutions.

The use of SUDS to control run-off also provides the additional benefit of reducing pollutants in the surface water by settling out suspended solids, and in some cases providing biological treatment.

The proposed surface water drainage system for this development has been designed as a sustainable urban drainage system and uses permeable surfacing for private parking areas / driveways, swales adjacent to roads/footpaths, bio-retention tree pits, above ground detention basins, and below ground infiltration systems to achieve:

- Treatment of runoff and removal of pollutants to improve quality;
- Restriction of outflow and controlling quantity of flow; and
- Increased amenity value for the development.

A stormwater management or treatment train approach assures that run-off quantity and quality are improved. The following objectives of the treatment train provide an integrated and balanced approach to help mitigate the changes in stormwater run-off flows that occur as land is urbanised and to help mitigate the impacts of stormwater quality on receiving systems:

1) **Source control:** conveyance and infiltration of run-off; and

2) **Site Control:** reduction in volume and rate of surface run-off, with some additional treatment provided.

The applicant has considered the use of all appropriate SUDS measures as part of the site SUDS strategy; details are outlined in Table 5-1.

Table 5-1: SUDS Measures

| SUDS Stage | SUDS Measure | Measure Outline | Use on site |
|---|---|---|---|
| **Source Control** | Permeable Surfacing / Paving | Permeable surfacing materials are made of porous material that enable surface water runoff to flow through or between the blocks into a layer of imported, easily | The permeable paving driveways will collect overland surface water runoff at source from the parking, from adjacent footpath |

| SUDS Stage | SUDS Measure | Measure Outline | Use on site |
|---|---|---|---|
| | | draining, material. Generally permeable surfacing areas will be constructed with permeable pipe systems below ground that connect into the surface water mainline with an inspection chamber. | arrangements, and from the residential dwelling roofs. |
| | Bio-retention Tree Pits | Bio-retention systems) are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution through the use of engineered soils and vegetation. The are particularly effective in delivering interception of rainfall. The pits will intercept and treat rainfall directly before discharging into the surface water network. | A total of 29 no. bio-detention tree pits will be constructed next to parking bays, adjacent to the internal roads network. |
| | Swales | Swales are shallow, landscaped depressions designed to store and/or convey run-off and remove pollutants. They may be used as conveyance structures to pass the run-off to the next stage of the treatment train and can be designed to promote infiltration where soil and groundwater conditions allow. | Swales are proposed throughout the subject development, in ach sub-catchment, adjacent to hardstanding areas such as roads and footpaths. |
| **Site Control** | Detention / Retention Basins | Detention basins are proposed to be utilised for attenuation of surface water. These basins can be utilised during regular weather conditions and generally remain dry with water levels increasing during heavier rainfall events. Detention basins are engineered depressions in the ground and are typical seeded with grass and may also be suitable for planting. | 1 no. above-ground detention/retention basin with a below ground Infiltration system is proposed for the southern, central, and northern areas of the subject development. This facility is proposed to capture surface water runoff during an extreme storm event working in tandem with the below ground infiltration system. |
| | Infiltration Trenches / System | An infiltration trench is an excavated linear feature filled with clean granular material (typically crushed stone) that provides temporary storage of surface water runoff before allowing it to infiltrate into the surrounding subsoil. Surface water enters the trench via perforated pipe inlets, filter strips, or proprietary catchpit chambers. Once inside, water | 1 no. below ground infiltration trench system with multiple trenches is proposed for Catchments A, B1, and C. This SuDS feature is proposed to capture up to the 1-in-100-year extreme storm event including 30% climate change. Each infiltration system is proposed to |

| SUDS Stage | SUDS Measure | Measure Outline | Use on site |
|---|---|---|---|
| | | temporarily fills the voids between the aggregate, then gradually soaks into the ground. | be located with an open green space area. |

In accordance with The SuDS Manual (CIRIA C753) the pollution prevention guidelines have been followed to ensure appropriate levels of treatment are provided before attenuated run-off from the site is discharged into the ordinary watercourse, the Irish sea.

Refer to Waterman Moylan Drawing no. SOU-WMC-PH2-XX-DR-C-P0200 for the proposed drainage and SUDS details.

## 5.2 SUDS Maintenance

For the SUDS strategy to work as designed the entire drainage system must be well maintained. It will be the responsibility of the landowners and site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, and manholes will ensure adequate performance.

Maintenance schedules for the various SUDS features have been sourced from The SuDS Manual (CIRIA C753) and summarised in the tables to follow.

Table 5-2: Permeable Surfacing / Pavement Maintenance Schedule

| | Maintenance Period | Maintenance Task | Frequency |
|---|---|---|---|
| Permeable Surfacing | Regular | Brushing and vacuuming (standard cosmetic sweep over the whole surface) | Once a year, after autumn leaf fall, or as required, based on site specific observations of clogging or manufacturer's recommendations. |
| | Occasional | Removal of weeds | As required |
| | Remedial actions | Remediation work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users | As required |
| | Monitoring | Inspect silt accumulation rates and establish appropriate brushing frequencies.<br>Monitor inspection chambers. | Annually |

Table 5-3: Bio-Retention Tree Pit Maintenance Schedule

| | Maintenance Period | Maintenance Task | Frequency |
|---|---|---|---|
| Bio-Retention Tree Pits | Regular | Remove the litter and debris | Monthly, or as required |
| | | Cut grass (if applicable) – to retain height within specified design range. | Monthly (during growing season), or as required |
| | | Manage other vegetation and remove nuisance plants. | Monthly at start, then as required |
| | | Inspect inlets, outlets and overflows for blockages, and clear if required. | Monthly |
| | | Inspect infiltration coverage | Monthly for 6 months, quarterly for 2 years, then half yearly |
| | | Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies | Half yearly |
| | Occasional | Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required | As required or if soil is exposed over 10% or more of the swale treatment area |
| | Remedial actions | Repair erosion or other damage by re-turfing or re-seeding | As required |
| | | Re-level uneven surfaces and reinstate design levels | As required |
| | | Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip | As required |
| | | Remove and dispose of oils or petrol residues using safe standards practices | As required |

Table 5-4: Swale Maintenance Schedule

| | Maintenance Period | Maintenance Task | Frequency |
|---|---|---|---|
| Swales | Regular | Remove the litter and debris | Monthly, or as required |
| | | Cut grass – to retain height within specified design range. | Monthly (during growing season), or as required |
| | | Manage other vegetation and remove nuisance plants. | Monthly at start, then as required |
| | | Inspect inlets, outlets and overflows for blockages, and clear if required. | Monthly |
| | | Inspect infiltration coverage | Monthly for 6 months, quarterly for 2 years, then half yearly |
| | | Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies | Half yearly |
| | Occasional | Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required | As required or if soil is exposed over 10% or more of the swale treatment area |
| | Remedial actions | Repair erosion or other damage by re-turfing or re-seeding | As required |
| | | Re-level uneven surfaces and reinstate design levels | As required |
| | | Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip | As required |
| | | Remove and dispose of oils or petrol residues using safe standards practices | As required |

Table 5-5: Detention Basin Maintenance Schedule

| | Maintenance Period | Maintenance Task | Frequency |
|---|---|---|---|
| Detention Basin | Regular | Remove the litter and debris | Monthly |
| | | Cut grass – for spillways and access routes | Monthly (during growing season), or as required |
| | | Manage other vegetation and remove nuisance plants | Monthly (at start, then as required) |
| | | Inspect inlets, outlets and overflows for blockages, and clear if required. | Monthly |
| | | Inspect banksides, structures, pipework etc for evidence of physical damage | Monthly |
| | | Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies | Monthly (for first year), then annually or as required |
| | | Check any penstocks and other mechanical devices | Annually |
| | | Tidy all dead growth before start of growing season | Annually |
| | | Remove sediment from inlets, outlet and forebay | Annually (or as required) |
| | | Manage wetland plants in outlet pool – where provided | Annually (as set out in Chapter 23) |
| | Occasional | Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required | As required or if soil is exposed over 10% or more of the swale treatment area |
| | | Prune and trim any trees and remove cuttings | Every 2 years, or as required |
| | | Remove sediment from inlets, outlets, forebay and main basin when required | Every 5 years, or as required |
| | Remedial actions | Repair erosion or other damage by re-turfing or re-seeding | As required |
| | | Realignment of rip-rap | As required |
| | | Repair/rehabilitation of inlets, outlets and overflows | As required |
| | | Relevel uneven surfaces and reinstate design levels | As required |

Table 5-6: Infiltration Systems (Soakaways)

| | Maintenance Period | Maintenance Task | Frequency |
|---|---|---|---|
| Infiltration Systems (Soakaways) | Regular | Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings | Annually |
| | | Cleaning of gutters and any filters on downpipes | Annually (or as required based on inspections) |
| | | Trimming any roots that may be causing blockages | Annually (or as required) |
| | Occasional | Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings | As required, based on inspections |
| | Remedial actions | Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs | As required |
| | | Replacement of clogged geotextile (will require reconstruction of soakaway) | As required |
| | Monitoring | Inspect silt traps and note rate of sediment accumulation | Monthly in the first year and then annually |
| | | Check soakaway to ensure emptying is occurring | Annually |

# 6. Water Supply

## 6.1 Introduction

The surrounding area in Southgreen is serviced by Uisce Éireann with water supply infrastructure, the water supply network for which the site will connect into (located within Southgreen, west of the site).

A Pre-Connection Enquiry (PCE) form was submitted Waterman Moylan to Uisce Éireann in December of 2024 to establish the available capacity in the network to facilitate the proposed development's water demands. The relevant Uisce Éireann reference number for the submission is CDS24010462. A response in the form of a Confirmation of Feasibility (COF) Letter was received on the 7th of February 2025 stating the development's water supply connection for the proposed 150 no. residential units (schedule of accommodation at the time) is feasible without infrastructure upgrades required to the public network.

A second COF was sought prior to the Stage 2A submission to Kildare County Council. The COF received on 12 August 2025", for a total of 170 no. residential units, and advised the following:

"*Feasible without infrastructure upgrade by Uisce Éireann."*

A third COF was sought prior to planning submission to Kildare County Council. The COF received on 16 February 2026", for a total of 146 no. residential units and creche, and advised the following:

*"Feasible without infrastructure upgrade by Uisce Éireann."*

This Confirmation of Feasibility is attached in Appendix A.

## 6.2 Existing Infrastructure

Information pertaining to the existing water supply infrastructure in the vicinity of the subject development is retrieved from the as-built drawing information and ground penetrating radar survey (GPR) for the Southgreen Phase 1 development, the Uisce Éireann COF Letter and the Uisce Éireann QGIS database.

According to the Uisce Éireann COF and the GPR survey/as-built info, an existing 315mm HDPE watermain is located within Southgreen Road, west of the development, and an existing 250mm uPVC watermain is located within Old Road, east of the development. Furthermore, according to the GPR survey/as-built info, the existing 315mm HDPE watermain runs along the southern road (between Phase 1 and the subject development), along Southgreen Road to the west, and loops around the northern boundary of the subject lands to connect into the existing 250mm uPVC watermain in Old Road on the east.

Refer to Figure 6-1 for an indicative sketch of the existing water supply is in the vicinity of the subject development.

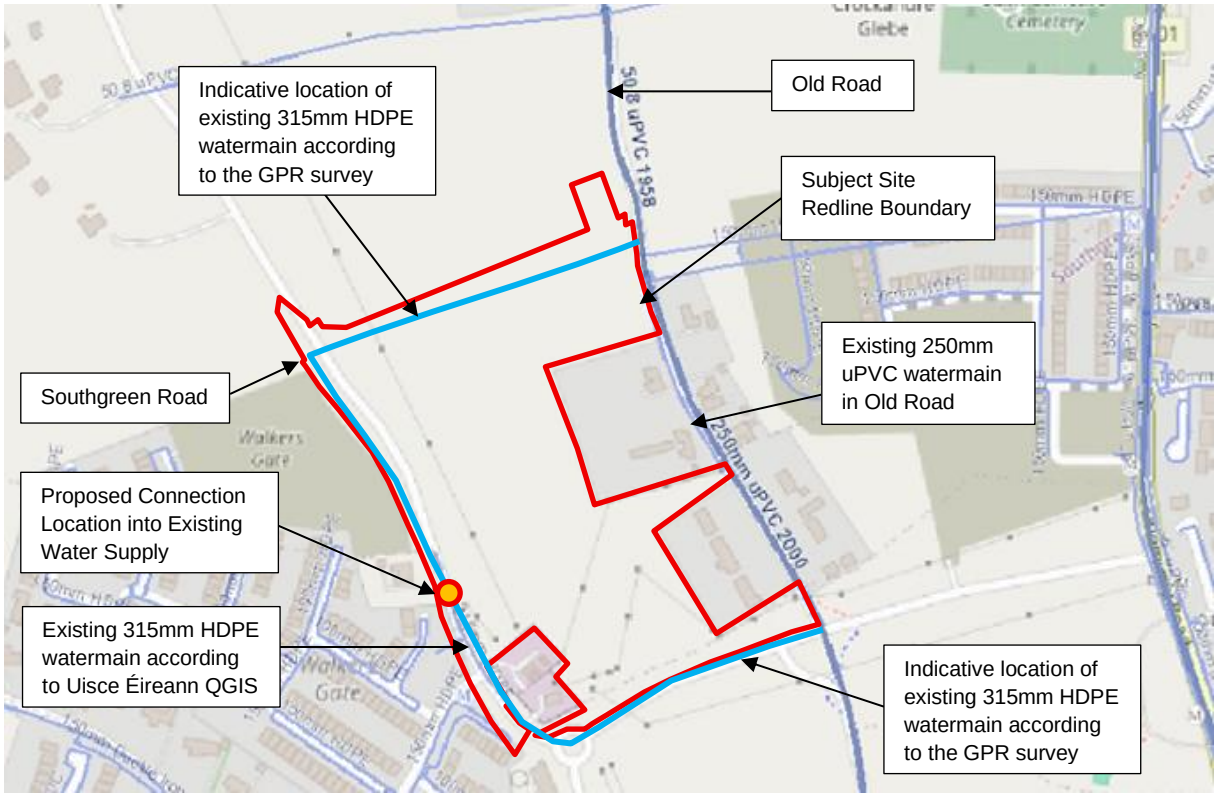



Figure 6-1 Indicative Sketch – Existing Uisce Éireann Water Supply Infrastructure near Subject Lands

## 6.3 Proposed Water Supply Network and Demand Calculation

It is proposed to connect the subject site's water supply into the existing 315 mm diameter HDPE water supply network west of the site, within Southgreen Road. The proposed development's water supply network will consist of 100 mm & 150 mm diameter networks looped within the internal roads network of the proposed development.

A water meter in accordance with the Uisce Éireann's Water Code of Practice will be installed on the proposed network before connecting into the existing 315 mm diameter watermain.

The proposed connection location of the subject developments water supply network is proposed at the subject development's access onto Southgreen Road. Refer to Figure 6-1 for which shows the proposed location with an indicative red and orange dot.

Refer to Waterman Moylan Drawing no. SOU-WMC-ZZ-XX-DR-C-P0300 for the proposed water supply layout.

The proposed development will consist of 146 no. residential units and a creche. Based on the Uisce Éireann Code of Practice, the peak water supply demand from the proposed development will be as outlined in Table 3-1.

Table 6-1: Total Water Demand Calculation

| Description | No. of Units | Flow (ℓ/h/day) | Population per Unit | Average Daily Domestic Demand (ℓ/d) |
|---|---|---|---|---|
| Residential Development | 146 no. | 150 | 2.7 | 58,725 |
| Creche | 1 no. (48 Persons) | 90 | 48 | 4,320 |
| | | | | |
| Average Daily Domestic Demand (from above) | | | | 63,045 |
| Average Daily Domestic Demand | | | | 0.73 ℓ/s |
| Average Day/Peak Week Demand (x1.25) | | | | 0.91 ℓ/s |
| Daily Peak Demand (x5) | | | | **4.56** ℓ/s |

As can be seen from the above table, the total daily peak water supply demand for the development is 4.56 ℓ/s. The total water requirement, from the public supply, for the development, is estimated at 63 $m^3$/day.

## 6.4 Watermain Network Design

Water Mains suitable for works and approved by Uisce Éireann shall be polyethylene (PE), with PE80 or PE100 rating (MDPE, HDPE or HPPE).

Refer to Figure 6-1 for an indicative sketch of the existing water supply network for the subject site. All water infrastructure will be designed in strict accordance with Uisce Éireann's Standards and Code of Practice.

Refer to Waterman Moylan Drawing no. SOU-WMC-ZZ-XX-DR-C-P0300 for details of the existing and proposed watermain to serve the subject lands.

## 6.5 Water Conservation

The water demand for the development can be subdivided as follows:

- Potable / Non-potable Breakdown

Detailed studies have quantified the breakdown between potable and non-potable uses for residential uses. According to the guideline: Promoting Sustainable Household Water Consumption, issued by Irish Water in September 2019, Figure 2.3 of the document (shown in Figure 6-2 below) illustrates the water use patterns that have been documented for a three-person household in the UK (insufficient data is available from Ireland households).

