



## **Engineering Assessment Report**

Proposed Amendment Application at Tinahisk, Arklow, County Wicklow.

October 2026

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## Quality Assurance – Approval Status

This document has been prepared and checked in accordance with  
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

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| Issue | Date      | Prepared by | Checked by | Approved by                                                                         |
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## 1. Introduction

This report has been prepared by Waterman Moylan Engineering Consultants, on behalf of the Client, Castlethorn, as part of an amendment application for a proposed development of 352 residential units with a creche located at Tinahisk, Arklow in County Wicklow. This submission is an amendment to a previously granted scheme, granted under Wicklow County Council Planning Reg. Ref. 24/325.

This report aims to provide a comprehensive overview of the engineering design criteria of the proposed development.

Supplementary documentation referred to when compiling this report, includes:

- Uisce Éireann's Code of Practice for Water Infrastructure (Rev 3 August 2025)
- Uisce Éireann's Code of Practice for Wastewater Infrastructure (Rev 3 August 2025)
- Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 2, for New Developments
- The SuDS Manual (CIRIA C753)
- Wickow County Council Development Plan 2022-2028
- Uisce Éireann's QGIS Database

## 2. Subject Site

### 2.1 Existing Site Location

The subject site is located to the southeast of Arklow town at Tinahisk Upper in County Wicklow. The site is greenfield in nature bounded by agricultural lands to the north, east and south. The Dublin – Rosslare railway line bounds the site to the west.

The area of the works included in this application measures c. 12.7 hectares (ha). The approximate Irish Grid Co-ordinates of the site are X: 324147; Y: 171932

Refer to Figure 2-1 for the location of the subject site.

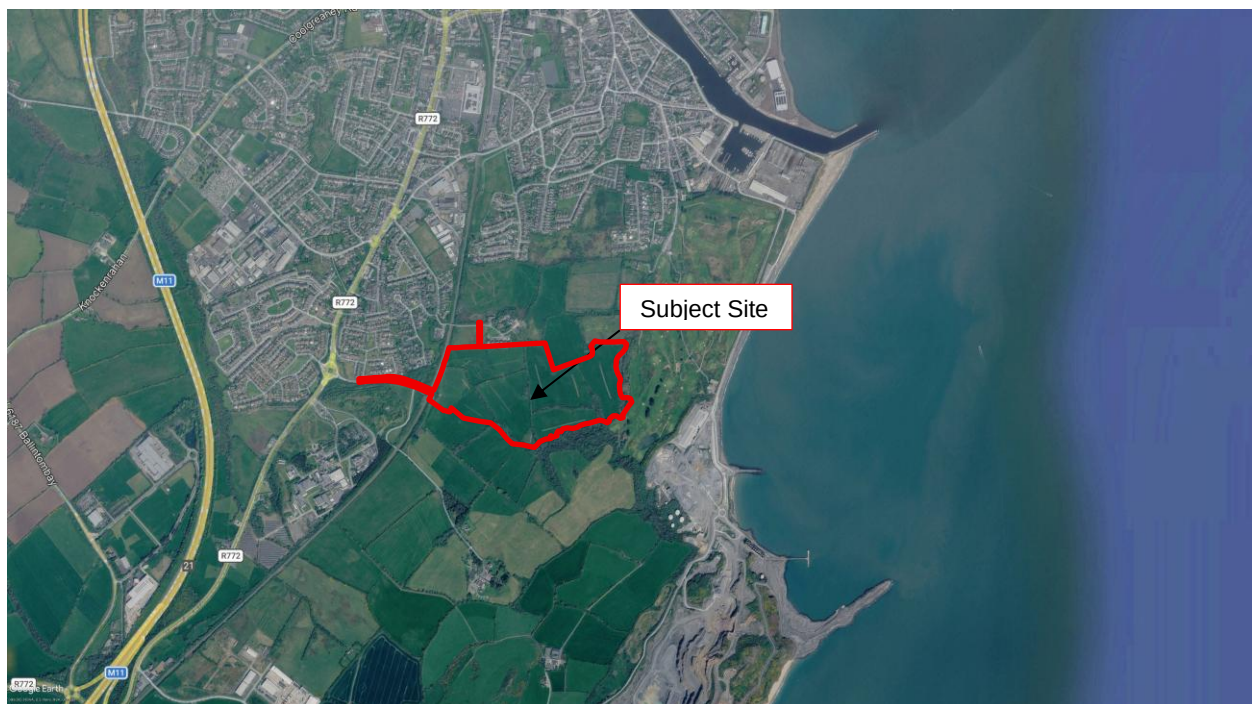


Figure 2-1: Site Location Map

A zoomed-in aerial view of the subject site and surrounds can be seen in Figure 2-2.



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

## 2.2 Existing Site Description

The existing site is greenfield in nature currently in use for agricultural purposes. There is an existing 2m deep ditch which naturally drains the site running from northwest to the southeast. The site topography falls from west to southeast whilst also locally falling towards the existing ditch line. The highest point on the site is 36.6m AOD along the western boundary, with the lowest surveyed level of 12.0m AOD at the southeastern boundary.

The main vehicular access to the site is via an existing bridge over the Irish Rail line at the southwest of the site. proposed Southern Port Access Road (SPAR) will form a partial piece of the southern boundary of the site. It is proposed to build approximately 90m of the SPAR as part of this amendment application.

## 2.3 Proposed Development Description

The proposed development comprises amendments to the Large-scale Residential Development permitted under WCC Reg. Ref. 24/325 consisting 352no. residential units proposed in a mix of houses and apartment units comprising 334no. houses (44no. 2-bedroom, 241no. 3-bedroom and 49no. 4-bedroom) ranging from 2 to 3 storeys, 18no. apartments (6no. 1-bedroom and 12no. 2-bedroom) in 1no. 4 storey building, 1no. creche (c. 711 sqm) at ground floor of apartment Block A; and all associated and ancillary site development works including on site attenuation, hard and soft landscaping and boundary treatment works, including public open space; communal open space, public lighting; surface car parking; bicycle parking store for apartment units; 4no. ESB substations; bin stores; vehicular access via existing Northwood Road and railway overbridge from Knockmore roundabout. The proposed development also includes road upgrade works to the existing railway overbridge and the western approach to same including the provision of a

2.5m footpath, 6m carriageway, safety barrier improvement works and other ancillary works required to facilitate these elements.

### 3. Foul Water Drainage

#### 3.1 Introduction

It is proposed to connect the wastewater from the site into Uisce Éireann foul water infrastructure at the northwest of the site. Due to the topography of the site, it is not possible to achieve a gravity connection into this network (Ground level at connection point 35.00m AOD). A foul pumping station will be constructed at the southeastern boundary, the lowest point of the site (15m AOD). The wastewater flows from each unit will outfall into the pumping station via gravity and then be pumped to a discharge manhole at the northwestern boundary via a  $\varnothing 200\text{mm}$  rising main.

A Pre Connection Enquiry was submitted for the subject site as part of this amendment application. A Confirmation of Feasibility (COF) was issued by Uisce Eireann on June 26<sup>th</sup>, 2026, under CDS26002695. The COF stated that a connection into the existing wastewater network is ***“feasible without infrastructure upgrades by Uisce Eireann.”***

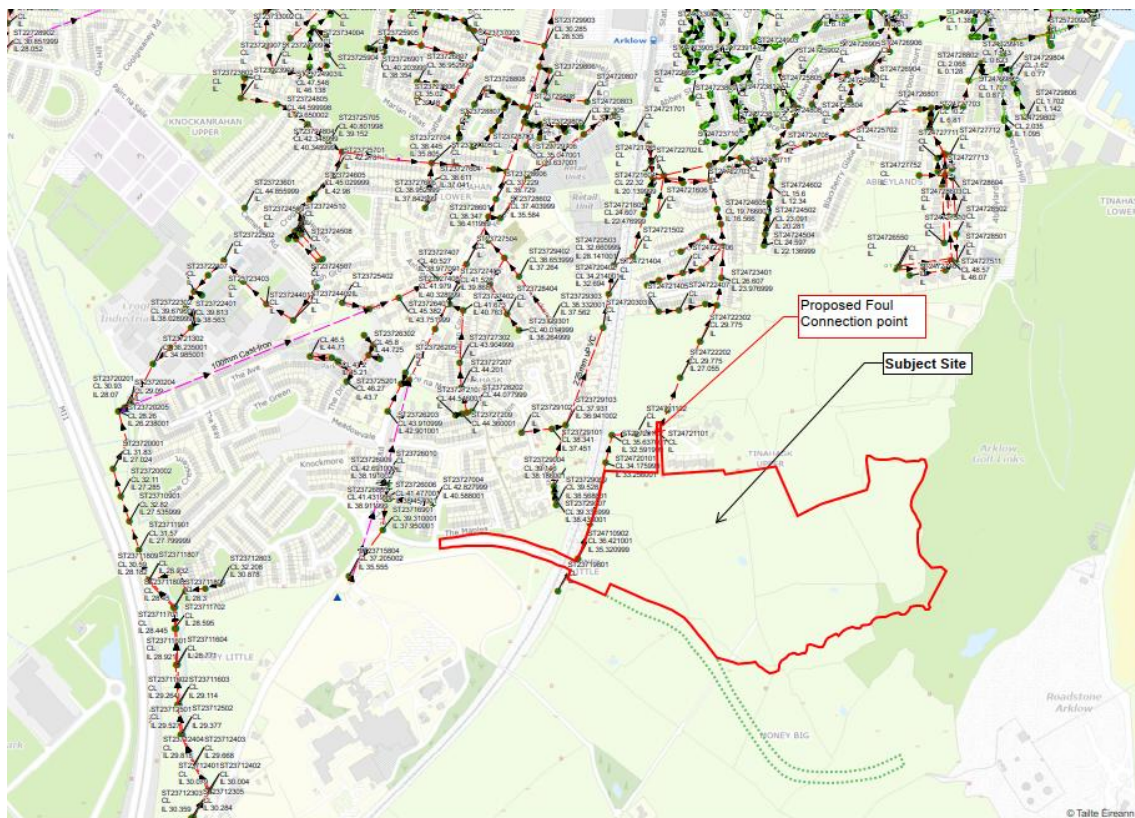


Figure 3-1: Map Displaying Existing Foul Water Network (Source: Uisce Eireann Service Maps)

A foul pumping station was included in the granted permission (under WCC Ref: 24/325). The pumping station was located at the northeastern boundary of the site. Waterman Moylan have reviewed the topography of the site and it has proposed to relocate the pumping station to the lowest part of the site at

the southeastern boundary. This allows for all units to outfall into the pumping station via gravity. The proposed location of the pumping station allows for a future connection from the school site at the south of the masterplan lands.



Figure 3-2: Proposed Amendment to Foul Pumping Station Location

### 3.2 Network Design

Prior to submitting this application, WCC drainage and roads were contacted to confirm the relocation of the foul pumping station.

Drains generally will consist of uPVC pipes (to IS 123). Pipes will be laid to comply with the requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Foul water sewers will consist of PE or concrete pipes (to IS 6) and laid strictly in accordance with Irish Water requirements for taking in charge.

All manholes will be constructed in line with the Uisce Eireann standard details. For more details of the network design please refer to Waterman Moylan drawings ARK-WAT-ZZ-XX-DR-P-0200 – 0203.

### 3.3 Proposed Foul Drainage and Calculations

The foul water drainage for the proposed development has been designed so that the minimum cleansing velocities outlined in the “Uisce Eireann Code of Practice for Wastewater Infrastructure” are achieved for all foul sewers. The peak foul flow is based on Irish Water recommended peak demand / flow factors which

are provided in the Uisce Eireann 'Code of Practice for Wastewater Infrastructure'. Pipe capacities and velocities have been calculated using the Colebrook-White formula with a roughness coefficient (Ks) of 1.5mm.

The proposed development will consist of 352. residential units and 1 crèche. Associated population calculated based on local population demographics has been applied to the crèche space for foul water flow purposes. Based on the Uisce Éireann Code of Practice, the peak foul flow from the proposed development will be as outlined in Table 3-1, below.

**Table 3-1: Calculation of Proposed Foul Water Flow - Amendment Application**

| Description       | No. of Units | Flow (l/h/day) | Population per Unit | Infiltration Factor | Total Discharge (l/d) |
|-------------------|--------------|----------------|---------------------|---------------------|-----------------------|
| Residential Units | 352          | 150            | 2.7                 | 1.1                 | 156,816               |
| Crèche            | 1            | 40             | 180                 | 1.1                 | 7,920                 |
| <b>Total</b>      |              |                |                     |                     | <b>164,736</b>        |

| Calculation of Proposed Peak Foul Flow   |              |            |
|------------------------------------------|--------------|------------|
| Total Daily Discharge (from above table) | 164,736      | l/d        |
| Dry Weather Flow (DWF)                   | 1.907        | l/s        |
| <b>Peak Foul Flow (= 6 x DWF)</b>        | <b>11.44</b> | <b>l/s</b> |

However, the foul pumping station has been designed to cater for the full masterplan lands including the subject application (352 units + creche), 2 No. future retail units, 1 No. future school and the addition of 648 No. future housing to the south of the Southern Port Access Road, and the east of the subject site. The total water demand and peak water demand for proposed development are summarised in Table 3.3.

| House category | Storage hours req. for each category | No. of houses in this category | Minimum req. storage volume (litres) |
|----------------|--------------------------------------|--------------------------------|--------------------------------------|
| 0 - 250        | 24 hrs storage                       | 250                            | 111,375                              |
| 251 - 333      | 18 hrs storage                       | 83                             | 27,732                               |
| 334 - 1000     | 12 hrs storage                       | 667                            | 148,574                              |
| <b>Total</b>   |                                      | <b>1,000</b>                   | <b>287,681</b>                       |

The emergency storage design is based off the Uisce Eireann Code of Practice, the storage capacity limits vary depending on the total number of units discharging into the pumping station.

| Houses      | Storage Hours                                             | Max Storage Volume (m <sup>3</sup> ) |
|-------------|-----------------------------------------------------------|--------------------------------------|
| 0 – 250     | 24                                                        | 112                                  |
| 250 - 333   | 24 for 250 and 18 thereafter                              | 139                                  |
| 334 - 1667  | 24 for 250, 18 up to 333 and 12 thereafter                | 437                                  |
| 1668 - 3333 | 24 for 250, 18 up to 333, 12 up to 1667 and 10 thereafter | 746                                  |

Table 3-2: Calculation of Storage Requirements for Retail, Creche and Future School Site

| Description                                                 | Occupancy                    | Flow (ℓ/h/day) | Population per Unit | Infiltration Factor | Storage Hours | Total Discharge (ℓ/d) |
|-------------------------------------------------------------|------------------------------|----------------|---------------------|---------------------|---------------|-----------------------|
| Creche<br>(Included in application)<br>(711m <sup>2</sup> ) | 1 Unit                       | 40             | 180                 | 1.1                 | 12            | 3960                  |
| Retail<br>(Future)<br>(1237m <sup>2</sup> )                 | 1 person / 100m <sup>2</sup> | 30             | 13                  | 1.1                 | 12            | 215                   |
| School<br>(Future)<br>(5650m <sup>2</sup> )                 | 1 person / 9m <sup>2</sup>   | 50             | 628                 | 1.1                 | 12            | 17,270                |
| <b>Total</b>                                                |                              |                |                     |                     |               | <b>18,453</b>         |

Table 3-2: Calculation of Total Storage Requirements

| Description       | No. of Units | Storage Hours | Storage (m <sup>3</sup> ) |
|-------------------|--------------|---------------|---------------------------|
| Residential Units | 250          | 24            | 111.375                   |
| Residential Units | 83           | 18            | 27.732                    |
| Residential Units | 667          | 12            | 148.574                   |
| Crèche            | 1            | 12            | 3.96                      |
| Retail            | 2            | 12            | 0.215                     |
| Future School     | 1            | 12            | 17.27                     |
| <b>Total</b>      |              |               | <b>309</b>                |

|                                        |         |     |
|----------------------------------------|---------|-----|
| Calculation of Proposed Peak Foul Flow |         |     |
| Total Daily Discharge                  | 488,389 | ℓ/d |

|                                   |              |            |
|-----------------------------------|--------------|------------|
| Dry Weather Flow (DWF)            | 5.65         | ℓ/s        |
| <b>Peak Foul Flow (= 6 x DWF)</b> | <b>33.92</b> | <b>ℓ/s</b> |

The total dry weather flow generated from the proposed development is 5.65 ℓ/s and the peak foul water flow generated from the development is 33.9 ℓ/s, with a proposed outfall from the development as 1-no. 300mm diameter pipe laid at a minimum gradient of 1:200. To service the development and future lands, a 200 mm OD rising main is proposed. At the design duty flow, this gives a velocity of approximately 1.61 m/s, which is within the permitted range of 0.75 m/s to 1.8 m/s set out in Section 3.2 of the Uisce Éireann Code of Practice. The rising main will be approximately 760 m in length and will be laid to an even grade where practicable. The proposed foul pumping station has been designed with a storage capacity of 309m<sup>3</sup>. Please refer to WM Drawing ARK-WAT-ZZ-XX-DR-P-0203 for location and details.

