PINNACLE
CONSULTING ENGINEERS

CAPAMI LTD.

OLDCOURT LAP LANDS, FIRHOUSE, DUBLIN 24

ENGINEERING PLANNING REPORT

PART 1 - REPORT

DOCUMENT CONTROL SHEET

Project Name	Oldcourt LAP Lands, Firhouse, Dublin 24
Document Title	Engineering Planning Report
Document Number	P211102-PIN-RP-00-C002-V2

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APPROVALS

	Name	Position	Date
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Approved by	Shaun O'Reilly	Senior Associate	02/09/2024

REVISIONS

Revision By	Date	Context
Draft	08/12/2023	Pre-Planning Draft
1	09/01/2024	Pre-Planning Submission
2	02/09/2024	Planning Submission

Table of Contents

See Part 2 for appendices

Appendices

APPENDIX A – Irish Water Diversion Agreement COF CDS23009245

APPENDIX B – Irish Water Diversion Agreement - DIV23291

APPENDIX C – Infiltration Test Report

APPENDIX D – Historical Rainfall Data - Met Eireann Historical Data

APPENDIX E – Greenfield Runoff Rate Estimation Calculation

APPENDIX F – Surface Water Analysis SWMM

1. INTRODUCTION

1.1 Introduction

This report was prepared by Pinnacle Consulting Engineers on behalf of Capami Ltd. (the Client) for submission to South Dublin County Council (SDCC) as part of the LRD planning submission for the residential development of 523 units, located at Oldcourt, Firhouse, Dublin 24.

This report intends to provide insight into the existing and proposed civil services infrastructure, for the proposed development including the water supply, foul water drainage and surface water drainage.

This report shall be read in conjunction with the Armstong Fenton Associates, Davey + Smith Architects Gannon and Associates planning submissions.

A Site-Specific Flood Risk Assessment (SSFRA) has been completed by Kilgallen and Partners Consulting Engineers (Doc Ref 24035-R-SSFRA). A provisional review of the SDCC Strategic Flood Risk Assessment (SFRA) indicated that the entire site is within Flood Zone C.

A site-specific SuDS Maintenance manual has been prepared under a separate cover.

1.2 References

Pinnacle Consulting Engineers have referred to the following documents through the design of the proposed development:

- The Greater Dublin Strategic Drainage Study (GDSDS)
- CIRIA SuDS Manual
- Greater Dublin Regional Code of Practice for Drainage Works
- Uisce Éireann (Irish Water) Current Codes of Practice and specifications for both Water and Wastewater
- Recommendations for Site Development Works for Housing Areas
- All Current Building Regulations, particularly Technical Guidance Document Part H
- The South Dublin County Council (SDCC) Development Management Plan
- The SDCC Sustainable Drainage Explanatory Design & Evaluation Guide 2022

2. Existing Site and Site Location

The subject site has an approximate area of 20.30 hectares and is located in the townlands of Bohernabreena and Oldcourt, Dublin 24. The proposed development lands are within the lands designated for the Ballycullen-Oldcourt Local Area Plan, 2014 (as extended).

The site location is shown in Figure 2-1. The approximate centroid coordinates for the subject site are X: 710212, Y: 725285 ITM.

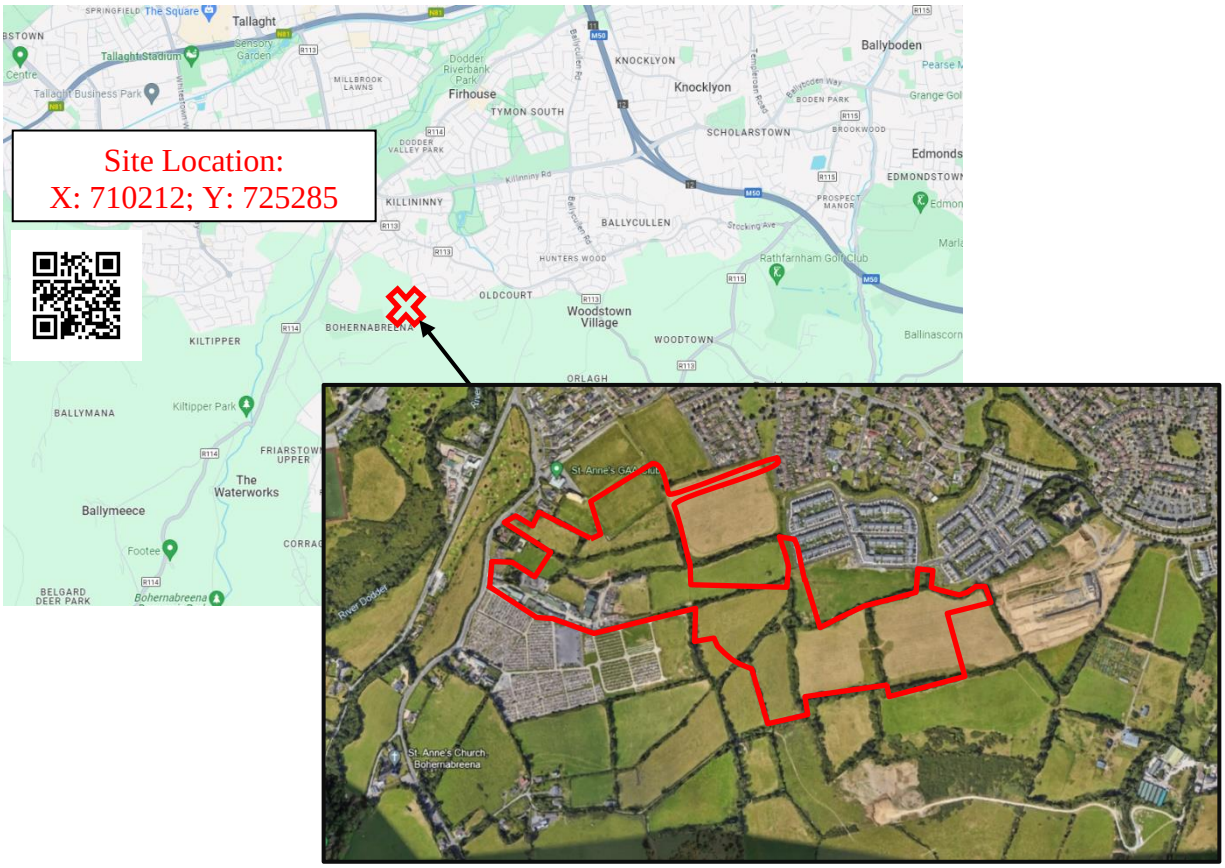

Figure 2-1: Site Location Map

The subject site is located to the east of Bohernabreena Road, north and east of Bohernabreena cemetery, south and south-east of St. Anne's GAA club, south and south-west of the Dodderbrook residential estate, west of the Ballycullen Gate residential development (currently under construction) and west of Oldcourt Road (the R113). Refer to Figure 2-2.

A small portion of land to the west of the subject site, and adjacent to the Bohernabreena Cemetery, is currently developed and occupied by several industrial warehouses. It is proposed that the existing warehouses within the site boundary shall be demolished as part of the development construction works.

There is an existing High Voltage (HV) overhead powerline and corresponding servitude running east to west, bisecting the site. On the eastern boundary, the powerline tends southwards across the Oldcourt Hill Farm Allotments. The HV overhead lines are proposed to remain, and the proposed development shall remain outside of the associated servitude.

There are several existing farm ditches across the site, conveying surface water runoff from the south to north across the subject site.

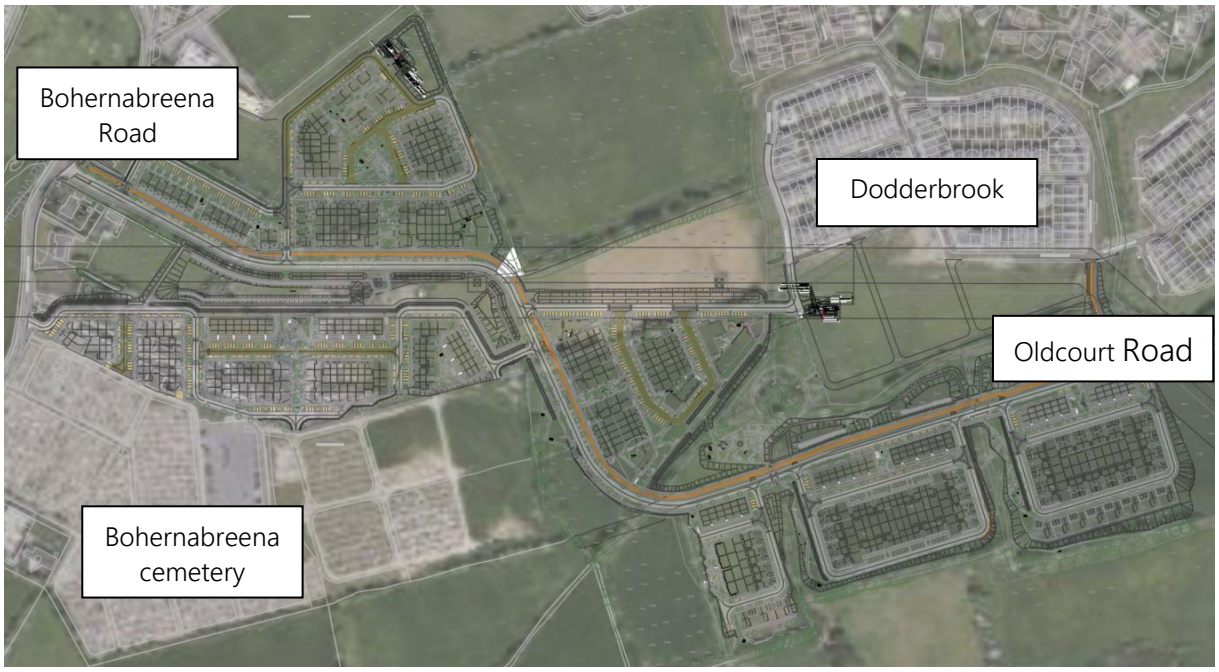

Figure 2-2: Site Layout Map

2.1 Existing Site Topography

The subject site generally falls from south to north, with a high point of the southern boundary of Approximately 119.78m OD Malin. The lowest point along the northern boundary is approximately 98.12m OD Malin where the site connects into an existing ditch, refer to Figure 2-3.

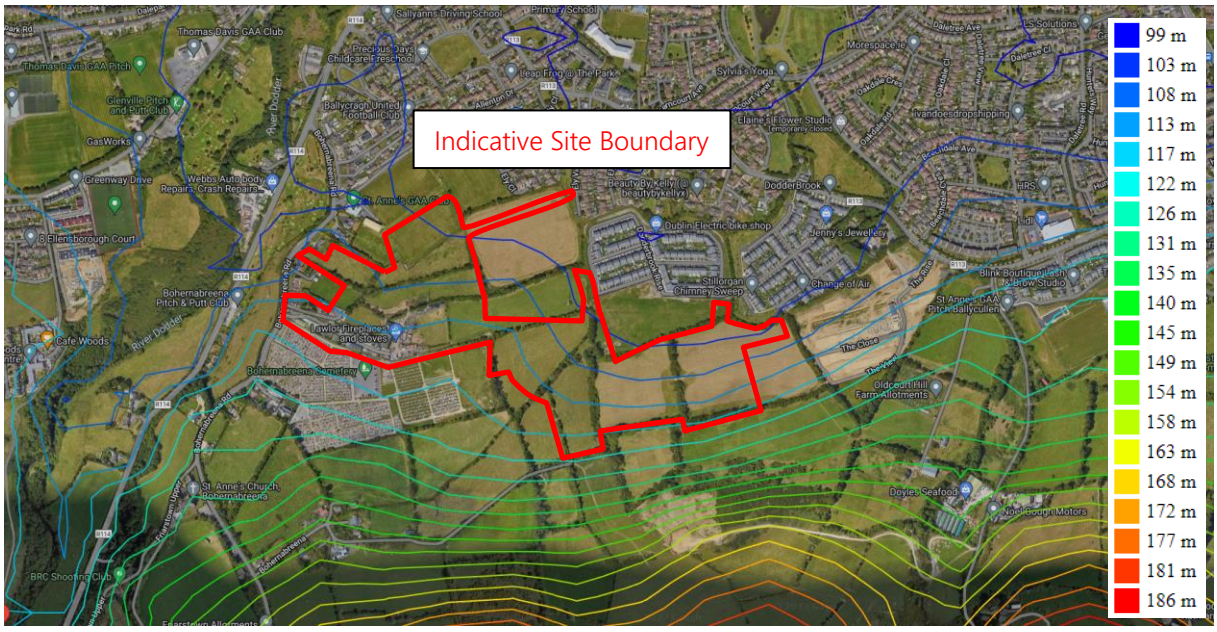

Figure 2-3: Preliminary Contour Analysis

3. Development Proposal

The proposed development consists of 523 no. residential units comprised of 253 no. 2, 3 & 4 bed detached, semi-detached and terraced houses, 208 no. 1, 2 & 3 bed duplex units in 20 no. 2 & 3 storey blocks, and 62 no. 1, 2 & 3 bed apartments in 4 no. 3 & 3-4 storey blocks, along with a 2-storey childcare facility of c. 457sq.m.

Private amenity space for the residential units is provided in the form of rear gardens for houses and ground floor terraces / upper floor balconies for apartments and duplex units. The proposed development provides for c. 7.38Ha of public open space and c.4,797 sq.m of communal open space associated with proposed residential units.

Vehicular access to the development will be via 4 no. access points, as follows:

(i) from the west of the site via 2 no. accesses located off Bohernabreena Road,
(ii) from the north of the site via 1 no. access at Dodderbrook Place,
(iii) from Oldcourt Road (the R113) to the east, via the adjoining residential development.

The proposed development includes for pedestrian and cyclist connections and accesses to adjoining lands to the north, east and west, and includes for cycling and pedestrian routes and infrastructure throughout the development.