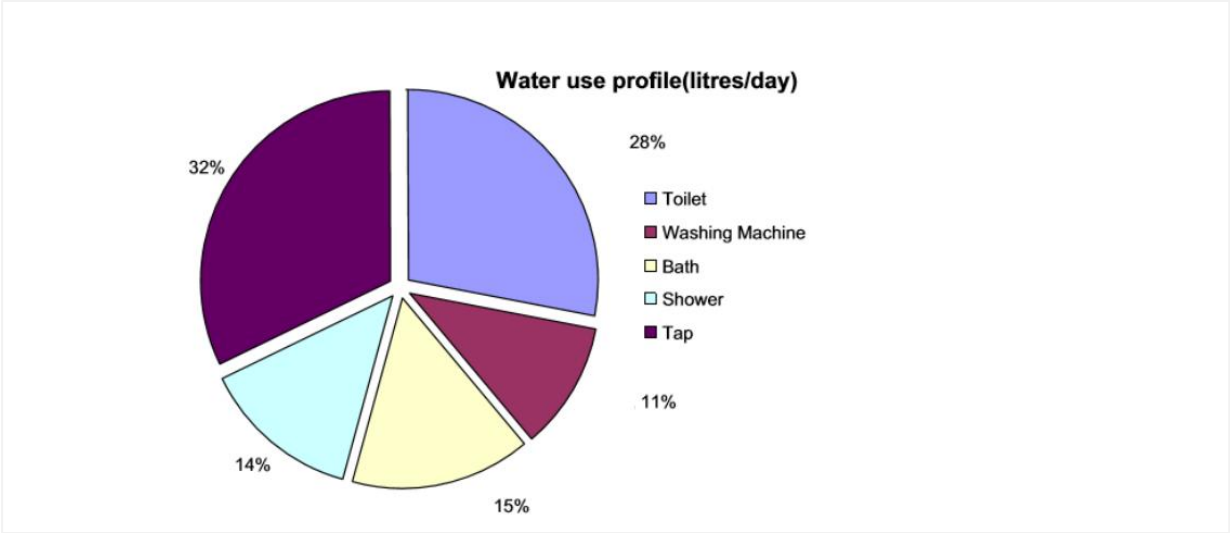



Figure 6-2: Water use patterns for 3-person households

The following water conservation measures will be used, to reduce overall water demand – water saving device installations including:

- Kitchen tap swivel aerator
- Water saving shower heads
- Spray taps
- Low volume flush / dual flush WC's
- Draw off tap controls
- Leak detection measures – through the metering of supply

# 7. Transportation

## 7.1 Proposed Site Access

The subject site is located north of Kildare Town, Co. Kildare. The site will have 2 no. proposed vehicular access points, off the Southgreen Road, to the west of the development. It is proposed to construct 6m wide access roads from Southgreen Road.

Southgreen Road is a rural roadway that begins at its intersection with Green Road, Friary Road, and Pigeon Lane, situated to the south of the southwestern railway line. It runs in a northerly direction, crossing the railway via an overpass, and terminates at its junction with the R401. Southgreen Road is proposed to be upgraded to a 6m wide two-way carriageway.

No footpaths exist on either side of Southgreen Road along the western boundary of the subject development. There are also currently no cycle facilities along this boundary. The posted speed limit on the Southgreen Road in the area of the subject site is 50 km/hr.

## 7.2 Roads Design

The proposed development has been designed with internal road gradients of 1:150 (minimum) and 1:20 (maximum). According to the Design Manual for Urban Roads and Streets (DMURS), a corresponding visibility splay of 2.4 m 65 m is applicable for a bus route road with a design speed of 50 km/hr. Forward visibility splays of 2.4 m x 65 m have been achieved at the proposed access junction on Southgreen Road.

Refer to Waterman Moylan Drawing no. SOU-WMC-PH2-XX-DR-C-P0115 for the proposed visibility splays at the Southgreen Road entrance.

This design approach reflects the core principles of DMURS by prioritising pedestrian movement and safety over private vehicle access.

The internal roads network is designed as 6.0 m and 5.5 m wide throughout. Public concrete footpaths to the north and south of the proposed junction accesses will be provided within the proposed access roads to facilitate future pedestrian linkage with the Southgreen Road. It is also proposed to provide a unidirectional cycle track along Southgreen Road, along both the eastern and western edges, within the development's redline boundary to facilitate further cycle infrastructure as part of the Southgreen Masterplan objectives.

The design ensures adequate provision for pedestrians. Footpaths of a minimum width of 2 m are provided along both sides of the proposed internal roads network which is designed as 5.5 m and 6 m carriageways, with sufficient carriageway and circulation aisles to allow safe access to perpendicular parking bays. The layout accommodates utilities, lamp standards, and other services without encroaching on private property.

The main internal north/south distributor road has been realigned to introduce gentle horizontal curvature in place of a long straight alignment. This approach reduces the potential requirement for additional speed control measures such as ramps or raised tables and is consistent with DMURS principles, which promote speed management through geometric design rather than reliance on vertical traffic calming alone. However, the two raised tables at the entrance junctions have been retained, as they provide an appropriate traffic-calming measure at points of entry to the development. Should it be the Council's preference to omit one or both of these raised tables, this can be accommodated.

Localised homezones have been incorporated within the internal layout. Increased / enhanced pedestrian facilities are provided at these locations. Raised tables are provided at key junctions and pedestrian crossing points to enhance safety, improve visibility, and encourage low vehicle speeds consistent with DMURS guidance.

## 7.3 Quality and Safety Audit

A Quality Audit for the proposed development has been undertaken by Road Plan, with document reference No. 26020-01-001_QA.pdf, and is included under Appendix C of this document. The recommendations as set out in the Quality Audit have been adopted and included in the design as submitted.

## 7.4 Car Parking

The required and proposed car parking quantum for the development is discussed in detail under Chapter 10 of the Traffic and Transportation (TTA) report undertaken by Waterman Moylan and submitted as part of this application under a separate cover. A summary of the car parking requirement and provision for the subject development is included below. Refer to the TTA for further details.

### 7.4.1 Car Parking Standards

The following guidelines and documents were assessed for the car parking standards of the subject development:

- Sustainable Residential Development and Compact Settlements Guidelines for Planning Authorities (2024)
- Sustainable Urban Housing: Design Standard for New Apartments (July 2023)
- Kildare County Development Plan 2023 – 2029

Each of the above standards is discussed in detail under Chapter 9.1 of the TTA. The Kildare County Development Plan standards are included here within for ease of reference.

Kildare County Development Plan sets out that *New residential development should take account of the different criteria regarding car parking including*:

*Parking spaces for visitors should be a minimum of 10% of the overall number of parking spaces provided in new residential developments.*

The maximum car parking spaces based on the Kildare County Development Plan is detailed in Table below.

Table 7-1: Kildare County Development Plan 2023 – 2029 – Maximum Car Parking Spaces

| Unit Type | No. Units | Maximum Car Parking Spaces | | | |
|---|---|---|---|---|---|
| | | Ratio | | Maximum | |
| | | Resident | Visitor | Resident | Visitor |
| 2-bed Houses | 7 | 1 | - | 7 | - |
| 3-bed Houses | 102 | 1 | - | 102 | - |
| 4-bed Houses | 27 | 1.5 | 0.5 per unit | 41 | 14 |
| 1-bed Apartments | 5 | 1 | 1 per 4 units | 5 | 3 |
| 2-bed Apartments | 3 | 1 | | 3 | |
| 3-bed Apartments | 2 | 1 | | 2 | |
| **Crèche** | 161 sqm GFA | 5 staff | 40 children | 5 | 11 |
| **Total** | **146** | | | **165** | **28** |

### 7.4.2 Car Parking Provided

Based on the County Development Plan and the national policies indicated above, it is proposed an appropriate level of car parking for the proposed site.

Table below shows the car parking spaces breakdown.

Table 7-2: Proposed Car Parking Spaces

| Unit Type | No. Units | Car Parking Spaces | | | |
|---|---|---|---|---|---|
| | | Ratio | | Proposed | |
| | | Resident | Visitor | Resident | Visitor |
| 2-bed Houses | 7 | 2 | 0.10 | 14 | 14 |
| 3-bed Houses | 102 | 2 | | 204 | |
| 4-bed Houses | 27 | 2 | | 54 | |
| 1-bed Apartments | 5 | 1 | 0.33 | 5 | 3 |
| 2-bed Apartments | 3 | 2 | | 6 | |
| 3-bed Apartments | 2 | 2 | | 4 | |
| Additional accessibility car parking spaces in the apartment area | | | | 1 | |
| **Total Residential** | **146** | **1.94** | **0.11** | **288** | **17** |
| **Crèche** | 161 sqm GFA | 5 staff | 40 children | 5 | 11 |
| **Proposed car parking spaces** | | | | **321** | |

Therefore, the Subject Development proposes a total of 321 no. car parking spaces. Of these, 288 no. spaces are allocated for residents, including 2 no. accessibility car parking spaces, and 17 no. visitor spaces distributed throughout the site, and 16 no. car parking spaces are proposed for the crèche, comprising 5 no. staff spaces and 11 no. drop-off spaces.

## 7.5 Cycle Parking

Based on the County Development Plan and the national policies indicated above, it is proposed an appropriate number of cycle parking for the proposed site.

Cycle parking spaces proposed for the subject development are shown in the below.

Table 7-3: Kildare County Development Plan 2023 – 2029 – Maximum Car Parking Spaces

| Unit Type | No. Units | Ratio | | Required | |
|---|---|---|---|---|---|
| | | Resident | Visitor | Resident | Visitor |
| 2-bed Houses | 7 | 2 | 0.5 | 14 | 4 |
| 3-bed Houses | 102 | 3 | 0.5 | 306 | 51 |
| 4-bed Houses | 27 | 4 | 0.5 | 108 | 13 |
| 1-bed Apartments | 5 | 1 | 0.5 | 5 | 2 |
| 2-bed Apartments | 3 | 2 | 0.5 | 6 | 1 |
| 3-bed Apartments | 2 | 3 | 0.5 | 6 | 1 |
| **Total** | **146 total** | | | **445** | **72** |
| | | | | **517** | |
| **Crèche** | 5 staff<br>40 children | 1 per 5 Staff | 1 per 10 children | **1** | **9** |
| | | | **Total** | **527** | |

The subject development included a total of 527 no. cycle parking spaces for apartments. Of these, 517 no. are for residents and 10 no. for the creche.

## 7.6 Traffic Analysis

Please refer to the Waterman Moylan TTA submitted as part of this planning application, and for which includes details on the following traffic analysis' for the subject development:

- Trip Generation and Distribution
- Junction Assessments
- Traffic Models

The summary of the Junction Assessment and Traffic Model, extracted from the TTA is included below:

*The results of the analysis demonstrated that all junctions and the Shuttle Link would operate within their respective capacities for all years and scenarios analysed.*

*In addition, the Shuttle Link has been assessed under a stress-test scenario in which the adopted trip rates were increased by 50 per cent. This stress-test scenario covers both Scenario A and Scenario B for all forecast scenarios outlined above. The results of the analysis demonstrate that the Shuttle Link on Southgreen Road would operate within its respective capacity for all years and scenarios assessed.*

## 7.7 Public Transport

This subject site is located in a town setting and is serviced by public transport. The details of the subject site and available public transport options are included below.

### 7.7.1 Bus Services

The nearest bus stops to the site are situated near Kildare Rail Station which is c. 1.0 km (14-min walk) as shown in Figure 7-1 below. The bus stops are served by bus route 883. Additional bus routes are available in Kildare Town Centre, around 1.2 km from the site (a 16-minute walk), including the bus routes 126, 126A, 126B, 126D, 26T, 126U, 726, IW02 & UM14.

The distance and walking times shown in the below figure are obtained from the southern pedestrian access to the subject site.

The bus routes and their frequencies are provided in Table 3 of the TTA. The times indicated in the table are based on the timetable for each bus stop. The full bus timetables are provided in Appendix A of the TTA.

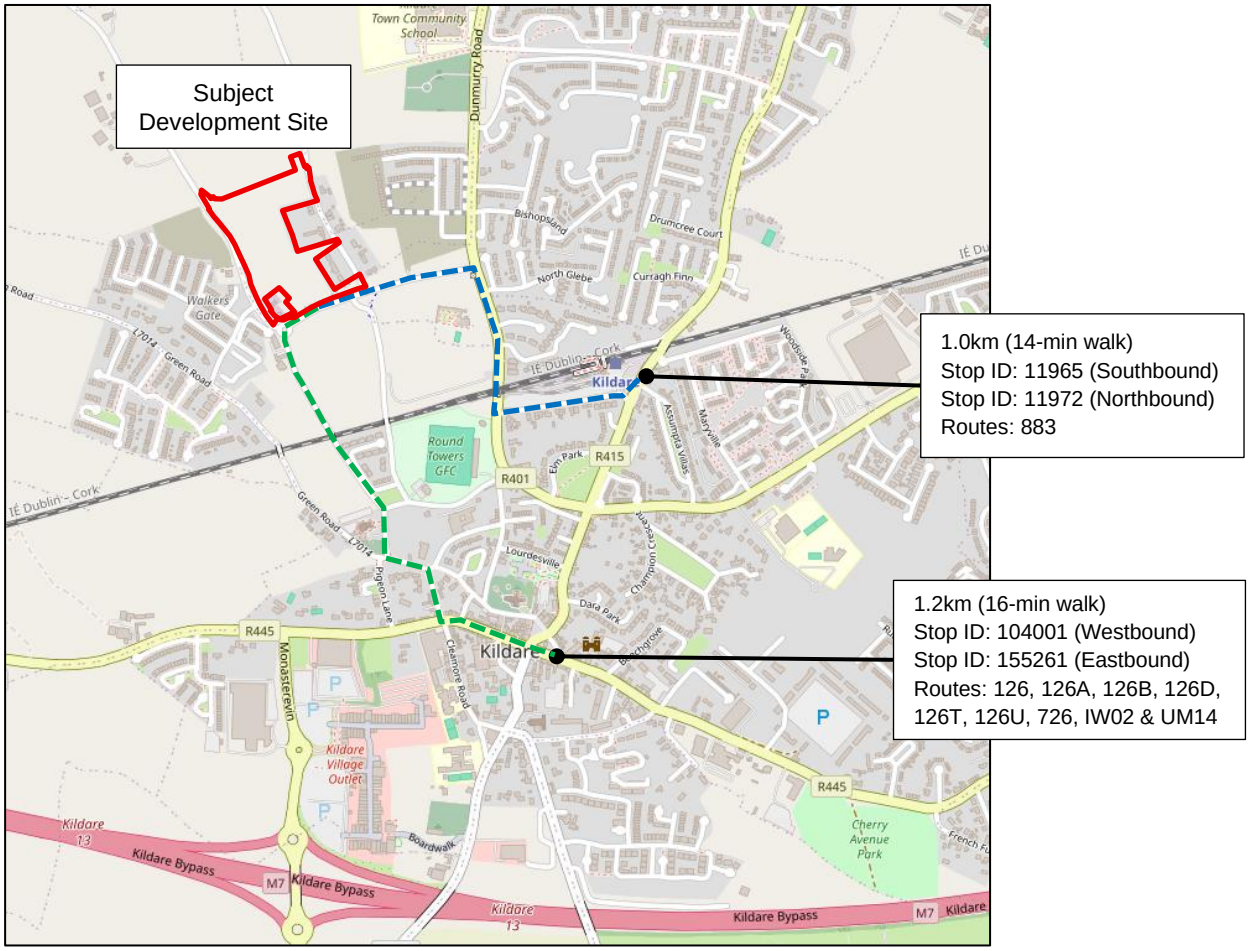



Figure 7-1: Bus Network – Walking distance from development to Bus Stops

### 7.7.2 Railway Network

The nearest rail station to the subject site is the Kildare Rail Station, located approximately 900m to the southeast of the site. This distance can be reached in 12-minute walking or c. 3-minute cycling. The location of the Kildare Rail Station in relation to the subject development can be seen in Figure 7-2, below.

For details of the rail rout serving the station, refer to Table 4 and Appendix A of the TTA.

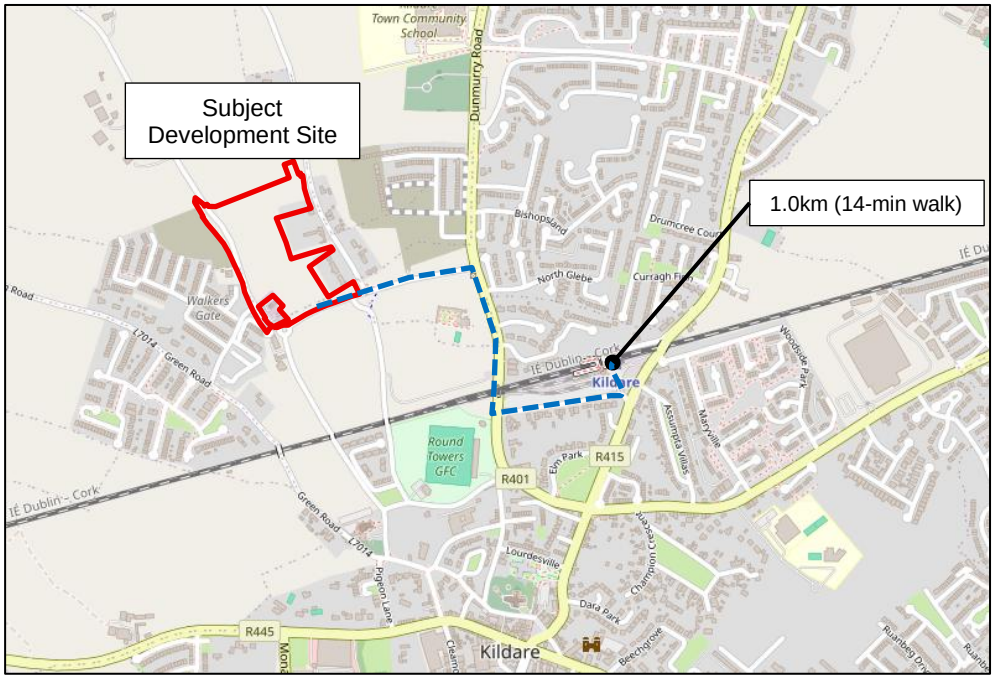



Figure 7-2: Location of Kildare Rail Station

### 7.7.3 Existing Cycle Facilities

Existing cycle facilities are present along the southern road, adjacent to the subject development. The future cycle network development plans in the vicinity of the subject development significant. Refer to Chapter 4.2 of the TTA for details of the cycling measures proposed in the Southgreen area and near the subject development under the Kildare Town LAP (2023-2029) and the GDA Cycle Network Plan (2002).