## 4. Surface Water Drainage

### 4.1 Introduction

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 and support water quality improvements. Features such as permeable paving, bio-retention tree pits, roadside swales, dry detention basins, and petrol interceptors 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 Existing Surface Water Drainage

The site is currently a green field in nature with a general slope from west to southeast. There is an existing ditch line which traverses the site naturally draining the site eastwards towards the Irish Sea via Arklow Golf Club lands. It is proposed to maintain this ditch line along the southern boundary, continuing to act as a natural drainage point for the subject site.

### 4.3 Proposed Surface Water Drainage

It is proposed to mimic the existing site drainage profile of the greenfield site by draining the surface water run-off via gravity to the south of the site, outfalling into the existing drainage ditch along the southern boundary of the site. The surface water strategy is to split the drainage areas into four catchments. Each catchment will have an attenuation system and a flow restriction device before outfalls into the existing ditch at the south of the site.

To maintain the pre-development greenfield runoff rate, flow control devices will be installed upstream of the discharge point. The surface water strategy for the development has been carefully coordinated focusing on source control measures within a comprehensive surface water management train.

The proposed surface water drainage network discharges to the existing ditch line which ultimately outfalls into the Irish Sea via the Arklow Gold Club lands.

In accordance with the GDSDS and Wicklow County Council requirements, the subject development's surface water outfall will be limited to a discharge rate of either 2 l/s/ha or the calculated QBAR (whichever is greater). This results in an allowable outflow rate of 8.47 l/s/ha.

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 sustainable urban drainage systems (SUDS). The SUDS for this subject site are summarised below:

- Permeable paving to be used below parking bays within the development
- Bio-retention systems including tree-pits throughout the development
- Roadside swales throughout the development
- A Hydro-Brake upstream of the storm outfall

Soil infiltration tests to BRE 365 were completed as part of the site investigation works to assess infiltration rates and determine appropriate SuDS measures across the site. Results indicate that the subsoil is not suitable for infiltration; refer to Appendix F – Soakaway Test section for full details. As a result, alternative SuDS measures will be required across the site to ensure that storm water is safely conveyed to the identified outfalls without placing undue pressure on the receiving network.

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 value to the biodiversity potential of the development. The images shown below illustrate already constructed robust and aesthetically pleasing nature-based solutions in the form of a well-established rain garden (image sourced from *The SuDS Manual*), and permeable paving below parking areas (image sourced from *The SuDS Manual*).



Figure 4-1: Images of a Rain Garden and Permeable Paving

It is proposed to attenuate the surface water runoff in a combination of overground detention basins and underground geocellular tanks. The underground systems are designed to cater for flows up to the 1:1 year storm. The overground detention basins are activated in larger storm events via open grated manholes. Please refer to WM Drawings ARK-WAT-ZZ-XX-DR-P-0200 – 0203 for details.

#### 4.4 Allowable Outflow Rate

In accordance with the GSDS & Wicklow County Council requirements, the surface water discharge rate is to be restricted 2 l/s/ha or the calculated greenfield runoff rate whichever is greater, resulting in a maximum allowable outflow of 8.47 l/s/ha. It is proposed to have 4 No catchments to service the site, each with their own allowable outflow rate. The drainage design includes the runoff from the future retail units at the southwest of the site.

The Met Eireann was consulted for the Rainfall Return Period and can be seen in Appendix B, and a summary of the site hydrological characteristics can be seen in Table 4-1. The catchment details can be seen in Table 4-2 below and on WM Drawing ARK-WAT-ZZ-XX-DR-P-0210.

### Table 4-1 Site Characteristics

|                              |                                    |
|------------------------------|------------------------------------|
|                              | Catchment                          |
| Catchment Drainage Area – Ha | 15.77 (Areas 1, 2A, 2B, 2C, 3 & 4) |
| SAAR – mm*2                  | 1132                               |
| SOIL Index                   | 0.47                               |
| Climate Change               | 20%                                |

### Table 4-2 Surface Water Catchment Details

| Attribute         | Area (ha) | Outflow Rate (l/s)                         |
|-------------------|-----------|--------------------------------------------|
| Catchment Area 1  | 7.276     | <b>61.8</b>                                |
| Catchment Area 2A | 0.9       | <b>7.63</b>                                |
| Catchment Area 2B | 1.0       | $(7.63 + 8.47) = \mathbf{16.1}$            |
| Catchment Area 2C | 2.5       | $(7.63 + 8.47 + 21.175) = \mathbf{37.275}$ |
| Catchment Area 3  | 0.747     | <b>6.32</b>                                |
| Catchment Area 4  | 3.35      | <b>28.39</b>                               |

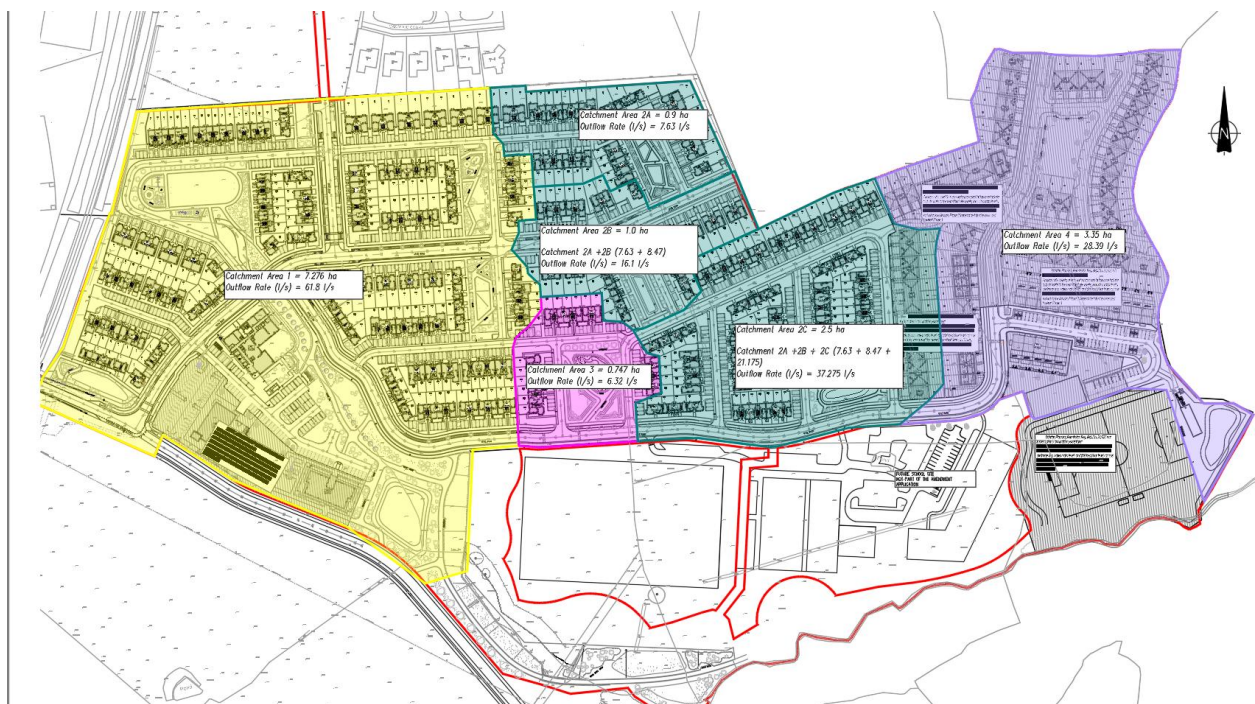


Figure 4-3: Proposed Catchment Areas.

## 4.5 Proposed Surface Water Storage

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 20% additional allowance for climate change.

Refer to Appendix D for the FLOW (Causeway) modelled surface water network showing the individual storage volumes provided by the SUDS features. The storage estimates are also summarised below in Table 4-3.

Table 4-3 Attenuation Details

| Characteristic             | Units | Catchment 1 | Catchment 2 |        |        | Catchment 3 |        | Catchment 4 |
|----------------------------|-------|-------------|-------------|--------|--------|-------------|--------|-------------|
|                            |       | DB01        | DB02        | DB03   | DB06   | DB04        | DB05   | DB07        |
| Ground/Bank Level          | (MOD) | 28.50       | 28.50       | 28.60  | 24.60  | 29.30       | 29.30  | 13.970      |
| Invert Level               | (MOD) | 27.20       | 27.90       | 28.00  | 23.90  | 28.80       | 29.00  | 13.900      |
| Top of Water Level         | (MOD) | 27.945      | 28.45       | 28.30  | 24.52  | 29.252      | 29.525 | 13.000      |
| Volume of Basin            | (m³)  | 852.70      | 31.20       | 31.00  | 131    | 145         | 47.0   | 352         |
| Invert Level Tank          | (MOD) | 24.475      | 26.26       | 25.70  | 21.825 | -           | -      | 11.688      |
| Top of Attenuation Tank    | (MOD) | 26.00       | 27.934      | 27.389 | 23.884 | -           | -      | 13.362      |
| Volume of Attenuation Tank | (m³)  | 1287        | 320         | 249    | 749    | -           | -      | 748         |
| Qbar Run-off Rate          | (l/s) | 61.80       | 7.63        | 16.1   | 37.275 | -           | -      | 28.39       |
| Total Volume Provided      | (m³)  | 2139        | 320         | 280    | 879    | 145         | 47.0   | 1100        |

## 4.6 Surface Water Network Design

It is proposed that, 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 storm water attenuation volumetric calculations. The surface water networks have been modelled using Causeway FLOW software (utilising the SWMM 5 hydraulic engine) in the 1, 30 & 100 year storm events. The simulation results are included in Appendix D. The simulation results show that there is no flooding in the 1, 5 & 30 year storm events. There are areas of spot flooding in the 100 year storm, which is acceptable. The overland flood routes are designed to convey any spot flooding events away from buildings and into the existing ditch network.

The surface water outfall downstream of the hydro-brake is a 300 mm diameter pipe laid at 1 in 300, which has a capacity of 63.8 l/s.

Calculations for pipe sizes and gradients are based on surface water runoff from the roofs and surfaced areas using the Rational Method for surface water design (Bilham's Formula), with a storm return period (N) of 1:5 years. Pipe capacities and velocities have been calculated using Colebrook-White formula with a roughness coefficient (Ks) of 0.6mm.

Surface water flow in excess of the allowable discharge rate shall be attenuated in online vegetated detention basins, as indicated on Waterman Moylan Drawings ARK-WAT-ZZ-XX-DR-P-0200 – 0203 for

details. The attenuation storage of surface water will be released at a controlled rate via a hydro-brake, as indicated on the drainage drawing. The surface water attenuation facility will be designed to cater for the 1 in 100-year+20%CC storm.

## 5. SUDS Design

### 5.1 SUDS Assessment

The surface water will be managed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 2, for New Developments, and CIRIA documents. Furthermore, the WCC Sustainable Drainage System Policy and Development Guidance has also been consulted as part of the SuDS design for the subject development. All the referenced 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 solution.

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. Mimicking natural catchment behaviour where rainfall either infiltrates through the soil or runs off slowly over the ground surface to a discharge point is an important aim of the SuDS design.

The proposed surface water drainage system for this development has been designed as a sustainable urban drainage system and uses permeable paving below parking bays, bio-retention tree pits, roadside swales, attenuation basins and petrol interceptors 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 address the changes in stormwater run-off flows associated with urbanisation and to reduce the impacts of the 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                                                                                                                                                                                                                                                  |
|-----------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Source Control</b> | Permeable Paving           | Permeable paving surfaces are made of porous material that enable surface water runoff to flow through or between the blocks into a layer of imported, easily draining, material. Generally permeable paving areas will be constructed with permeable pipe systems below ground that connect into the surface water mainline with an inspection chamber. | The permeable paving areas will collect overland surface water runoff at source from the footpaths, roofs and landscaped areas.                                                                                                                              |
|                       | Permeable Surfacing        | Permeable surfacing areas are made of porous material that enable surface water runoff to flow through or between the blocks into a layer of imported, easily draining, material. Generally permeable paving areas will be constructed with permeable pipe systems below ground that connect into the surface water mainline with an inspection chamber. | The permeable surfacing areas will collect overland surface water runoff at source from the footpaths, roofs and landscaped areas.                                                                                                                           |
|                       | Bio-Retention Rain Gardens | Shallow, landscaped depressions that use specially selected soil and plants to absorb and filter surface water runoff. Designed to manage water at the source, rain gardens help reduce runoff volume, improve water quality by filtering pollutants, and promote groundwater recharge.                                                                  | To be installed in strategic locations throughout the site to capture rainwater runoff from impervious surfaces. They will retain and treat surface water before gradually releasing it, reducing the burden on the drainage system and lowering flood risk. |
|                       | 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. | Bio-retention tree pits will be constructed adjacent to the internal roads network providing a form of treatment and infiltration for run off from sections of the road.                                                                                     |

| SUDS Stage          | SUDS Measure        | Measure Outline                                                                                                                                                                                                               | Use on site                                                                                                                                             |
|---------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site Control</b> | Flow Control Device | Hydro-Brake structures are used to restrict the outfall from the attenuation tank to the equivalent of the existing greenfield run-off. This ensures the development will not give rise to any impact downstream of the site. | Flow control Hydro-Brakes will be installed downstream of each attenuation system to ensure the flow is restricted to 8.47 l/s/ha.                      |
|                     | Petrol Interceptor  | Petrol Interceptors are structures used to trap and filter out hydrocarbon pollutants from rainwater runoff. This includes hydrocarbons from fuel spillage.                                                                   | 3-no. Petrol Interceptors will be installed at the site, upstream of the storm outfall points into the existing drainage ditch at the south of the site |

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.

## 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 Paving Maintenance Schedule

| Permeable Paving / Surfacing | Maintenance Period | Maintenance Task                                                                                                                                    | Frequency                                                                                                                               |
|------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|                              | 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 Pits Maintenance Schedule

| Bio-Retention Tree Pits | Maintenance Period | Maintenance Task                                                                                          | Frequency                                                                |
|-------------------------|--------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
|                         | 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 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: Bio-Retention Rain Garden Maintenance Schedule

| Rain Gardens | Maintenance Period | Maintenance Task                                                                                                                                                 | Frequency                                                                                 |
|--------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
|              | Regular            | Remove debris, leaves and sediment buildup to maintain water flow and infiltration.                                                                              | Twice a year, in spring and autumn, and after heavy rain events.                          |
|              | Occasional         | Prune and manage vegetation, replant as needed to maintain healthy growth and effective filtration. Remove invasive species that may compete with native plants. | Annually or as needed based on plant condition.                                           |
|              | Remedial actions   | Repair any erosion, address ponding issues and restore soil to maintain infiltration and filtration capacity.                                                    | As required, based on regular inspections or observed performance issues.                 |
|              | Monitoring         | Monitor soil infiltration rates and check for standing water to ensure rain garden efficiency. Inspect inflow and outflow areas for blockages.                   | Annually or more frequently if water quality or drainage performance issues are observed. |

## 6. Water Supply

### 6.1 Introduction

It is proposed to connect to the exiting watermain at the existing bridge deck over the Irish Rail line at the western boundary of the site. An existing watermain spur was left at the bridge deck to cater for future development of these lands. The subject site will be fed off this connection point via a main 200mm spine watermain with 150mm and 100mm loops feeding off the spine main. Please refer to WM Drawings ARK-WAT-ZZ-XX-DR-P-0300 – 0303 for details. Spurs for future provision have also been incorporated into the design.

The minimum depth of cover from the finished ground level to the external crown of a watermain shall be 900mm. A greater depth of cover and/or greater strength pipe and/or a higher class of bedding may be required where high traffic loading is anticipated. Depths may be altered to avoid obstructions, including separation distances between other utility services. The desirable maximum cover for a service connection pipe or a watermain should be 1200mm, where practicable. Sluice valves will be provided so that no more than 40 houses can be isolated at any time and hydrants provided so that each part of the dwellings are within 46 metres of a hydrant.