The proposed development also includes all associated site development works, demolition of existing buildings/structures, landscaping works, boundary treatments, SuDS features, drainage infrastructure, services infrastructure, bin stores, bicycle stores, car parking areas (including EV parking facilities), public lighting etc.

The subject site has been broken down into 4 No. neighbourhood zones. Neighbourhood Zone 01 is located to the southeast of the site, Neighbourhood Zone 02 is central to the site, Neighbourhood Zone 03 is to the northwest of the development and Neighbourhood Zone 04 is located to the southwest of the site. Refer to Figure 3-1.

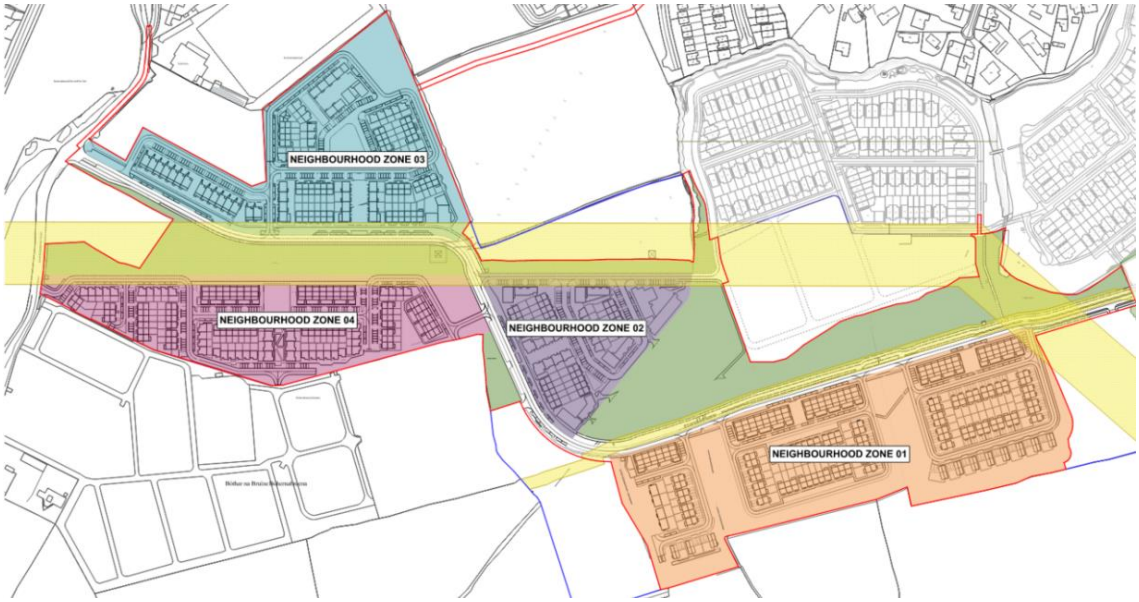

Figure 3-1: Neighbourhood Zoning Layout as per Davey + Smith Architects MP10

4. SDCC Opinion Report and subsequent communications

SDCC issued an opinion following a LRD pre planning meeting held on the 1st of March 2024. Subsequent to the meeting an opinion report was issued under the cover of "LRDOP001.24 - Opinion Report".

Subsequent to the Pre-development meeting and circulation of the Opinion report, Pinnacle Consulting Engineers together with Capami LTD attended a meeting with south Dublin Councils Water Services and Park Division (Public Realm), on the 13th of May 2024, to discuss and agree the way forward.

4.1 Opinion Report - sustainable drainage systems section and responses

The following items raised in sustainable drainage systems section of the opinion report relating to the civils services were addressed as per the below responses.

1) Surface water attenuation needs to be increased by approximately 20%,

Response: The attenuation provided on the site subsequent to the pre-planning submission has been increase by over 20 %, in order to achieve an attenuation volume of 15,800 m^3. Furthermore, a detailed investigation into the onsite infiltration revealed that the existing substrate was permeable. The resultant infiltration of surface water runoff in the SuDS elements has aided in reducing the required attenuation volume. Overall, surplus attenuation storage is provided than is require allowing for a factor of safety in the surface water attenuation systems and achieving the SDCC required 20% increase.

2) A flow route analysis must be provided showing the current and future direction of flow of surface water,

Response: A pre-development flow route analysis was completed and issued to Brian Harkin of South Dublin County Council Water Services on the 25th of July 2024, prior to the planning submission.

P211102-PIN-XX-XX-DR-C-00220-S2 - PRE-DEVELOPMENT FLOW ROUTE ANALYSIS.

3) Revised proposals relating to surface water sewer diversion as the current proposals are not acceptable,

Response: During the meeting with the SDCC Water Services division, it was discussed and agreed in principle, that the diversion was required to facilitate the new proposed development. Furthermore, said diversion should remain piped, as it is currently, ensuring that the same capacity is provided. The pipe would remain piped rather than be discharged into an open ditch within the boundary of the proposed development, which would create a surface water flood risk if the upstream network's discharge in the pipeline was not attenuated.

Overall, it was proposed that the diversion remain piped in order to limit risk of flooding and where possible, all bends shall be approximately 45 degrees, limiting the junction losses on the pipeline.

The proposed diverted surface water pipeline is setback a minimum of 5m from all proposed structures.

It is also noted that the proposed development drainage is not interconnected to said diverted pipeline, so that the surface water quantity and quality of the upstream lands are entirely separated from the proposed development.

The proposed diversion was issued to SDCC drainage department for comment prior to submission for planning.

P211102-PIN-XX-XX-DR-C-00210-S2	SURFACE WATER DIVERSION LAYOUT
P211102-PIN-XX-XX-DR-C-00211-S2	SURFACE WATER DIVERSION PROPOSED LONGSECTION

4) Drawings required showing surface water attenuation of each SuDS element,

Response: this is provided in the planning drawing pack, refer to the below listed drawings.

P211102-PIN-XX-XX-DR-C-00600-S2	SUDS DRAINAGE LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00601-S2	SUDS DRAINAGE LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00602-S2	SUDS DRAINAGE LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00603-S2	SUDS DRAINAGE LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00604-S2	SUDS DRAINAGE LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00605-S2	SUDS DRAINAGE LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00606-S2	SUDS DRAINAGE LAYOUT- SHEET 6 OF 6

5) Clarification on how surface water from roads will flow into SuDS features and not gullies,

Response: It was discussed and agreed upon in principle during the meeting with SDCC Water Services on the 13th of May 2024, that, where possible, the surface water runoff from the road surface shall discharge directly into SuDS mechanisms (bio-retention tree pits, bio-retention raingardens, swales and land/filter drains). In areas where runoff drains directly into SuDS via kerb openings, drainage gullies may be provided downstream of the kerb opening as a redundant capture device. This ensures that in higher order storms, any surface water runoff that may potentially bypass SuDS inlets, is adequately captured (by a gully trap) and conveyed to the attenuation basins. The subject site is particularly susceptible to surface water runoff with high velocity on roads, due to steep gradients of the roads in which instance the overshooting of kerb openings is more likely.

Additionally, it was agreed that gullies shall be placed above ramps to prevent localized low points at the head of ramps.

6) Drawing showing discharge rate of water on site and location, catchment areas and location of discharge points. A report for calculations of same is also required,

Response: All of the above requirements have been submitted as per of this planning application, the drawing related queries can be found in the drawings listed below. The calculations can be found appended to the Engineering Planning Report, see Part 2.

P211102-PIN-XX-XX-DR-C-00600-S2	SUDS DRAINAGE LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00601-S2	SUDS DRAINAGE LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00602-S2	SUDS DRAINAGE LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00603-S2	SUDS DRAINAGE LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00604-S2	SUDS DRAINAGE LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00605-S2	SUDS DRAINAGE LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00606-S2	SUDS DRAINAGE LAYOUT- SHEET 6 OF 6
P211102-PIN-XX-XX-DR-C-00610-S2	SURFACE WATER CATCHMENT LAYOUT- OVERALL LAYOUT

7) Surface water to be attenuated close to source and conveyed via above ground, nature-based solutions.

Response: The surface water drainage network for the site has been designed with a nature-based SuDS philosophy, utilizing extensive SuDS treatment trains, in order to capture and control runoff and as close to source as possible. The overall layout of the proposed suds drainage network can be seen in the drawings listed below:-

P211102-PIN-XX-XX-DR-C-00600-S2	SUDS DRAINAGE LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00601-S2	SUDS DRAINAGE LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00602-S2	SUDS DRAINAGE LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00603-S2	SUDS DRAINAGE LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00604-S2	SUDS DRAINAGE LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00605-S2	SUDS DRAINAGE LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00606-S2	SUDS DRAINAGE LAYOUT- SHEET 6 OF 6

4.2 Opinion Report – Appendix 5 Water Services Report Response

1.1 The surface water attenuation of 11,525 m3 is undersized by approximately 20% and needs to be increased by approximately 20%. The proposed SAAR value of 991mm is high and needs to be clarified how this was calculated.

Response: The attenuation provided on the site subsequent to the pre-planning submission has been increased by over 20 %, in order to achieve an attenuation volume of 15,800 m^3. Furthermore, a detailed investigation into the onsite infiltration revealed that the existing substrate was permeable. The resultant infiltration of surface water runoff in the SuDS elements has aided in reducing the required attenuation volume. Overall, a surplus of attenuation storage is provided than is required, allowing for a factor of safety in the surface water attenuation systems and achieving the SDCC required 20% increase.

The SAAR value is 991mm as per Met Eireann records for Irish grid X310599, Y225308, and is deemed to be correct. This shall only be amended under the explicit instruction of SDCC, to a value of their instruction.

1.2 There is no flow route analysis proposed for the development. Submit a drawing showing the direction of flow of surface water on site pre-development and post development. The surface water flow routes routes post development should correlate closely with pre development flow routes as much as possible.

Response: A pre-development flow route analysis was completed and issued to Brian Harkin of South Dublin County Council Water Services on the 25th of July 2024, prior to the planning submission. Detailed pre and post development flow route analysis's can be found in the drawings listed below:-

P211102-PIN-XX-XX-DR-C-00220-S2	PRE-DEVELOPMENT FLOW ROUTE ANALYSIS
P211102-PIN-XX-XX-DR-C-00221-S2	POST-DEVELOPMENT FLOW ROUTE ANALYSIS

1.3 It is not acceptable to divert 450mm surface water sewer away from the current direction of flow of site and it is not acceptable to have a 90˚ (degree) bend on surface water sewer. The current route of the 450mm surface water sewer should remain or if there is a change in its location, then the direction of surface water flow should be improved and where possible opened up into a surface water SuDS feature, with a suitable setback distance from proposed structures.

Response: During the aforementioned meeting with the SDCC Water Services division, it was discussed and agreed "in principle" that the diversion was required to facilitate the new proposed development. Furthermore, the said diversion should remain piped, as it is currently, ensuring that the same capacity is provided. The pipe would remain piped rather than be discharged into an open ditch within the boundary of the proposed development, which would create a surface water flood risk if the upstream networks discharge into the pipeline was not attenuated.

Overall, it was proposed that the diversion remain piped to limit risk of flooding and where possible, all bends shall be approximately 45 degree, limiting the junction losses on the pipeline.

The proposed diverted surface water pipeline is setback a minimum of 5m from all proposed structures.

It is also noted that the proposed developments drainage network is not interconnected to said diverted pipeline, so that the surface water quantity and quality of the upstream catchment are separated from the proposed development.

1.4 Submit a drawing showing what surface water attenuation in m3 is proposed for the development in each of the SuDS (Sustainable Drainage Systems) elements on site.

Response: this is provided in the planning drawing pack, refer to the below listed drawings.

P211102-PIN-XX-XX-DR-C-00600-S2	SUDS DRAINAGE LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00601-S2	SUDS DRAINAGE LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00602-S2	SUDS DRAINAGE LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00603-S2	SUDS DRAINAGE LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00604-S2	SUDS DRAINAGE LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00605-S2	SUDS DRAINAGE LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00606-S2	SUDS DRAINAGE LAYOUT- SHEET 6 OF 6

1.5 Clarify on a drawing how surface water from roads will flow into SuDS features and not gullies. Road gullies and pipes can be used but only where SuDS is not feasible. Examine if surface water pipes can be replaced with SuDS such as Swales or other such SuDS features.

Response: It was discussed and agreed upon "in principle" during the meeting with SDCC Water Services on the 13th of May 2024, that, where possible, the surface water runoff from road surfaces shall discharge directly into SuDS features? (bio-retention tree pits, bio-retention raingardens, swales and land drains). In areas where runoff drains directly into SuDS via kerb openings, drainage gullies may be provided downstream of the kerb opening as a redundant capture device. This ensures that in higher order storms, any surface water runoff that may potentially bypass SuDS inlets, is adequately captured and conveyed to the attenuation basins. The subject site is particularly susceptible to surface water runoff, with high velocity on roads due to the steep gradients of the roads, in which instance the overshooting of kerb openings is more likely. Furthermore, it was agreed that gullies shall be placed above ramps in order to prevent localized low points at the head of the ramps. A detail of the gullies located downstream of a kerb opening is shown below.