### 7.7.4 Existing Pedestrian Facilities

The existing pedestrian infrastructure in the surrounding urban area comprises a well-connected network of footpaths that link the various neighbourhoods to one another, to the existing educational institutions and to the surrounding public transport network. The surrounding area is characterised by the presence of footpaths on both sides of the road and pedestrian crossings at all intersections. The extensive interconnection of the network allows for greater flexibility in the transportation of pedestrians.

Figure 7-3 below details the 10-minute, 15-minute and 24-minute walking catchments areas to summarise the accessibility of the subject site on foot (Preferred Maximum) to “Town Centres, Commuting / School / Sight-seeing, and Elsewhere” respectively. The figure below illustrates the presence of grocery stores, schools and first medical care within each walking isochrone.

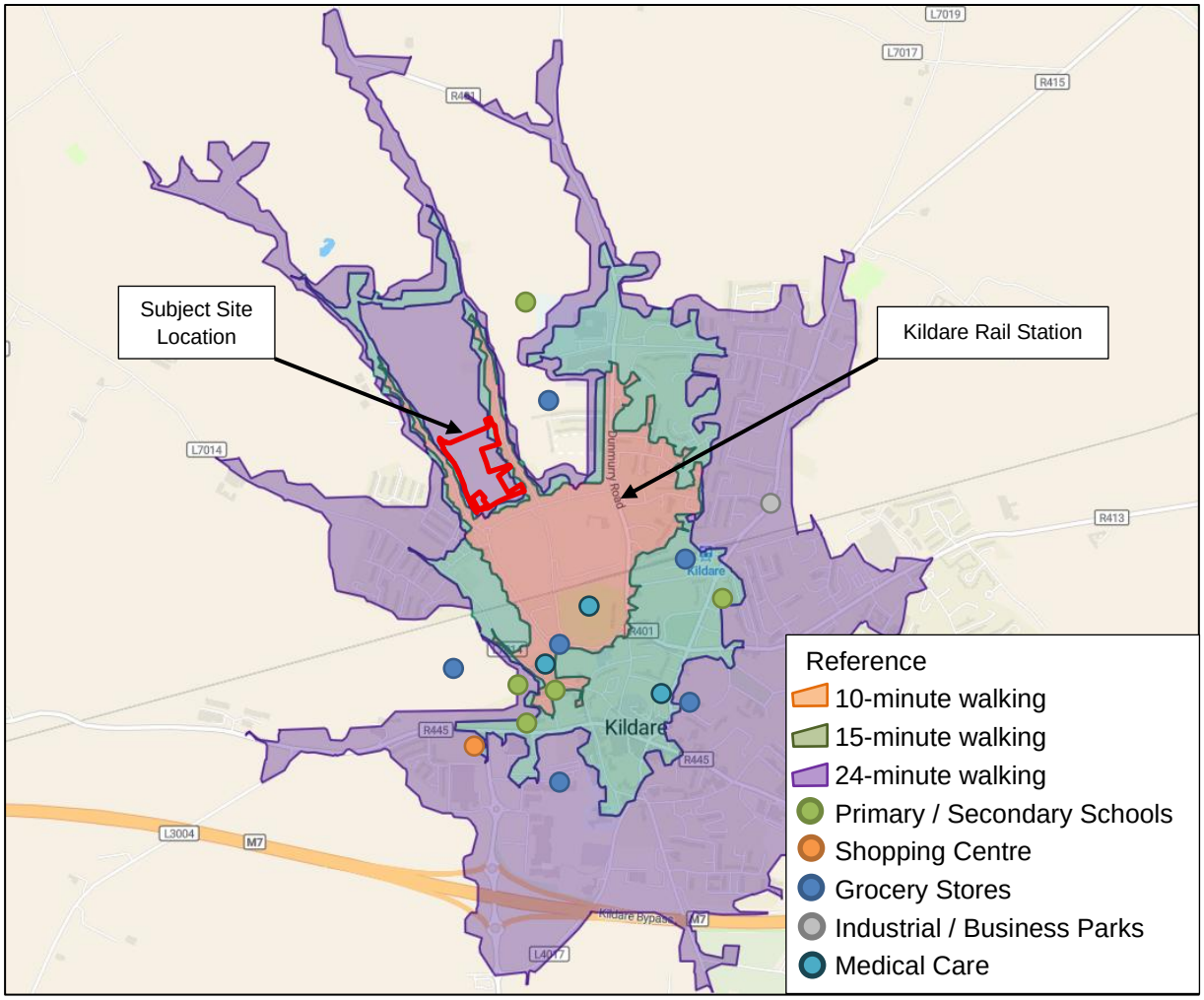



Figure 7-3: Isochrone map indicating Walking Accessibility (Source: Smappen)

# APPENDICES

# A. Uisce Éireann Confirmation of Feasibility Letter

## CONFIRMATION OF FEASIBILITY

Cormac Maher
Waterman Moylan
Block S
Eastpoint Business Park
Alife Byrne Road
Eastwall
Dublin
D03H3F4

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

**Uisce Éireann**
PO Box 448
South City
Delivery Office
Cork City

**www.water.ie**

16 February 2026

**Our Ref: CDS26000241 Pre-Connection Enquiry Site at South Green, Kildare**

Dear Applicant/Agent,

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

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Multi/Mixed Use Development of 146 unit(s) at Site at, South Green, Kildare, (the **Development)**.

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

- **Water Connection**
  - Feasible without infrastructure upgrade by Uisce Éireann
- **Wastewater Connection**
  - Feasible without infrastructure upgrade by Uisce Éireann

- Proposed connection to Uisce Éireann network is via Phase 1 of Southgreen Development Zone, south of the site. All the relevant Phase 1 wastewater infrastructure must be completed, of adequate capacity and connected to Dunmurry Road Pumping station, prior the connection.

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

**Stiúrthóirí / Directors:** Niall Gleeson (POF / CEO), Jerry Grant (Cathaoirleach / Chairperson), Gerard Britchfield, Liz Joyce, Michael Nolan, Patricia King, Eileen Maher, Cathy Mannion, Paul Reid, Michael Walsh.
**Oifig Chláraithe / Registered Office:** Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin, Ireland D01NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Uisce Éireann is a designated activity company, limited by shares.
Cláraithe in Éirinn Uimh.: 530363 / Registered in Ireland No.: 530363.

to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

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/

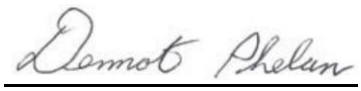
## Where can you find more information?

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

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

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

Yours sincerely,



**Dermot Phelan**
**Connections and Developer Services**

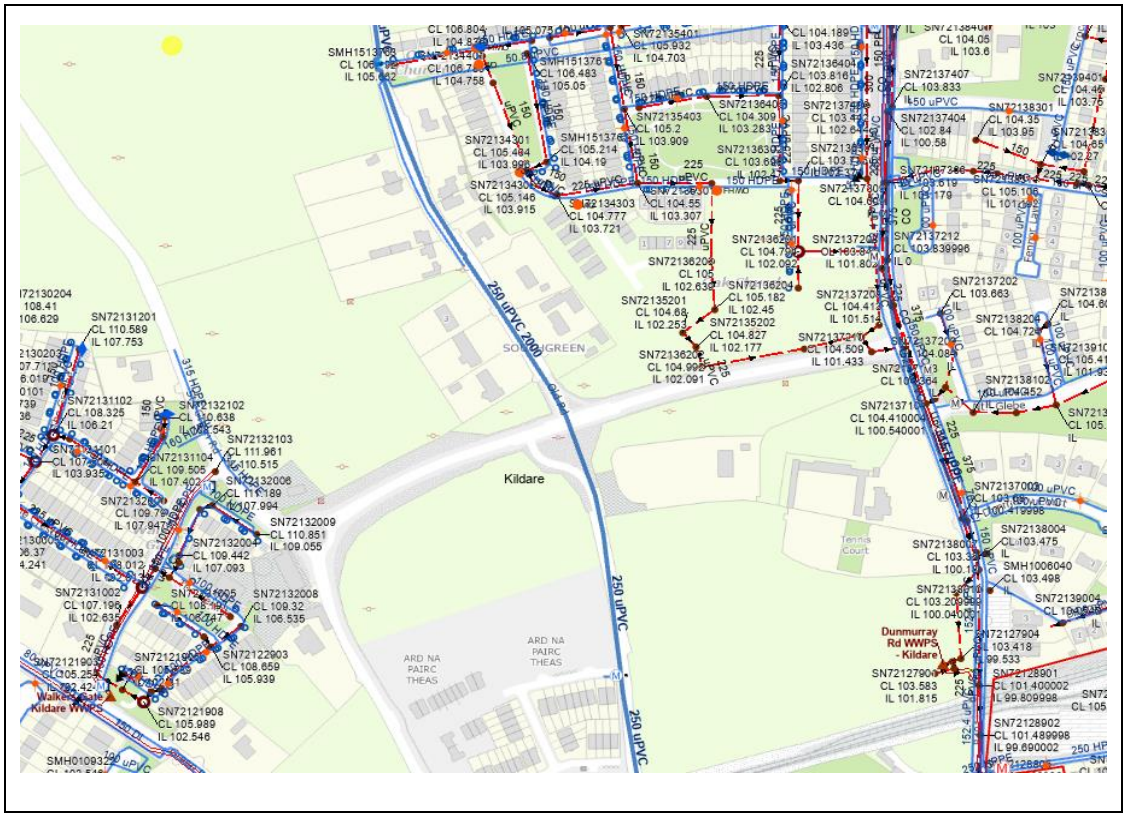
## Section A - What is important to know?

| 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 Uisce Éireann's network(s).<br>• Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann. |
| **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?** | • Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/ |
| **Who will carry out the connection work?** | • All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*.<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 Uisce Éireann's network(s)?** | • Requests for maps showing Uisce Éireann'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 Uisce Éireann 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 Uisce Éireann's Network(s)

**The map included below outlines the current Uisce Éireann infrastructure adjacent the Development:** To access Uisce Éireann 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 Uisce Éireann'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 Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann 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 Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann'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.

## B. Surface Water Model for Subject Development (FLOW Causeway)

## Design Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Maximum Time of Concentration (mins) | 30.00 |
| Return Period (years) | 5 | Maximum Rainfall (mm/hr) | 50.0 |
| Additional Flow (%) | 10 | Minimum Velocity (m/s) | 1.00 |
| FSR Region | Scotland and Ireland | Connection Type | Level Soffits |
| M5-60 (mm) | 15.400 | Minimum Backdrop Height (m) | 0.200 |
| Ratio-R | 0.320 | Preferred Cover Depth (m) | 1.200 |
| CV | 1.000 | Include Intermediate Ground | ✓ |
| Time of Entry (mins) | 4.00 | Enforce best practice design rules | ✓ |

## Pipeline Schedule

| Link | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) |
|---|---|---|---|---|---|---|---|
| 7.000 | 20.407 | 60.0 | 225 | Circular | 112.300 | 110.875 | 1.200 |
| 8.000 | 20.112 | 200.0 | 150 | Circular | 111.500 | 110.150 | 1.200 |
| 7.001 | 88.977 | 26.0 | 225 | Circular | 111.990 | 109.974 | 1.791 |
| 7.002 | 61.932 | 200.0 | 300 | Circular | 108.150 | 106.475 | 1.375 |
| 1.000 | 32.856 | 269.3 | 225 | Circular | 112.282 | 110.857 | 1.200 |
| 1.001 | 100.541 | 40.0 | 225 | Circular | 112.282 | 110.735 | 1.322 |
| 1.003 | 38.323 | 200.0 | 300 | Circular | 108.239 | 106.888 | 1.051 |
| 7.003 | 32.575 | 200.0 | 375 | Circular | 108.266 | 106.090 | 1.801 |
| 1.006 | 27.892 | 200.0 | 375 | Circular | 109.450 | 106.426 | 2.649 |
| 1.007 | 17.169 | 57.2 | 450 | Circular | 108.679 | 105.852 | 2.377 |
| 3.000 | 8.959 | 60.1 | 150 | Circular | 108.900 | 107.550 | 1.200 |
| 6.000 | 15.822 | 100.1 | 150 | Circular | 108.800 | 107.450 | 1.200 |
| 1.004 | 24.560 | 200.0 | 300 | Circular | 108.700 | 106.696 | 1.704 |
| 10.000 | 19.628 | 149.8 | 300 | Circular | 108.500 | 107.000 | 1.200 |
| 9.000 | 36.698 | 100.0 | 225 | Circular | 109.000 | 107.575 | 1.200 |
| 4.000 | 13.178 | 22.0 | 225 | Circular | 114.220 | 112.400 | 1.595 |
| 5.000 | 22.265 | 99.8 | 225 | Circular | 109.500 | 108.075 | 1.200 |
| 4.001 | 91.665 | 23.0 | 225 | Circular | 114.218 | 111.801 | 2.192 |
| 1.005 | 14.373 | 200.0 | 375 | Circular | 109.806 | 106.498 | 2.933 |

| Link | US Node | DS Node | Dia (mm) |
|---|---|---|---|
| 7.000 | 13 | 15 | 1200 |
| 8.000 | 14 | 15 | 1200 |
| 7.001 | 15 | 17 | 1200 |
| 7.002 | 17 | 18 | 1350 |
| 1.000 | PP C3 | 2 | 1200 |
| 1.001 | 2 | 1 | 1200 |
| 1.003 | 4 | 6 | 1200 |
| 7.003 | 18 | 20 | 1350 |
| 1.006 | 12 | 20 | 1350 |
| 1.007 | 20 | Central Soakaway | |
| 3.000 | PP C5 | 6 | 1200 |
| 6.000 | C1 Swale - 30m | 12 | 1350 |
| 1.004 | 6 | 10 | 1350 |
| 10.000 | PP C2 | 20 | 1350 |
| 9.000 | PP C1 | 17 | 1200 |
| 4.000 | 7 | 8 | 1200 |
| 5.000 | PP C4 | 10 | 1350 |
| 4.001 | 8 | 10 | 1350 |
| 1.005 | 10 | 12 | 1350 |

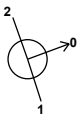
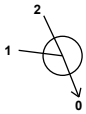
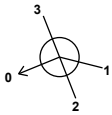
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## Pipeline Schedule

| Link | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) |
|---|---|---|---|---|---|---|---|
| 2.000 | 24.371 | 150.4 | 150 | Circular | 108.090 | 107.200 | 0.740 |
| 1.002 | 52.458 | 150.0 | 225 | Circular | 109.800 | 108.221 | 1.354 |

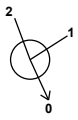
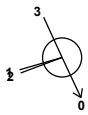
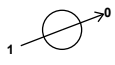
| Link | US Node | DS Node | Dia (mm) |
|---|---|---|---|
| 2.000 | C1 Swale - 45m | 4 | 1200 |
| 1.002 | 1 | 4 | 1200 |

## Manhole Schedule

| Node | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|
| 13 | 112.300 | 1.425 | 1200 |  | | | |
| | | | | 0 | 7.000 | 110.875 | 225 |
| 14 | 111.500 | 1.350 | 1200 |  | | | |
| | | | | 0 | 8.000 | 110.150 | 150 |
| 15 | 111.990 | 2.016 | 1200 |  | 1 | 8.000 | 110.049 | 150 |
| | | | | | 2 | 7.000 | 110.535 | 225 |
| | | | | 0 | 7.001 | 109.974 | 225 |
| 17 | 108.150 | 1.675 | 1200 |  | 1 | 9.000 | 107.208 | 225 |
| | | | | | 2 | 7.001 | 106.550 | 225 |
| | | | | 0 | 7.002 | 106.475 | 300 |
| 2 | 112.282 | 1.547 | 1200 |  | 1 | 1.000 | 110.735 | 225 |
| | | | | 0 | 1.001 | 110.735 | 225 |
| PP C3 | 112.282 | 1.425 | |  | | | |
| | | | | 0 | 1.000 | 110.857 | 225 |
| 4 | 108.239 | 1.351 | 1200 |  | 1 | 2.000 | 107.038 | 150 |
| | | | | | 2 | 1.002 | 107.871 | 225 |
| | | | | 0 | 1.003 | 106.888 | 300 |
| 18 | 108.266 | 2.176 | 1350 |  | 1 | 7.002 | 106.165 | 300 |
| | | | | 0 | 7.003 | 106.090 | 375 |
| 12 | 109.450 | 3.024 | 1350 |  | 1 | 6.000 | 107.292 | 150 |
| | | | | | 2 | 1.005 | 106.426 | 375 |
| | | | | 0 | 1.006 | 106.426 | 375 |
| 20 | 108.679 | 2.827 | 1350 |  | 1 | 10.000 | 106.869 | 300 |
| | | | | | 2 | 7.003 | 105.927 | 375 |
| | | | | | 3 | 1.006 | 106.287 | 375 |
| | | | | 0 | 1.007 | 105.852 | 450 |