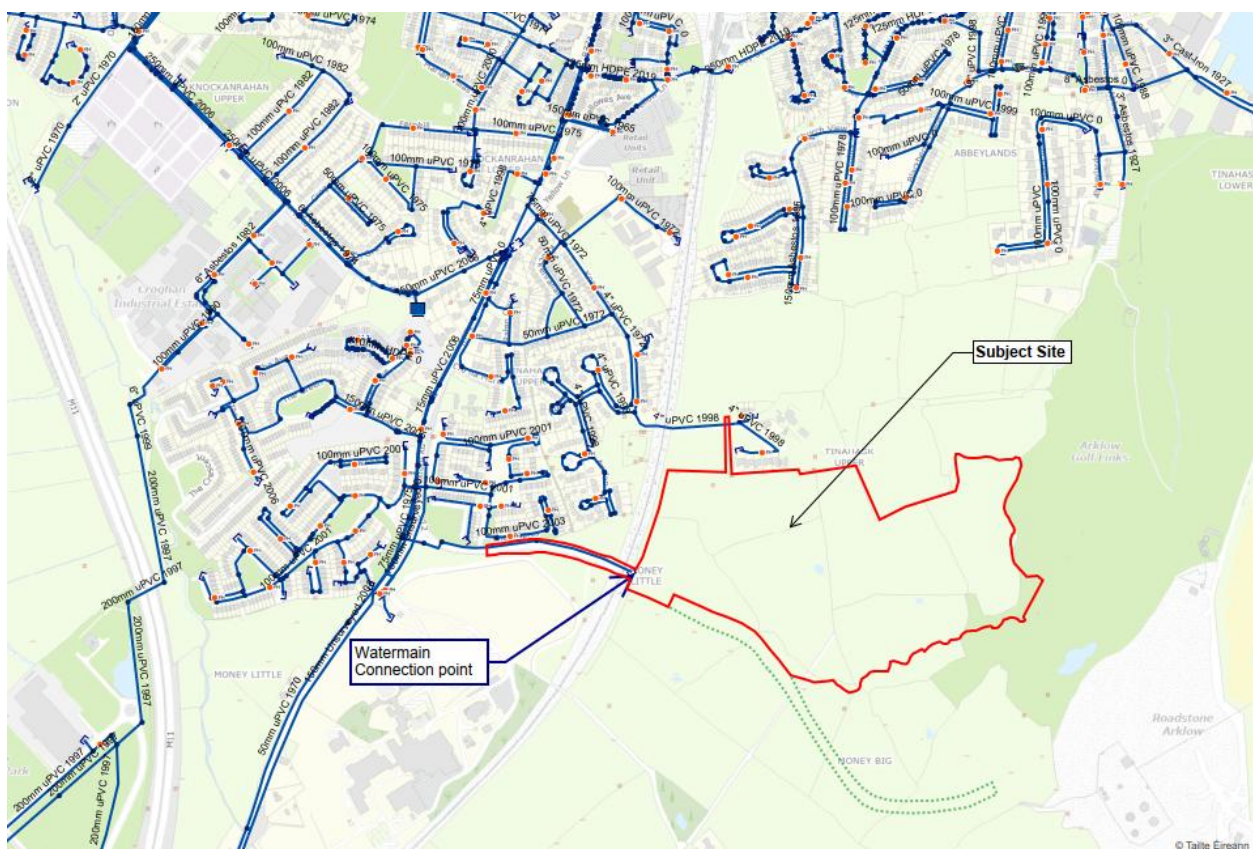


Figure 6-1: Map Displaying Existing Water Supply Infrastructure (Source: Uisce Éireann)

A Pre Connection Enquiry was submitted for the subject site as part of this amendment application. A Confirmation of Feasibility (COF) was issued by Uisce Eireann on June 26<sup>th</sup>, 2026, under CDS26002695. The COF stated that a connection into the existing water network is ***“feasible subject to upgrades.”***

The offsite upgrades include upsizing an existing 150mm watermain on Emoclew Road to 250mm. The required works would take place approximately 650m northwest of the site entrance, please see below image taken from the Uisce Eireann COF. Please refer to Appendix A for the Uisce Eireann Confirmation of Feasibility.

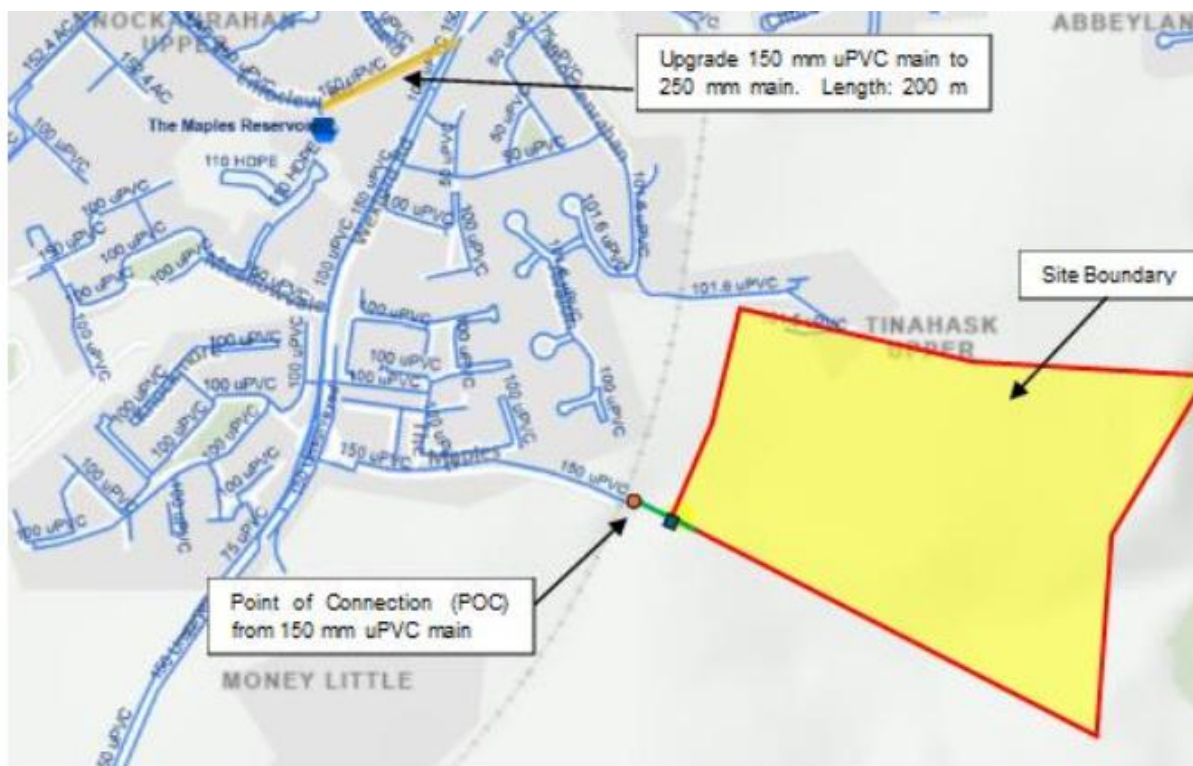


Figure 6-2: Image from Uisce Eireann Confirmation of Feasibility

## 6.2 Proposed Water Demand Calculation

The proposed amendment application consists of 352-no. residential units, and 1 No. crèche. Associated population calculated based on local population demographics has been applied to the crèche for water demand purposes.

Based on the Uisce Eireann Code of Practice, the estimate of water demand from the public water supply system for the proposed development can be seen below:

Table 6-1: Total Water Demand Calculation

| Description                 | No. of Units | Flow (ℓ/h/day) | Population per Unit | Total Discharge (ℓ/d) |
|-----------------------------|--------------|----------------|---------------------|-----------------------|
| Residential                 | 352 no.      | 150            | 2.7                 | 142,560               |
| Crèche (868m <sup>2</sup> ) | 1 no.        | 40             | 180                 | 7,200                 |
| <b>Total</b>                |              |                |                     | <b>152,760</b>        |

The total water requirement, from the public supply, for the development, is estimated at 153 m<sup>3</sup>/day.

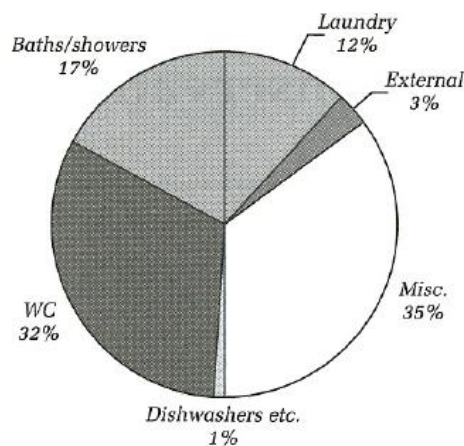
### 6.3 Introduction

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.

The following diagram illustrates the current percentage breakdown of water usage in domestic circumstances and is from Griggs and Shouler 1994 as published in Chapter 11 of 'Water, Sanitary & Waste Services for Buildings' by Wise and Sheffield.



In addition, water conservation measures will be used, to further reduce overall water demand, including:

- Low volume flush / dual flush WC's
- Aerated shower heads
- Spray taps
- Draw off tap controls.
- Leak detection measures – through the metering of supply

## **7. Traffic & Transport**

A detailed Traffic and Transportation Assessment (TTA) has been undertaken by Waterman Moylan and is submitted under separate cover as part of this application.

The Transport Department of Wicklow County Council was contacted on 25<sup>th</sup> March, 2026 regarding the update to the previous TTA for the permitted development and the modelling junctions.

The information presented within the Transport section of this report has been extracted from the TTA and is summarised herein. For further detail in relation to any of the transport-related headings that follow, reference should be made to the full Traffic and Transportation Assessment.

### **7.1 Proposed Site Access**

Vehicular access to the site is provided from the south via the existing bridge over the Irish Rail line at the western boundary. The Southern Pork Access Road (SPAR) will be built along the southern boundary of the site forming a connection from the R772 to the harbour area. where the southern access is designed as a shared surface accommodating vehicles, pedestrians and cyclists.

It is proposed to provide a 1.8 one way cycle track on either side of the main spine road through the site. This is the same strategy as the previously granted scheme. It is proposed to have future cycle and pedestrian links to the northwest, and northeast of the site.

### **7.2 Roads Design**

The internal layout of the subject site provides pedestrian pathways to link internal units to the surrounding pedestrian network and to internal public spaces.

Footpaths will be provided in accordance with Section 4.3.1 of the DMURS which suggests that a minimum 2.0m footpath should be provided where possible.

### **7.3 Road Safety & Quality Audit**

A Stage 1 Quality Audit has been completed as part of this amendment application. The Quality Audit was completed by RYCO Consultants, please refer to Appendix E for information.

### **7.4 Sightlines & Swept Path Analysis**

The main road network through the site is designed for a 30kph speed limit. Sightlines are provided at the junction from each Cargo Unit for 2.4m x 23m visibility splays, which complies with the requirements of the Department of Transport 'Design Manual for Urban Roads and Streets' recommendation for a road of design speed of 30 km/h. Refer to Waterman Moylan Drawing ARK-WAT-ZZ-XX-DR-P-0140-142 for details of the sightlines provided.

A swept path analysis was completed for a refuse vehicle and fire tender truck accessing the subject site as part of this planning application. Please refer to Waterman Moylan Drawings ARK-WAT-ZZ-XX-DR-P-0116 - 0118 for details.

## APPENDICES

## **A. Uisce Éireann Confirmation of Feasibility Letter**

## CONFIRMATION OF FEASIBILITY

Noel Mahon  
Waterman Moylan  
Block S  
Alfie Byrne Road  
Eastpoint  
Dublin 3  
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](http://www.water.ie)

26 June 2026

**Our Ref: CDS26002695 Pre-Connection Enquiry  
Site at, Tinask Upper, Arklow, Co. Wicklow**

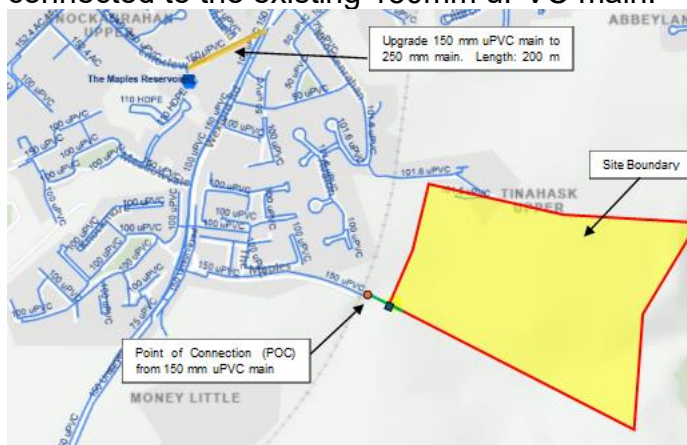
Dear Applicant/Agent,

### **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 485 unit(s) at Site at, Tinask Upper, Arklow, Wicklow, (the **Development**).

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

- **Water Connection** - Feasible Subject to upgrades
- In order to accommodate the proposed connection, the existing 150mm uPVC main on Emoclew Road needs to be upgraded to 250mm ID pipe for approximately 200m. The Developer will be required to fund the upgrade works. The fee will be calculated at a connection application stage.
- Connection main should be a 150mm main with a bulk meter and connected to the existing 150mm uPVC main.



**Stiúrthóirí / Directors:** Jerry Grant (Cathaoirleach / Chairperson), Niall Gleeson (POF / CEO), Douglas Millican, Michael Nolan, Patricia King, Eileen Maher, Cathy Mannion, Michael Walsh, Rena O'Sullivan and Orlagh Nevin.

**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

- **Wastewater Connection** - Feasible without infrastructure upgrade by Uisce Éireann
- At a connection application stage, when site layout drawings will be provided, the assessment will be reviewed and a detail hydraulic modelling will be undertaken to confirm the connection feasibility or to determine possible network upgrade requirements.

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 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/](http://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](http://www.water.ie/connections), email [newconnections@water.ie](mailto:newconnections@water.ie) or contact 1800 278 278.