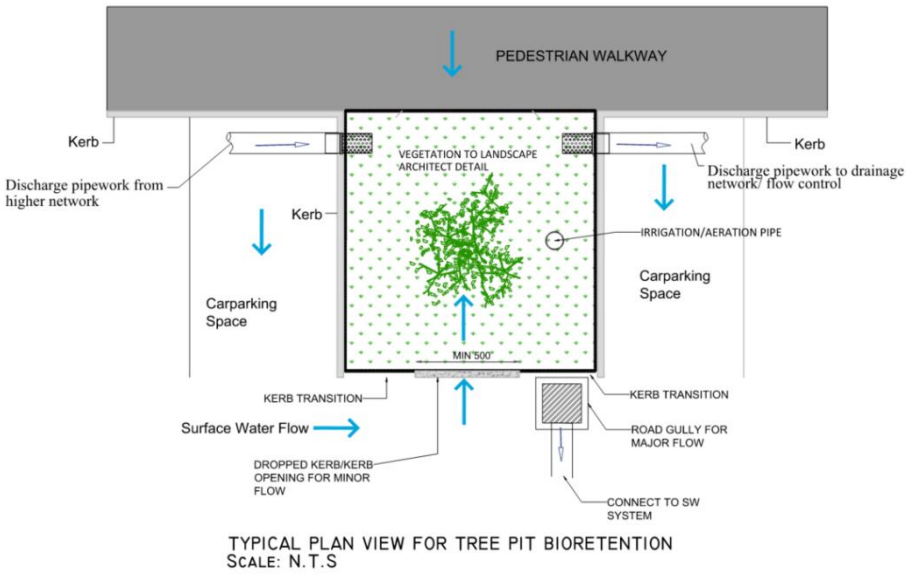

Figure 4-1: Bio-retention tree pit with bypass/overflow gully downstream of kerb opening.

1.6 Submit a drawing showing the discharge rate of surface water on site and show the location of same. Show on a drawing and report where catchment areas are and what the discharge rate for each catchment is and show the location of each discharge point on a drawing. Submit a report showing calculations of discharge rate for each catchment.

Response: The surface water design is clearly shown on the drawings listed below, including attenuation volumes and discharge rates. Summary of the discharge rates, catchment and appended detailed calculations are indicated in the Engineering Planning Report.

P211102-PIN-XX-XX-DR-C-00600-S2	SUDS DRAINAGE LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00601-S2	SUDS DRAINAGE LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00602-S2	SUDS DRAINAGE LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00603-S2	SUDS DRAINAGE LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00604-S2	SUDS DRAINAGE LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00605-S2	SUDS DRAINAGE LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00606-S2	SUDS DRAINAGE LAYOUT- SHEET 6 OF 6
P211102-PIN-XX-XX-DR-C-00610-S2	SURFACE WATER CATCHMENT LAYOUT- OVERALL LAYOUT

1.7 Surface water should be attenuated as close to the source of surface water initial source on site and not piped long distances to another area of site. Surface water should be conveyed above ground on nature based surfaces as much as possible.

Response: The surface water drainage network for the site has been designed with a nature based SuDS philosophy, utilizing extensive SuDS treatment trains, in order to capture and control runoff as close to source as possible. The overall layout of the proposed SuDS drainage network can be seen in the drawings listed below:-

P211102-PIN-XX-XX-DR-C-00600-S2	SUDS DRAINAGE LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00601-S2	SUDS DRAINAGE LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00602-S2	SUDS DRAINAGE LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00603-S2	SUDS DRAINAGE LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00604-S2	SUDS DRAINAGE LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00605-S2	SUDS DRAINAGE LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00606-S2	SUDS DRAINAGE LAYOUT- SHEET 6 OF 6

Flood Risk Comments

• Increase surface water attenuation by 20% as per above comments.
• The Developer shall ensure that there is complete separation of the foul and surface water drainage for the proposed development.
• All works for this development shall comply with the requirements of the Greater Dublin Regional Code of Practice for Drainage Works.

Response:

- The surface water attenuation has been increased by approximately 20%, excluding safety freeboard on attenuation basis, as advised by the planning opinion report.
- Pinnacle Consulting Engineers confirm that there is full separation of the foul and surface water discharge from the proposed development.
- As stated in the Engineering Planning Report, the drainage design is in accordance with the GDSDS, CIRIA Suds manual and the SDCC Sustainable Drainage Explanatory Design & Evaluation Guide 2022

5. Foul Water

5.1 Existing Foul Sewer Drainage Network:

According to the Uisce Éireann (Irish Water) GIS records and the site-specific topographical survey, there is an existing Ø225mm foul sewer on the west of the site, draining northwards, providing service to the existing private dwellings. A portion of this existing foul sewer shall remain outside of the site boundary and ties into the new proposed foul sewer network. Where the existing line crosses the subject site, it shall be integrated into the proposed foul network prior to being discharged into the existing foul sewer to the north-east. This discharge will ultimately outfall into the same network located in Oldcourt Road.

There are existing foul water networks within both existing north-eastern Dodderbrook developments, although the western-most of the two developments is not yet available on Uisce Éireann (Irish Water) GIS.

The foul water from the subject site shall ultimately connect to the existing surrounding public foul water sewer network from where it shall ultimately discharge to the Ringsend Wastewater Treatment Works (WWTW).

Refer to Figure 5-1 for the existing foul water services, as extracted from Uisce Éireann (Irish Water) GIS records.

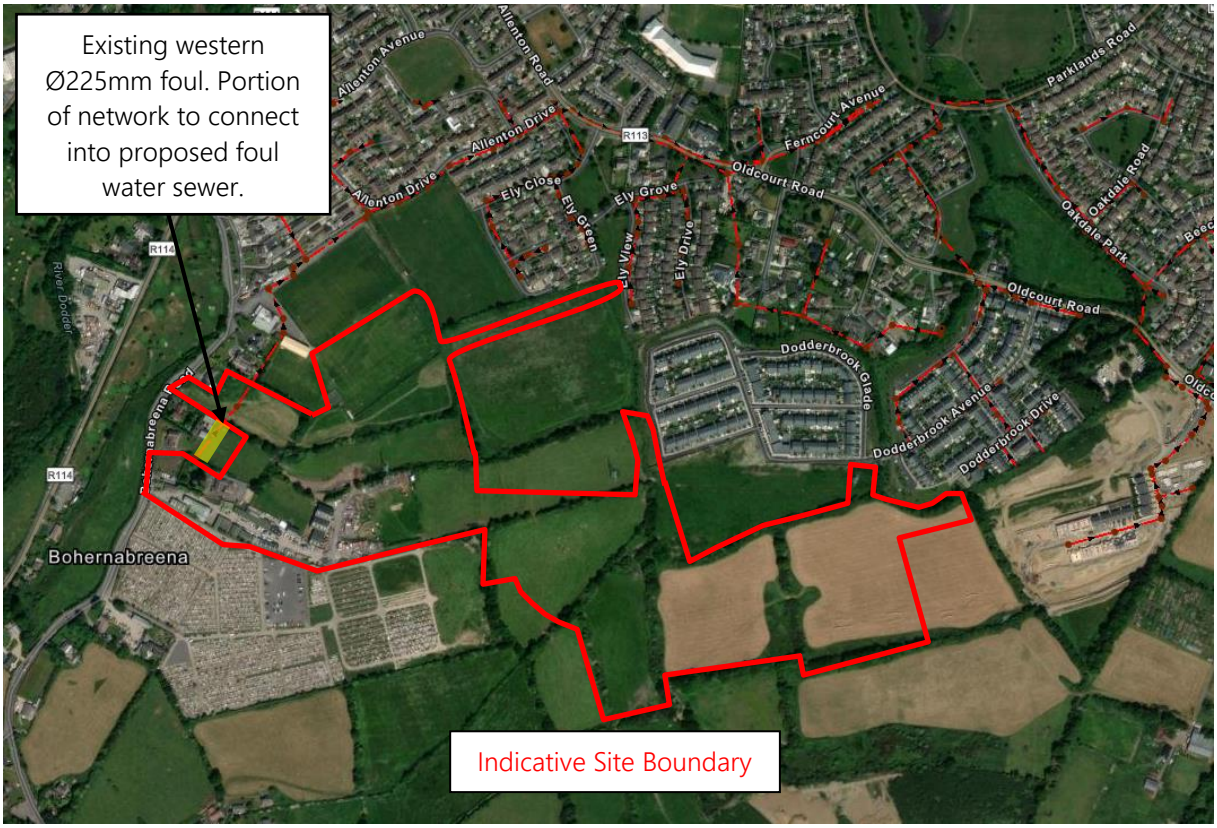

Figure 5-1: Existing foul water network – Uisce Éireann (Irish Water) GIS

5.2 Proposed Foul Sewer Drainage:

A Pre-Connection Enquiry (PCE) was issued to Uisce Éireann (Irish Water) on the 8th of December 2023. A Confirmation of Feasibility (COF) (ref: CDS23009245) dated the 12th August 2024, has since been received

from Uisce Éireann with condition, summary of which is extracted below for ease of reference. The COF can be found in Appendix A.

> "Wastewater Connection - Feasible Subject to upgrades
>
> *- According to a hydraulic modelling report for the catchment area, currently only Phase 1 (130 residential units) of the Development can be connect to the existing Uisce Éireann network.*
>
> *- The remaining phases of the Development could be served via installation of interim pumping stations with adequate storage facilities, which would then be decommissioned once the network capacity downstream has been remediated by Uisce Éireann. The temporary pumping station rates and the storage volumes have to be reviewed and agreed at a connection application stage. Telemetry systems must be installed at the pumping station facilities.*
>
> *- Currently, Uisce Éireann is working on solutions for the catchment which will provide the necessary network capacity for the permanent gravity connection"*

In line with the Uisce Éireann stipulations in the COF, the eastern most connection (connection 1) shall service 130 units via gravity, discharging into the existing foul water gravity network to the north.

The remaining 393 units, creche and 3 external units shall be services by internal gravity networks which will discharge to the existing downstream foul network via temporary foul water pumping stations.

The pumping stations are designed such that the associated holding tanks allow for the onsite effluent to be pumped at off peak times, reducing the pressure on the downstream public foul network. The gravity network before and after the pumping stations are design such that the pumping stations can be taken offline should the downstream public network constrains be resolved negating need for the pump stations. Both pumping stations shall discharge into the existing foul water gravity networks located to the north of the subject site.

The pumping stations shall be designed in detail, should they still be required, at connection application stage and shall be fully compliant with Uisce Éireann (Irish Water) COP Part 5.

The foul drainage from the subject site will be discharged to the existing public foul water network via 3 No. outfall connections. As stated below for ease of reference and depicted in Figure 5-2.

Connection 1: Gravity connection to the northeast of the site, the connection is proposed into the an existing Ø225mm public sewer located at the junction of Dodderbrook glade and Dodderbrook Avenue.

Connection 2: Temporarily pumped connection to the north of the site, it is proposed that a connection be made into the existing public Ø225mm foul sewer, located with Dodder Lawn Road in the northern located residential development of OCIL Phase 1.

Connection 3: Temporarily pumped connection to the north of the site, it is proposed that a connection be made into the existing public Ø225mm foul sewer, located within Ely View Road in the northern located residential development.

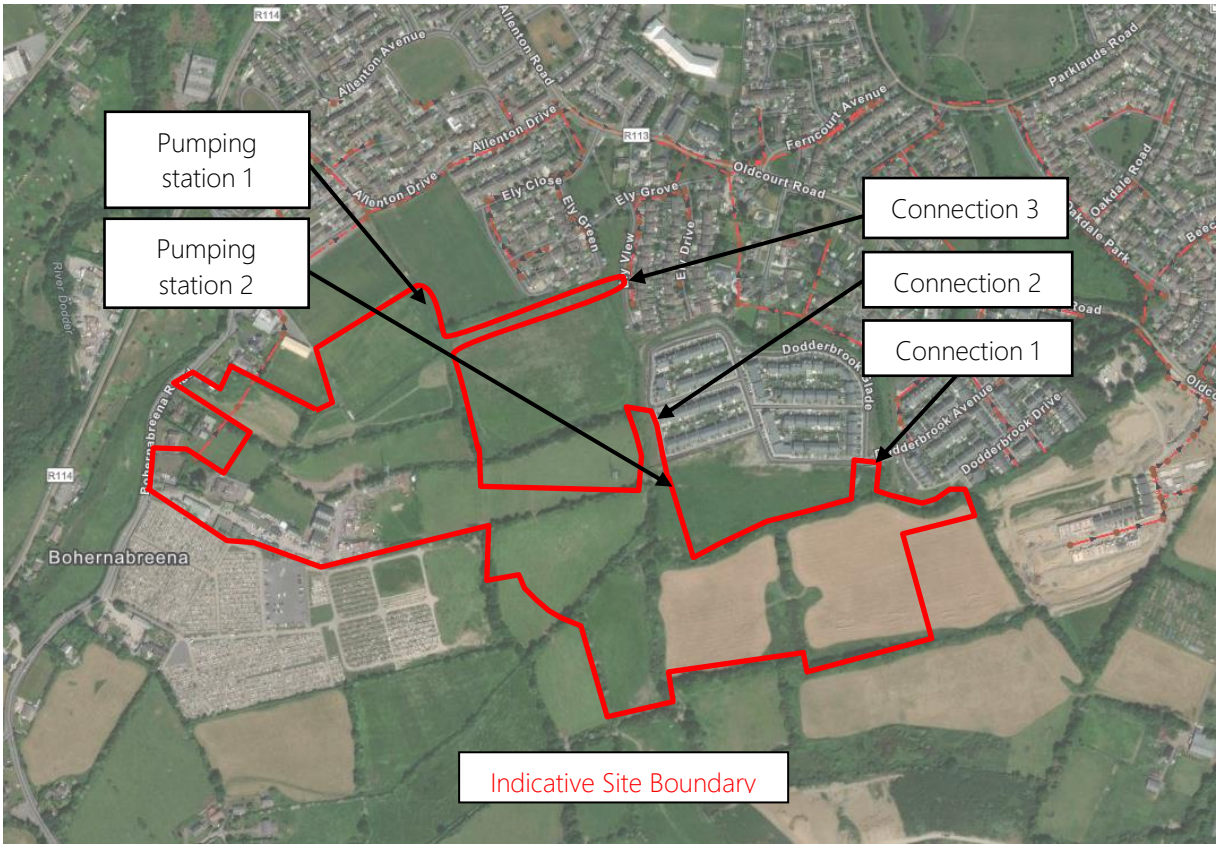

Figure 5-2: Indicative foul water connection points

5.3 Proposed Foul Water Calculations:

The foul water discharge for the proposed development has been calculated below, in accordance with Uisce Éireann (Irish Water) regulations (Uisce Éireann Code of Practice for Wastewater):

Based on a development of circa 523 No. Units + creche, the total flow for the proposed development has been calculated below;

Residential:	
Proposed Dwellings	= 523
Existing Dwellings	= 3 No. (Foul Connection 3 only)
450 litres/unit/day	= IW COP
Total outflow	= 236,700 litres/day (2.74 litres/sec)
Infiltration allowance	= 10%
Dry Weather Flow (DWF)	= 3.01 litres/sec
Peak Flow (= 6 x DWF)	= 18.08 litres/sec

Non-Residential (Creche):	
Estimated occupancy	= 126
50 litres/person/day	= IW COP Appendix C
Total outflow	= 6,300 litres/day (0.07 litres/sec)
Infiltration allowance	= 10%
Dry Weather Flow (DWF)	= 0.08 litres/sec
Peak Flow (= 2.5 x DWF)	= 0.2 litres/sec
Total Outflow	= 243,000 litres/day
Peak Flow	= 18.28 litres/sec

A breakdown of the estimated foul water discharge for each of the proposed connections is summarised in Table 5-1. The various foul water catchments are shown in Figure 5-3.