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## Manhole Schedule

| Node | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|
| PP C5 | 108.900 | 1.350 | |  | | | |
| | | | | 0 | 3.000 | 107.550 | 150 |
| Central Soakaway | 107.850 | 2.298 | | | | | |
| | | | | 1 | 1.007 | 105.552 | 450 |
| C1 Swale - 30m | 108.800 | 1.350 | |  | | | |
| | | | | 0 | 6.000 | 107.450 | 150 |
| 6 | 108.700 | 2.004 | 1200 |  | | | |
| | | | | 1 | 3.000 | 107.401 | 150 |
| | | | | 2 | 1.003 | 106.696 | 300 |
| | | | | 0 | 1.004 | 106.696 | 300 |
| PP C2 | 108.500 | 1.500 | |  | | | |
| | | | | 0 | 10.000 | 107.000 | 300 |
| PP C1 | 109.000 | 1.425 | |  | | | |
| | | | | 0 | 9.000 | 107.575 | 225 |
| 10 | 109.806 | 3.308 | 1350 |  | | | |
| | | | | 1 | 5.000 | 107.852 | 225 |
| | | | | 2 | 4.001 | 107.816 | 225 |
| | | | | 3 | 1.004 | 106.573 | 300 |
| | | | | 0 | 1.005 | 106.498 | 375 |
| 8 | 114.218 | 2.417 | 1200 |  | | | |
| | | | | 1 | 4.000 | 111.801 | 225 |
| | | | | 0 | 4.001 | 111.801 | 225 |
| 7 | 114.220 | 1.820 | 1200 |  | | | |
| | | | | 0 | 4.000 | 112.400 | 225 |
| PP C4 | 109.500 | 1.425 | |  | | | |
| | | | | 0 | 5.000 | 108.075 | 225 |
| C1 Swale - 45m | 108.090 | 0.890 | |  | | | |
| | | | | 0 | 2.000 | 107.200 | 150 |
| 1 | 109.800 | 1.579 | 1200 |  | | | |
| | | | | 1 | 1.001 | 108.221 | 225 |
| | | | | 0 | 1.002 | 108.221 | 225 |

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## Simulation Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Skip Steady State | x |
| Rainfall Events | Singular | Drain Down Time (mins) | 240 |
| FSR Region | Scotland and Ireland | Additional Storage (m³/ha) | 20.0 |
| M5-60 (mm) | 15.400 | Starting Level (m) | |
| Ratio-R | 0.320 | Check Discharge Rate(s) | x |
| Summer CV | 1.000 | Check Discharge Volume | x |
| Analysis Speed | Normal | | |

### Storm Durations

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 60 | 180 | 360 | 600 | 960 | 2160 | 4320 | 7200 | 10080 |
| 30 | 120 | 240 | 480 | 720 | 1440 | 2880 | 5760 | 8640 | |

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

## Node C1 Swale - 45m Online Head/Flow Control

| | | | |
|---|---|---|---|
| Flap Valve | x | Replaces Downstream Link | x |
| Downstream Link | 2.000 | Invert Level (m) | 107.200 |

| Head (m) | Flow (l/s) |
|---|---|
| 0.800 | 3.000 |

## Node C1 Swale - 30m Soakaway Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 107.450 | Depth (m) | 1.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 0 | Inf Depth (m) | 1.000 |
| Safety Factor | 2.0 | Pit Width (m) | 1.000 | Number Required | 1 |
| Porosity | 0.40 | Pit Length (m) | 30.000 | | |

## Node PP C3 Carpark Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 110.857 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 0 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 57.000 | Inf Depth (m) | |
| Porosity | 0.40 | Length (m) | 5.000 | | |

## Node Central Soakaway Soakaway Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.03600 | Invert Level (m) | 104.000 | Depth (m) | 2.600 |
| Side Inf Coefficient (m/hr) | 0.03600 | Time to half empty (mins) | 2189 | Inf Depth (m) | 1.000 |
| Safety Factor | 2.0 | Pit Width (m) | 2.400 | Number Required | 5 |
| Porosity | 0.96 | Pit Length (m) | 30.000 | | |

## Node PP C2 Carpark Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 107.000 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 90.000 | Inf Depth (m) | 0.350 |
| Porosity | 0.40 | Length (m) | 5.000 | | |

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**Node PP C1 Carpark Storage Structure**

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 107.575 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 120 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 111.000 | Inf Depth (m) | 0.350 |
| Porosity | 0.40 | Length (m) | 5.000 | | |

**Node PP C4 Carpark Storage Structure**

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 108.075 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 0 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 100.000 | Inf Depth (m) | 0.350 |
| Porosity | 0.40 | Length (m) | 5.000 | | |

**Node C1 Swale - 45m Soakaway Storage Structure**

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 107.200 | Depth (m) | 1.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 136 | Inf Depth (m) | 1.000 |
| Safety Factor | 2.0 | Pit Width (m) | 1.000 | Number Required | 1 |
| Porosity | 0.40 | Pit Length (m) | 45.000 | | |

**Node PP C5 Carpark Storage Structure**

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 107.550 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 180 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 60.000 | Inf Depth (m) | |
| Porosity | 0.40 | Length (m) | 4.000 | | |

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**Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.43%**

| Node Event | US Node | Level (m) | Depth (m) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|
| 15 minute summer | 13 | 110.962 | 0.087 | 0.1388 | 0.0000 | OK |
| 15 minute summer | 14 | 110.800 | 0.650 | 1.2596 | 0.0000 | SURCHARGED |
| 15 minute summer | 15 | 110.118 | 0.144 | 0.2349 | 0.0000 | OK |
| 2160 minute summer | 17 | 107.815 | 1.340 | 2.8685 | 0.0000 | SURCHARGED |
| 30 minute summer | 2 | 110.845 | 0.110 | 0.1567 | 0.0000 | OK |
| 30 minute summer | PP C3 | 111.031 | 0.174 | 13.0201 | 0.0000 | OK |
| 2160 minute summer | 4 | 107.815 | 0.927 | 1.3270 | 0.0000 | SURCHARGED |
| 2160 minute summer | 18 | 107.815 | 1.725 | 4.0460 | 0.0000 | SURCHARGED |
| 2160 minute summer | 12 | 107.815 | 1.389 | 2.5841 | 0.0000 | SURCHARGED |
| 2160 minute summer | 20 | 107.816 | 1.964 | 3.3008 | 0.0000 | SURCHARGED |
| 2160 minute summer | PP C5 | 107.815 | 0.265 | 20.9537 | 0.0000 | SURCHARGED |
| 2160 minute summer | Central Soakaway | 107.815 | 2.263 | 898.7328 | 0.0000 | OK |
| 2160 minute summer | C1 Swale - 30m | 107.815 | 0.365 | 4.6308 | 0.0000 | SURCHARGED |
| 2160 minute summer | 6 | 107.815 | 1.119 | 1.9152 | 0.0000 | SURCHARGED |
| 2160 minute summer | PP C2 | 107.815 | 0.815 | 54.2482 | 0.0000 | SURCHARGED |
| 2160 minute summer | PP C1 | 107.815 | 0.240 | 40.0575 | 0.0000 | SURCHARGED |
| 2160 minute summer | 10 | 107.815 | 1.317 | 1.9009 | 0.0000 | SURCHARGED |
| 15 minute summer | 8 | 111.893 | 0.092 | 0.1381 | 0.0000 | OK |
| 15 minute summer | 7 | 112.448 | 0.048 | 0.0640 | 0.0000 | OK |
| 30 minute summer | PP C4 | 108.210 | 0.135 | 14.7187 | 0.0000 | OK |
| 180 minute summer | C1 Swale - 45m | 108.081 | 0.881 | 16.9186 | 0.0000 | FLOOD RISK |
| 30 minute summer | 1 | 108.394 | 0.173 | 0.1956 | 0.0000 | OK |

| US Node | Outflow (l/s) | Velocity (m/s) |
|---|---|---|
| 13 | 19.6 | 1.435 |
| 14 | 28.9 | 1.642 |
| 15 | 76.7 | 2.089 |
| 17 | 11.5 | 0.800 |
| 2 | 39.8 | 1.622 |
| PP C3 | 31.7 | 1.222 |
| 4 | 5.9 | 0.539 |
| 18 | 14.4 | 0.826 |
| 12 | 18.3 | 0.878 |
| 20 | 40.2 | 1.682 |
| PP C5 | 2.0 | 0.794 |
| Central Soakaway | 3.4 | |
| C1 Swale - 30m | 1.3 | 0.587 |
| 6 | 9.6 | 0.750 |
| PP C2 | -7.6 | 0.749 |
| PP C1 | 4.9 | 0.828 |
| 10 | 15.1 | 0.740 |
| 8 | 37.3 | 2.480 |
| 7 | 11.1 | 1.098 |
| PP C4 | 33.5 | 1.378 |
| C1 Swale - 45m | 3.0 | 0.647 |
| 1 | 38.3 | 1.200 |

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## Design Settings

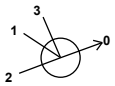
| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Maximum Time of Concentration (mins) | 30.00 |
| Return Period (years) | 5 | Maximum Rainfall (mm/hr) | 50.0 |
| Additional Flow (%) | 10 | Minimum Velocity (m/s) | 1.00 |
| FSR Region | Scotland and Ireland | Connection Type | Level Soffits |
| M5-60 (mm) | 15.400 | Minimum Backdrop Height (m) | 0.200 |
| Ratio-R | 0.320 | Preferred Cover Depth (m) | 1.200 |
| CV | 1.000 | Include Intermediate Ground | ✓ |
| Time of Entry (mins) | 4.00 | Enforce best practice design rules | ✓ |

## Pipeline Schedule

| Link | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) |
|---|---|---|---|---|---|---|---|
| 1.000 | 54.728 | 28.0 | 225 | Circular | 112.700 | 110.975 | 1.500 |
| 2.000 | 30.411 | 18.7 | 225 | Circular | 112.185 | 110.764 | 1.196 |
| 1.001 | 33.780 | 30.0 | 225 | Circular | 110.620 | 108.776 | 1.619 |
| 1.002 | 20.230 | 60.0 | 300 | Circular | 109.500 | 107.575 | 1.625 |
| 3.000 | 10.280 | 27.9 | 150 | Circular | 110.570 | 109.220 | 1.200 |
| 1.003 | 4.522 | 100.5 | 300 | Circular | 109.000 | 107.238 | 1.462 |

| Link | US Node | DS Node | Dia (mm) |
|---|---|---|---|
| 1.000 | 1 | 4 | 1200 |
| 2.000 | 2 | 4 | 1200 |
| 1.001 | 4 | 5 | 1200 |
| 1.002 | 5 | Central B Basin | |
| 3.000 | PP C2B | 4 | 1200 |
| 1.003 | Central B Basin | Dummy MH | 1200 |

## Manhole Schedule

| Node | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|
| PP C2B | 110.570 | 1.350 | |  | 0 | 3.000 | 109.220 | 150 |
| 4 | 110.620 | 1.844 | 1200 |  | 1 | 3.000 | 108.851 | 150 |
| | | | | | 2 | 2.000 | 109.137 | 225 |
| | | | | | 3 | 1.000 | 109.020 | 225 |
| | | | | | 0 | 1.001 | 108.776 | 225 |
| 2 | 112.185 | 1.421 | 1200 |  | 0 | 2.000 | 110.764 | 225 |
| 1 | 112.700 | 1.725 | 1200 |  | 0 | 1.000 | 110.975 | 225 |
| 5 | 109.500 | 1.925 | 1200 |  | 1 | 1.001 | 107.650 | 225 |
| | | | | | 0 | 1.002 | 107.575 | 300 |

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## Manhole Schedule

| Node | CL (m) | Depth (m) | Dia (mm) | Connections | | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|---|
| Central B Basin | 109.000 | 1.762 | |  | 1 | 1.002 | 107.238 | 300 |
| | | | | | 0 | 1.003 | 107.238 | 300 |
| Dummy MH | 109.000 | 1.807 | 1200 |  | 1 | 1.003 | 107.193 | 300 |

## Simulation Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Skip Steady State | x |
| Rainfall Events | Singular | Drain Down Time (mins) | 240 |
| FSR Region | Scotland and Ireland | Additional Storage (m³/ha) | 20.0 |
| M5-60 (mm) | 15.400 | Starting Level (m) | |
| Ratio-R | 0.320 | Check Discharge Rate(s) | x |
| Summer CV | 1.000 | Check Discharge Volume | x |
| Analysis Speed | Normal | | |

### Storm Durations

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 60 | 180 | 360 | 600 | 960 | 2160 | 4320 | 7200 | 10080 |
| 30 | 120 | 240 | 480 | 720 | 1440 | 2880 | 5760 | 8640 | |

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

## Node Central B Basin Online Hydro-Brake® Control

| | | | |
|---|---|---|---|
| Flap Valve | x | Objective | (HE) Minimise upstream storage |
| Replaces Downstream Link | x | Sump Available | ✓ |
| Invert Level (m) | 107.238 | Product Number | CTL-SHE-0045-1000-1200-1000 |
| Design Depth (m) | 1.200 | Min Outlet Diameter (m) | 0.075 |
| Design Flow (l/s) | 1.0 | Min Node Diameter (mm) | 1200 |

## Node PP C2B Carpark Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 109.220 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 4 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 84.000 | Inf Depth (m) | 0.350 |
| Porosity | 0.40 | Length (m) | 5.000 | | |

## Node Central B Basin Depth/Area Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0 | Invert Level (m) | 108.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity | 1.00 | Time to half empty (mins) | |

| Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 478.0 | 478.0 | 0.500 | 660.0 | 664.8 | 0.501 | 0.0 | 664.8 |

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**Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 98.31%**

| Node Event | US Node | Level (m) | Depth (m) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|
| 30 minute summer | PP C2B | 109.440 | 0.220 | 26.8508 | 0.0000 | SURCHARGED |
| 15 minute summer | 4 | 109.858 | 1.082 | 1.5133 | 0.0000 | SURCHARGED |
| 15 minute summer | 2 | 110.873 | 0.108 | 0.2709 | 0.0000 | OK |
| 15 minute summer | 1 | 111.108 | 0.133 | 0.3134 | 0.0000 | OK |
| 1440 minute summer | 5 | 108.947 | 1.372 | 1.8143 | 0.0000 | SURCHARGED |
| 1440 minute summer | Central B Basin | 108.947 | 1.709 | 251.0226 | 0.0000 | FLOOD RISK |
| 1440 minute summer | Dummy MH | 107.215 | 0.022 | 0.0000 | 0.0000 | OK |

| US Node | Outflow (l/s) | Velocity (m/s) | Discharge Vol (m³) |
|---|---|---|---|
| PP C2B | 33.5 | 2.095 | |
| 4 | 87.4 | 2.198 | |
| 2 | 56.8 | 2.356 | |
| 1 | 61.2 | 2.048 | |
| 5 | 14.0 | 0.199 | |
| Central B Basin | 1.2 | 0.510 | 107.0 |

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## Design Settings

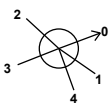
| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Maximum Time of Concentration (mins) | 30.00 |
| Return Period (years) | 5 | Maximum Rainfall (mm/hr) | 50.0 |
| Additional Flow (%) | 10 | Minimum Velocity (m/s) | 1.00 |
| FSR Region | Scotland and Ireland | Connection Type | Level Soffits |
| M5-60 (mm) | 15.400 | Minimum Backdrop Height (m) | 0.200 |
| Ratio-R | 0.320 | Preferred Cover Depth (m) | 1.200 |
| CV | 1.000 | Include Intermediate Ground | ✓ |
| Time of Entry (mins) | 4.00 | Enforce best practice design rules | ✓ |

## Pipeline Schedule

| Link | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) |
|---|---|---|---|---|---|---|---|
| 3.000 | 9.085 | 54.7 | 100 | Circular | 107.800 | 106.500 | 1.200 |
| 2.000 | 56.940 | 150.0 | 150 | Circular | 108.110 | 106.685 | 1.275 |
| 1.002 | 33.599 | 200.0 | 225 | Circular | 106.916 | 105.300 | 1.391 |
| 1.003 | 53.433 | 100.0 | 300 | Circular | 107.708 | 105.057 | 2.351 |
| 1.004 | 9.455 | 100.0 | 300 | Circular | 107.317 | 104.523 | 2.494 |
| 11 | 14.282 | 99.9 | 300 | Circular | 106.000 | 104.428 | 1.272 |
| 1.000 | 15.587 | 50.0 | 150 | Circular | 107.700 | 106.350 | 1.200 |
| 4.000 | 5.853 | 28.4 | 150 | Circular | 107.800 | 106.450 | 1.200 |
| 1.001 | 33.146 | 50.0 | 225 | Circular | 107.523 | 105.963 | 1.335 |
| 5.000 | 57.207 | 200.0 | 225 | Circular | 107.450 | 106.025 | 1.200 |

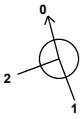
| Link | US Node | DS Node | Dia (mm) |
|---|---|---|---|
| 3.000 | N1 Swale - 45m | 7 | 1200 |
| 2.000 | 4 | 7 | 1200 |
| 1.002 | 3 | 7 | 1200 |
| 1.003 | 7 | 9 | 1200 |
| 1.004 | 9 | North Basin | |
| 11 | North Basin | Northern Soakaway | |
| 1.000 | PP N2 | 2 | 1200 |
| 4.000 | PP N1 | 7 | 1200 |
| 1.001 | 2 | 3 | 1200 |
| 5.000 | 8 | 9 | 1200 |