Yours sincerely,



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

## Section A - What is important to know?

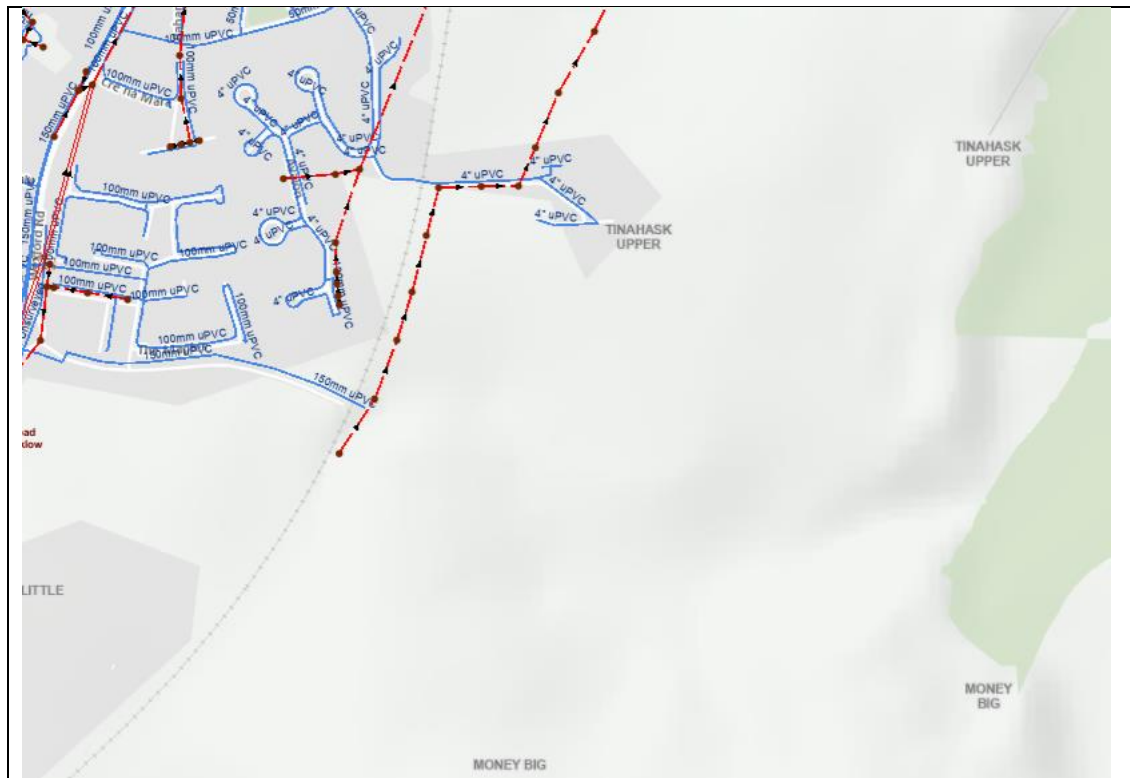
| What is important to know?                                    | Why is this important?                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Do you need a contract to connect?</b>                     | <ul style="list-style-type: none"> <li>• 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).</li> <li>• Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application <u>and be granted and sign</u> a connection agreement with Uisce Éireann.</li> </ul> |
| <b>When should I submit a Connection Application?</b>         | <ul style="list-style-type: none"> <li>• A connection application should only be submitted after planning permission has been granted.</li> </ul>                                                                                                                                                                                                                                                                             |
| <b>Where can I find information on connection charges?</b>    | <ul style="list-style-type: none"> <li>• Uisce Éireann connection charges can be found at: <a href="https://www.water.ie/connections/information/charges/">https://www.water.ie/connections/information/charges/</a></li> </ul>                                                                                                                                                                                               |
| <b>Who will carry out the connection work?</b>                | <ul style="list-style-type: none"> <li>• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*.</li> </ul> <p>*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</p>                                                          |
| <b>Fire flow Requirements</b>                                 | <ul style="list-style-type: none"> <li>• 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.</li> <li>• <b>What to do?</b> - Contact the relevant Local Fire Authority</li> </ul>                                                                                                                              |
| <b>Plan for disposal of storm water</b>                       | <ul style="list-style-type: none"> <li>• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters.</li> <li>• <b>What to do?</b> - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.</li> </ul>                                                                                             |
| <b>Where do I find details of Uisce Éireann's network(s)?</b> | <ul style="list-style-type: none"> <li>• Requests for maps showing Uisce Éireann's network(s) can be submitted to: <a href="mailto:datarequests@water.ie">datarequests@water.ie</a></li> </ul>                                                                                                                                                                                                                                |

|                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>What are the design requirements for the connection(s)?</b></p> | <ul style="list-style-type: none"> <li>• The design and construction of the Water &amp; Wastewater pipes and related infrastructure to be installed in this Development shall comply with <b><i>the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice</i></b>, available at <a href="http://www.water.ie/connections">www.water.ie/connections</a></li> </ul>                                                                                                                                                                                           |
| <p><b>Trade Effluent Licensing</b></p>                                | <ul style="list-style-type: none"> <li>• 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).</li> <li>• More information and an application form for a Trade Effluent License can be found at the following link:<br/><a href="https://www.water.ie/business/trade-effluent/about/">https://www.water.ie/business/trade-effluent/about/</a></li> </ul> <p>**trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)</p> |

## 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](mailto: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. Rainfall Data**

| Duration | 0.5 yrs | 1 yrs | 2 yrs | 3 yrs | 4 yrs | 5 yrs | 10 yrs | 20 yrs | 30 yrs | 50 yrs | 75 yrs | 100 yrs | 120 yrs |
|----------|---------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|---------|---------|
| 5 mins   | 2.9     | 4.2   | 5     | 6.1   | 6.9   | 7.5   | 9.5    | 11.9   | 13.5   | 15.8   | 17.8   | 19.4    | 20.5    |
| 10 mins  | 3.8     | 5.5   | 6.4   | 7.8   | 8.8   | 9.6   | 12.1   | 15     | 16.9   | 19.6   | 22.1   | 24      | 25.3    |
| 15 mins  | 4.4     | 6.4   | 7.5   | 9.1   | 10.2  | 11    | 13.9   | 17.1   | 19.3   | 22.3   | 25     | 27.2    | 28.6    |
| 30 mins  | 5.9     | 8.4   | 9.7   | 11.7  | 13.1  | 14.1  | 17.6   | 21.5   | 24.1   | 27.8   | 31.1   | 33.6    | 35.3    |
| 1 hour   | 7.8     | 10.9  | 12.6  | 15.1  | 16.7  | 18    | 22.3   | 27.1   | 30.2   | 34.6   | 38.5   | 41.5    | 43.6    |
| 2 hours  | 10.3    | 14.3  | 16.3  | 19.4  | 21.5  | 23.1  | 28.2   | 34     | 37.8   | 43.1   | 47.8   | 51.4    | 53.8    |
| 3 hours  | 12.1    | 16.7  | 19    | 22.5  | 24.8  | 26.6  | 32.4   | 38.9   | 43.1   | 49     | 54.2   | 58.2    | 60.8    |
| 4 hours  | 13.6    | 18.6  | 21.2  | 25    | 27.5  | 29.5  | 35.8   | 42.8   | 47.4   | 53.7   | 59.2   | 63.5    | 66.4    |
| 6 hours  | 16      | 21.7  | 24.6  | 29    | 31.8  | 34    | 41.1   | 48.9   | 54     | 61     | 67.2   | 71.9    | 75      |
| 9 hours  | 18.8    | 25.4  | 28.7  | 33.6  | 36.8  | 39.3  | 47.2   | 56     | 61.6   | 69.4   | 76.2   | 81.4    | 84.9    |
| 12 hours | 21.2    | 28.3  | 32    | 37.3  | 40.8  | 43.5  | 52.1   | 61.6   | 67.6   | 76     | 83.3   | 88.9    | 92.6    |
| 18 hours | 24.9    | 33.1  | 37.2  | 43.2  | 47.2  | 50.2  | 59.9   | 70.4   | 77.1   | 86.4   | 94.5   | 100.6   | 104.7   |
| 24 hours | 28      | 37    | 41.5  | 48    | 52.3  | 55.6  | 66.1   | 77.4   | 84.7   | 94.7   | 103.3  | 109.9   | 114.3   |
| 2 days   | 36.2    | 46.5  | 51.6  | 58.9  | 63.6  | 67.2  | 78.5   | 90.5   | 98.1   | 108.4  | 117.3  | 124     | 128.5   |
| 3 days   | 43.1    | 54.5  | 60    | 68    | 73.1  | 76.9  | 88.9   | 101.6  | 109.6  | 120.4  | 129.6  | 136.5   | 141     |
| 4 days   | 49.4    | 61.7  | 67.6  | 76.1  | 81.5  | 85.6  | 98.2   | 111.6  | 119.9  | 131    | 140.5  | 147.7   | 152.4   |
| 6 days   | 60.7    | 74.6  | 81.3  | 90.6  | 96.6  | 101.1 | 114.9  | 129.2  | 138.1  | 150    | 160.1  | 167.6   | 172.5   |
| 8 days   | 71      | 86.3  | 93.6  | 103.7 | 110.2 | 115   | 129.8  | 145    | 154.5  | 167    | 177.6  | 185.4   | 190.6   |
| 10 days  | 80.7    | 97.3  | 105.1 | 115.9 | 122.8 | 127.9 | 143.6  | 159.6  | 169.5  | 182.6  | 193.6  | 201.8   | 207.1   |
| 12 days  | 90.1    | 107.7 | 116   | 127.5 | 134.7 | 140.1 | 156.5  | 173.3  | 183.6  | 197.3  | 208.7  | 217.1   | 222.6   |
| 16 days  | 107.8   | 127.4 | 136.6 | 149.2 | 157.1 | 163   | 180.8  | 198.9  | 209.9  | 224.5  | 236.6  | 245.6   | 251.4   |
| 20 days  | 124.7   | 146.1 | 156   | 169.6 | 178.1 | 184.5 | 203.5  | 222.7  | 234.4  | 249.7  | 262.5  | 271.9   | 278     |
| 25 days  | 145     | 168.4 | 179.2 | 193.9 | 203.1 | 209.9 | 230.2  | 250.7  | 263.1  | 279.3  | 292.8  | 302.7   | 309.1   |

## **C. Allowable Outflow QBAR Calculation**

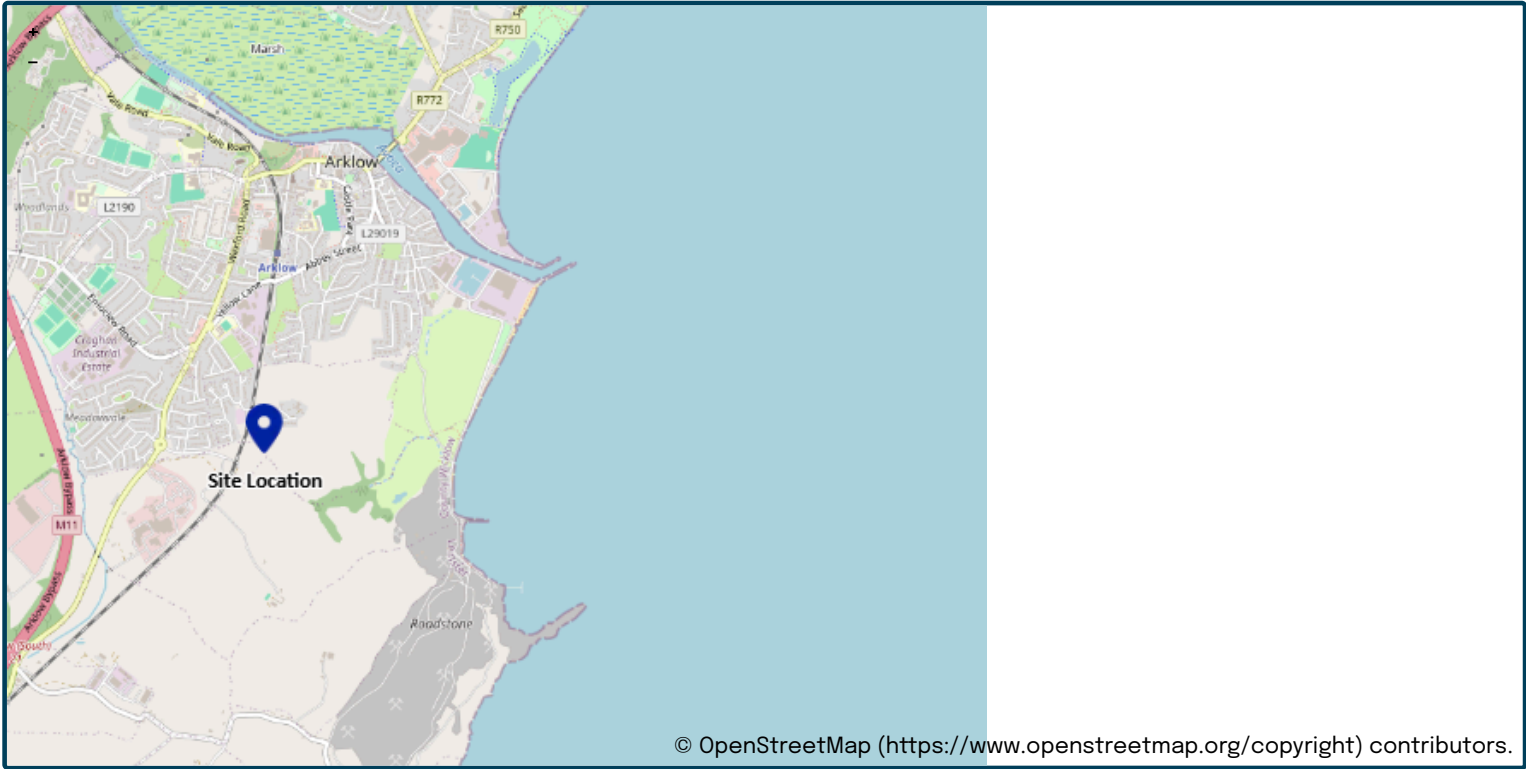
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

## Project details

|               |                                          |
|---------------|------------------------------------------|
| Date          | <input type="text" value="02/10/2026"/>  |
| Calculated by | <input type="text" value="J. Muhia"/>    |
| Reference     | <input type="text" value="Catchment 3"/> |
| Model version | <input type="text" value="2.2.3"/>       |

## Location

|               |                                          |
|---------------|------------------------------------------|
| Site name     | <input type="text" value="26-035"/>      |
| Site location | <input type="text" value="Arklow - C1"/> |



|                                           |                                     |
|-------------------------------------------|-------------------------------------|
| Site easting (Irish Grid)                 | <input type="text" value="324150"/> |
| Site northing (Irish Grid)                | <input type="text" value="171834"/> |
| Site easting (Irish Transverse Mercator)  | <input type="text" value="724074"/> |
| Site northing (Irish Transverse Mercator) | <input type="text" value="671874"/> |

## Site details

|                      |                                  |    |
|----------------------|----------------------------------|----|
| Total site area (ha) | <input type="text" value="7.3"/> | ha |
|----------------------|----------------------------------|----|

# Greenfield runoff

## Method

|        |       |
|--------|-------|
| Method | IH124 |
|--------|-------|

## IH124

|                            |                                             |     |                                   |
|----------------------------|---------------------------------------------|-----|-----------------------------------|
|                            | <u>My value</u>                             |     | <u>Map value</u>                  |
| SAAR (mm)                  | <input type="text" value="1132"/>           | mm  | <input type="text" value="1132"/> |
| How should SPR be derived? | <input type="text" value="WRAP soil type"/> |     |                                   |
| WRAP soil type             | <input type="text" value="4"/>              |     | <input type="text" value="4"/>    |
| SPR                        | <input type="text" value="0.47"/>           |     |                                   |
| QBar (IH124) (l/s)         | <input type="text" value="61.8"/>           | l/s |                                   |

## Growth curve factors

|                        |                                   |  |                                 |
|------------------------|-----------------------------------|--|---------------------------------|
|                        | <u>My value</u>                   |  | <u>Map value</u>                |
| Hydrological region    | <input type="text" value="12"/>   |  | <input type="text" value="12"/> |
| 1 year growth factor   | <input type="text" value="0.85"/> |  |                                 |
| 2 year growth factor   | <input type="text" value="0.95"/> |  |                                 |
| 10 year growth factor  | <input type="text" value="1.72"/> |  |                                 |
| 30 year growth factor  | <input type="text" value="2.13"/> |  |                                 |
| 100 year growth factor | <input type="text" value="2.61"/> |  |                                 |
| 200 year growth factor | <input type="text" value="2.86"/> |  |                                 |

## Results

|                           |                                    |     |
|---------------------------|------------------------------------|-----|
| Method                    | <input type="text" value="IH124"/> |     |
| Flow rate 1 year (l/s)    | <input type="text" value="52.6"/>  | l/s |
| Flow rate 2 year (l/s)    | <input type="text" value="58.7"/>  | l/s |
| Flow rate 10 years (l/s)  | <input type="text" value="106.4"/> | l/s |
| Flow rate 30 years (l/s)  | <input type="text" value="131.7"/> | l/s |
| Flow rate 100 years (l/s) | <input type="text" value="161.4"/> | l/s |
| Flow rate 200 years (l/s) | <input type="text" value="176.9"/> | l/s |