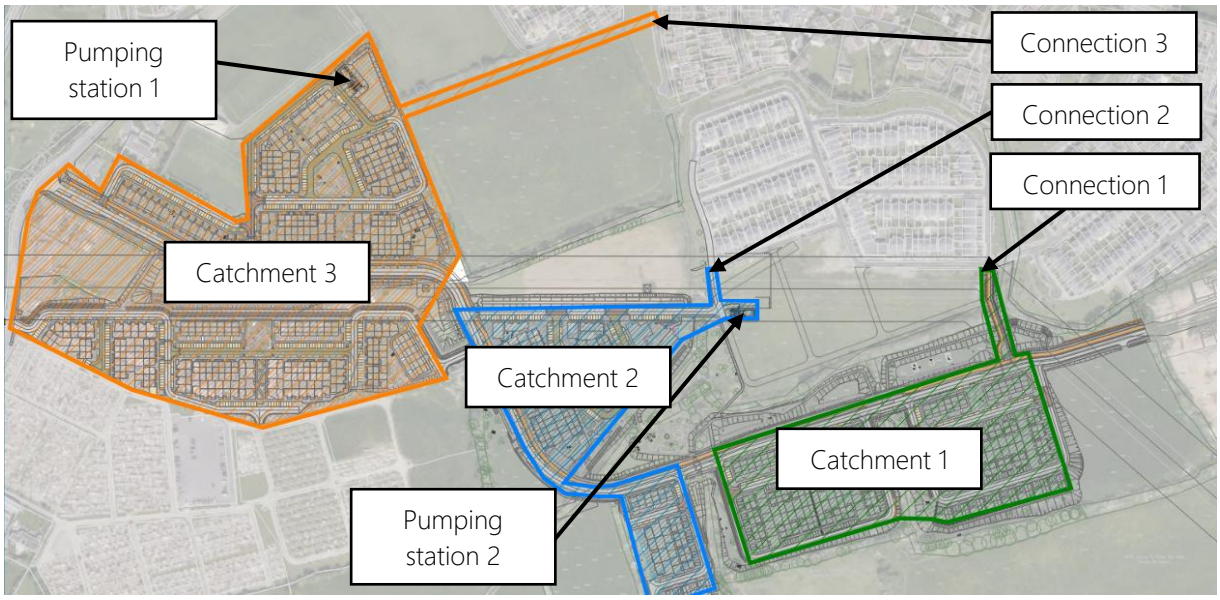

Figure 5-3: Indicative Foul Water Catchments

Table 5-1: Summary of Estimated Foul Water Discharge

Total Site - Foul Water Discharge							
Unit type	No.	Demand (l/unit/day)	Total Outflow (l/day)	Total Outflow (l/s)	Infiltration (10%)	Dry Weather Flow (l/s)	Peak Flow (l/s)
Houses	319	450	143550	1.66	1.1	1.83	10.97
Duplex	142	450	63900	0.74	1.1	0.81	4.88
Apartments	62	450	27900	0.32	1.1	0.36	2.13
3 No.existing	3	450	1350	0.02	1.1	0.02	0.10
Sub-Total	526	450	236700	2.74	10%	3.01	18.08
	Est Pop.	Demand (l/p/day)	Total Outflow (l/day)	Total Outflow (l/s)	Infiltration (10%)	Dry Weather Flow (l/s)	Peak Flow (l/s)
Creche	126	50	6300	0.07	1.1	0.08	0.20
Sub-Total	126	50	6300	0.07	10%	0.08	0.20
Total			243000	2.81		3.09	18.28

Summary - Foul Water Discharge Per Connection							
Connection	No of units	Demand (l/unit/day)	Total Outflow (l/day)	Total Outflow (l/s)	Infiltration (10%)	Dry Weather Flow (l/s)	Peak Flow (l/s)
Conn. 1 - Resi	130	450	58500	0.68	1.1	0.74	4.47
Conn. 2 - Resi	127	450	57150	0.66	1.1	0.73	4.37
Conn. 3 - Resi	266	450	119700	1.39	1.1	1.52	9.14
- Ex Resi	3	450	1350	0.02	1.1	0.02	0.10
- Creche	126	50	6300	0.07	1.1	0.08	0.20
Total	652	450	243000	2.81		3.09	18.28

5.4 Proposed Temporary Foul Water Pumpstations:

The two temporary foul water pumping stations are designed such that the associated holding tanks allow for the onsite effluent to be pumped at off peak times, reducing the pressure on the downstream public foul network. The gravity network before and after the pumping stations are designed such that the pumping stations can be taken offline should the downstream public network constrains be resolved. Both pumping stations shall discharge into the existing foul water gravity networks located to the north of the subject site.

The pumping stations shall be designed in detail, should they still be required, at connection application stage and shall be fully compliant with Uisce Éireann (Irish Water) COP Part 5. Specific inclusions at preliminary design stage for the layout and location of the temporary pump stations are listed below;

- Both pump stations are located at the lowest point of the respective foul water catchments to ensure suitable gravity inlet, whilst limiting depth, for the associate inlet,
- There is sufficient space to carry out the chosen method of pump maintenance and installation of temporary pumps,

- The access is sufficiently wide to accommodate a vacuum tanker, a large van or a mobile pump/generator,
- Access is provided to the pumping station site is via the access road suitably designed and constructed for such access with appropriate safe sight distances,
- No overhead obstructions or electrical cables are located at or near the site that could pose a risk of electrocution and have been located such that they are a minimum of 10m away for electrical servitudes as per ESB requirements,
- The location of the pumping station is not susceptible to flooding,
- Both pump stations are located a minimum of 15m from all proposed and existing dwelling/building to minimise the risk of odour, noise and vibration nuisance.

The provisional estimated 24 hours emergency storage/ temporary holding storage is in line with the Irish Water COP Section 5.11, is summarised in Table 5-2 below. This storage shall allow the for the off-peak pumping from each pump station to minimise the impact on the downstream foul network.

Table 5-2: Summary of Estimated Temporary Soul Water Storage

Estimated temporary 24-hour foul storage				
Summary of IW COP Section 5.11 24 -hour storage requiremetns				
Houses	Storage Hours		Max Storage Volume m^3	
0 - 250	24		112	
250 - 333	24 for 250 and 18 thereafter		139	
334 - 1667	24 for 250 18 u to 333 and 12 thereafter		437	
1668 - 3333	24 for 250. 18 u to 333. 12 u to 1667 and 10 thereafter		746	
Estimated Emergency Storage provided				
Pump Station	Total Inflow l/day	Total Inflow m^3/day	Storage provided m^3	additional capacity %
PS1	127 350	127	139	9%
PS2	57 150	57	65	14%

5.5 Proposed Foul Water Network:

The proposed foul drainage network comprises of a series of 150/225mm diameter pipes, discharging to the pumping stations and gravity outfall described above. Each residential unit is serviced by individual 100mm diameter connections in accordance with Irish Waters Code of Practice for Wastewater.

All on-site gravity foul sewers have been designed to be uPVC Class SN8 pipes, with gradients designed to achieve self-cleansing velocities and in compliance with Irish Wastewater Code of Practice (COP) Section 3.6 and Appendix B.

Foul water drains will be laid to comply with the Building Regulations 2010 and in accordance with the recommendations contained in the Technical Guidance Documents, Section H – Drainage and Wastewater Disposal, dated 2016.

All manholes will be constructed as block work, suitable precast products or cast in-situ concrete. Construction details for the proposed drainage systems are included in the accompanying planning submission drawing.

All standard drainage details including manhole details, pipe bedding, channels, hydrants etc. will be provided and are included in the accompanying planning drawings. Details of the types and construction methods will be agreed upon with Uisce Éireann (Irish Water) and the Local Authority, prior to construction. Drains generally will consist of PVC (to IS 123) or concrete spigot and socket pipes to IS 6.

Strict separation of surface water and foul sewerage will be imposed on the development. Drains will be laid out to minimise the risk of inadvertent connections of sinks, dishwashers etc. to the surface water system.

All works are to be carried out in accordance with Uisce Éireann's (Irish Water) Code of Practice for Wastewater Infrastructure, dated July 2020: Document IW-CDS-5030-03 & with Uisce Éireann's (Irish Water) Code of Practice for Water Infrastructure, dated July 2020: Document IW-CDS-5020-03 and any subsequent revisions thereof.

Refer to Pinnacle Consulting Engineering Drawings:

P211102-PIN-XX-XX-DR-C-00400-S2	FOUL WATER DRAINAGE LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00401-S2	FOUL WATER DRAINAGE LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00402-S2	FOUL WATER DRAINAGE LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00403-S2	FOUL WATER DRAINAGE LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00404-S2	FOUL WATER DRAINAGE LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00405-S2	FOUL WATER DRAINAGE LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00406-S2	FOUL WATER DRAINAGE LAYOUT- SHEET 6 OF 6
P211102-PIN-XX-XX-DR-C-00409-S2	FOUL WATER MANHOLE SCHEDULE
P211102-PIN-XX-XX-DR-C-00410-S2	FOUL WATER DRAINAGE LONGSECTION - SHEET 1 OF 7
P211102-PIN-XX-XX-DR-C-00411-S2	FOUL WATER DRAINAGE LONGSECTION - SHEET 2 OF 7
P211102-PIN-XX-XX-DR-C-00412-S2	FOUL WATER DRAINAGE LONGSECTION - SHEET 3 OF 7
P211102-PIN-XX-XX-DR-C-00413-S2	FOUL WATER DRAINAGE LONGSECTION - SHEET 4 OF 7
P211102-PIN-XX-XX-DR-C-00414-S2	FOUL WATER DRAINAGE LONGSECTION - SHEET 5 OF 7
P211102-PIN-XX-XX-DR-C-00415-S2	FOUL WATER DRAINAGE LONGSECTION - SHEET 6 OF 7
P211102-PIN-XX-XX-DR-C-00416-S2	FOUL WATER DRAINAGE LONGSECTION - SHEET 7 OF 7
P211102-PIN-XX-XX-DR-C-00215-S2	TEMPORARY FOUL PUMPING STATION 1
P211102-PIN-XX-XX-DR-C-00216-S2	TEMPORARY FOUL PUMPING STATION 2

6. Water Supply

6.1 Existing Watermain Network:

Uisce Éireann (Irish Water) GIS records and the site-specific topographical survey information have identified an existing Ø160mm HPPE watermain located along Oldcourt Road to the east of the site running in a north-westerly direction along Oldcourt Road and a Ø100mm uPVC watermain located in Bohernabreena Road to the west of the site, refer to Figure 6-1.

There are two existing raw water watermains crossing the subject site in an east-west direction, a Ø375mm Cast Iron Pipe and a Ø475mm cast iron pipe. It is proposed that these two existing pipes shall be diverted and located within a dedicated roadside servitude along the cycle track and footpath of the central east-west spine road of the proposed development.

Confirmation of Feasibility was received on the 5th of January 2024 for the Irish Water diversion application DIV23291, as indicated in Appendix B. Preliminary discussions have been had with the Irish Water and DCC drainage department and final conditions from Uisce Éireann (Irish Water) and DCC shall be agreed upon prior to undertaking the diversion. Part of said diversion has been initiated on the adjacent site to the east (diversion agreement ref DIV24134) in which the eastern adjacent raw water watermain in in progress at the time of writing this report.