## Manhole Schedule

| Node | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|
| N1 Swale - 45m | 107.800 | 1.300 | |  0 | 3.000 | 106.500 | 100 |
| 3 | 106.916 | 1.616 | 1200 |  1 | 1.001 | 105.300 | 225 |
| | | | | 0 | 1.002 | 105.300 | 225 |
| 7 | 107.708 | 2.651 | 1200 |  1 | 4.000 | 106.244 | 150 |
| | | | | 2 | 3.000 | 106.334 | 100 |
| | | | | 3 | 2.000 | 106.305 | 150 |
| | | | | 4 | 1.002 | 105.132 | 225 |
| | | | | 0 | 1.003 | 105.057 | 300 |

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## Manhole Schedule

| Node | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|
| 9 | 107.317 | 2.794 | 1200 |  1 | 5.000 | 105.739 | 225 |
| | | | | 2 | 1.003 | 104.523 | 300 |
| | | | | 0 | 1.004 | 104.523 | 300 |
| North Basin | 106.000 | 1.572 | |  1 | 1.004 | 104.428 | 300 |
| | | | | 0 | 11 | 104.428 | 300 |
| Northern Soakaway | 106.000 | 1.715 | | 1  | 11 | 104.285 | 300 |
| PP N2 | 107.700 | 1.350 | |  0 | 1.000 | 106.350 | 150 |
| PP N1 | 107.800 | 1.350 | |  | | | |
| | | | | 0 | 4.000 | 106.450 | 150 |
| 2 | 107.523 | 1.560 | 1200 |  1 | 1.000 | 106.038 | 150 |
| | | | | 0 | 1.001 | 105.963 | 225 |
| 8 | 107.450 | 1.425 | 1200 |  | | | |
| | | | | 0 | 5.000 | 106.025 | 225 |
| 4 | 108.110 | 1.425 | 1200 |  | | | |
| | | | | 0 | 2.000 | 106.685 | 150 |

## Simulation Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Skip Steady State | x |
| Rainfall Events | Singular | Drain Down Time (mins) | 240 |
| FSR Region | Scotland and Ireland | Additional Storage (m³/ha) | 20.0 |
| M5-60 (mm) | 15.400 | Starting Level (m) | |
| Ratio-R | 0.320 | Check Discharge Rate(s) | x |
| Summer CV | 1.000 | Check Discharge Volume | x |
| Analysis Speed | Normal | | |

### Storm Durations

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 60 | 180 | 360 | 600 | 960 | 2160 | 4320 | 7200 | 10080 |
| 30 | 120 | 240 | 480 | 720 | 1440 | 2880 | 5760 | 8640 | |

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

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## Node PP N2 Carpark Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 106.350 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 2 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 30.000 | Inf Depth (m) | 0.350 |
| Porosity | 0.40 | Length (m) | 5.000 | | |

## Node Northern Soakaway Soakaway Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00154 | Invert Level (m) | 99.500 | Depth (m) | 2.500 |
| Side Inf Coefficient (m/hr) | 0.00154 | Time to half empty (mins) | 46542 | Inf Depth (m) | 1.000 |
| Safety Factor | 2.0 | Pit Width (m) | 2.200 | Number Required | 4 |
| Porosity | 0.96 | Pit Length (m) | 20.000 | | |

## Node North Basin Depth/Area Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0 | Invert Level (m) | 105.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity | 1.00 | Time to half empty (mins) | |

| Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 300.0 | 441.0 | 1.000 | 620.0 | 850.7 | 1.001 | 0.0 | 850.7 |

## Node PP N1 Carpark Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 106.450 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 0 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 53.600 | Inf Depth (m) | 0.350 |
| Porosity | 0.40 | Length (m) | 5.000 | | |

## Node N1 Swale - 45m Soakaway Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 106.500 | Depth (m) | 1.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 0 | Inf Depth (m) | |
| Safety Factor | 2.0 | Pit Width (m) | 45.000 | Number Required | 1 |
| Porosity | 0.40 | Pit Length (m) | 1.000 | | |

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**Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.09%**

| Node Event | US Node | Level (m) | Depth (m) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|
| 30 minute summer | N1 Swale - 45m | 106.545 | 0.045 | 0.8169 | 0.0000 | OK |
| 15 minute summer | 3 | 106.395 | 1.095 | 1.7804 | 0.0000 | SURCHARGED |
| 15 minute summer | 7 | 106.260 | 1.203 | 2.1684 | 0.0000 | SURCHARGED |
| 10080 minute summer | 9 | 105.730 | 1.207 | 1.9809 | 0.0000 | SURCHARGED |
| 10080 minute summer | North Basin | 105.730 | 1.302 | 304.4724 | 0.0000 | FLOOD RISK |
| 10080 minute summer | Northern Soakaway | 105.730 | 1.445 | 422.4845 | 0.0000 | OK |
| 15 minute summer | PP N2 | 106.577 | 0.227 | 10.1779 | 0.0000 | SURCHARGED |
| 15 minute summer | PP N1 | 106.604 | 0.154 | 10.0977 | 0.0000 | SURCHARGED |
| 15 minute summer | 2 | 106.426 | 0.463 | 0.5235 | 0.0000 | SURCHARGED |
| 15 minute summer | 8 | 106.113 | 0.088 | 0.1258 | 0.0000 | OK |
| 15 minute summer | 4 | 108.013 | 1.328 | 2.8072 | 0.0000 | FLOOD RISK |

| US Node | Outflow (l/s) | Velocity (m/s) |
|---|---|---|
| N1 Swale - 45m | 3.3 | 0.973 |
| 3 | 45.3 | 1.139 |
| 7 | 136.6 | 1.941 |
| 9 | 5.1 | 0.801 |
| North Basin | 5.1 | 0.813 |
| Northern Soakaway | 0.1 | |
| PP N2 | 26.6 | 1.600 |
| PP N1 | 32.4 | 2.021 |
| 2 | 33.4 | 1.169 |
| 8 | 11.5 | 0.822 |
| 4 | 28.5 | 1.621 |

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## Design Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Maximum Time of Concentration (mins) | 30.00 |
| Return Period (years) | 5 | Maximum Rainfall (mm/hr) | 50.0 |
| Additional Flow (%) | 10 | Minimum Velocity (m/s) | 1.00 |
| FSR Region | Scotland and Ireland | Connection Type | Level Soffits |
| M5-60 (mm) | 15.400 | Minimum Backdrop Height (m) | 0.200 |
| Ratio-R | 0.320 | Preferred Cover Depth (m) | 1.200 |
| CV | 1.000 | Include Intermediate Ground | ✓ |
| Time of Entry (mins) | 4.00 | Enforce best practice design rules | ✓ |

## Pipeline Schedule

| Link | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) |
|---|---|---|---|---|---|---|---|
| 1.001 | 40.223 | 200.0 | 225 | Circular | 107.470 | 106.045 | 1.200 |
| 1.002 | 7.738 | 200.0 | 300 | Circular | 108.000 | 105.769 | 1.931 |
| 3.000 | 40.576 | 20.0 | 225 | Circular | 110.400 | 108.975 | 1.200 |
| 1.003 | 25.261 | 200.0 | 300 | Circular | 108.282 | 105.730 | 2.252 |
| 4.000 | 24.894 | 200.0 | 225 | Circular | 108.116 | 106.575 | 1.316 |
| 1.004 | 27.988 | 200.0 | 375 | Circular | 108.187 | 105.484 | 2.328 |
| 7.000 | 27.781 | 200.0 | 225 | Circular | 106.958 | 105.533 | 1.200 |
| 1.005 | 5.825 | 100.0 | 375 | Circular | 107.300 | 105.244 | 1.681 |
| 9 | 8.746 | 100.5 | 375 | Circular | 107.000 | 105.186 | 1.439 |
| 2.000 | 9.773 | 26.9 | 150 | Circular | 108.000 | 106.650 | 1.200 |
| 6.000 | 13.804 | 68.3 | 150 | Circular | 108.500 | 107.150 | 1.200 |
| 5.000 | 16.017 | 36.3 | 150 | Circular | 107.500 | 106.150 | 1.200 |
| 1.000 | 20.654 | 25.0 | 225 | Circular | 108.600 | 107.175 | 1.200 |

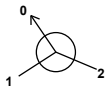
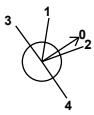
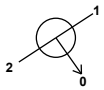
| Link | US Node | DS Node | Dia (mm) |
|---|---|---|---|
| 1.001 | 2 | 4 | 1200 |
| 1.002 | 4 | 6 | 1200 |
| 3.000 | 5 | 6 | 1200 |
| 1.003 | 6 | 10 | 1350 |
| 4.000 | 7 | 10 | 1350 |
| 1.004 | 10 | 12 | 1350 |
| 7.000 | 11 | 12 | 1350 |
| 1.005 | 12 | South Basin | |
| 9 | South Basin | Southern Soakaway | |
| 2.000 | PP S2 | 4 | 1200 |
| 6.000 | PP S1 | 10 | 1350 |
| 5.000 | S1 Swale - 40 m | 10 | 1350 |
| 1.000 | Sw Swale - 45 m | 2 | 1200 |

## Manhole Schedule

| Node | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|
| 2 | 107.470 | 1.425 | 1200 | 1 | 1.000 | 106.349 | 225 |
| | | | |  | | | |
| | | | | 0 | 1.001 | 106.045 | 225 |
| 4 | 108.000 | 2.231 | 1200 | 1 | 2.000 | 106.287 | 150 |
| | | | | 2 | 1.001 | 105.844 | 225 |
| | | | |  | | | |
| | | | | 0 | 1.002 | 105.769 | 300 |

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## Manhole Schedule

| Node | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|
| 5 | 110.400 | 1.425 | 1200 |  | | | |
| | | | | 0 | 3.000 | 108.975 | 225 |
| 6 | 108.282 | 2.552 | 1200 |  | 1 | 3.000 | 106.946 | 225 |
| | | | | | 2 | 1.002 | 105.730 | 300 |
| | | | | 0 | 1.003 | 105.730 | 300 |
| 7 | 108.116 | 1.541 | 1200 |  | | | |
| | | | | 0 | 4.000 | 106.575 | 225 |
| 10 | 108.187 | 2.703 | 1350 |  | 1 | 6.000 | 106.948 | 150 |
| | | | | | 2 | 5.000 | 105.709 | 150 |
| | | | | | 3 | 4.000 | 106.451 | 225 |
| | | | | | 4 | 1.003 | 105.604 | 300 |
| | | | | 0 | 1.004 | 105.484 | 375 |
| 11 | 106.958 | 1.425 | 1200 |  | | | |
| | | | | 0 | 7.000 | 105.533 | 225 |
| 12 | 107.300 | 2.056 | 1350 |  | 1 | 7.000 | 105.394 | 225 |
| | | | | | 2 | 1.004 | 105.344 | 375 |
| | | | | 0 | 1.005 | 105.244 | 375 |
| South Basin | 107.000 | 1.814 | |  | 1 | 1.005 | 105.186 | 375 |
| | | | | 0 | 9 | 105.186 | 375 |
| Southern Soakaway | 107.000 | 1.901 | |  | 1 | 9 | 105.099 | 375 |
| PP S2 | 108.000 | 1.350 | |  | | | |
| | | | | 0 | 2.000 | 106.650 | 150 |
| PP S1 | 108.500 | 1.350 | |  | | | |
| | | | | 0 | 6.000 | 107.150 | 150 |
| S1 Swale - 40 m | 107.500 | 1.350 | |  | | | |
| | | | | 0 | 5.000 | 106.150 | 150 |
| Sw Swale - 45 m | 108.600 | 1.425 | |  | | | |
| | | | | 0 | 1.000 | 107.175 | 225 |

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## Simulation Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Skip Steady State | x |
| Rainfall Events | Singular | Drain Down Time (mins) | 240 |
| FSR Region | Scotland and Ireland | Additional Storage (m³/ha) | 20.0 |
| M5-60 (mm) | 15.400 | Starting Level (m) | |
| Ratio-R | 0.320 | Check Discharge Rate(s) | x |
| Summer CV | 1.000 | Check Discharge Volume | x |
| Analysis Speed | Normal | | |

### Storm Durations

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 60 | 180 | 360 | 600 | 960 | 2160 | 4320 | 7200 | 10080 |
| 30 | 120 | 240 | 480 | 720 | 1440 | 2880 | 5760 | 8640 | |

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

## Node South Basin Depth/Area Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0 | Invert Level (m) | 105.500 |
| Side Inf Coefficient (m/hr) | 0.03600 | Porosity | 1.00 | Time to half empty (mins) | 2280 |

| Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 107.0 | 441.0 | 1.000 | 395.0 | 850.7 | 1.001 | 0.0 | 850.7 |

## Node Southern Soakaway Soakaway Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 100.500 | Depth (m) | 2.000 |
| Side Inf Coefficient (m/hr) | 0.03600 | Time to half empty (mins) | 5867 | Inf Depth (m) | 0.500 |
| Safety Factor | 2.0 | Pit Width (m) | 2.000 | Number Required | 3 |
| Porosity | 0.96 | Pit Length (m) | 22.000 | | |

## Node PP S2 Carpark Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 106.650 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.03600 | Time to half empty (mins) | 0 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 72.000 | Inf Depth (m) | 0.350 |
| Porosity | 0.95 | Length (m) | 5.000 | | |

## Node PP S1 Carpark Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 107.150 | Slope (1:X) | 40.0 |
| Side Inf Coefficient (m/hr) | 0.03600 | Time to half empty (mins) | 0 | Depth (m) | 0.350 |
| Safety Factor | 2.0 | Width (m) | 38.400 | Inf Depth (m) | 0.350 |
| Porosity | 0.40 | Length (m) | 5.000 | | |

## Node S1 Swale - 40 m Soakaway Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 106.150 | Depth (m) | 1.000 |
| Side Inf Coefficient (m/hr) | 0.03600 | Time to half empty (mins) | 0 | Inf Depth (m) | 1.000 |
| Safety Factor | 2.0 | Pit Width (m) | 1.000 | Number Required | 1 |
| Porosity | 0.40 | Pit Length (m) | 40.000 | | |

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## Node Sw Swale - 45 m Soakaway Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 107.175 | Depth (m) | 1.000 |
| Side Inf Coefficient (m/hr) | 0.03600 | Time to half empty (mins) | 0 | Inf Depth (m) | 1.000 |
| Safety Factor | 2.0 | Pit Width (m) | 1.000 | Number Required | 1 |
| Porosity | 0.40 | Pit Length (m) | 45.000 | | |

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**Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.04%**

| Node Event | US Node | Level (m) | Depth (m) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|
| 15 minute summer | 2 | 107.330 | 1.285 | 2.7097 | 0.0000 | FLOOD RISK |
| 15 minute summer | 4 | 106.767 | 0.998 | 1.2768 | 0.0000 | SURCHARGED |
| 15 minute summer | 5 | 109.094 | 0.119 | 0.3048 | 0.0000 | OK |
| 15 minute summer | 6 | 106.728 | 0.998 | 1.5411 | 0.0000 | SURCHARGED |
| 15 minute summer | 7 | 106.669 | 0.094 | 0.1328 | 0.0000 | OK |
| 5760 minute summer | 10 | 106.493 | 1.009 | 1.8020 | 0.0000 | SURCHARGED |
| 5760 minute summer | 11 | 106.493 | 0.960 | 1.6866 | 0.0000 | SURCHARGED |
| 5760 minute summer | 12 | 106.493 | 1.249 | 2.2792 | 0.0000 | SURCHARGED |
| 5760 minute summer | South Basin | 106.493 | 1.307 | 248.2510 | 0.0000 | SURCHARGED |
| 5760 minute summer | Southern Soakaway | 106.493 | 1.394 | 253.9984 | 0.0000 | OK |
| 15 minute summer | PP S2 | 106.705 | 0.055 | 4.2217 | 0.0000 | OK |
| 15 minute summer | PP S1 | 107.243 | 0.093 | 2.7033 | 0.0000 | OK |
| 5760 minute summer | S1 Swale - 40 m | 106.493 | 0.343 | 5.7531 | 0.0000 | SURCHARGED |
| 15 minute summer | Sw Swale - 45 m | 107.369 | 0.193 | 3.6886 | 0.0000 | OK |

| US Node | Outflow (l/s) | Velocity (m/s) |
|---|---|---|
| 2 | 65.5 | 1.648 |
| 4 | 84.7 | 1.203 |
| 5 | 60.3 | 2.916 |
| 6 | 148.4 | 2.108 |
| 7 | 12.7 | 0.826 |
| 10 | 7.6 | 0.619 |
| 11 | 0.7 | 0.338 |
| 12 | 8.8 | 0.814 |
| South Basin | 6.2 | 0.835 |
| South Basin | 2.0 | |
| Southern Soakaway | 0.4 | |
| PP S2 | 10.0 | 1.583 |
| PP S2 | 0.0 | |
| PP S1 | 14.4 | 1.286 |
| PP S1 | 0.0 | |
| S1 Swale - 40 m | 0.8 | 0.663 |
| S1 Swale - 40 m | 0.1 | |
| Sw Swale - 45 m | 41.6 | 2.171 |
| Sw Swale - 45 m | 0.1 | |

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## C. RoadPlan Quality Audit

**26020-01-001**

# SOUTH GREEN, PHASE 2, KILDARE TOWN

## Stage 1 Quality Audit

**(Incorporating a DMURS Street Design Audit, and Audits of Accessibility, Cycling, Walking and Road Safety)**

for

WATERMAN MOYLAN

on behalf of

POUSTERLE LIMITED

FEBRUARY 2026

ROADPLAN CONSULTING

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# DOCUMENT CONTROL SHEET

| | |
|---|---|
| **Project Title** | Proposed Residential development at South Green, Phase 2, Kildare Town |
| **Project No.** | 26020-01 |
| **Document Title** | Stage 1 Quality Audit |
| **Document No.** | 26020-01-001 |

| Status | Author(s) | Reviewed By | Approved By | Issue Date |
|---|---|---|---|---|
| Draft 1 | JP | GF | GF | 20/2/2026 |
| Final | JP | GF | GF | 26/2/2026 |

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# 1. INTRODUCTION

1.1 Roadplan Consulting has been commissioned by Waterman Moylan on behalf of Pousterle Limited to carry out a Quality Audit on a proposed residential development at South Green, Phase 2 Kildare Town.