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

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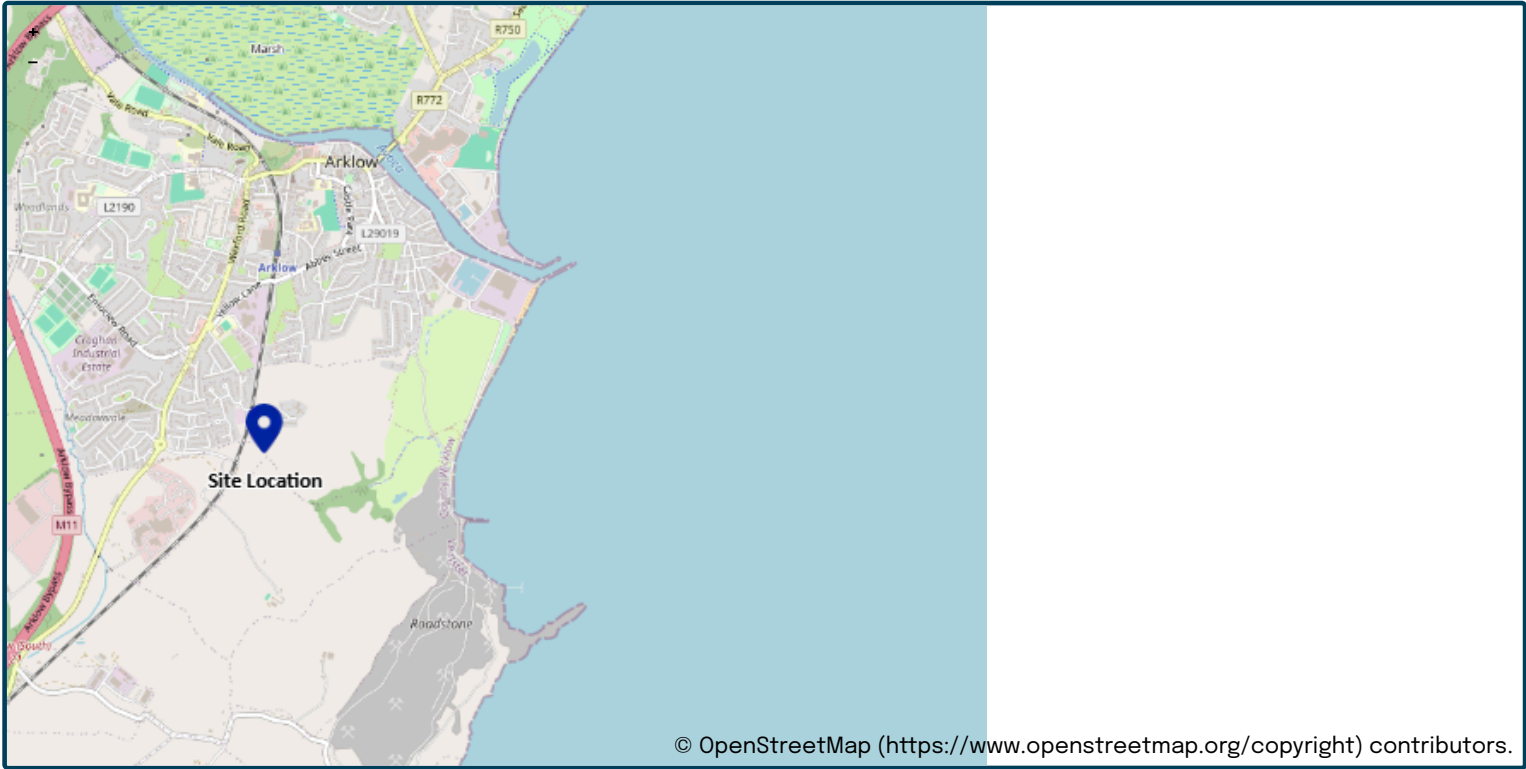
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

## Project details

|               |                                          |
|---------------|------------------------------------------|
| Date          | <input type="text" value="02/10/2026"/>  |
| Calculated by | <input type="text" value="J. Muhia"/>    |
| Reference     | <input type="text" value="Catchment 3"/> |
| Model version | <input type="text" value="2.2.3"/>       |

## Location

|               |                                           |
|---------------|-------------------------------------------|
| Site name     | <input type="text" value="26-035"/>       |
| Site location | <input type="text" value="Arklow - C2A"/> |



|                                           |                                     |
|-------------------------------------------|-------------------------------------|
| Site easting (Irish Grid)                 | <input type="text" value="324150"/> |
| Site northing (Irish Grid)                | <input type="text" value="171834"/> |
| Site easting (Irish Transverse Mercator)  | <input type="text" value="724074"/> |
| Site northing (Irish Transverse Mercator) | <input type="text" value="671874"/> |

## Site details

|                      |                                  |    |
|----------------------|----------------------------------|----|
| Total site area (ha) | <input type="text" value="0.9"/> | ha |
|----------------------|----------------------------------|----|

# Greenfield runoff

## Method

|                            |                                         |                                                  |
|----------------------------|-----------------------------------------|--------------------------------------------------|
| Method                     | IH124                                   |                                                  |
|                            |                                         |                                                  |
| IH124                      |                                         |                                                  |
|                            |                                         |                                                  |
|                            | <u>My value</u>                         | <u>Map value</u>                                 |
| SAAR (mm)                  | <div><div>1132</div><div>mm</div></div> | <div><div><div></div></div><div>1132</div></div> |
| How should SPR be derived? | WRAP soil type                          |                                                  |
| WRAP soil type             | <div><div>4</div></div>                 | <div><div><div></div></div><div>4</div></div>    |
| SPR                        | <div><div>0.47</div><div></div></div>   |                                                  |
| QBar (IH124) (l/s)         | <div><div>7.6</div><div>l/s</div></div> |                                                  |

## Growth curve factors

|                        |                                       |                                                |
|------------------------|---------------------------------------|------------------------------------------------|
|                        | <u>My value</u>                       | <u>Map value</u>                               |
| Hydrological region    | <div><div>12</div></div>              | <div><div><div></div></div><div>12</div></div> |
| 1 year growth factor   | <div><div>0.85</div><div></div></div> |                                                |
| 2 year growth factor   | <div><div>0.95</div><div></div></div> |                                                |
| 10 year growth factor  | <div><div>1.72</div><div></div></div> |                                                |
| 30 year growth factor  | <div><div>2.13</div><div></div></div> |                                                |
| 100 year growth factor | <div><div>2.61</div><div></div></div> |                                                |
| 200 year growth factor | <div><div>2.86</div><div></div></div> |                                                |

## Results

|                           |                                          |  |
|---------------------------|------------------------------------------|--|
| Method                    | IH124                                    |  |
| Flow rate 1 year (l/s)    | <div><div>6.5</div><div>l/s</div></div>  |  |
| Flow rate 2 year (l/s)    | <div><div>7.2</div><div>l/s</div></div>  |  |
| Flow rate 10 years (l/s)  | <div><div>13.1</div><div>l/s</div></div> |  |
| Flow rate 30 years (l/s)  | <div><div>16.2</div><div>l/s</div></div> |  |
| Flow rate 100 years (l/s) | <div><div>19.9</div><div>l/s</div></div> |  |
| Flow rate 200 years (l/s) | <div><div>21.8</div><div>l/s</div></div> |  |

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

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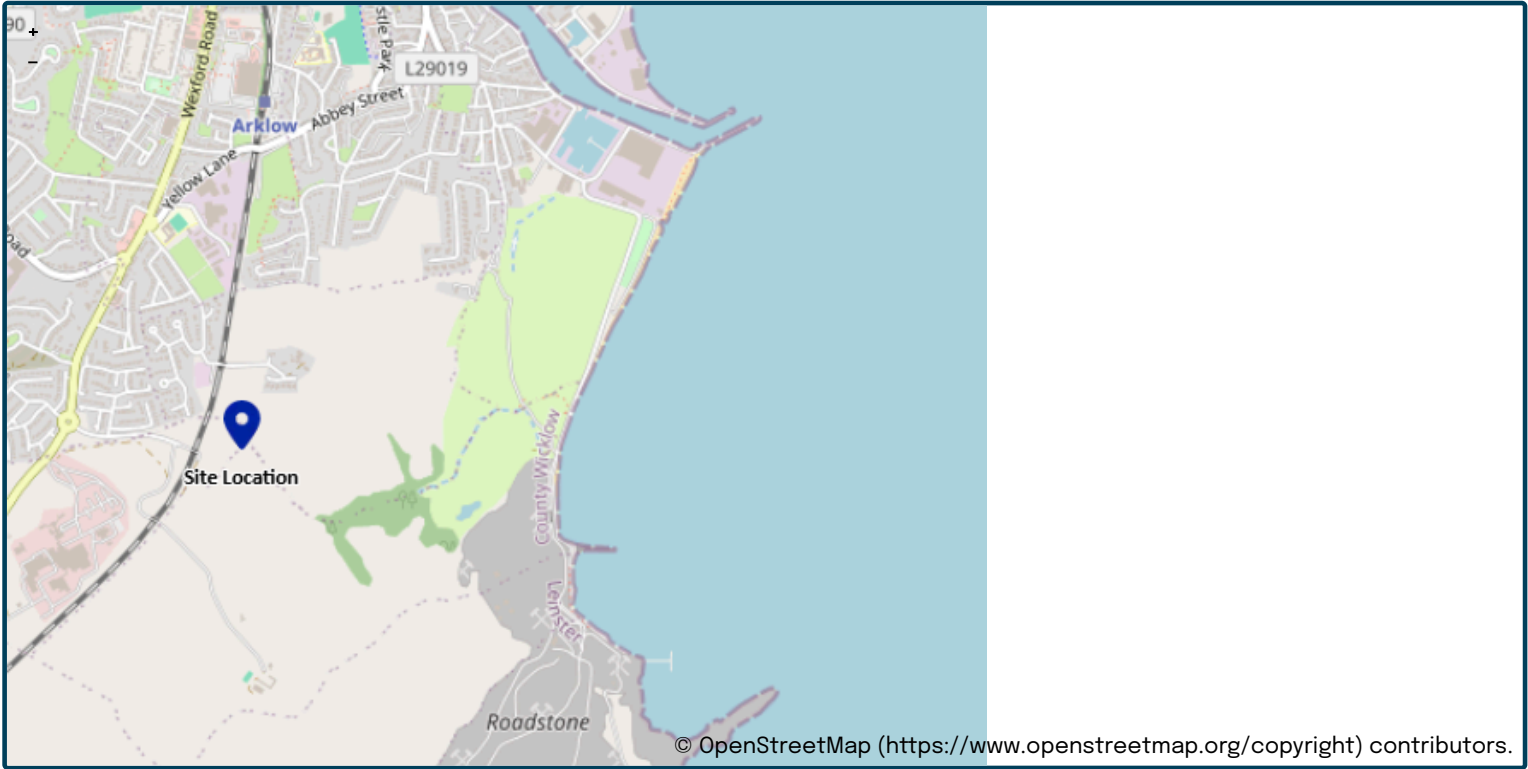
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### Project details

|               |             |
|---------------|-------------|
| Date          | 02/10/2026  |
| Calculated by | J. Muhia    |
| Reference     | Catchment 3 |
| Model version | 2.2.3       |

### Location

|               |              |
|---------------|--------------|
| Site name     | 26-035       |
| Site location | Arklow - C2B |



|                                           |        |
|-------------------------------------------|--------|
| Site easting (Irish Grid)                 | 324150 |
| Site northing (Irish Grid)                | 171834 |
| Site easting (Irish Transverse Mercator)  | 724074 |
| Site northing (Irish Transverse Mercator) | 671874 |

### Site details

|                      |     |    |
|----------------------|-----|----|
| Total site area (ha) | 1.9 | ha |
|----------------------|-----|----|

# Greenfield runoff

## Method

|                            |                                       |                                                         |
|----------------------------|---------------------------------------|---------------------------------------------------------|
| Method                     | IH124                                 |                                                         |
| IH124                      |                                       |                                                         |
|                            | <u>My value</u>                       | <u>Map value</u>                                        |
| SAAR (mm)                  | <input type="text" value="1132"/> mm  | <input type="radio"/> <input type="text" value="1132"/> |
| How should SPR be derived? | WRAP soil type                        |                                                         |
| WRAP soil type             | <input type="text" value="4"/>        | <input type="radio"/> <input type="text" value="4"/>    |
| SPR                        | <input type="text" value="0.47"/>     |                                                         |
| QBar (IH124) (l/s)         | <input type="text" value="16.1"/> l/s |                                                         |

## Growth curve factors

|                        |                                   |                                                       |
|------------------------|-----------------------------------|-------------------------------------------------------|
|                        | <u>My value</u>                   | <u>Map value</u>                                      |
| Hydrological region    | <input type="text" value="12"/>   | <input type="radio"/> <input type="text" value="12"/> |
| 1 year growth factor   | <input type="text" value="0.85"/> |                                                       |
| 2 year growth factor   | <input type="text" value="0.95"/> |                                                       |
| 10 year growth factor  | <input type="text" value="1.72"/> |                                                       |
| 30 year growth factor  | <input type="text" value="2.13"/> |                                                       |
| 100 year growth factor | <input type="text" value="2.61"/> |                                                       |
| 200 year growth factor | <input type="text" value="2.86"/> |                                                       |

## Results

|                           |                                    |     |
|---------------------------|------------------------------------|-----|
| Method                    | <input type="text" value="IH124"/> |     |
| Flow rate 1 year (l/s)    | <input type="text" value="13.7"/>  | l/s |
| Flow rate 2 year (l/s)    | <input type="text" value="15.3"/>  | l/s |
| Flow rate 10 years (l/s)  | <input type="text" value="27.7"/>  | l/s |
| Flow rate 30 years (l/s)  | <input type="text" value="34.3"/>  | l/s |
| Flow rate 100 years (l/s) | <input type="text" value="42.0"/>  | l/s |
| Flow rate 200 years (l/s) | <input type="text" value="46.0"/>  | l/s |

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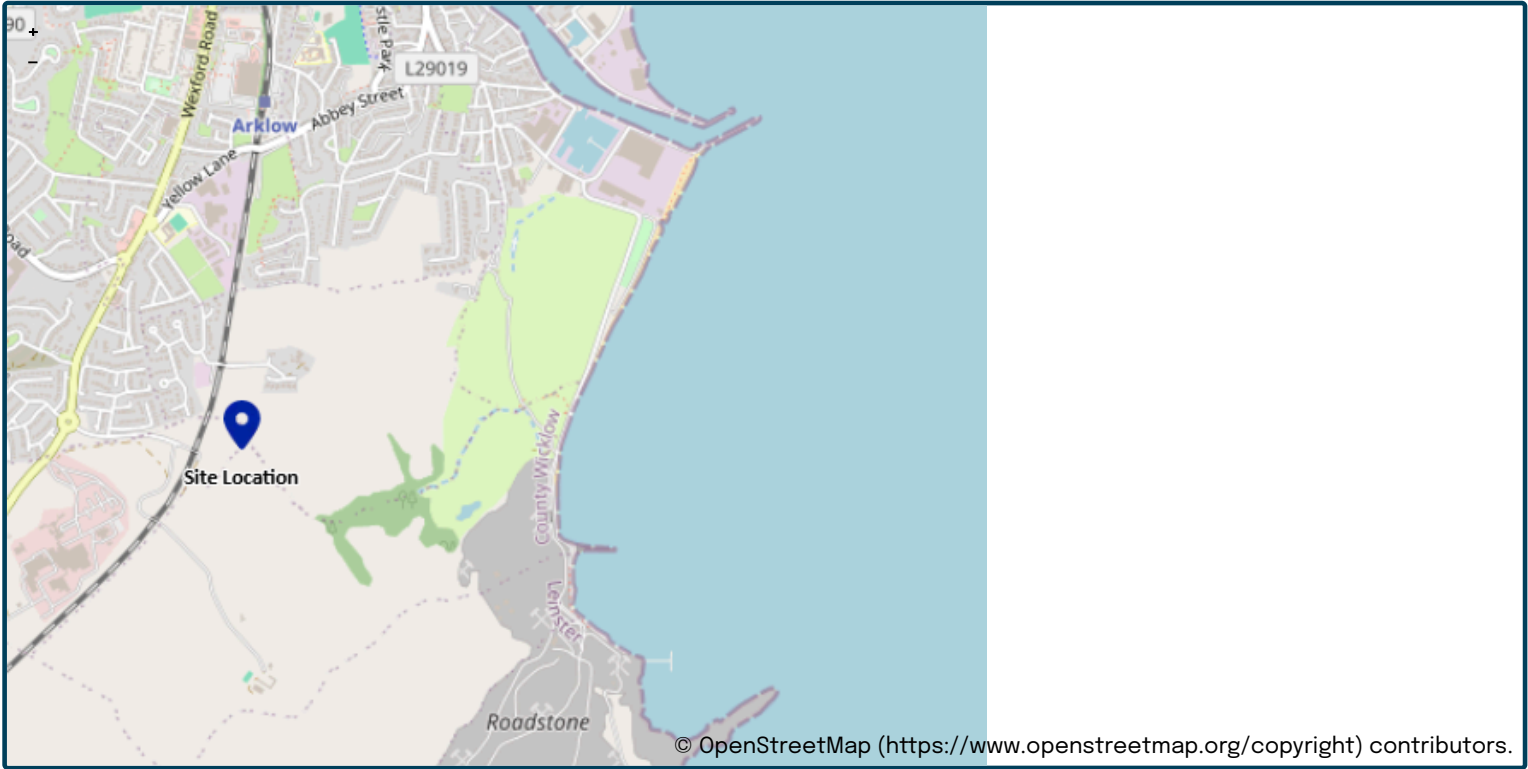
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### Project details

|               |             |
|---------------|-------------|
| Date          | 02/10/2026  |
| Calculated by | J. Muhia    |
| Reference     | Catchment 3 |
| Model version | 2.2.3       |