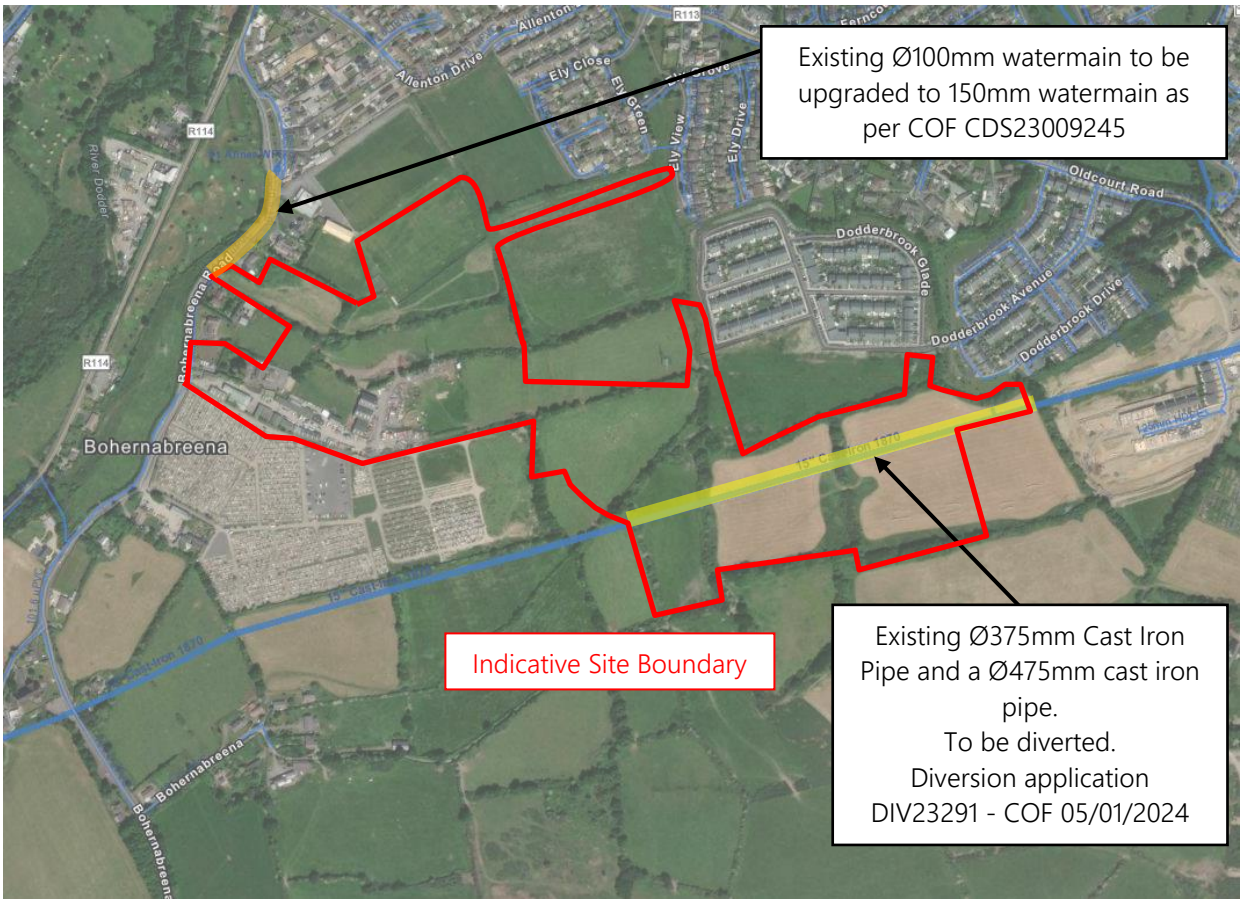

Figure 6-1: Existing water records – Uisce Éireann (Irish Water) GIS

6.2 Proposed Water Supply

A Pre-Connection Enquiry (PCE) was issued to Uisce Éireann (Irish Water) on the 8th of December 2023 which outlines the proposals for the development. The confirmation of feasibility COF (ref CDS23009245), as found in Appendix A, stated that water connection is feasible with conditions, summary of which is extracted below for ease of reference.

> "Water Connection - Feasible Subject to upgrades
>
> *- Primary connection should be from the East of the Development to the future 150mm ID provided by adjacent development. The proposed main must be constructed, connected to Uisce Éireann infrastructure and in function, prior the connection.*
>
> *- Secondary connection should be from the West of the Development, to the existing 4''uPVC distribution main. The connection should be closed during normal operations and open at time of emergency.*
>
> *- The proposed 150mm spine main is to be connected to Uisce Éireann infrastructure on either way.*
>
> *- If the connection from the West is made primary, the 4'' main has to be upgraded to 150mm pipe for approximately 300m. The upgrade will be funded by the Developer and the fee will be calculated at a connection application stage. The 4'' main has capacity to supply only 50 no. houses and any demand above would require the upgrade."*

It is proposed that the proposed development has 2 water supply connections, refer to Figure 6-2. The two connections will be on either end, east and west, of a proposed Ø150mm spine watermain. Several 100mm diameter looped networks shall supply water to the surrounding proposed residential units off of the 150mm spine main. The units immediately adjacent to the proposed 150mm spine main shall connect to the 150mm pipeline.

The COF connection conditions states that the western 150mm water connection requires an upgrade of the existing 100mm water main 9where use exceeds 50 no. houses) located in Bohernabreena Road. The upgrade shall consist of a new 150mm watermain, replacing the existing 100mm watermain from the western site connection northwards, terminating at the St Annes WPS. The upgrade shall be funded by the developer and shall be constructed as part of the proposed development. Further discussion, details of the connection and construction timelines of the required upgrade shall be agreed upon with Irish Water, post receipt of a grant of planning, during the connection application stage.

The ultimate connection and metering strategy will be finalized during detailed design and connection application stage with Irish Water prior to commencing with the development.

At the eastern proposed connection, the proposed Ø150mm watermain shall tie into a spur left for future connection under the planning submission for the adjacent eastern-located development (planning ref SD23A/0083).

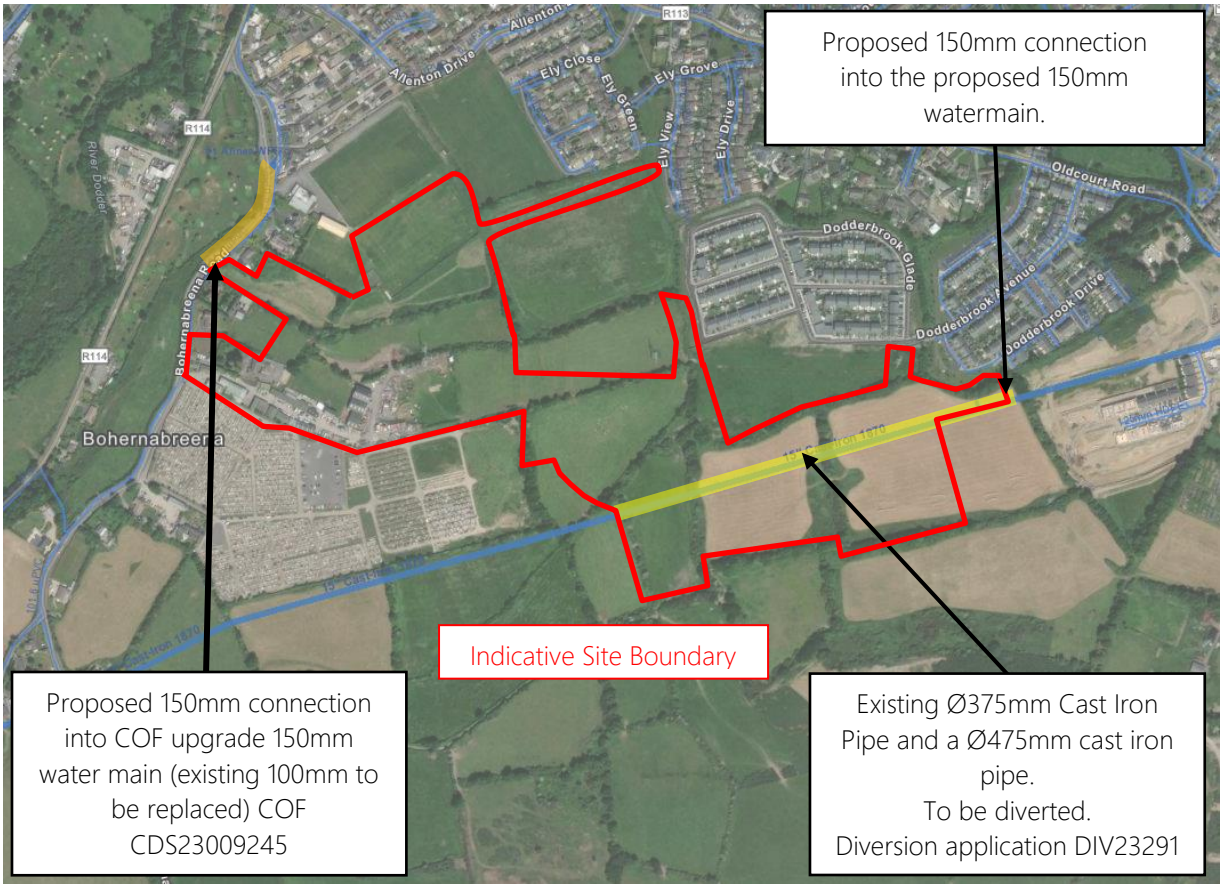

Figure 6-2: Proposed Water Supply Connections

6.3 Proposed Water Network:

The internal water supply reticulation network shall consist of Ø100mm and Ø150mm HDPE PE100 SDR17 pipes.

Water meters, sluice valves and hydrants, in line with Uisce Éireann (Irish Water) requirements and specifications, will be installed at the connections onto the existing water mains as required by Uisce Éireann (Irish Water).

Hydrants will be installed in accordance with the requirements of the Building Regulations and in accordance with the recommendations contained in the Technical Guidance Documents, Section B – Fire Safety, dated 2006, and these are detailed on our engineering drawings.

Refer to Pinnacle Consulting Engineering Drawings:

P211102-PIN-XX-XX-DR-C-00300-S2	WATERMAIN LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00301-S2	WATERMAIN LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00302-S2	WATERMAIN LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00303-S2	WATERMAIN LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00304-S2	WATERMAIN LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00305-S2	WATERMAIN LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00306-S2	WATERMAIN LAYOUT- SHEET 6 OF 6

6.4 Water Demand Calculations:

The water demand for the proposed development has been calculated below, in accordance with Uisce Éireann (Irish Water) regulations:

Residential:

Dwellings	= 523
PE 2.7 per dwelling	= IW COP
Demand	= 150 litres/head/day:
Daily Water Demand	= 211,815 litres/day

Non-Residential (Creche):

Estimated occupancy (PE)	= 126
Demand	= 90 litres/head/day
Daily Water Demand	= 11,340 litres/day

Total Water Demand

Total Daily Water Demand	= 223,155 litres/day
Daily demand	= 2.58
Average Flow (= 1.25 x Daily Demand)	= 3.23 litres/sec
Peak Flow (= 5 x Daily Demand)	= 16.14 litres/sec

A breakdown of the estimated water demand for the proposed development is summarised in Table 6-1.

Table 6-1: Summary of Water Supply Demand

Total Site - Water Demand							
Unit type	No.	PE	Demand (l/unit/day)	Daily Water Demand (l/day)	Daily Water Demand (A) (l/s)	Average flow (A) x1.15 = (B) (l/s)	Peak Flow (B) x 5PF (l/s)
Houses	319	2.7	150	129195	1.50	1.87	9.35
Duplex	142	2.7	150	57510	0.67	0.83	4.16
Apartment	62	2.7	150	25110	0.29	0.36	1.82
Creche	1 (126)	1	90	11340	0.13	0.16	0.82
Total	**523**			**223155**	**2.58**	**3.23**	**16.14**

The total daily water demand from the public supply, for the development, is estimated at 223.16 m^3/day, with a peak demand of 16.14 l/s.

6.5 Proposed Watermain Diversion

There are two existing watermains, a Ø375mm Cast Iron Pipe and a Ø475mm cast iron pipe, crossing the site in an east-west direction. It is proposed that these two existing pipes shall be diverted and located within a dedicated roadside servitude along the cycle track and footpath of the central east-west spine road of the proposed development.

Confirmation of Feasibility (COF) was received on the 5th of January 2024 for the Irish Water diversion application DIV23291, as indicated in Appendix B and extracted below for ease of reference. Preliminary discussions have been had with the DCC drainage department and final conditions from Uisce Éireann (Irish Water) and DCC shall be included in the planning submission.

COF: *"Based upon the details you have provided with your enquiry and as assessed by Irish Water, we wish to advise you that, subject to valid agreement/s being put in place, the proposed diversion can be facilitated."*

Refer to Pinnacle Consulting Engineering Drawings:

P211102-PIN-XX-XX-DR-C-00310-S2	EXISTING RAW WATER WATERMAIN DIVSERION
P211102-PIN-XX-XX-DR-C-00311-S2	WATERMAIN DIVERSION LONG SECTIONS

7. Surface Water Network

7.1 Existing Surface Water Drainage Networks:

There are several existing agricultural ditches across the site, conveying surface water runoff from the south northwards across the subject site. The surrounding ditches ultimately discharge into the Dodder River, refer to Figure 6-1.

According to South Dublin County Council GIS record Information and site-specific topographical survey, there is an existing Ø450mm surface water sewer on the west of the site. The existing Ø450mm sewer conveys surface water from the Bohernabreena cemetery northwards through the proposed development.

A provisional review of the SDCC SFRA indicated that the entire site is within Flood Zone C, refer to Figure 7-1. A Site-Specific Flood Risk Assessment (SSFRA) completed by Kilgallen and Partners Consulting Engineers.

The SSFRA, as prepared by Kilgallen and Partners, concludes, "The proposed development is not at risk of flooding and will not increase flood risk elsewhere. The proposed development is therefore appropriate from a flood risk perspective."