1.2 The proposed development comprises the construction residential units and footpaths. The development will also include dedicated car parking spaces, bike parking spaces, and allotment gardens.

1.3 The development is situated on South Green Road in Kildare. The development is situated close to Junction 13 on the M7.

1.4 Figure 1 below is a layout drawing of the development. South Green Road has a speed limit of 80 km/h in the area of the proposed development.

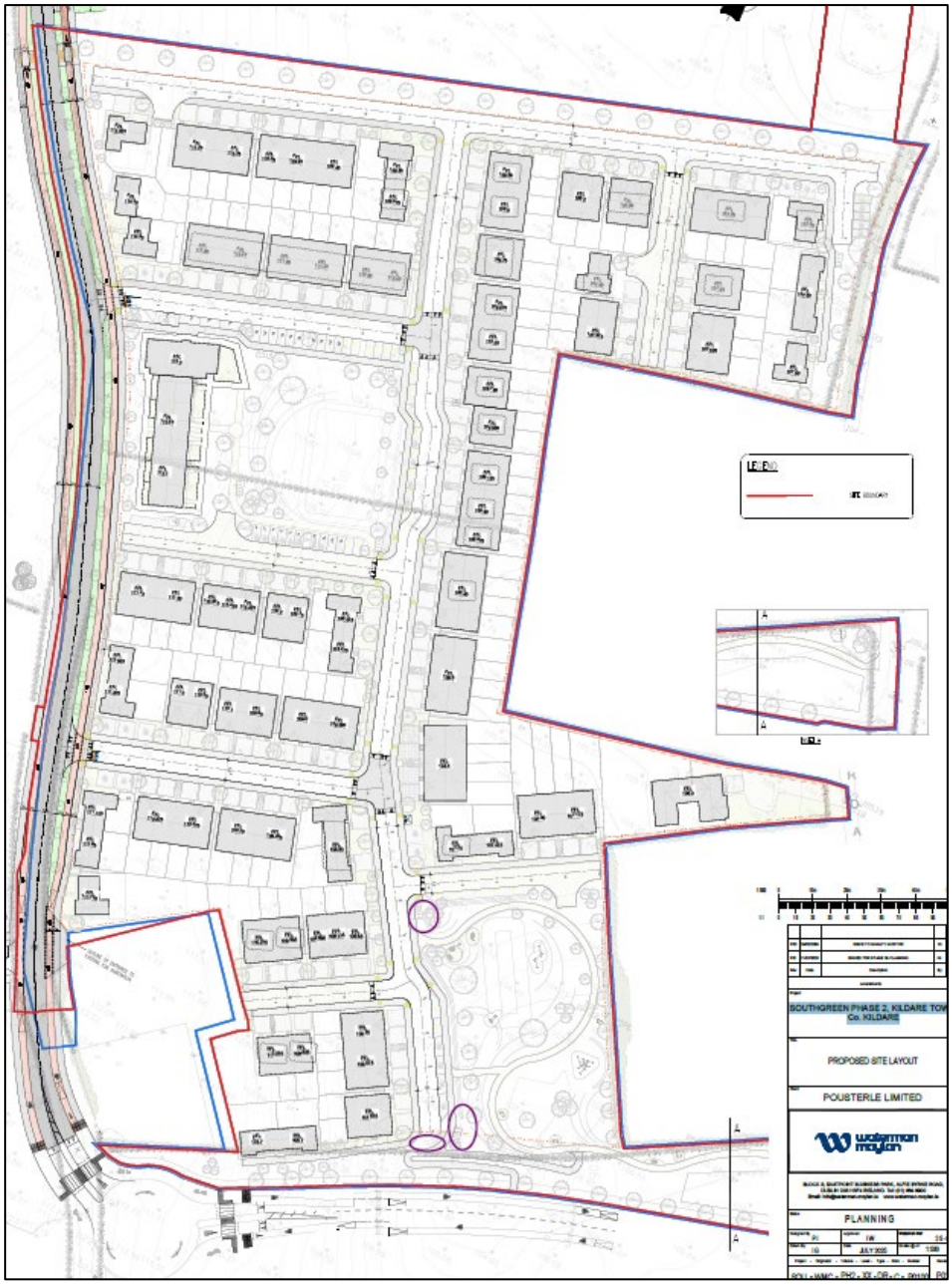



***Figure 1.1–*** *Site Location Map and Site Layout for the development*

# 2. QUALITY AUDIT

2.1 Quality Audit is a defined process, independent of, but involving, the design team that, through planning, design, construction and management stages of a project provides a check that high quality places are delivered and maintained by all relevant parties, for the benefit of all end users. Quality Audit is a process, applied to urban roads, traffic management or development schemes, which systematically reviews projects using a series of discrete but linked evaluations and ensures that the broad objectives of place, functionality, maintenance and safety are achieved.

2.2 Quality Audit was introduced in the publication Design Manual for Urban Roads and Streets following concerns that in the design of new streets provisions made for motor vehicles frequently led to a poorly designed public realm. In an urban area there is a high level of competing demand from different classes of road users. A well-balanced street will have minimal visual clutter and obstacles; it will use durable materials and most importantly, will encourage a degree of negotiation between road users as they make their way through it.

2.3 Quality Audit involves various assessments of the impacts of a street scheme in terms of road safety, visual quality and the use of streets by the community. Access for disabled people, pedestrians, cyclists and drivers of motor vehicles is considered.

2.4 In the context of a Quality Audit, road safety assessment is considered to be an appropriate method of examining road safety issues as it incorporates both the hazard identification techniques used in road safety audit and formal risk assessment techniques. This allows the opportunity at an early stage for road safety issues to be considered in a more dynamic way within the design process, and to ensure that safety issues are considered as part of the design rather than after design work is completed.

2.5 The Quality Audit Team reports findings with suggestions for future action. It should be noted that, in a Quality Audit, it is not the intention that suggestions would be binding on the design team; they are offered for detailed consideration in the design process.

2.6 DMURS states that Quality Audits should consist of the following parts:

- DMURS Street Design Audit
- Individual Design Audits
- Quality Audit Report

In the case of this report the individual design audits comprise an RSA, an Accessibility audit, a Walking audit and a Cycle audit.

# 3. METHODOLOGY

3.1 The Audit Team was as follows:

- George Frisby Chartered Engineer MIEI
- Jince Philip Zachariah MIEI

3.2 Road safety, non-motorised users, visual quality, access for disabled and functionality were considered in the Quality Audit. This exercise focused on issues such as:

- the design rationale as it related to vehicle, cycle and pedestrian movements;
- pedestrian desire lines both to and through the site;
- access requirements for all modes of transport;
- access requirements for disabled people and other vulnerable users;
- any road safety concerns associated with the scheme;
- how the scheme is experienced by those entering it and moving around within the street, including how this affects road user behavior; and
- any other issues considered relevant to each constituent element of the Quality Audit process.

3.3 The site visit for this quality audit was carried out on 31st January 2026.

The documents provided for the audit were:

| Drawing Number | Rev | Drawing Title |
|---|---|---|
| SOU-WMC-PH2-XX-DR-C-P0100 | P02 | Proposed Site Layout |
| SOU-WMC-PH2-XX-DR-C-P0110 | P02 | Proposed Road Levels and Kerbing Layout |
| SOU-WMC-PH2-XX-DR-C-P0115 | P02 | Proposed Visibility Splays |
| SOU-WMC-PH2-XX-DR-C-P0120 | P02 | Swept Path Analysis Refuse Vehicle |
| SOU-WMC-PH2-XX-DR-C-P0130 | P02 | Proposed Road Markings & Signage |

Copies of these audited drawings are contained in Appendix A.

Details of drainage or road lighting are not provided. It is assumed that adequate layouts will be provided for each.

In accordance with DMURS Advice Note No. 4 May 2019 (contained on https://www.dmurs.ie/supplementary-material) a Quality Audit should always contain a DMURS Street Design Audit and Other Design Audits (as required). Section 4 of this report contains the Street Design Audit and Section 5 contains the Other Design Audits (Road Safety, Walking, Cycling, Accessibility). The Street Design Audit is in the format provided as a template on the DMURS website.

# 4 STREET DESIGN AUDIT

| CONNECTIVITY | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| Strategic routes/major desire lines been identified and are clearly incorporated into the design. | 3.1 – Integrated Street Network<br>3.2.1 – Movement Function<br>3.3.1 – Street layouts<br>3.3.4 - Wayfinding | 3.2.1 – Not all pedestrian desire lines are met. | Appropriate set back of landscaping and parking bays will be made to ensure clear visibility splays for pedestrians at these locations. |
| Multiple points of access are provided to the site/place, in particular for sustainable modes. | 3.3.1 – Street Layouts<br>3.3.3 – Retrofitting [1] | No Comment. | Multiple points of access have been provided to the subject development for all modes of transport, vehicular, cycle, and pedestrian in nature. |
| Accessibility throughout the site is maximised for pedestrians and cyclists, ensuring route choice. | 3.3.1 – Street Layouts<br>3.3.2 – Block Sizes<br>3.4.1 – Vehicle Permeability | 3.3.1 – There are no dedicated cycleways shown on the drawing. | A cycle access, shared surface, will be incorporated to the south of the development. A 3m wide shared pedestrian and cyclist access. Cyclists will make use of the internal roads network when entering the subject development from the west, via South Green Road. |
| Through movements by private vehicles on local streets are | 3.2.1 – Movement Function<br>3.2.2 – Place Context | No Comment. | Streets are designed with horizontal curvature, raised tables, |

[1] *When connecting with existing communities a detailed analysis and extensive community consultation should be carried out to identify the optimal location for connections (refer also to the NTA Permeability in Existing Urban Areas: Best Practice Guide).*

| CONNECTIVITY | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| discouraged by an appropriate level of traffic calming measures. | 3.4.1 – Vehicle Permeability | | shared surfaces, and will contain speed limit signage throughout to encourage traffic calming. |

| SELF-REGULATING STREET ENVIRONMENT | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| A suitable range of design speeds have been applied with regard to context and function. | 3.2.1 – Movement Function<br>3.2.2 – Place Context<br>4.1.1 – A Balanced Approach to Speed [2] | No Comment. | A speed limit of 20km/hr has been incorporated into the development and is reflected in the updated roads markings and signage drawing. |
| The street environment will facilitate the creation of a traffic calmed environment via the use of 'softer' or passive measures.3 | 4.2.1 – Building Height and Street Width<br>4.2.2 – Street Trees<br>4.2.3 – Active Street Edges<br>4.2.4 – Signage and Line Marking<br>4.2.7 – Planting<br>4.4.2 – Carriageway Surfaces<br>4.4.9 – On-Street Parking<br>Advice Note 1 – Transitions and Gateways | 4.2.2 – Street trees are proposed in the design for the proposed development. However, these trees are blocking visibility splays at the proposed accesses. In addition, their location should not create risk for road users with regard to falling leaves. | Street trees will be set back or relocated where required to ensure visibility splays are unhindered. |
| A suitable range of design standards/ measures have been applied that are consistent with the applied design speeds. | 4.4.1 – Carriageway Widths<br>4.4.4 – Forward Visibility<br>4.4.5 – Visibility Splays<br>4.4.6 – Alignment and curvature<br>4.4.7 – Horizontal and Vertical Deflections | 4.4.1 – It is unclear if proposed carriageway widths are adequate for fire tenders.<br>4.4.5 – Visibility splays at pedestrian crossings should be | Refuse vehicle tracking has been undertaken for the development (worst-case scenario) and shows adequate carriage way widths. |

[2] *Refer also to the National Speed Limit Guidelines*

[3] *In retrofit situations a detailed analysis should be carried out to establish what measures exist, what their likely effectiveness is and level of intervention required to achieve the designed design speed.*

| SELF-REGULATING STREET ENVIRONMENT | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| | Advice Note 1 – Transitions and Gateways | kept clear of all obstructions including parked vehicles. | Appropriate set back of landscaping and parking bays will be made to ensure clear visibility splays for pedestrians at these locations. |

| PEDESTRIAN AND CYCLING ENVIRONMENT | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| The built environment contributes to the creation of a safe and comfortable pedestrian environment. | 4.2.1 – Building Height and Street Width<br>4.2.3 – Active Street Edges<br>4.2.5 – Street Furniture<br>4.4.9 – On-Street parking | 4.2.5 – Street Furniture: While swept path analysis for bin truck movements have been provided, it is not clear where the intended bin storage is for many units and where they are to be stored or left out for collection. Bins could impede pedestrian and vehicular movements were left informally. | Bin storage will be provided for each unit within the private curtilage of same. |
| Footpaths are continuous and wide enough to cater for the anticipated number of pedestrian movements. | 3.2.1 – Movement Function<br>3.2.2 – Place Context<br>4.2.5 – Street Furniture<br>4.3.1 - Footways, Verges and Strips<br>4.3.2 - Pedestrian Crossings | 3.2.1 - The footpath on either side of the access road is shown as nearly two metres in width. The drawing indicates that cyclists are being encouraged to use the access roadway rather than the footpath to access the | Item 3.2.1 is noted however the scheme has been designed to incorporate horizontal curvature, raised tables, shared surfaces, and will contain speed limit signage throughout to encourage traffic calming and the safety of |

| PEDESTRIAN AND CYCLING ENVIRONMENT | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| | | development. However, many cyclists, especially younger cyclists, may not feel safe on the roadway and may want to use the footpath as a cycleway. Consideration should be given to reviewing the road safety concerns with this proposal, and to investigate making a shared cycleway footpath and either side of the access roadway.<br><br>4.3.1 – Uncontrolled pedestrian crossings are provided within the development. It is unclear whether adequate inter-visibility is provided between drivers of vehicles approaching the pedestrian crossings and pedestrians stopped waiting to cross at the pedestrian crossing. Obstructions to visibility may include parked vehicles adjacent to the pedestrian crossing. | cyclists using the internal roads network.<br><br>4.3.1 – Adequate visibility will be provided between drivers and approaching pedestrians at uncontrolled crossings by ensuring landscaping and cark parking bays are set back appropriately. |
| Cycling facilities will cater for cyclists of all ages and abilities. | 3.2.1 – Movement Function<br>3.2.2 – Place Context<br>4.3.5 - Cycle facilities | 3.2.1 – No sperate cycle tracks are provided within the layout. Cyclists will use proposed roads. | 3.2.1 – This is correct.<br>4.3.5 – Dropped kerbs on footpaths adjacent to cycle parking areas and the internal |

| PEDESTRIAN AND CYCLING ENVIRONMENT | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| | | 4.3.5 – No details are provided on how cyclists can safely access the bicycle parking spaces. | roads network will be provided to offer direct access for cyclists to the parking areas. |
| The particular needs of visually and mobility impaired users been identified and incorporated in the design. | 4.2.5 - Street Furniture<br>4.3.1 - Footways, Verges and Strips<br>4.3.2 - Pedestrian Crossings<br>4.3.4 - Pedestrianised and Shared Surfaces | 4.2.5 – It is not clear if street lighting has been considered.<br><br>4.2.5 – There is no benches provided on the proposed street network. This should be provided to support pedestrians with mobility impairments.<br><br>4.2.5 Street Furniture: In some locations it is not clear where the intended bin storage is and where they are to be stored or left out for collection. In other locations there does not appear to be access for vehicles to bin storage areas. Bins could impede pedestrian and vehicular movements were left informally. All street furniture should be located outside of footpaths where feasible.<br><br>4.3.1 – Footpaths throughout the development may be used by cyclists as there is no designated cycleway network. | 4.2.5 – The street lighting design will be submitted as part of the planning submission and has been considered as part of the design co-ordination.<br><br>4.2.5 – This is noted.<br><br>4.2.5 – This is noted.<br><br>4.3.1 – The concern is noted; however, the proposed traffic-calming measures are intended to ensure the safety of cyclists and pedestrians, with cyclists accommodated within the internal road network.<br><br>4.3.1 dropped kerbs from disabled parking to footpaths will be provided.<br><br>4.3.2 This is noted. |

| PEDESTRIAN AND CYCLING ENVIRONMENT | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| | | 4.3.1 – Ramped access to footways does not appear to be provided from disabled parking spaces.<br><br>4.3.2 – Visibility splays at all pedestrian crossings should be kept clear of all obstructions including parked vehicles. | |

| VISUAL QUALITY | | | |
|---|---|---|---|
| **Key Issues** | **Key DMURS Reference** | **Audit Suggestion** | **Design Team Response** |
| The landscape plan responds to the street hierarchy and the value of the place. | 3.2.1 – Movement Function<br>3.2.2 – Place Context<br>4.2.2 – Street Trees<br>4.2.7 – Planting<br>Advice Note 1 – Transitions and Gateways | No Comments | No comment |
| Street furniture is orderly placed. | 3.2.1 – Movement Function<br>3.2.2 – Place Context<br>4.2.5 - Street Furniture<br>4.3.1 - Footways, Verges and Strips | 4.2.5 – It is not clear what the refuse storage strategy is which may result in wheelie bins stored informally throughout the development. This should be carried out in an organised manner. | This is noted. |
| The use of signage and line marking has been minimised. | 3.2.1 – Movement Function.<br>3.2.2 – Place Context.<br>4.2.4 - Signage and Line Marking. | No Comments | No comment |
| Materials and finishes used throughout the scheme have been selected from a limited palette and respond to the value of the place? | 3.2.1 – Movement Function<br>3.2.2 – Place Context<br>4.2.6 – Materials and Finishes<br>4.2.8 – Historic Contexts<br>4.3.2 – Pedestrian Crossings<br>4.4.2 – Carriageway Surfaces<br>Advice Note 2 – Materials and Specifications | 4.2.6 – No information has been provided on the details of materials finished, along with details of carriageway surfaces and pedestrian crossings. | Materials and finishes will provided in accordance with the local authority requirements. |

## ADDITIONAL COMMENTS

# 5. ROAD SAFETY

5.1 **Issue**

The visibility splay to the left and right from the development accesses are partially obstructed by the proposed street trees located within the roadside verge. The risk of collision is increased in situations where inter-visibility between drivers turning from an access and drivers approaching on the mainline is restricted.