### Location

|               |              |
|---------------|--------------|
| Site name     | 26-035       |
| Site location | Arklow - C2C |



|                                           |        |
|-------------------------------------------|--------|
| Site easting (Irish Grid)                 | 324150 |
| Site northing (Irish Grid)                | 171834 |
| Site easting (Irish Transverse Mercator)  | 724074 |
| Site northing (Irish Transverse Mercator) | 671874 |

### Site details

|                      |     |    |
|----------------------|-----|----|
| Total site area (ha) | 4.4 | ha |
|----------------------|-----|----|

# Greenfield runoff

## Method

|        |       |
|--------|-------|
| Method | IH124 |
|--------|-------|

## IH124

|                            |                                             |     |                                   |
|----------------------------|---------------------------------------------|-----|-----------------------------------|
|                            | <u>My value</u>                             |     | <u>Map value</u>                  |
| SAAR (mm)                  | <input type="text" value="1132"/>           | mm  | <input type="text" value="1132"/> |
| How should SPR be derived? | <input type="text" value="WRAP soil type"/> |     |                                   |
| WRAP soil type             | <input type="text" value="4"/>              |     | <input type="text" value="4"/>    |
| SPR                        | <input type="text" value="0.47"/>           |     |                                   |
| QBar (IH124) (l/s)         | <input type="text" value="37.3"/>           | l/s |                                   |

## Growth curve factors

|                        |                                   |  |                                 |
|------------------------|-----------------------------------|--|---------------------------------|
|                        | <u>My value</u>                   |  | <u>Map value</u>                |
| Hydrological region    | <input type="text" value="12"/>   |  | <input type="text" value="12"/> |
| 1 year growth factor   | <input type="text" value="0.85"/> |  |                                 |
| 2 year growth factor   | <input type="text" value="0.95"/> |  |                                 |
| 10 year growth factor  | <input type="text" value="1.72"/> |  |                                 |
| 30 year growth factor  | <input type="text" value="2.13"/> |  |                                 |
| 100 year growth factor | <input type="text" value="2.61"/> |  |                                 |
| 200 year growth factor | <input type="text" value="2.86"/> |  |                                 |

## Results

|                           |                                    |     |
|---------------------------|------------------------------------|-----|
| Method                    | <input type="text" value="IH124"/> |     |
| Flow rate 1 year (l/s)    | <input type="text" value="31.7"/>  | l/s |
| Flow rate 2 year (l/s)    | <input type="text" value="35.4"/>  | l/s |
| Flow rate 10 years (l/s)  | <input type="text" value="64.1"/>  | l/s |
| Flow rate 30 years (l/s)  | <input type="text" value="79.4"/>  | l/s |
| Flow rate 100 years (l/s) | <input type="text" value="97.3"/>  | l/s |
| Flow rate 200 years (l/s) | <input type="text" value="106.6"/> | l/s |

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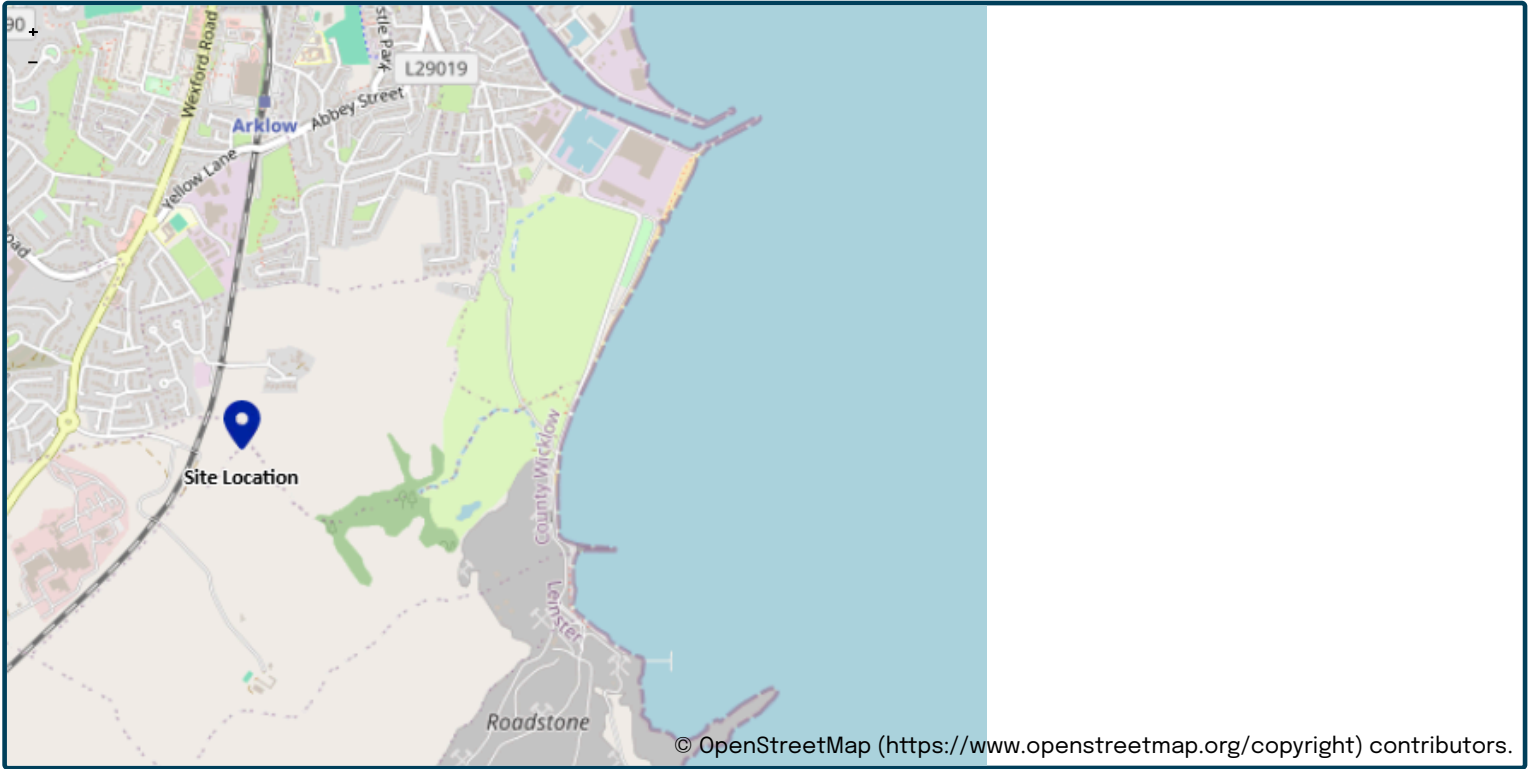
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### Project details

|               |             |
|---------------|-------------|
| Date          | 02/10/2026  |
| Calculated by | J. Muhia    |
| Reference     | Catchment 3 |
| Model version | 2.2.3       |

### Location

|               |             |
|---------------|-------------|
| Site name     | 26-035      |
| Site location | Arklow - C3 |



|                                           |        |
|-------------------------------------------|--------|
| Site easting (Irish Grid)                 | 324150 |
| Site northing (Irish Grid)                | 171834 |
| Site easting (Irish Transverse Mercator)  | 724074 |
| Site northing (Irish Transverse Mercator) | 671874 |

### Site details

|                      |       |    |
|----------------------|-------|----|
| Total site area (ha) | 0.747 | ha |
|----------------------|-------|----|

# Greenfield runoff

## Method

|        |       |
|--------|-------|
| Method | IH124 |
|--------|-------|

## IH124

|                            |                                             |     |                                   |
|----------------------------|---------------------------------------------|-----|-----------------------------------|
|                            | <u>My value</u>                             |     | <u>Map value</u>                  |
| SAAR (mm)                  | <input type="text" value="1132"/>           | mm  | <input type="text" value="1132"/> |
| How should SPR be derived? | <input type="text" value="WRAP soil type"/> |     |                                   |
| WRAP soil type             | <input type="text" value="4"/>              |     | <input type="text" value="4"/>    |
| SPR                        | <input type="text" value="0.47"/>           |     |                                   |
| QBar (IH124) (l/s)         | <input type="text" value="6.3"/>            | l/s |                                   |

## Growth curve factors

|                        |                                   |  |                                 |
|------------------------|-----------------------------------|--|---------------------------------|
|                        | <u>My value</u>                   |  | <u>Map value</u>                |
| Hydrological region    | <input type="text" value="12"/>   |  | <input type="text" value="12"/> |
| 1 year growth factor   | <input type="text" value="0.85"/> |  |                                 |
| 2 year growth factor   | <input type="text" value="0.95"/> |  |                                 |
| 10 year growth factor  | <input type="text" value="1.72"/> |  |                                 |
| 30 year growth factor  | <input type="text" value="2.13"/> |  |                                 |
| 100 year growth factor | <input type="text" value="2.61"/> |  |                                 |
| 200 year growth factor | <input type="text" value="2.86"/> |  |                                 |

## Results

|                           |                                   |     |
|---------------------------|-----------------------------------|-----|
| Method                    | IH124                             |     |
| Flow rate 1 year (l/s)    | <input type="text" value="5.4"/>  | l/s |
| Flow rate 2 year (l/s)    | <input type="text" value="6.0"/>  | l/s |
| Flow rate 10 years (l/s)  | <input type="text" value="10.9"/> | l/s |
| Flow rate 30 years (l/s)  | <input type="text" value="13.5"/> | l/s |
| Flow rate 100 years (l/s) | <input type="text" value="16.5"/> | l/s |
| Flow rate 200 years (l/s) | <input type="text" value="18.1"/> | l/s |

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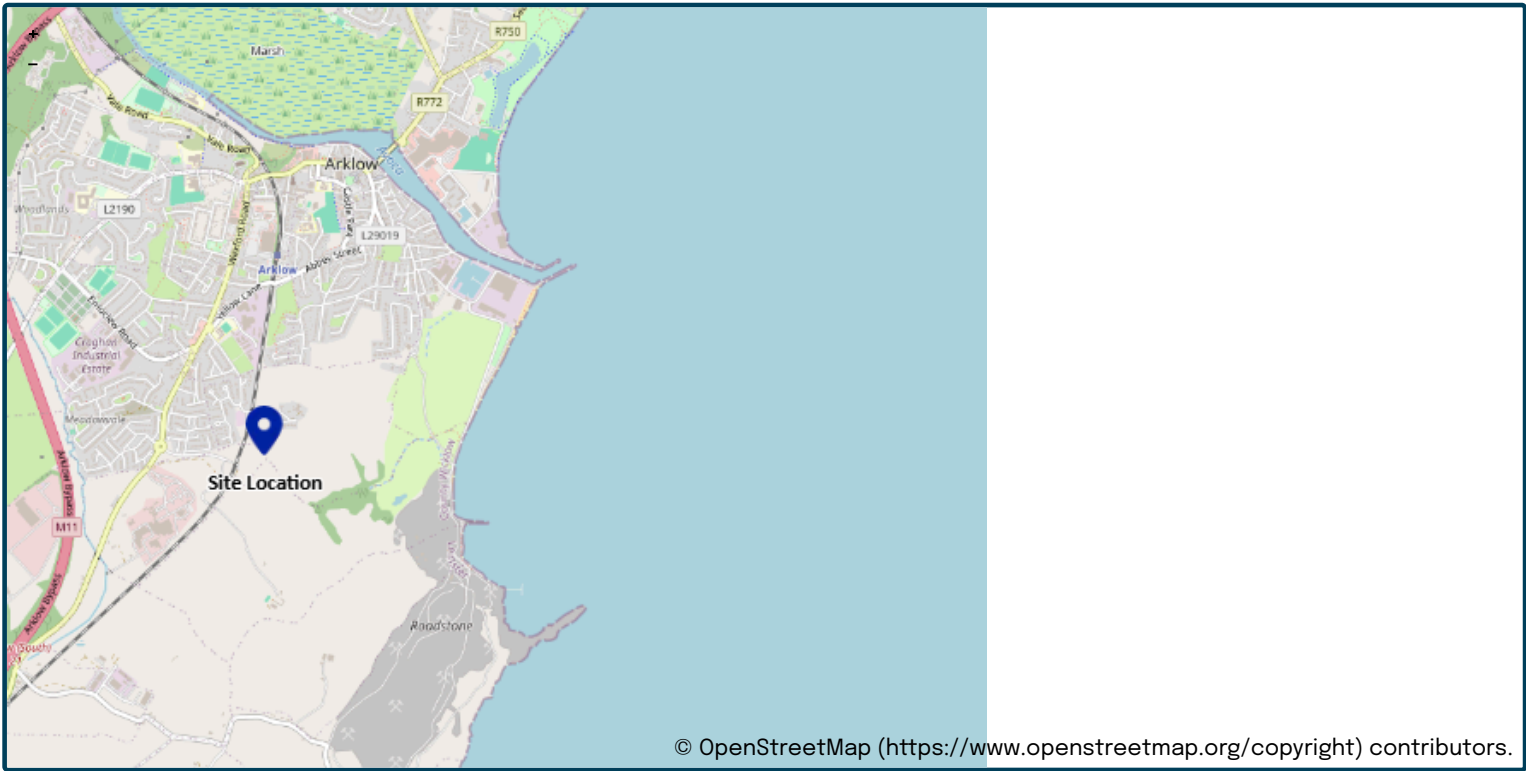
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## Project details

|               |                                          |
|---------------|------------------------------------------|
| Date          | <input type="text" value="02/10/2026"/>  |
| Calculated by | <input type="text" value="J. Muhia"/>    |
| Reference     | <input type="text" value="Catchment 3"/> |
| Model version | <input type="text" value="2.2.3"/>       |

## Location

|               |                                          |
|---------------|------------------------------------------|
| Site name     | <input type="text" value="26-035"/>      |
| Site location | <input type="text" value="Arklow - C4"/> |



|                                           |                                     |
|-------------------------------------------|-------------------------------------|
| Site easting (Irish Grid)                 | <input type="text" value="324150"/> |
| Site northing (Irish Grid)                | <input type="text" value="171834"/> |
| Site easting (Irish Transverse Mercator)  | <input type="text" value="724074"/> |
| Site northing (Irish Transverse Mercator) | <input type="text" value="671874"/> |

## Site details

|                      |                                   |    |
|----------------------|-----------------------------------|----|
| Total site area (ha) | <input type="text" value="3.35"/> | ha |
|----------------------|-----------------------------------|----|

# Greenfield runoff

## Method

|        |       |
|--------|-------|
| Method | IH124 |
|--------|-------|

## IH124

|                            |                                             |     |                                   |
|----------------------------|---------------------------------------------|-----|-----------------------------------|
|                            | <u>My value</u>                             |     | <u>Map value</u>                  |
| SAAR (mm)                  | <input type="text" value="1132"/>           | mm  | <input type="text" value="1132"/> |
| How should SPR be derived? | <input type="text" value="WRAP soil type"/> |     |                                   |
| WRAP soil type             | <input type="text" value="4"/>              |     | <input type="text" value="4"/>    |
| SPR                        | <input type="text" value="0.47"/>           |     |                                   |
| QBar (IH124) (l/s)         | <input type="text" value="28.4"/>           | l/s |                                   |

## Growth curve factors

|                        |                                   |  |                                 |
|------------------------|-----------------------------------|--|---------------------------------|
|                        | <u>My value</u>                   |  | <u>Map value</u>                |
| Hydrological region    | <input type="text" value="12"/>   |  | <input type="text" value="12"/> |
| 1 year growth factor   | <input type="text" value="0.85"/> |  |                                 |
| 2 year growth factor   | <input type="text" value="0.95"/> |  |                                 |
| 10 year growth factor  | <input type="text" value="1.72"/> |  |                                 |
| 30 year growth factor  | <input type="text" value="2.13"/> |  |                                 |
| 100 year growth factor | <input type="text" value="2.61"/> |  |                                 |
| 200 year growth factor | <input type="text" value="2.86"/> |  |                                 |