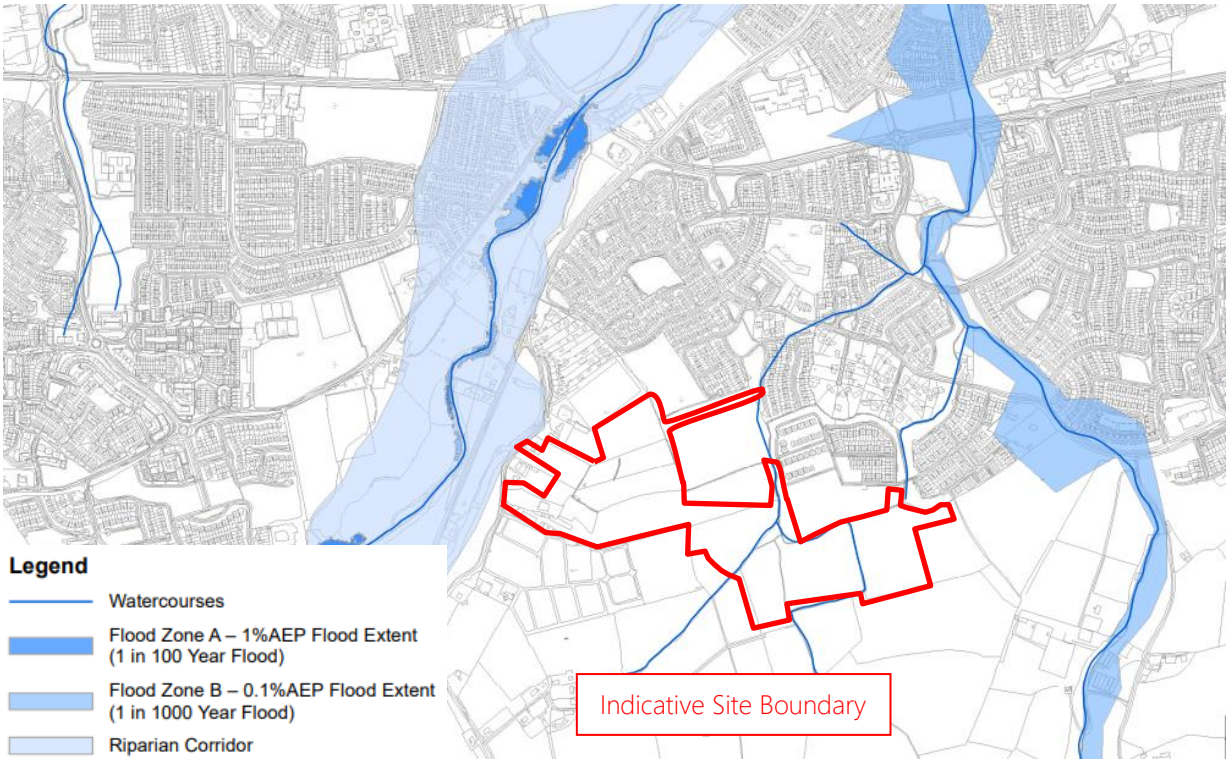

Figure 7-1: Existing Surface water records – SDCC SFRA Extract

Pre-development Surface Water Analysis:

As discussed in the topography section of this report, the subject site generally falls from south to north, with a high point of the southern boundary of approximately 119.78m OD Malin. The pre-development existing surface water runoff of the subject site drains freely across the agricultural fields, towards the north of the site, in sheet flow conditions until is discharges into the network of existing drainage ditches. Various existing ditches occur along the southern boundary, capturing and conveying surface water from the above

located overland catchment, located to the south of the development, preventing external surface water runoff from entering the agricultural fields which will be developed. Refer to Figure 7-2 for an extract of Pinnacle Consulting Engineers Drawing number P211102-PIN-XX-XX-DR-C-00220-S2 PRE-DEVELOPMENT FLOW ROUTE ANALYSIS.

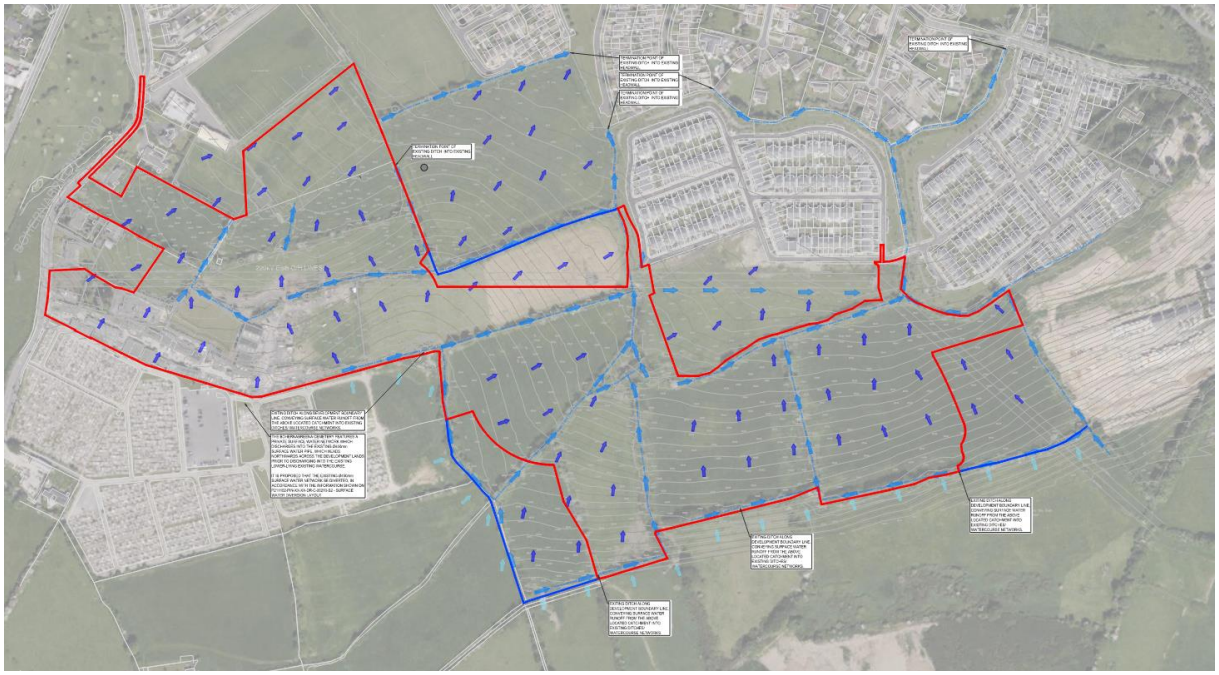

Figure 7-2: Extract - P211102-PIN-XX-XX-DR-C-00220-S2 PRE-DEVELOPMENT FLOW ROUTE ANALYSIS

Infiltration Testing:

Infiltration testing was undertaken by IGLS in July 2024. The infiltration tests were performed in accordance with BRE Digest 365 'Soakaway Design'. Refer to Appendix C for the detailed infiltration test report.

Overall, of the 32 No. infiltration tests were conducted across the site, it was found that the existing substrate material has sufficient infiltration rate ($1.4x10^{-5}$ m/s) to be accounted for in the SuDS design for the proposed development, in accordance with the CIRIA SuDS Manual Table 25.1, extracted below in Table 7-1 for ease of reference.

Table 7-1: Extract from CIRIA Suds Manual Table 25.1

Table 25.1 - Typical infiltration coefficients based on soil texture (after Bettess, 1996)		
Soil type/texture	ISO 14688-1 description	Typical infiltration
	(after Blake, 2010)	coefficients (m/s)
Good infiltration media		
• gravel	Sandy GRAVEL	3×10^{-4} - 3×10^{-2}
• sand	Slightly silty slightly clayey SAND	1×10^{-5} - 5×10^{-5}
• loamy sand	Silty slightly clayey SAND	1×10^{-4} - 3×10^{-5}
• sandy loam	Silty clayey SAND	1×10^{-7} - 1×10^{-5}

It was noted that a ground water table was present in several borehole location, generally at 1.5-1.7m deep. The proposed design has taken account of the water table depth to ensure that there is no impact on the existing groundwater table or influence of the groundwater table on the proposed development.

Existign Surface water Diversion:

The existing Ø450mm surface water sewer shall be diverted along an alternate route though the proposed development, refer to Figure 7-3.

During the aforementioned meeting with the SDCC Water Services division, it was discussed and agreed in principle, that the diversion was required to facilitate the new proposed development. Furthermore, said diversion should remain piped, as it is currently, ensuring that the same capacity is provided.

It is proposed that the diverted pipeline would remain piped rather than be discharged into an open ditch within the boundary of the proposed development, which would create a surface water flood risk if the upstream network's discharge in the pipeline was not attenuated.

The proposed diverted surface water pipeline is setback a minimum of 5m from all proposed structures. The proposed development drainage, both foul and surface water, shall remain completed isolated from the proposed diversion.

Refer to Pinnacle Consulting Engineers drawings;

P211102-PIN-XX-XX-DR-C-00210-S2	SURFACE WATER DIVERSION LAYOUT
P211102-PIN-XX-XX-DR-C-00211-S2	SURFACE WATER DIVERSION PROPOSED LONGSECTION

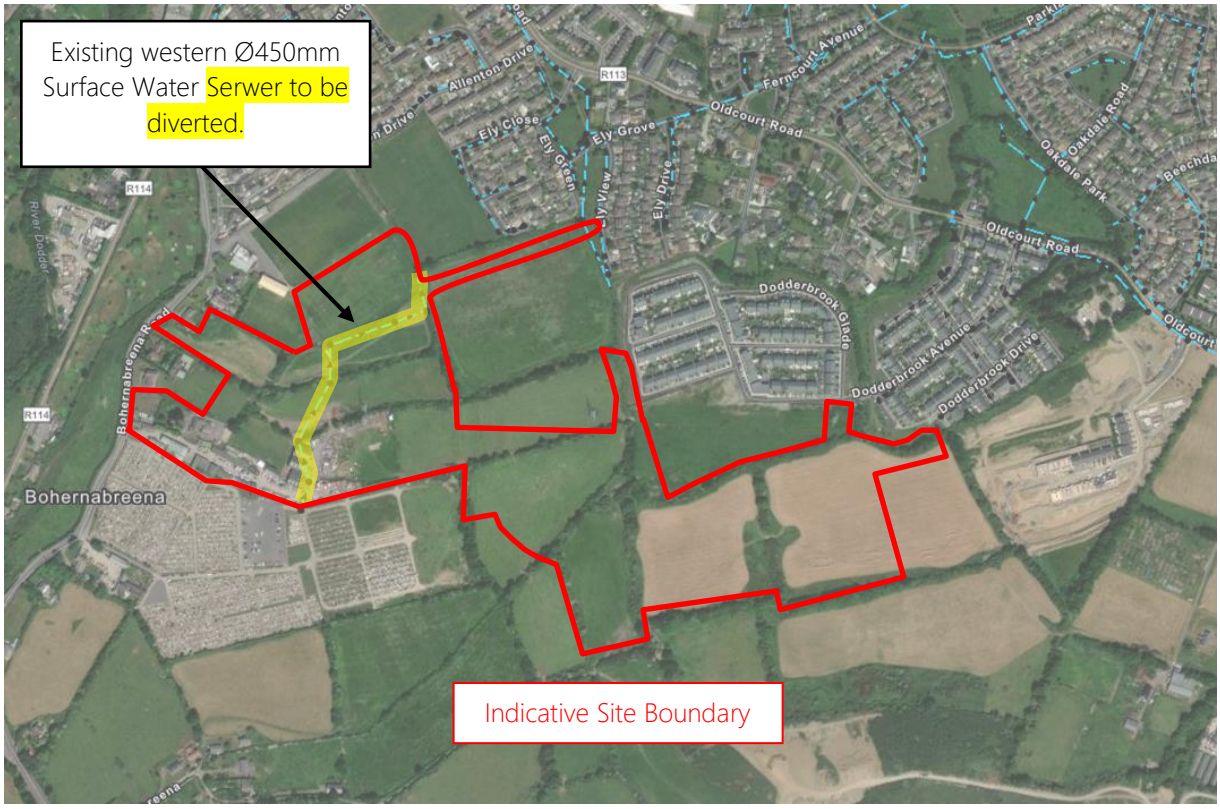

Figure 7-3: Existing Surface water records – SDCC GIS

7.2 Proposed Surface Water Drainage:

The Surface Water Drainage design and SuDS Assessment carried out for the subject site have been undertaken in compliance with the requirements of the SDCC County Development Plan, the guidelines set by the Greater Dublin Strategic Drainage Study (GDSDS), the CIRIA SuDS Guideline and the Sustainable Drainage Explanatory Design & Evaluation Guide 2022.

The design concept intends to employ SuDS drainage measures to manage the post-development surface water runoff in such a manner that the urban drainage network mimics the natural drainage process as far as possible, limiting the impact on the downstream receiving environment. The proposed system intends to manage surface water runoff within the development to ensure there is no increased risk of flooding on or downstream of the subject site.

Due to the steep nature of the site, a piped surface water conveyance system has been added to the design as a redundancy and shall only be engaged by the overtopping or bypassing upstream SuDS features, or in areas where SuDS measures are not viable. The piped conveyance network will seek to capture any surface water that has potentially bypassed or exceeded the SuDS features capacity and discharge the surface water at a safe strategic outlet location via an attenuation basin, reducing the risk of overland flooding. Furthermore, the roads throughout the development have been designed as overland flow routes for exceedance events in which the surface water shall still be conveyed to the attenuation basins.

All existing ditches on the site, of function and purpose to the wider surface water network within the region, have been maintained across the site, with road crossing culverts provided to maintain function of the existing watercourses. The post-development surface water design shall capture and treat surface at source where possible, the conveyance system shall drain surface water northwards and discharge in existing ditches, in line with the pre-development runoff condition on the site. Refer to Figure 7-4 for the post development overland flow route analysis, extracted from Pinnacle Consulting engineers Drawings P211102-PIN-XX-XX-DR-C-00221-S2 - POST-DEVELOPMENT FLOW ROUTE ANALYSIS.