***Figure 5.1*** *– Obstructed visibility at the access*

**Suggestion**

Adequate visibility splays should be provided at the proposed access from the development and if necessary, obstructions within the visibility splay should be removed.

5.2 **Issue**

An appropriate tuning head does not appear to be provided at the end of some of the cul-de-sacs. A lack of an appropriate turning area may lead to long reversing manoeuvres along the access road increasing collision risk.




***Figure 5.2*** *– No turning head*

**Suggestion**

Provide an appropriate turning head at the end of the cul-de-sacs.

5.3 **Issue**

There is an existing sign near the south access which is not shown to be retained. The omission of the junction ahead warning sign may contribute to a collision at the junction.



***Figure 5.3*** *– Existing Sign*

**Suggestion**

Ensure the existing sign is retained.

5.4 **Issue**

The horizontal alignment of the internal access roads appears to change direction suddenly in a number of locations. The provision of horizontal alignment with low curve radii may contribute to loss of control collision or side swipe collisions at these locations.

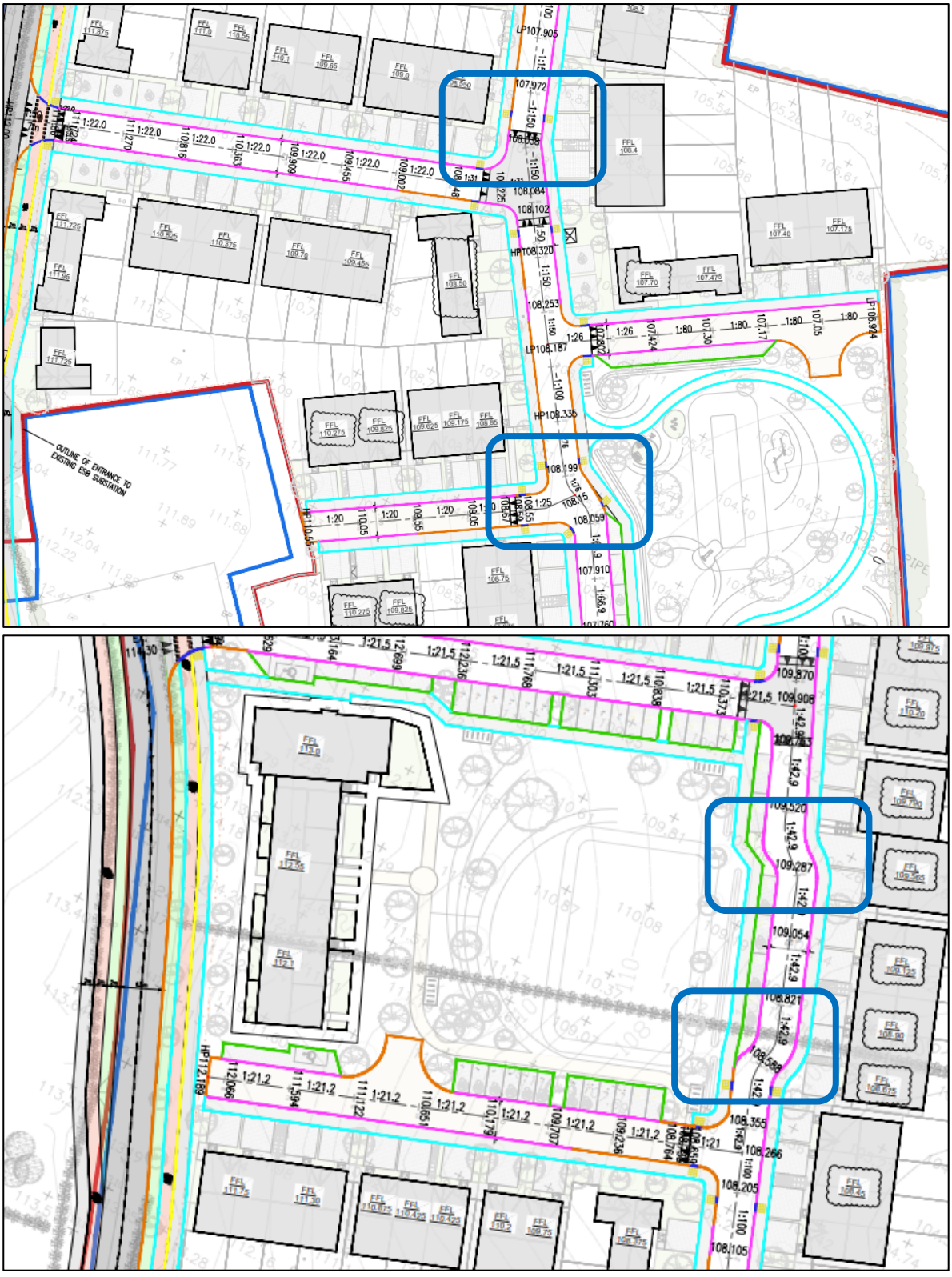



***Figure 5.4*** *– Change in horizontal alignment*

**Suggestion**

Ensure that the horizontal alignment of the internal access roads is in line with the minimum curve radii in accordance with Table 4.3 of the DMURS.

5.5 **Issue**

Intervisibility between pedestrians crossing pedestrian crossings at the locations shown below and drivers of vehicles approaching the crossings may be restricted by parked cars and landscaping. A lack of adequate intervisibility may contribute to a collision at this location.

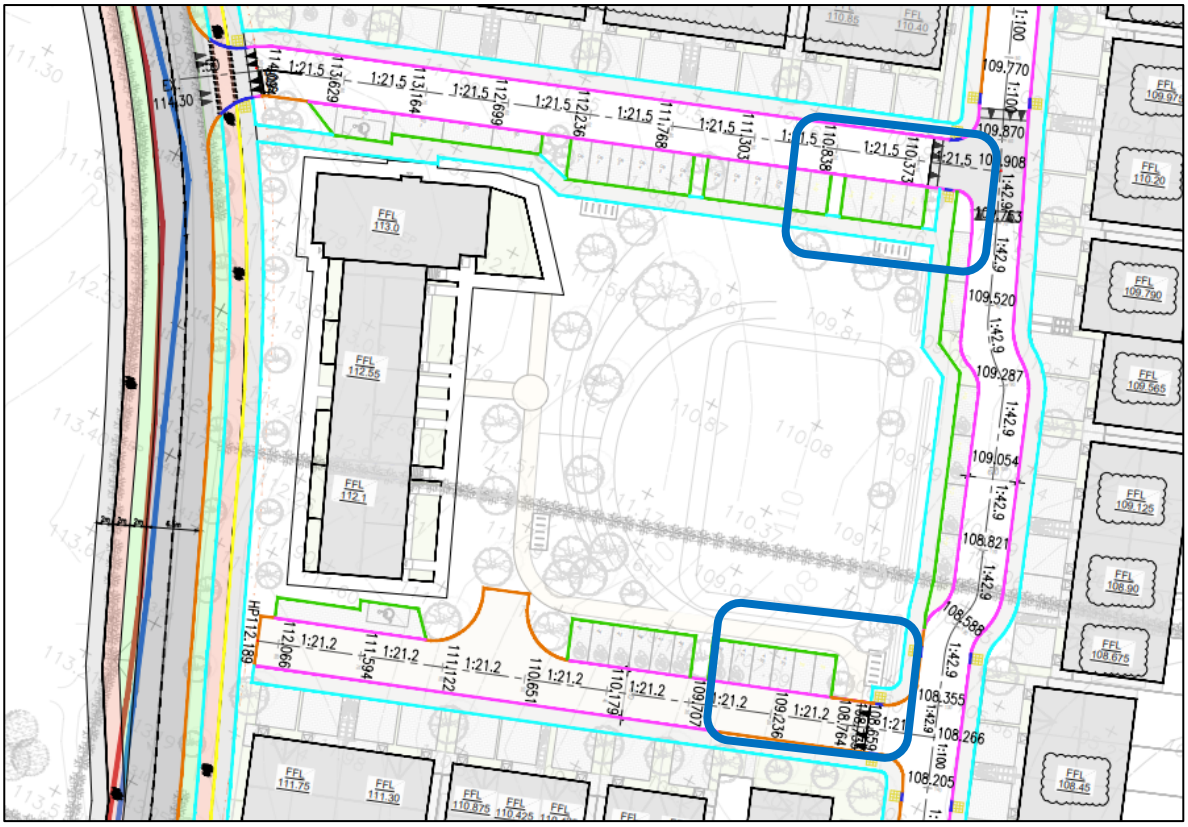


***Figure 5.5*** *– Inadequate Intervisibility*

**Suggestion**

Ensure that adequate intervisibility is provided between pedestrians and drivers of vehicles approaching all pedestrian crossing locations.

5.6 **Issue**

Appropriate tactile paving is not shown to be provided at the proposed pedestrian crossings. A lack of adequate tactile paving may lead to issues for visually impaired pedestrians crossing at the proposed pedestrian crossings.




***Figure 5.6*** *– No tactile paving*

**Suggestion**

Provide appropriate tactile paving to cater for pedestrians crossing the proposed pedestrian crossings.

5.7 **Issue**

It is unclear from the drawing if adequate turning facilities are provided to cater for cars, emergency vehicles and delivery vehicles turning within the development. No swept path analysis has been provided for these vehicles. Vehicle manoeuvres inside the development may prove challenging especially for larger vehicles.

**Suggestion**

Carry out swept path analysis to ensure that the internal layout can cater for all vehicles and modify the layout if necessary.

5.8 **Issue**

The visibility splay to the right at the proposed internal junction shown in the image below may be partially obstructed by vehicles parked in the adjacent car parking spaces. A lack of adequate visibility may contribute to a turning collision at this junction.

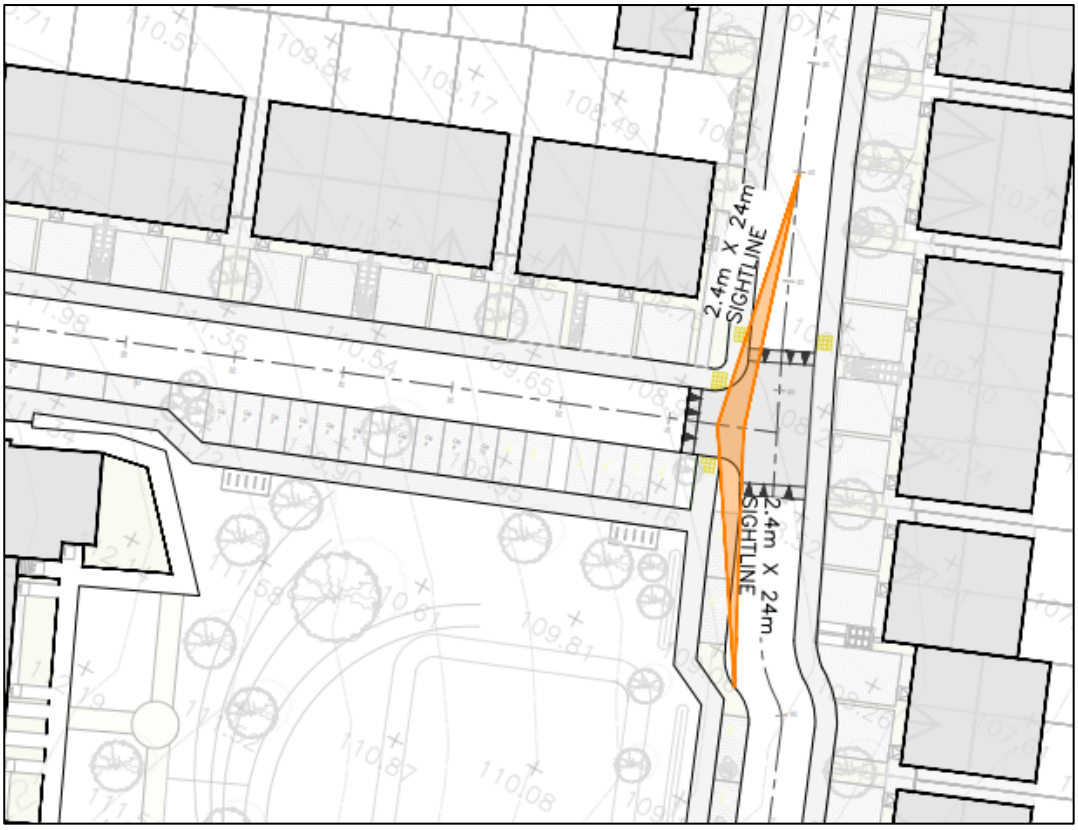



***Figure 5.7*** *– Visibility Splays*

**Suggestion**

Adequate visibility splays should be provided at all internal junctions within the proposed development and if necessary, obstructions within the visibility splay should be removed.

# 6. WALKING

## 6. 1 Issue

Adequate footpath links have not been provided adjacent to some parking spaces. A lack of adequate footpath links may lead to pedestrians travelling along the carriageway where they would be at an increased risk of being struck by a passing vehicle or into adjacent landscaping causing trips and falls when the ground is wet.




***Figure 6.1*** *– No pedestrian links for parking*

**Suggestion**

Provide adequate pedestrian walkway links from the car parking to the proposed access of the dwellings.

6. 2 **Issue**

Grassed areas (or Landscaped areas) are proposed between parking spaces and footpaths in a few locations. This may result in slips and falls when the ground is wet for pedestrians travelling between the parking spaces and adjacent footpaths.

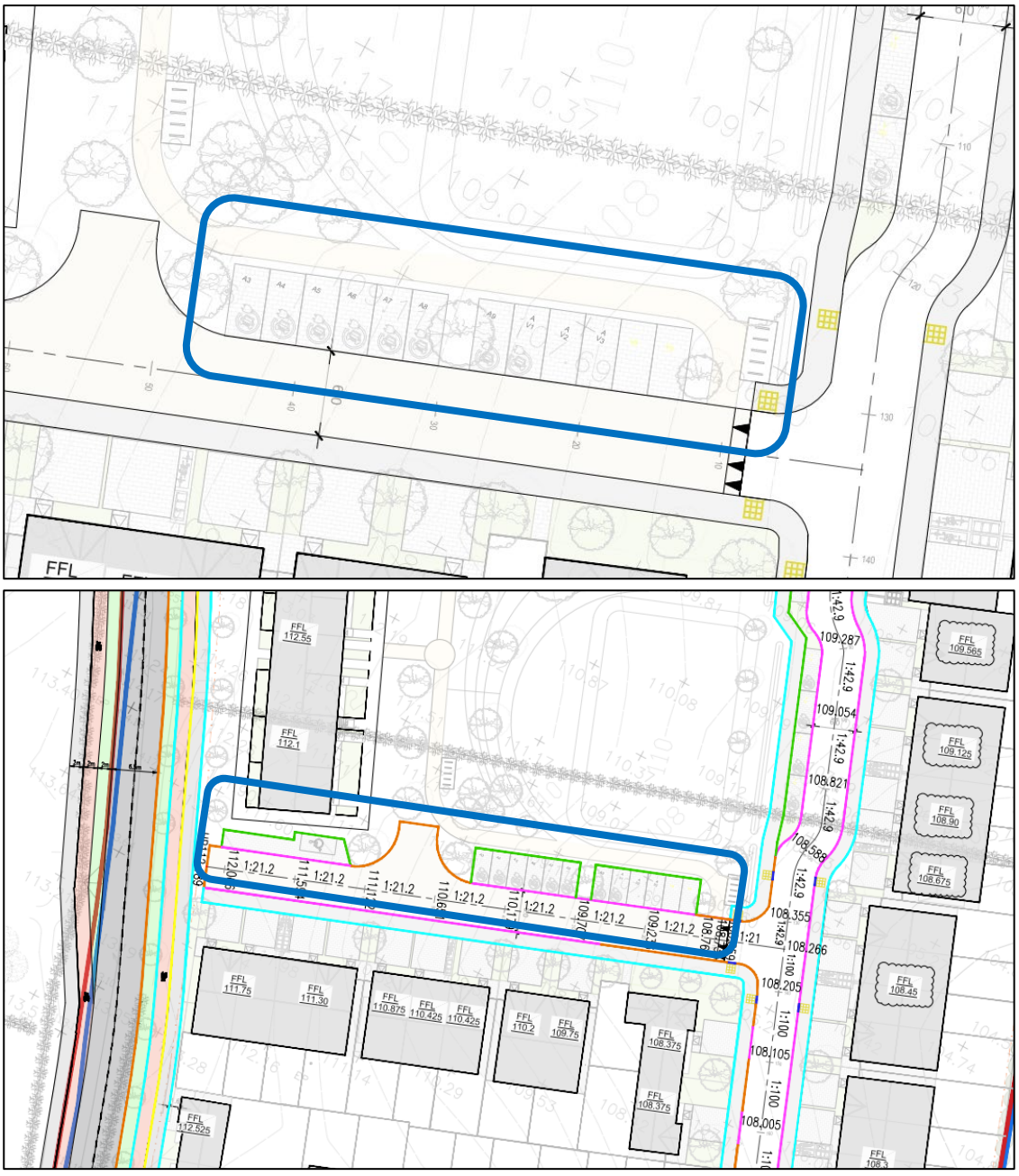



***Figure 6.2*** *– Grassed area between footpath and parking space*

**Suggestion**

Provide a hard surfaced area adjacent to the parking spaces.