## Results

|                           |                                    |     |
|---------------------------|------------------------------------|-----|
| Method                    | <input type="text" value="IH124"/> |     |
| Flow rate 1 year (l/s)    | <input type="text" value="24.1"/>  | l/s |
| Flow rate 2 year (l/s)    | <input type="text" value="27.0"/>  | l/s |
| Flow rate 10 years (l/s)  | <input type="text" value="48.8"/>  | l/s |
| Flow rate 30 years (l/s)  | <input type="text" value="60.5"/>  | l/s |
| Flow rate 100 years (l/s) | <input type="text" value="74.1"/>  | l/s |
| Flow rate 200 years (l/s) | <input type="text" value="81.2"/>  | l/s |

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

### Disclaimer

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

## **D. Causeway Flow Design Report – 1, 30 & 100 Year Storm Events**

**Simulation Settings**

|                      |                      |                                         |        |
|----------------------|----------------------|-----------------------------------------|--------|
| Rainfall Methodology | FSR                  | Analysis Speed                          | Normal |
| Rainfall Events      | Singular             | Skip Steady State                       | x      |
| FSR Region           | Scotland and Ireland | Drain Down Time (mins)                  | 240    |
| M5-60 (mm)           | 18.100               | Additional Storage (m <sup>3</sup> /ha) | 20.0   |
| Ratio-R              | 0.325                | Starting Level (m)                      |        |
| Summer CV            | 1.000                | Check Discharge Rate(s)                 | x      |
| Winter CV            | 1.000                | Check Discharge Volume                  | x      |

**Storm Durations**

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

| Return Period<br>(years) | Climate Change<br>(CC %) | Additional Area<br>(A %) | Additional Flow<br>(Q %) |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 30                       | 20                       | 0                        | 0                        |
| 100                      | 20                       | 0                        | 0                        |

### Design Settings

|                       |                      |                                      |               |
|-----------------------|----------------------|--------------------------------------|---------------|
| Rainfall Methodology  | FSR                  | Maximum Time of Concentration (mins) | 30.00         |
| Return Period (years) | 5                    | Maximum Rainfall (mm/hr)             | 50.0          |
| Additional Flow (%)   | 0                    | Minimum Velocity (m/s)               | 1.00          |
| FSR Region            | Scotland and Ireland | Connection Type                      | Level Soffits |
| M5-60 (mm)            | 18.100               | Minimum Backdrop Height (m)          | 0.600         |
| Ratio-R               | 0.325                | Preferred Cover Depth (m)            | 1.200         |
| CV                    | 1.000                | Include Intermediate Ground          | ✓             |
| Time of Entry (mins)  | 4.00                 | Enforce best practice design rules   | x             |

### Nodes

| Name            | Area<br>(ha) | T of E<br>(mins) | Cover<br>Level<br>(m) | Diameter<br>(mm) | Easting<br>(m) | Northing<br>(m) | Depth<br>(m) | Invert<br>Level<br>(m) |
|-----------------|--------------|------------------|-----------------------|------------------|----------------|-----------------|--------------|------------------------|
| 201             | 0.023        | 4.00             | 32.185                | 1200             | 724230.182     | 672089.475      | 1.425        | 30.760                 |
| 250             | 0.008        | 4.00             | 29.851                | 1200             | 724309.012     | 671955.817      | 1.458        | 28.393                 |
| 202             | 0.114        | 4.00             | 30.730                | 1200             | 724286.847     | 672092.966      | 1.389        | 29.341                 |
| 251             |              | 4.00             | 30.950                | 1200             | 724266.339     | 671953.632      | 1.425        | 29.525                 |
| 203             | 0.030        | 4.00             | 29.900                | 1200             | 724317.224     | 672105.592      | 1.381        | 28.519                 |
| PP201           | 0.067        | 4.00             | 31.000                |                  | 724276.030     | 672099.218      | 0.500        | 30.500                 |
| 204             | 0.042        | 4.00             | 29.650                | 1200             | 724328.033     | 672101.488      | 1.516        | 28.134                 |
| PP202           | 0.048        | 4.00             | 31.000                |                  | 724277.125     | 672087.591      | 0.500        | 30.500                 |
| 205             | 0.050        | 4.00             | 28.985                | 1200             | 724341.112     | 672072.337      | 2.202        | 26.783                 |
| PP205           | 0.071        | 4.00             | 29.000                |                  | 724348.135     | 672075.873      | 0.500        | 28.500                 |
| 207             | 0.005        | 4.00             | 28.790                | 1200             | 724371.060     | 672061.604      | 1.875        | 26.915                 |
| PP203           | 0.009        | 4.00             | 30.500                |                  | 724311.708     | 672099.621      | 0.500        | 30.000                 |
| 206             | 0.004        | 4.00             | 28.700                | 1200             | 724345.929     | 672062.641      | 1.425        | 27.275                 |
| PP204           | 0.024        | 4.00             | 30.500                |                  | 724313.440     | 672112.872      | 0.500        | 30.000                 |
| 209             | 0.125        | 4.00             | 28.858                | 1200             | 724337.784     | 672046.381      | 2.658        | 26.200                 |
| PP206           | 0.062        | 4.00             | 29.000                |                  | 724349.876     | 672041.820      | 0.500        | 28.500                 |
| 210             | 0.090        | 4.00             | 29.460                | 1200             | 724314.248     | 672035.755      | 3.464        | 25.996                 |
| PP207           | 0.043        | 4.00             | 30.200                |                  | 724272.220     | 672034.983      | 0.500        | 29.700                 |
| 211             | 0.004        | 4.00             | 31.670                | 1200             | 724232.841     | 672021.002      | 1.425        | 30.245                 |
| PP208           | 0.044        | 4.00             | 30.200                |                  | 724273.585     | 672013.118      | 0.500        | 29.700                 |
| 212             | 0.162        | 4.00             | 30.246                | 1200             | 724289.006     | 672024.929      | 1.550        | 28.696                 |
| DB05            | 0.008        | 4.00             | 29.300                |                  | 724300.633     | 671914.996      | 1.550        | 27.750                 |
| 213             | 0.061        | 4.00             | 28.920                | 1200             | 724334.979     | 671991.595      | 3.087        | 25.833                 |
| 236             | 0.042        | 4.00             | 28.235                | 1200             | 724365.837     | 671982.785      | 2.832        | 25.403                 |
| 252             |              | 4.00             | 28.850                | 1200             | 724339.743     | 671981.200      | 1.425        | 27.425                 |
| Hydrobrake DB05 |              |                  | 29.850                | 1200             | 724301.370     | 671905.590      | 2.147        | 27.703                 |
| PP209           | 0.026        | 4.00             | 29.000                |                  | 724338.727     | 672003.529      | 0.500        | 28.500                 |
| PP210           | 0.048        | 4.00             | 30.500                |                  | 724258.652     | 671932.444      | 0.500        | 30.000                 |
| PP211           | 0.051        | 4.00             | 30.500                |                  | 724282.193     | 671966.685      | 0.500        | 30.000                 |
| PP212           | 0.038        | 4.00             | 30.000                |                  | 724319.204     | 671929.926      | 0.500        | 29.500                 |
| 218             | 0.016        | 4.00             | 31.400                | 1200             | 724236.227     | 671956.973      | 1.525        | 29.875                 |
| PP213           | 0.040        | 4.00             | 29.000                |                  | 724362.630     | 671943.148      | 0.500        | 28.500                 |
| 219             | 0.046        | 4.00             | 31.100                | 1200             | 724259.887     | 671957.111      | 1.698        | 29.402                 |
| PP214           | 0.089        | 4.00             | 29.000                |                  | 724375.142     | 671946.110      | 0.500        | 28.500                 |
| 222             | 0.022        | 4.00             | 30.184                | 1200             | 724299.882     | 671959.629      | 1.593        | 28.591                 |
| PP215           | 0.077        | 4.00             | 26.500                |                  | 724420.260     | 671957.755      | 0.500        | 26.000                 |
| PP216           | 0.059        | 4.00             | 26.500                |                  | 724430.396     | 671958.762      | 0.500        | 26.000                 |
| 224             | 0.039        | 4.00             | 29.600                | 1200             | 724311.200     | 671923.581      | 1.622        | 27.978                 |
| 227             | 0.067        | 4.00             | 29.722                | 1200             | 724302.697     | 671897.295      | 2.061        | 27.661                 |
| PP17            | 0.068        | 4.00             | 25.500                |                  | 724477.386     | 671961.786      | 0.500        | 25.000                 |

### Nodes

| Name            | Area<br>(ha) | T of E<br>(mins) | Cover<br>Level<br>(m) | Diameter<br>(mm) | Easting<br>(m) | Northing<br>(m) | Depth<br>(m) | Invert<br>Level<br>(m) |
|-----------------|--------------|------------------|-----------------------|------------------|----------------|-----------------|--------------|------------------------|
| DB02            | 0.067        | 4.00             | 28.500                |                  | 724330.872     | 672067.223      | 2.240        | 26.260                 |
| DB03            | 0.041        | 4.00             | 28.600                |                  | 724324.651     | 671986.316      | 2.900        | 25.700                 |
| DB04            | 0.034        | 4.00             | 29.300                |                  | 724279.767     | 671912.613      | 0.500        | 28.800                 |
| Hydrobrake DB03 | 0.009        | 4.00             | 28.800                | 2100             | 724329.084     | 671976.474      | 3.120        | 25.680                 |
| 235             | 0.060        | 4.00             | 28.800                | 1200             | 724342.288     | 671971.522      | 3.191        | 25.609                 |
| PP18            | 0.103        | 4.00             | 25.500                |                  | 724492.269     | 671965.074      | 0.500        | 25.000                 |
| Hydrobrake DB02 |              |                  | 28.900                | 1500             | 724334.847     | 672052.641      | 2.665        | 26.235                 |
| PP19            | 0.051        | 4.00             | 27.000                |                  | 724412.983     | 672012.418      | 0.500        | 26.500                 |
| 220             | 0.054        | 4.00             | 30.520                | 1200             | 724269.093     | 671911.506      | 2.180        | 28.340                 |
| PP20            | 0.042        | 4.00             | 26.000                |                  | 724449.201     | 672029.233      | 0.500        | 25.500                 |
| 229A            |              |                  | 26.100                | 1200             | 724428.371     | 671898.144      | 4.636        | 21.464                 |
| 247A            | 0.060        | 4.00             | 26.596                | 1200             | 724406.262     | 671897.510      | 1.455        | 25.141                 |
| 228             |              | 4.00             | 28.517                | 1200             | 724322.428     | 671962.498      | 1.425        | 27.092                 |
| 246             | 0.132        | 4.00             | 27.430                | 1200             |                |                 | 3.759        | 23.671                 |
| 246A            | 0.124        | 4.00             | 27.400                | 1200             | 724372.215     | 671900.178      | 1.425        | 25.975                 |
| 242             | 0.064        | 4.00             | 26.830                | 1200             | 724423.040     | 671997.441      | 1.425        | 25.405                 |
| 245             | 0.025        | 4.00             | 28.985                | 1200             | 724367.579     | 671976.724      | 1.425        | 27.560                 |
| 244B            | 0.032        | 4.00             | 26.005                | 1200             | 724431.972     | 671902.392      | 1.500        | 24.505                 |
| 249A            | 0.024        | 4.00             | 29.115                | 1200             | 724324.001     | 671901.248      | 1.425        | 27.690                 |
| 237             | 0.088        | 4.00             | 26.562                | 1200             | 724442.449     | 672017.325      | 1.500        | 25.062                 |
| 234             |              |                  | 28.066                | 1200             | 724352.835     | 671903.084      | 1.689        | 26.377                 |
| 238             | 0.119        | 4.00             | 26.012                | 1350             | 724466.616     | 672027.790      | 1.575        | 24.437                 |
| 239             | 0.069        | 4.00             | 26.035                | 1350             | 724477.942     | 672025.684      | 1.911        | 24.124                 |
| 240             | 0.033        | 4.00             | 25.377                | 1350             | 724481.306     | 671976.922      | 2.550        | 22.827                 |
| 241             | 0.196        | 4.00             | 24.936                | 1350             | 724484.175     | 671929.713      | 3.055        | 21.881                 |
| DB06            | 0.083        | 4.00             | 24.600                |                  | 724449.846     | 671920.745      | 2.775        | 21.825                 |
| 229             |              |                  | 26.596                | 1200             | 724406.770     | 671894.328      | 5.205        | 21.391                 |
| 230             |              |                  | 24.000                | 1200             | 724407.386     | 671879.742      | 3.000        | 21.000                 |
| 248             |              |                  | 27.153                | 1200             | 724372.994     | 671896.797      | 1.430        | 25.723                 |
| 231             |              |                  | 28.066                | 1200             | 724352.795     | 671900.183      | 1.660        | 26.406                 |
| HB06            | 0.045        | 4.00             | 25.523                | 2700             | 724453.417     | 671904.879      | 3.973        | 21.550                 |
| 243B            | 0.128        | 4.00             | 26.212                | 1200             | 724428.730     | 671917.373      | 3.245        | 22.967                 |
| 232             |              |                  | 24.000                | 1200             | 724389.494     | 671878.219      | 3.060        | 20.940                 |
| 233             |              |                  | 21.500                | 1200             | 724384.954     | 671797.935      | 1.565        | 19.935                 |
| J1              |              |                  | 20.000                |                  | 724369.434     | 671753.439      | 1.300        | 18.700                 |
| 260             |              |                  | 21.500                | 1200             | 724369.330     | 671777.676      | 1.885        | 19.615                 |

Links

| Name   | US Node        | DS Node | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|--------|----------------|---------|------------|-------------|-----------|-----------|----------|-------------|----------|---------------|--------------|
| 21.003 | 250            | 224     | 32.310     | 0.600       | 28.393    | 28.070    | 0.323    | 100.0       | 225      | 5.07          | 50.0         |
| 1.012  | 235            | 236     | 26.104     | 0.600       | 25.609    | 25.478    | 0.131    | 200.0       | 225      | 7.57          | 50.0         |
| 1.014  | 237            | 238     | 26.336     | 0.600       | 25.062    | 24.512    | 0.550    | 47.9        | 300      | 9.16          | 50.0         |
| 1.015  | 238            | 239     | 11.520     | 0.600       | 24.437    | 24.124    | 0.313    | 36.8        | 375      | 9.23          | 50.0         |
| 1.017  | 240            | 241     | 47.296     | 0.600       | 22.827    | 21.881    | 0.946    | 50.0        | 450      | 9.78          | 50.0         |
| 1.018  | 241            | DB06    | 35.481     | 0.600       | 21.990    | 21.825    | 0.165    | 215.0       | 450      | 10.21         | 50.0         |
| 24.000 | 251            | 220     | 42.216     | 0.600       | 29.525    | 28.340    | 1.185    | 35.6        | 225      | 4.32          | 50.0         |
| 24.001 | 220            | DB04    | 10.731     | 0.600       | 29.039    | 28.800    | 0.239    | 44.9        | 225      | 4.41          | 50.0         |
| 21.004 | 224            | DB05    | 13.615     | 0.600       | 27.978    | 27.750    | 0.228    | 59.7        | 225      | 5.21          | 50.0         |
| 21.007 | 227            | 231     | 50.181     | 0.600       | 27.661    | 26.406    | 1.255    | 40.0        | 225      | 5.93          | 50.0         |
| 21.008 | 231            | 248     | 20.481     | 0.600       | 26.406    | 25.723    | 0.683    | 30.0        | 225      | 6.07          | 50.0         |
| 30.000 | 242            | 243B    | 80.270     | 0.600       | 25.405    | 24.335    | 1.070    | 75.0        | 225      | 4.89          | 50.0         |
| 15.000 | 228            | 235     | 21.814     | 0.600       | 27.092    | 26.983    | 0.109    | 200.0       | 225      | 4.39          | 50.0         |
| 1.019  | DB06           | HB06    | 16.263     | 0.600       | 21.825    | 21.550    | 0.275    | 59.1        | 450      | 10.31         | 50.0         |
| 26.004 | 243B           | 246     | 17.682     | 0.600       | 24.260    | 23.671    | 0.589    | 30.0        | 300      | 5.60          | 50.0         |
| 1.000  | 201            | 202     | 56.772     | 0.600       | 30.760    | 29.341    | 1.419    | 40.0        | 225      | 4.46          | 50.0         |
| 1.002  | 203            | 204     | 11.562     | 0.600       | 28.519    | 28.134    | 0.385    | 30.0        | 225      | 4.80          | 50.0         |
| 1.001  | 202            | 203     | 32.896     | 0.600       | 29.341    | 28.519    | 0.822    | 40.0        | 225      | 4.72          | 50.0         |
| 1.003  | 204            | 205     | 31.951     | 0.600       | 28.134    | 26.783    | 1.351    | 23.6        | 225      | 5.00          | 50.0         |
| 8.000  | 207            | 209     | 36.593     | 0.600       | 26.915    | 26.732    | 0.183    | 200.0       | 225      | 4.66          | 50.0         |
| 6.000  | 206            | 205     | 10.827     | 0.600       | 27.275    | 26.783    | 0.492    | 22.0        | 225      | 4.06          | 50.0         |
| 1.004  | 205            | DB02    | 11.446     | 0.600       | 26.783    | 26.260    | 0.523    | 21.9        | 225      | 5.07          | 50.0         |
| 1.006  | Hydobrake DB02 | 209     | 6.915      | 0.600       | 26.235    | 26.200    | 0.035    | 200.0       | 225      | 5.28          | 50.0         |
| 10.000 | 211            | 212     | 56.302     | 0.600       | 30.245    | 28.696    | 1.549    | 36.3        | 225      | 4.43          | 50.0         |