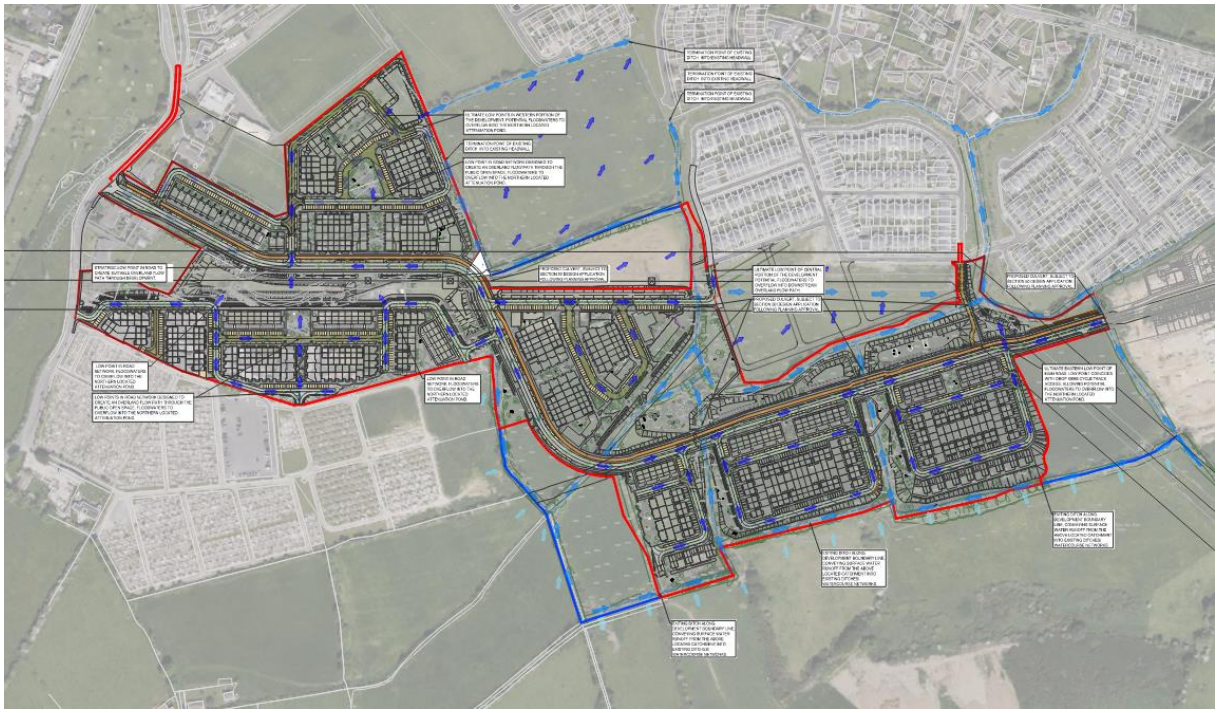

Figure 7-4: Extract - P211102-PIN-XX-XX-DR-C-00221-S2 - POST-DEVELOPMENT FLOW ROUTE ANALYSIS

Proposed Culverts:

In order to maintain the functioning of the existing agricultural ditches, several road-crossing culverts have be designed in line with the Office of Public Works (OPW) requirements and the Arterial Drainage Act 1945. During detailed design, post-planning, the necessary Section 50 application shall be made for each of the proposed culverts prior to commencement of the development.

In line with the ecologists' requirements and in line with NRA "Guidelines for the Crossing for Watercourses During National Road Scheme", selected crossings have been provided at several of the major road crossing culverts coinciding with existing hedges, including provision for safe animal crossing.

Refer to Pinnacle Consulting Engineers drawings;

P211102-PIN-XX-XX-DR-C-01000-S2	STOMRWATER CULVERT OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-01001-S2	STOMRWATER CULVERT 01 DETAILS
P211102-PIN-XX-XX-DR-C-01002-S2	STOMRWATER CULVERT 02 DETAILS
P211102-PIN-XX-XX-DR-C-01003-S2	STOMRWATER CULVERT 03 DETAILS
P211102-PIN-XX-XX-DR-C-01004-S2	STOMRWATER CULVERT 04 DETAILS
P211102-PIN-XX-XX-DR-C-01005-S2	STOMRWATER CULVERT 05 DETAILS
P211102-PIN-XX-XX-DR-C-01006-S2	STOMRWATER CULVERT 06 DETAILS
P211102-PIN-XX-XX-DR-C-01007-S2	STOMRWATER CULVERT 07 DETAILS
P211102-PIN-XX-XX-DR-C-01008-S2	STOMRWATER CULVERT 08 DETAILS

Hydrology and Attenuation:

The subject site, in its current state, is predominantly in greenfield conditions, consisting of existing agricultural lands and operating farmlands. A small portion to the southwest of the subject site is an existing hardstanding area proposed to be demolished and developed into residential units. It is unlikely that the existing portion of the hardstanding area to the southwest is currently being attenuated, the proposed residential development of this area shall improve the surface water runoff rate by limiting the site surface water runoff rate to greenfield conditions (Qbar).

The attenuated post-development surface water runoff shall discharge into the existing ditches at a restricted rate equal to the greenfield runoff rate (Qbar) as specified by the Greater Dublin Strategic Drainage Study (GDSDS). It is important to note that "Long Term" storage, as outlined in Section 6.7 of the GDSDS, is not necessary when outflows are restricted to Qbar, according to Table 6.3 of the GDSDS. Where the subject site shall have multiple surface water outlets in the existing ditches, each sub-catchment shall discharge surface water at a restricted rate, proportional to the area of the contributing sub-catchment.

The surface water from the proposed drainage system will be restricted/attenuated using a vortex flow control device (such as a Hydrobrake or similar) along with associated Sustainable Urban Drainage Systems (SuDS) features and overland nature-based solutions like basins, swales, and bio-retention infrastructure. Additionally, the surface water discharge will pass through a full retention fuel/oil separator, sized according to the site's permitted discharge levels.

The post-development catchment runoff coefficients utilized for the surface water assessment have been set out in Table 7-2. The final post-development runoff shall be estimated using a 1D- hydrodynamic stormwater management model (SWMM) using Causeway Flow. The hardstanding within the SWMM shall be modelled with the parameters set out in Table 7-2.

Table 7-2: Post-development Runoff Coefficients

Post-development Runoff Coefficients	
Area	(C factor (coefficient)) or (impermeability/100)
Roads	0.9
Roofs	0.95
Footpath	0.9
Private Landscaping (flat and isolated)*	0.2
Public Landscaping	0.1
Direct rainfall SuDS (permeable paving, rain gardens)	0.9
Green Roofs	0.9
Direct rainfall in Attenuation Basins	1

*Private landscaping C Value of 0.2 includes for 10% urban creep.

Note A: Where the permeable paving is designed to attenuate the direct rainfall, it is assumed to capture 90% of the rainfall volume. Therefore, the full rainfall volume must be included towards the required attenuation volume for the site. Cv is set to 0.9 and is modelled as a storage element in the SWMM.

Note B: Where the rain garden is design to attenuate the direct rainfall, it captures 90% of the rainfall volume. Therefore, the full rainfall volume must be included towards the required attenuation volume for the site. Cv is set to 0.9 and is modelled as a storage element in the SWMM.

Note C: The attenuation basins capture 100% of the direct rainfall volume. Therefore, the full rainfall volume over the plan area must be included towards the required attenuation volume for the site. Cv is set to 1 and is modelled as a storage element in the SWMM.

Note D: Where green roofs areas capture 90% of the direct rainfall volume. The full rainfall volume must be included towards the required attenuation volume for the site. Cv is set to 0.9 and is modelled in the SWMM.

The estimated average runoff coefficient across the development area is in approximately 0.62 for the entire development, typical for a development of this nature. A summary of the hardstanding, effective area and runoff coefficients for catchments 1 to 3, can be seen in Tables 7-3 to Table 7-5.

Table 7-3: Catchment 1 – Summary of Effective Hardstanding Area

Catchment 1 - Summary of Harstanding Breakdown and Effective Area			
Surface Type	Area (m^2)	C-Value	Effective Area (m^2)
Roof	8812	0.95	8371.4
Cycle Track	1866	0.9	1679.4
Footpath	6423	0.9	5780.7
Road	7900	0.9	7110
Private Landscape	8208	0.2	1641.6
Public Landscape	27410	0.1	2741
Permeable Paving	5800	0.9	5220
Rain Garden	1506	0.9	1355.4
Detention Basin	4622	1	4622
Bio Retention Areas/ Tree Pits	812	0.9	730.8
Green roof	0	0.9	0
Total	73359	NA	39252.3
Average C Value	0.54		
Hardstanding %	53.51		

Table 7-4: Catchment 2 – Summary of Effective Hardstanding Area

Catchment 2 - Summary of Harstanding Breakdown and Effective Area			
Surface Type	Area (m^2)	C-Value	Effective Area (m^2)
Roof	2650	0.95	2517.5
Cycle Track	442	0.9	397.8
Footpath	6545	0.9	5890.5
Road	3869	0.9	3482.1
Private Landscape	2115	0.2	423
Public Landscape	7303	0.1	730.3
Permeable Paving	1770	0.9	1593
Rain Garden	546	0.9	491.4
Detention Basin	1689	1	1689
Bio Retention Areas/ Tree Pits	785	0.9	706.5
Green roof	1770	0.9	1770
Total	29484	NA	19691.1
Average C Value	0.67		
Hardstanding %	66.79		

Table 7-5: Catchment 3 – Summary of Effective Hardstanding Area

Catchment 3 - Summary of Harstanding Breakdown and Effective Area			
Surface Type	Area (m^2)	C-Value	Effective Area (m^2)
Roof	14030	0.95	13328.5
Cycle Track	2040	0.9	1836
Footpath	9899	0.9	8909.1
Road	13748	0.9	12373.2
Private Landscape	7798	0.2	1559.6
Public Landscape	22056	0.1	2205.6
Permeable Paving	5105	0.9	4594.5
Rain Garden	2080	0.9	1872
Detention Basin	6826	1	6826
Bio Retention Areas/ Tree Pits	2495	0.9	2245.5
Green roof	321	0.9	321
Total	86398	NA	56071
Average C Value	0.65		
Hardstanding %	64.9		

The allowances and assumptions utilized for hydraulics assessment and attenuation design are listed below.

Rainfall data:	Refer to Appendix D – Met Eireann Historical Data
SAAR:	991 mm – Met Eireann Historical Data
Hardstanding	Table 7-3 to 7-5 (modelled per catchment)
Soil type:	Type 2
Climate Change:	20% Allowance of post-development rainfall
Urban Creep:	10% Allowance – for private green space area accounted for in runoff coefficient.

The Local Authority requirements stipulate that post-development run-off rates are limited to greenfield run-off rates for the site. The greenfield run-off rates for the site have been calculated in accordance with the Institute of Hydrology report No 124 "Flood Estimation for Small Catchments". A summary of the greenfield runoff rate and post-development attenuated discharges are presented in Table 7-6. Refer to Appendix E for the pre-development greenfield runoff rate estimation calculation. Refer to Appendix F for the SWMM simulation results for the proposed stormwater design, including SuDS elements.

Table 7-6: Summary of Estimate Surface Water Runoff Rates

Summary of Surface Water Discharge Rates				
Catchment 1				
	Greenfields/Pre-development (l/s)	Post-development (attenuated) (l/s)	Attenuation required (m^3)	Attenuation Provided (m^3)
Q_{bar}	20.1	-	-	-
1:10	33.5	16.2	-	-
1:30	42.1	16.4	-	-
1:100+20%CC	52.2	17.2	5003	5337
Catchment 2				
	Greenfields/Pre-development (l/s)	Post-development (attenuated) (l/s)	Attenuation required (m^3)	Attenuation Provided (m^3)
Q_{bar}	8	-	-	-
1:10	13.4	5.4	-	-
1:30	16.9	5.5	-	-
1:100+20%CC	20.9	6.2	2011	2416
Catchment 3				
	Greenfields/Pre-development (l/s)	Post-development (attenuated) (l/s)	Attenuation required (m^3)	Attenuation Provided (m^3)
Q_{bar}	23.6	-	-	-
1:10	39.4	23.3	-	-
1:30	49.6	23.6	-	-
1:100+20%CC	61.4	23.6	5893	8024

Overall, discharge for all 3 catchments is less than the Qbar for each respective catchment and with outfall locations strategically chosen to mimic the pre-development runoff from the subject site. Furthermore, the attenuation provided is in excess of the simulated required attenuation volume, providing additional safety freeboard.

The attenuation provided in the final planning application is in excess of the 20% increase in attenuation requested by SDCC drainage department and where all aspects of the attenuation as compliant with local county council requirements, the surface water drainage design attenuation systems are deemed to be suitable.

7.3 SuDS Strategy:

As per the SDCC Development Management Plan and the Sustainable Drainage Explanatory Design & Evaluation Guide 2022, surface water should be managed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 6, for New Developments and CIRIA guidelines. These documents specify that surface water run-off should be managed as close to its source as possible, with the re-use of rainwater within the buildings and infiltration prioritised.

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 consist 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. 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.

A stormwater management or treatment train approach ensures that run-off quantity and quality are improved and mimics the greenfield condition for the subject site as far as possible. 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:

Source control: conveyance and infiltration of run-off; and

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

It is proposed that the surface water from the proposed development will be captured by various nature-based sustainable urban drainage systems (SuDS) interventions over the use of a conventional gully and piped surface water network, as guided by the SDCC Sustainable Drainage Explanatory Design & Evaluation Guide 2022.

Due to the steep nature of the site, a piped surface water conveyance system has been added to the design as a redundancy and shall only be engaged by the overtopping or bypassing upstream SuDS features. The piped conveyance network will seek to capture any surface water that has potentially bypassed or exceeded the SuDS features capacity and discharge the surface water at a safe strategic outlet location, reducing the risk of overland flooding.

The proposed SuDS interventions have been implemented to ensure runoff is treated to the standards outlined in the Greater Dublin Strategic Drainage Study and to add bio-diversity value, improving the aesthetic design of the development. All the proposed SuDS measures are subject to the findings from a

ground investigation, including infiltration and observations of any potential water tables. All proposed surface water and SuDS standard details shall comply with SDCC Taking In Charge (TIC) standards.

Where the subject site is known to have an average permeability rate of $1.4x10^{-5}$ m/s, infiltration has been incorporated into the majority of the proposed SuDS measures, including; swales, bio-retention tree pits, bio-retention rain gardens, land drains/filter drains and attenuation basins.

The proposed SuDS measures selected incorporated in the design for the proposed site are listed below and discussed in detail in Tables 7-7 and 7-8, including;

- Green roofs
- Permeable paving
- Swales
- Land/filter drains
- Bio-retention Tree pits
- Bio-retention Rain gardens
- Attenuation/Detention basins
- Petrol/Hydrocarbon separators
- Flow control devices

A site-specific SuDS Maintenance Manual has been prepared under a separate cover.