6. 3 **Issue**

Connectivity of pedestrian facilities appears incomplete in terms of extents of footpaths at the locations indicated below. The absence of facilities along desire lines may lead to pedestrians traveling along undesired areas, increasing the risk of trips and falls.




***Figure 6.3*** *– Pedestrian desire lines not served*

**Suggestion**

Adequate pedestrian links should be provided within the development to cater for the desire lines of pedestrians.

# 7. CYCLING

7. 1 **Issue**

Bicycle parking is provided within the proposed development. However, cyclists may have difficulty accessing the bicycle parking spaces as they are required to mount a footpath to access the bicycle parking spaces and it is unclear from the drawing if adequate facilities are provided to allow cyclist access these spaces.



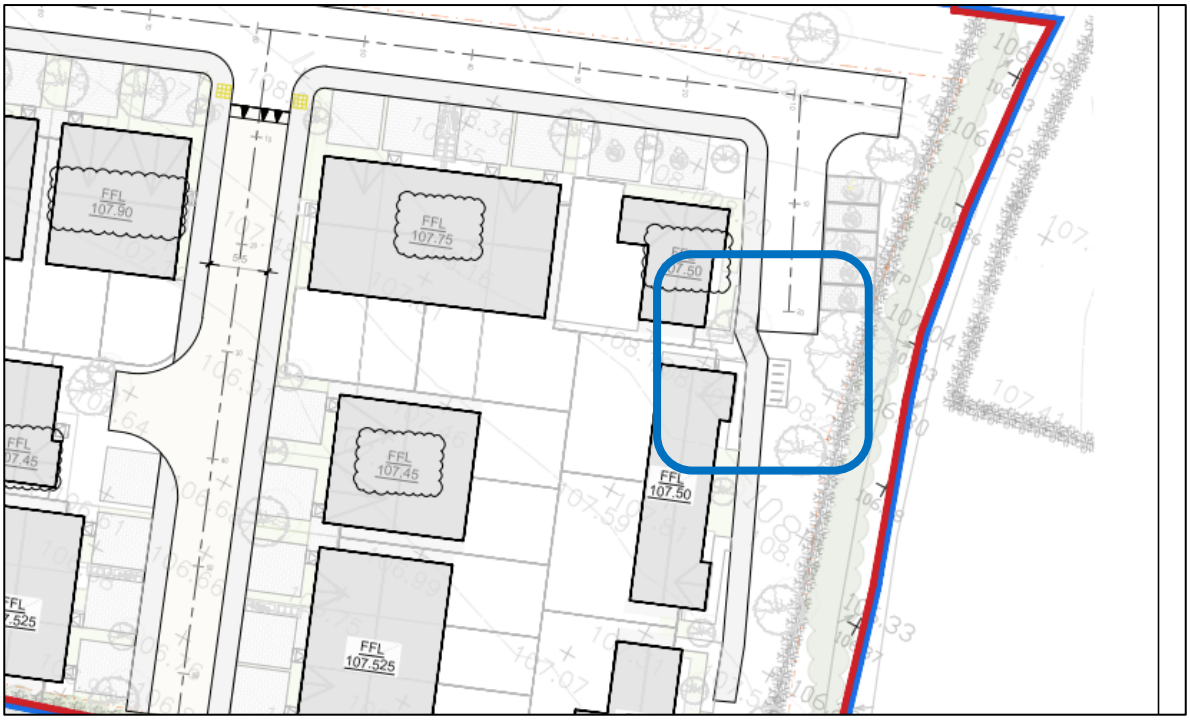



***Figure 7.1*** *– Unclear Access*

**Suggestion**

Ensure facilities are provided to allow cyclist to directly access the bicycle parking spaces from the carriageway. Shared cycle path/footpath surfaces may need to be provided in some locations.

7. 2 **Issue**

It is unclear how a cyclist travelling on the cycle track along the left side of the public road would safely access/exit the development accesses. The absence of a clearly defined and appropriate cyclist crossing facility may result in unsafe crossing manoeuvres, increasing the potential for cyclist–vehicle collisions at this location.




***Figure 7.2** – Unclear Access*

**Suggestion**

Provide an appropriate cyclist crossing facility at these locations.

7. 3 **Issue**

A cycle access has not been provided to the proposed development from the public road to the south of the development. A lack of a cycle access at this location may result in cyclists using the footpath to access the proposed development.

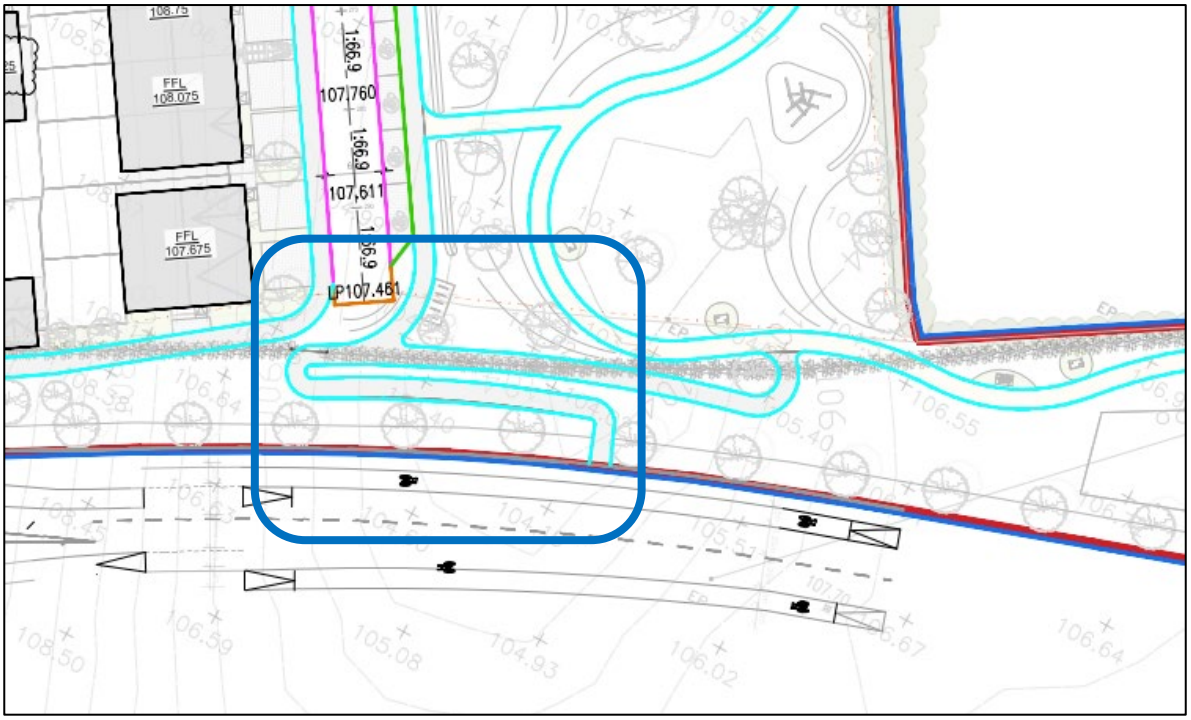



***Figure 7.3*** *– Insufficient corduroy paving*

**Suggestion**

Provide a cycle access to the proposed development at this location.

# 8. ACCESSIBILITY

8. 1 **Issue**

A disabled parking space is provided within the residential development. However, no dropped kerbs are shown to be provided to allow a mobility impaired pedestrian to access the footpath adjacent to the disabled parking space. A lack of dropped may lead to mobility impaired pedestrians travelling along the carriageway to access the footpath where they would be at an increased risk of being struck by a passing vehicle.

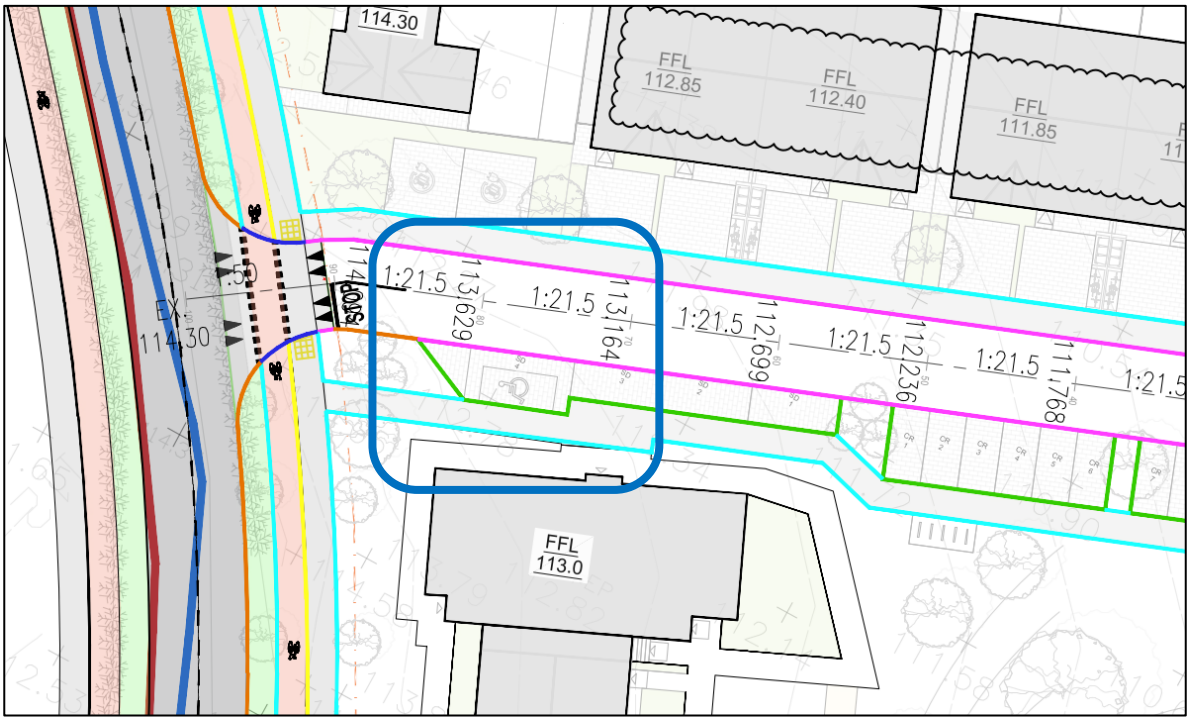



***Figure 8.1** – No dropped kerb at disabled parking bay*

**Suggestion**

The proposed kerb layout should be reviewed and modifications implemented to ensure dropped kerbs for pedestrian access is provided at locations where pedestrian access/use is anticipated.

8. 2 **Issue**

It is unclear how the residential unit in the image below is to be accessed, either by vehicular traffic or by pedestrians. The absence of clearly identifiable access arrangements may lead to confusion for residents and visitors, potentially resulting in informal or unsafe movements.

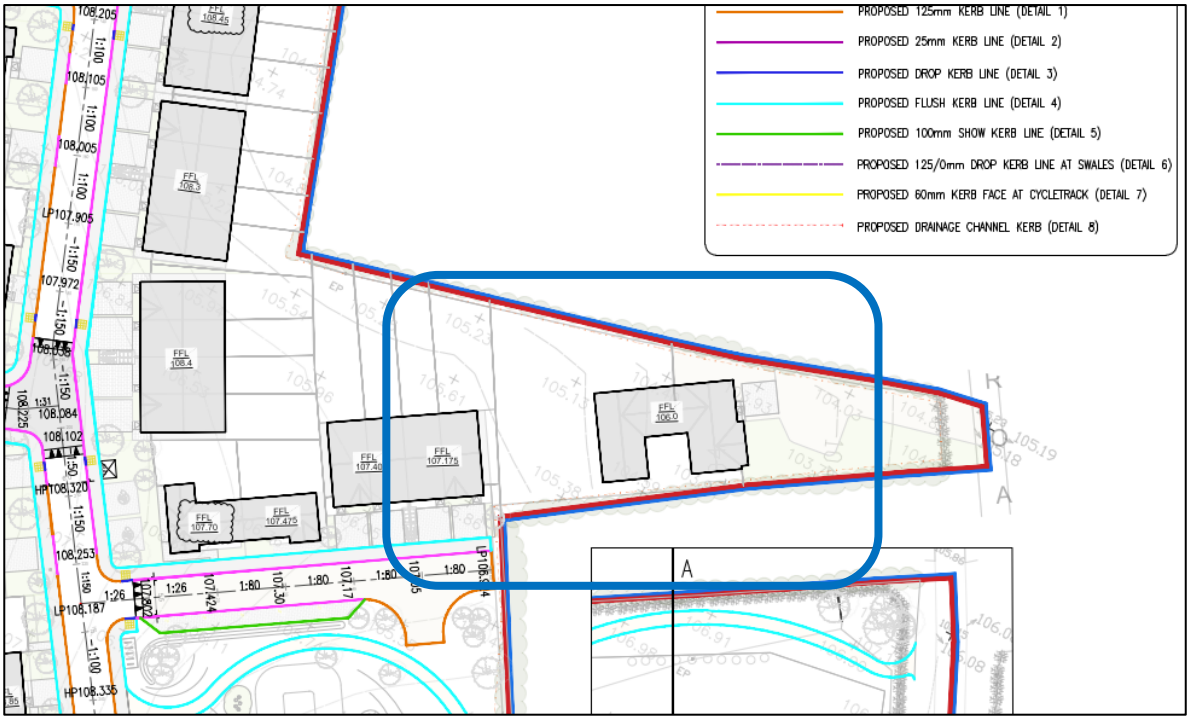



***Figure 8.2*** *– Unclear access*

**Suggestion**

Provide clear and defined vehicular and pedestrian access arrangements to the residential unit.

## 9. QUALITY AUDIT FEEDBACK FORM

**Scheme:** Proposed Residential development at South Green, Phase 2 Kildare Town

**Document Number:** 26020-01-001

**Date Audit Completed:** 19th February 2026

| Paragraph No. in Quality Audit Report | To Be Completed By Designer | | | To Be Completed by Audit Team |
|---|---|---|---|---|
| | Issue Accepted (yes/no) | Suggested Measure Accepted (yes/no) | Describe alternative measure(s). Give reasons for not accepting suggested measure. Only complete if suggested measure is not accepted. | Alternative measures or reasons accepted by auditors (yes/no) |
| **5.1** | YES | YES | Adequate visibility splays have been provided at the proposed access. Proposed trees within splays have been removed/relocated. | ---------- |
| **5.2** | YES | YES | Turning head/s will be added to the site layout in this location as required by the local authority. | ---------- |
| **5.3** | YES | YES | The existing sign is currently located within the footprint of the proposed road widening required for the Southgreen Road proposals. As the sign lies within the centre of the proposed carriageway, it will be relocated to the side of the proposed road. | ---------- |
| **5.4** | YES | YES | The road curvature will be designed in accordance with DMURS and the requirements of the local authority. | ---------- |
| **5.5** | YES | YES | Appropriate set back of landscaping and parking bays will be made to ensure clear visibility splays for pedestrians at these locations. | ---------- |
| **5.6** | YES | YES | This is noted; appropriate tactile paving will be provided. | ---------- |
| **5.7** | YES | YES | The worst-case scenario auto tracking, for a refuse vehicle, has been undertaken for the subject development and shows unobstructed movement throughout the development. | ---------- |
| **5.8** | YES | YES | The parking spaces as identified will be shifted to ensure visibility splays are unhindered. | ---------- |

| | | | | |
|---|---|---|---|---|
| **6.1** | YES | YES | Adequate pedestrian walkway links form the car parking to the proposed access of dwellings will be provided. | ---------- |
| **6.2** | YES | YES | Hard surface areas adjacent to the parking spaces will be provided. | ---------- |
| **6.3** | YES | YES | Due to level differences, pedestrian connectivity in the outlined locations is not feasible. However, a pedestrian link is provided for within the updated layout for connectivity at the south of the development, via steps. | ---------- |
| **7.1** | YES | YES | Dropped kerbs can be incorporated for cycle parking areas adjacent to the internal road network. Where required, the repositioning of parking areas can be assessed to facilitate this. | ---------- |
| **7.2** | YES | YES | Appropriate cyclist crossing facilities have been incorporated into the updated site layout to accommodate this connectivity. | ---------- |
| **7.3** | YES | YES | A cycle access has been provided at the outlined location within the access route increased to a 3m wide shared surface to accommodate both cyclist and pedestrian activity. | ---------- |
| **8.1** | YES | YES | This is noted; a drop kerb will be shown in this location to facilitate appropriate use. | ---------- |
| **8.2** | YES | YES | The unit is to be access to the east, off Old Road. | ---------- |

**Safety Audit Signed off** ..... **Design Team Leader**

**Print Name** Ian Worrell..... **Date** 25/02/26.....

**Safety Audit Signed off** ..... **Audit Team Leader**

**Print Name** George Frisby..... **Date** 26/2/2026.....

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# UK and Ireland Office Locations