Table 7-7: Proposed Source Control SuDS Measures

SUDS Measure	Measure Outline	Proposed Implementation on Site
Permeable Pavements	Permeable pavements are alternative paving surfaces to standard finishes that allow stormwater run-off to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated.	Permeable paving will be utilised for the surface-level car parking area to provide treatment and storage to rainwater falling on these areas. The primary use of the permeable paving sub-base will be used for attenuation purposes and interception. The design will include a perforated pipe to convey surface water to the site-wide drainage system. Based on positive finding in infiltration testing, permeable paving shall infiltrate into the substrate in accordance with SDCC guidelines.
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 will be used for access road surface water treatment, where possible, to treat water at the source before conveying it to the downstream attenuation facilities. Based on positive finding in infiltration testing, all swales shall infiltrate into the substrate in accordance with SDCC guidelines.
Green Roofs	As well as providing ecological benefits, green roofs contribute the following positive effects to surface water drainage design: • The retention of water, through storage in the growing medium and evapotranspiration from the roof's plants and substrate, reducing run-off volumes and the burden on the drainage network. • Due to the time for water to infiltrate and permeate the substrate, there is also a reduction in peak rates of run-off, helping to reduce the risk of flooding. • They improve water quality through the filtration of pollutants during the	Several areas of green roofs are proposed, specifically on the proposed apartment blocks.

	process of water infiltration. This provides treatment in line with the CIRIA SuDS Manual management train.	
Filter Drains	Filter Drains are shallow trenches filled with gravel and wrapped in a geotextile membrane to treat and temporarily store surface water run-off.	Filter Drains are provided for the footpath and podium level surface water treatment to treat surface water at the source before conveying it to the site-wide surface water drainage network. Based on positive finding in infiltration testing, all filter drains shall infiltrate into the substrate in accordance with SDCC guidelines.
Bio-retention rain gardens and tree pits	As well as providing ecological benefits, bio-retention elements contribute the following positive effects to surface water drainage design: • The retention of water, through storage in the growing medium and evapotranspiration from the roof's plants and substrate, reducing run-off volumes and the burden on the drainage network. • Due to the time for water to infiltrate and permeate the substrate, there is also a reduction in peak rates of run-off, helping to reduce the risk of flooding. They improve water quality through the filtration of pollutants during the process of water infiltration. This provides treatment in line with the CIRIA SuDS Manual management train.	Bio-retention tree pits shall be utilized extensively alongside roads acting ass the first capture device for road surface runoff and an essential treatment for potential contaminants from the road surface. Bio-retention rain gardens shall be utilized in selected private areas as small containment private planters, receiving runoff from private roofs. Public Park areas will have selected bio-retention rain gardens as source control, treating surface water runoff from the immediate surrounding area as well as surface water pipe to the control area. Based on positive finding in infiltration testing, all tree pits and rain gardens drains shall infiltrate into the substrate in accordance with SDCC guidelines.

Table 7-8: Proposed Site Control SuDS Measures

SUDS Measure	Measure Outline	Use on Site
Attenuation Facilities and Flow controls	Attenuation facilities, proposed in the form of detention basins, are used to create surface-level storage for the temporary storage of surface water before controlled release to the receiving existing watercourses to eh north of the subject site. Flow Control devices are used to restrict the outfall from the surface water drainage system to the equivalent of the existing greenfield run-off rate. This ensures the development will not give rise to flooding downstream of the site.	Several detention basins are proposed on the lower-lying northern open space within the subject site. The onsite post-development runoff shall be attenuated prior to discharging into the existing receiving watercourse at a restricted greenfield runoff rate. Suitable vegetation shall be incorporated into the attenuation facility to ensure visually appealing aesthetics and water quality treatment. The proposed basins shall have a maximum side slope of 1:3. Based on positive finding in infiltration testing, all attenuation basins shall infiltrate into the substrate in accordance with SDCC guidelines.
Hydrocarbon Interceptor	A hydrocarbon interceptor is a trap used to filter out hydrocarbon pollutants from rainwater run-off. It is typically used in road construction to prevent fuel contamination of water courses carrying away the run-off. Hydrocarbon interceptors work on the premise that some hydrocarbons such as petroleum and diesel float on the top of water. The contaminated water enters the interceptor typically after flowing off roads and entering a drain before being deposited into the first tank inside the interceptor. The first tank builds up a layer of the hydrocarbon as well as other scum preventing it from entering the watercourse.	Hydrocarbon Interceptors will be installed, upstream of the proposed attenuation facilities as a final treatment.

Based on a preliminary surface water assessment of the subject site, provisional SuDS volumes have been estimated, as indicated in Tables 7-9 to 7-11.

Table 7-9: Catchment 1 - Summary of Preliminary SuDS Volume

Site Catchment 1 Attenuation Storage				
Estimated Attenuation Storage Provided				
SuDS Element	Value	Units	SDCC SuDS annual - Indicative Attenuation storage (m^3 of storage per m^2 of SuDS structure)	Volume m^3
Permeable Paving (0.35m deep sub base)	5800.00	m^3	0.15	870
Bio Retention Tree Pit	812.00	m^2	0.3	243.6
Rain Garden	1371.00	m^2	0.3	411.3
Private Rainwater Planters	135.00	m^2	0.3	40.5
Green Roofs	0.00	m^2	0.075	0
Swales	904.00	m^2	0.6	542.4
Land/Filter Drains	521.00	m^2	0.2	104.2
Detention Basin	3125	m^3	1	3125
Total				**5337**

Table 7-10: Catchment 2 - Summary of Preliminary SuDS Volume

Site Catchment 2 Attenuation Storage				
Estimated Attenuation Storage Provided				
SuDS Element	Value	Units	SDCC SuDS annual - Indicative Attenuation storage (m^3 of storage per m^2 of SuDS structure)	Volume m^3
Permeable Paving (0.35m deep sub base)	1770.00	m^3	0.15	265.5
Bio Retention Tree Pit	785.00	m^2	0.3	235.5
Rain Garden	481.00	m^2	0.3	144.3
Private Rainwater Planters	65.00	m^2	0.3	19.5
Green Roofs	1770.00	m^2	0.075	132.75
Swales	564.00	m^2	0.6	338.4
Land/Filter Drains	0.00	m^2	0.4	0
Detention Basin	1280	m^3	1	1280
Total				**2416**

Table 7-11: Catchment 3 - Summary of Preliminary SuDS Volume

Site Catchment 3 Attenuation Storage				
Estimated Attenuation Storage Provided				
SuDS Element	Value	Units	SDCC SuDS annual - Indicative Attenuation storage (m^3 of storage per m^2 of SuDS structure)	Volume m^3
Permeable Paving (0.35m deep sub base)	5105.00	m^3	0.15	765.75
Bio Retention Tree Pit	2495.00	m^2	0.3	748.5
Rain Garden	1807.00	m^2	0.3	542.1
Private Rainwater Planters	273.00	m^2	0.3	81.9
Green Roofs	321.00	m^2	0.075	24.075
Swales	1454.00	m^2	0.6	872.4
Land/Filter Drains	0.00	m^2	0.4	0
Detention Basin	4989	m^3	1	4989
Total				**8024**

Refer to Pinnacle Consulting Engineers drawings;

P211102-PIN-XX-XX-DR-C-00600-S2	SUDS DRAINAGE LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00601-S2	SUDS DRAINAGE LAYOUT- SHEET 1 OF 6
P211102-PIN-XX-XX-DR-C-00602-S2	SUDS DRAINAGE LAYOUT- SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00603-S2	SUDS DRAINAGE LAYOUT- SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00604-S2	SUDS DRAINAGE LAYOUT- SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00605-S2	SUDS DRAINAGE LAYOUT- SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00606-S2	SUDS DRAINAGE LAYOUT- SHEET 6 OF 6
P211102-PIN-XX-XX-DR-C-00610-S2	SURFACE WATER CATCHMENT LAYOUT- OVERALL LAYOUT
P211102-PIN-XX-XX-DR-C-00632-S2	SURFACE WATER DRAINAGE LONGSECTION - SHEET 2 OF 6
P211102-PIN-XX-XX-DR-C-00633-S2	SURFACE WATER DRAINAGE LONGSECTION - SHEET 3 OF 6
P211102-PIN-XX-XX-DR-C-00634-S2	SURFACE WATER DRAINAGE LONGSECTION - SHEET 4 OF 6
P211102-PIN-XX-XX-DR-C-00635-S2	SURFACE WATER DRAINAGE LONGSECTION - SHEET 5 OF 6
P211102-PIN-XX-XX-DR-C-00636-S2	SURFACE WATER DRAINAGE LONGSECTION - SHEET 6 OF 6
P211102-PIN-XX-XX-DR-C-00620-S2	SUDS TYPICAL DETAILS - SHEET 1 OF 3
P211102-PIN-XX-XX-DR-C-00621-S2	SUDS TYPICAL DETAILS - SHEET 2 OF 3
P211102-PIN-XX-XX-DR-C-00622-S2	SUDS TYPICAL DETAILS - SHEET 3 OF 3
P211102-PIN-XX-XX-DR-C-00640-S2	SURFACE WATER ATTENUATION SECTION - SHEET 1 OF 9
P211102-PIN-XX-XX-DR-C-00641-S2	SURFACE WATER ATTENUATION SECTION - SHEET 2 OF 9
P211102-PIN-XX-XX-DR-C-00642-S2	SURFACE WATER ATTENUATION SECTION - SHEET 3 OF 9
P211102-PIN-XX-XX-DR-C-00643-S2	SURFACE WATER ATTENUATION SECTION - SHEET 4 OF 9
P211102-PIN-XX-XX-DR-C-00644-S2	SURFACE WATER ATTENUATION SECTION - SHEET 5 OF 9
P211102-PIN-XX-XX-DR-C-00645-S2	SURFACE WATER ATTENUATION SECTION - SHEET 6 OF 9
P211102-PIN-XX-XX-DR-C-00646-S2	SURFACE WATER ATTENUATION SECTION - SHEET 7 OF 9
P211102-PIN-XX-XX-DR-C-00647-S2	SURFACE WATER ATTENUATION SECTION - SHEET 8 OF 9
P211102-PIN-XX-XX-DR-C-00648-S2	SURFACE WATER ATTENUATION SECTION - SHEET 9 OF 9

7.4 Proposed Surface Water Network (conventional):

All standard drainage details including manhole details, pipe bedding, channels, hydrants etc. will be provided and are included in the drawings listed below. Details of the types and construction methods will be agreed upon with the Local Authority, prior to construction. Drains generally will consist of PVC (to IS 123) or concrete spigot and socket pipes to IS 6.

Drains shall be laid to comply with the requirements of the Building Regulations and in accordance with the recommendations contained in the Technical Guidance Documents, Section H – Drainage & Wastewater Disposal, dated 2016.

Strict separation of surface water and foul sewerage will be imposed on the development. Drains will be laid out to minimise the risk of inadvertent connections of sinks, dishwashers etc. to the surface water system.

In order to minimise the risk of floating contamination of the surface water system, road gullies will be precast trapped gullies to BS5911:Part2:1982.

Concrete bed and surround to the pipe runs will be used where the cover to the pipes is less than 900mm, where the pipes are sufficiently close to the building, or where the pipe runs are below the ground floor slab.

7.5 Construction Phase Surface Water Management

Water pollution will be minimised by the implementation of good construction practices. Such practices will include adequate bunding for oil containers, wheel washers and dust suppression on on-site roads, and regular plant maintenance.

The Construction Industry Research and Information Association provides guidance on the control and management of water pollution from construction sites in their publication Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors – C532 CIRIA Report (Masters-Williams et al, 2001), which provides information on these issues.

Pollutants can commonly include suspended solids, oil, chemicals, cement, cleaning materials and paints. These can enter controlled waters in various ways:

- directly into a watercourse
- via drains or public sewers
- via otherwise dry ditches
- in old field drains
- by seepage into groundwater systems
- through excavations into underlying aquifers
- by disturbance of an already contaminated site

The proximity of the site to streams, aquifers and water abstractions; potential sources, pathways and impacts of pollution; and the historical uses of the site and nearby areas have been examined early in

project planning and design, to ensure that suitable redesign and mitigation measures are undertaken as necessary.

During construction, careful management and planning will help minimise water pollution. This may include adequate bunding of all oil tanks, wheel washers and dust suppression on haul roads, particular care to be taken near watercourses, and regular plant maintenance.

A contingency plan for pollution emergencies should also be developed by the contractor and regularly updated, which would identify the actions to be taken in the event of a pollution incident.

The CIRIA document (2001), recommends that a contingency plan for pollution emergencies should address the following:

- containment measures
- emergency discharge routes
- list of appropriate equipment and clean-up materials
- maintenance schedule for equipment
- details of trained staff, location, and provision for 24-hour cover
- details of staff responsibilities
- notification procedures to inform the relevant environmental protection authority
- audit and review the schedule
- telephone numbers of statutory water undertakers and local water company
- list of specialist pollution clean-up companies and their telephone numbers

7.6 Mitigation Measures

The construction management of the building project will incorporate protection measures to minimise as far as possible the risk of spillage that could lead to surface and groundwater contamination.

All appropriate methods will be utilised to ensure that surface water arising during the course of construction activities will contain minimum sediment, prior to the ultimate discharge to the existing watercourse.

Best practices in design and construction will be employed for the installation of surface water and sanitary drainage.

8. CONCLUSION

In conclusion, the engineering planning design for the proposed residential development proposed in Oldcourt Firhouse is considered a suitable use of the site. The engineering proposed enclosed within this report shall bear the consideration of the Local County Council's response to the preliminary design.

The site will be developed in a sustainable manner, in order to minimise the impact of the development during construction and throughout the lifespan of the proposed development.

Pinnacle Consulting Engineers has actively engaged with Irish Water for several months to ensure that the development met their discharge requirements and conditions.

All SDCC post-planning meeting requested have been included in the final design as well as extended meetings and correspondence regarding the drainage design with the drainage department to ensure that the development is designed in such a manner that is satisfactory to the local council.

Accordingly, there are no reasons in relation to the drainage elements, as to why this scheme should not be granted planning permission.

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