| Name   | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|--------|-----------|-----------|------------|--------------|--------------|-------------|--------------------|----------------|--------------------|
| 21.003 | 1.307     | 52.0      | 25.9       | 1.233        | 1.305        | 0.144       | 0.0                | 112            | 1.305              |
| 1.012  | 0.921     | 36.6      | 231.7      | 2.966        | 2.532        | 1.282       | 0.0                | 225            | 0.938              |
| 1.014  | 2.277     | 161.0     | 255.1      | 1.200        | 1.200        | 1.412       | 0.0                | 300            | 2.307              |
| 1.015  | 2.994     | 330.7     | 293.5      | 1.200        | 1.536        | 1.624       | 0.0                | 276            | 3.363              |
| 1.017  | 2.880     | 458.1     | 312.0      | 2.100        | 2.605        | 1.726       | 0.0                | 273            | 3.086              |
| 1.018  | 1.382     | 219.8     | 378.2      | 2.496        | 2.325        | 2.093       | 0.0                | 450            | 1.400              |
| 24.000 | 2.199     | 87.4      | 0.0        | 1.200        | 1.955        | 0.000       | 0.0                | 0              | 0.000              |
| 24.001 | 1.957     | 77.8      | 18.4       | 1.256        | 0.275        | 0.102       | 0.0                | 74             | 1.610              |
| 21.004 | 1.695     | 67.4      | 39.8       | 1.397        | 1.325        | 0.220       | 0.0                | 124            | 1.763              |
| 21.007 | 2.074     | 82.5      | 78.0       | 1.836        | 1.435        | 0.432       | 0.0                | 175            | 2.349              |
| 21.008 | 2.397     | 95.3      | 78.0       | 1.435        | 1.205        | 0.432       | 0.0                | 155            | 2.663              |
| 30.000 | 1.511     | 60.1      | 11.5       | 1.200        | 1.652        | 0.064       | 0.0                | 66             | 1.170              |
| 15.000 | 0.921     | 36.6      | 0.0        | 1.200        | 1.592        | 0.000       | 0.0                | 0              | 0.000              |
| 1.019  | 2.647     | 421.0     | 393.3      | 2.325        | 3.523        | 2.177       | 0.0                | 347            | 2.987              |
| 26.004 | 2.881     | 203.6     | 130.5      | 1.652        | 3.459        | 0.722       | 0.0                | 175            | 3.050              |
| 1.000  | 2.074     | 82.5      | 4.2        | 1.200        | 1.164        | 0.023       | 0.0                | 34             | 1.087              |
| 1.002  | 2.397     | 95.3      | 57.0       | 1.156        | 1.291        | 0.315       | 0.0                | 125            | 2.499              |
| 1.001  | 2.074     | 82.5      | 45.6       | 1.164        | 1.156        | 0.252       | 0.0                | 119            | 2.122              |
| 1.003  | 2.701     | 107.4     | 64.5       | 1.291        | 1.977        | 0.357       | 0.0                | 126            | 2.823              |
| 8.000  | 0.921     | 36.6      | 1.0        | 1.650        | 1.901        | 0.005       | 0.0                | 25             | 0.396              |
| 6.000  | 2.801     | 111.4     | 0.7        | 1.200        | 1.977        | 0.004       | 0.0                | 13             | 0.780              |
| 1.004  | 2.809     | 111.7     | 87.1       | 1.977        | 2.015        | 0.482       | 0.0                | 150            | 3.095              |
| 1.006  | 0.921     | 36.6      | 99.3       | 2.440        | 2.433        | 0.549       | 0.0                | 225            | 0.938              |
| 10.000 | 2.177     | 86.5      | 0.8        | 1.200        | 1.325        | 0.004       | 0.0                | 15             | 0.660              |

Links

| Name   | US Node         | DS Node         | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|--------|-----------------|-----------------|------------|-------------|-----------|-----------|----------|-------------|----------|---------------|--------------|
| 1.007  | 209             | 210             | 25.824     | 0.600       | 26.200    | 26.071    | 0.129    | 200.0       | 225      | 5.75          | 50.0         |
| 26.000 | 245             | 246A            | 76.686     | 0.600       | 27.560    | 25.975    | 1.585    | 48.4        | 225      | 4.68          | 50.0         |
| 21.001 | 219             | 222             | 40.074     | 0.600       | 29.402    | 28.591    | 0.811    | 49.4        | 225      | 4.57          | 50.0         |
| 1.022  | 229             | 230             | 14.599     | 0.600       | 21.391    | 21.000    | 0.391    | 37.3        | 300      | 11.29         | 50.0         |
| 1.008  | 210             | 213             | 48.784     | 0.600       | 25.996    | 25.833    | 0.163    | 300.0       | 300      | 6.65          | 50.0         |
| 31.000 | PP216           | 243B            | 41.423     | 0.600       | 26.000    | 24.460    | 1.540    | 26.9        | 100      | 4.46          | 50.0         |
| 21.002 | 222             | 250             | 9.894      | 0.600       | 28.591    | 28.393    | 0.198    | 50.0        | 225      | 4.66          | 50.0         |
| 29.000 | PP213           | 246A            | 44.026     | 0.600       | 28.500    | 26.739    | 1.761    | 25.0        | 100      | 4.47          | 50.0         |
| 10.001 | 212             | 210             | 27.466     | 0.600       | 28.696    | 27.911    | 0.785    | 35.0        | 225      | 4.64          | 50.0         |
| 1.009  | 213             | DB03            | 11.599     | 0.600       | 25.833    | 25.700    | 0.133    | 87.2        | 300      | 6.76          | 50.0         |
| 1.013  | 236             | 237             | 84.038     | 0.600       | 25.403    | 25.062    | 0.341    | 246.4       | 300      | 8.97          | 50.0         |
| 2.000  | PP201           | 202             | 12.494     | 0.600       | 30.500    | 30.309    | 0.191    | 65.4        | 150      | 4.17          | 50.0         |
| 21.000 | 218             | 219             | 23.660     | 0.600       | 29.875    | 29.402    | 0.473    | 50.0        | 225      | 4.21          | 50.0         |
| 21.005 | DB05            | Hydrobrake DB05 | 9.435      | 0.600       | 27.750    | 27.703    | 0.047    | 200.0       | 225      | 5.38          | 50.0         |
| 24.002 | DB04            | DB05            | 21.002     | 0.600       | 28.800    | 27.750    | 1.050    | 20.0        | 225      | 4.53          | 50.0         |
| 1.010  | DB03            | Hydrobrake DB03 | 4.000      | 0.600       | 25.700    | 25.680    | 0.020    | 200.0       | 225      | 6.84          | 50.0         |
| 1.011  | Hydrobrake DB03 | 235             | 14.102     | 0.600       | 25.680    | 25.609    | 0.071    | 200.0       | 225      | 7.09          | 50.0         |
| 3.000  | PP202           | 202             | 11.109     | 0.600       | 30.500    | 30.327    | 0.173    | 64.2        | 150      | 4.15          | 50.0         |
| 1.005  | DB02            | Hydrobrake DB02 | 5.000      | 0.600       | 26.260    | 26.235    | 0.025    | 200.0       | 225      | 5.16          | 50.0         |
| 21.006 | Hydrobrake DB05 | 227             | 8.400      | 0.600       | 27.703    | 27.661    | 0.042    | 200.0       | 225      | 5.53          | 50.0         |
| 1.016  | 239             | 240             | 48.878     | 0.600       | 24.124    | 22.902    | 1.222    | 40.0        | 375      | 9.51          | 50.0         |
| 28.000 | PP214           | 246A            | 46.025     | 0.600       | 28.500    | 26.659    | 1.841    | 25.0        | 150      | 4.38          | 50.0         |
| 21.009 | 248             | 229             | 33.866     | 0.600       | 25.723    | 24.876    | 0.847    | 40.0        | 225      | 6.35          | 50.0         |

| Name   | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|--------|-----------|-----------|------------|--------------|--------------|-------------|--------------------|----------------|--------------------|
| 1.007  | 0.921     | 36.6      | 134.2      | 2.433        | 3.164        | 0.742       | 0.0                | 225            | 0.938              |
| 26.000 | 1.885     | 74.9      | 4.4        | 1.200        | 1.200        | 0.025       | 0.0                | 36             | 1.034              |
| 21.001 | 1.865     | 74.2      | 11.3       | 1.473        | 1.368        | 0.062       | 0.0                | 59             | 1.359              |
| 1.022  | 2.581     | 182.4     | 479.4      | 4.905        | 2.700        | 2.653       | 0.0                | 300            | 2.614              |
| 1.008  | 0.902     | 63.8      | 196.0      | 3.164        | 2.787        | 1.085       | 0.0                | 300            | 0.914              |
| 31.000 | 1.494     | 11.7      | 10.7       | 0.400        | 1.652        | 0.059       | 0.0                | 75             | 1.689              |
| 21.002 | 1.854     | 73.7      | 24.5       | 1.368        | 1.233        | 0.136       | 0.0                | 89             | 1.671              |
| 29.000 | 1.550     | 12.2      | 7.3        | 0.400        | 0.561        | 0.040       | 0.0                | 56             | 1.620              |
| 10.001 | 2.218     | 88.2      | 45.6       | 1.325        | 1.324        | 0.252       | 0.0                | 115            | 2.236              |
| 1.009  | 1.684     | 119.0     | 211.8      | 2.787        | 2.600        | 1.172       | 0.0                | 300            | 1.706              |
| 1.013  | 0.997     | 70.5      | 239.3      | 2.532        | 1.200        | 1.324       | 0.0                | 300            | 1.010              |
| 2.000  | 1.245     | 22.0      | 12.1       | 0.350        | 0.271        | 0.067       | 0.0                | 79             | 1.274              |
| 21.000 | 1.854     | 73.7      | 2.9        | 1.300        | 1.473        | 0.016       | 0.0                | 30             | 0.907              |
| 21.005 | 0.921     | 36.6      | 65.9       | 1.325        | 1.922        | 0.365       | 0.0                | 225            | 0.938              |
| 24.002 | 2.939     | 116.8     | 24.6       | 0.275        | 1.325        | 0.136       | 0.0                | 70             | 2.342              |
| 1.010  | 0.921     | 36.6      | 219.2      | 2.675        | 2.895        | 1.213       | 0.0                | 225            | 0.938              |
| 1.011  | 0.921     | 36.6      | 220.8      | 2.895        | 2.966        | 1.222       | 0.0                | 225            | 0.938              |
| 3.000  | 1.257     | 22.2      | 8.7        | 0.350        | 0.253        | 0.048       | 0.0                | 65             | 1.183              |
| 1.005  | 0.921     | 36.6      | 99.3       | 2.015        | 2.440        | 0.549       | 0.0                | 225            | 0.938              |
| 21.006 | 0.921     | 36.6      | 65.9       | 1.922        | 1.836        | 0.365       | 0.0                | 225            | 0.938              |
| 1.016  | 2.872     | 317.2     | 305.9      | 1.536        | 2.100        | 1.693       | 0.0                | 298            | 3.249              |
| 28.000 | 2.022     | 35.7      | 16.2       | 0.350        | 0.591        | 0.089       | 0.0                | 71             | 1.971              |
| 21.009 | 2.074     | 82.5      | 78.0       | 1.205        | 1.495        | 0.432       | 0.0                | 175            | 2.349              |

Links

| Name   | US Node | DS Node | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|--------|---------|---------|------------|-------------|-----------|-----------|----------|-------------|----------|---------------|--------------|
| 27.000 | 249A    | 234     | 28.892     | 0.600       | 27.690    | 26.377    | 1.313    | 22.0        | 225      | 4.17          | 50.0         |
| 4.000  | PP204   | 203     | 8.205      | 0.600       | 30.000    | 29.727    | 0.273    | 30.0        | 100      | 4.10          | 50.0         |
| 5.000  | PP203   | 203     | 8.129      | 0.600       | 30.000    | 29.729    | 0.271    | 30.0        | 100      | 4.10          | 50.0         |
| 7.000  | PP205   | 205     | 7.863      | 0.600       | 28.500    | 28.377    | 0.123    | 63.9        | 150      | 4.10          | 50.0         |
| 9.000  | PP206   | 209     | 12.924     | 0.600       | 28.500    | 28.222    | 0.278    | 46.5        | 150      | 4.15          | 50.0         |
| 11.000 | PP207   | 212     | 19.567     | 0.600       | 29.700    | 29.211    | 0.489    | 40.0        | 100      | 4.27          | 50.0         |
| 12.000 | PP208   | 212     | 19.424     | 0.600       | 29.700    | 29.214    | 0.486    | 40.0        | 100      | 4.26          | 50.0         |
| 14.000 | 252     | 213     | 11.435     | 0.600       | 27.425    | 27.234    | 0.191    | 60.0        | 225      | 4.11          | 50.0         |
| 13.000 | PP209   | 213     | 12.509     | 0.600       | 28.500    | 28.288    | 0.212    | 59.0        | 100      | 4.21          | 50.0         |
| 25.000 | PP210   | 220     | 23.397     | 0.600       | 30.000    | 29.532    | 0.468    | 50.0        | 150      | 4.27          | 50.0         |
| 22.000 | PP211   | 222     | 19.044     | 0.600       | 30.000    | 29.619    | 0.381    | 50.0        | 150      | 4.22          | 50.0         |
| 23.000 | PP212   | 224     | 10.214     | 0.600       | 29.500    | 29.299    | 0.201    | 50.8        | 100      | 4.16          | 50.0         |
| 33.000 | PP214   | 246     | 43.958     | 0.600       | 28.500    | 27.035    | 1.465    | 30.0        | 100      | 4.52          | 50.0         |
| 34.000 | PP213   | 246     | 42.132     | 0.600       | 28.500    | 27.096    | 1.404    | 30.0        | 100      | 4.50          | 50.0         |
| 16.000 | PP19    | 238     | 55.792     | 0.600       | 26.500    | 25.384    | 1.116    | 50.0        | 150      | 4.65          | 50.0         |
| 17.000 | PP20    | 238     | 17.475     | 0.600       | 25.500    | 25.151    | 0.349    | 50.0        | 100      | 4.27          | 50.0         |
| 18.000 | PP18    | 241     | 36.276     | 0.600       | 25.000    | 24.274    | 0.726    | 50.0        | 150      | 4.42          | 50.0         |
| 19.000 | PP17    | 241     | 32.784     | 0.600       | 25.000    | 24.344    | 0.656    | 50.0        | 150      | 4.38          | 50.0         |
| 27.001 | 234     | 246A    | 19.597     | 0.600       | 26.377    | 25.975    | 0.402    | 48.7        | 225      | 4.35          | 50.0         |
| 26.001 | 246A    | 247A    | 34.151     | 0.600       | 25.975    | 25.141    | 0.834    | 40.9        | 225      | 4.96          | 50.0         |
| 26.003 | 244B    | 243B    | 21.251     | 0.600       | 24.505    | 24.399    | 0.106    | 200.0       | 300      | 5.50          | 50.0         |
| 26.002 | 247A    | 244B    | 26.169     | 0.600       | 25.141    | 24.580    | 0.561    | 46.6        | 225      | 5.18          | 50.0         |
| 20.000 | 243B    | DB06    | 21.384     | 0.600       | 22.967    | 21.975    | 0.992    | 21.6        | 300      | 4.10          | 50.0         |
| 1.020  | HB06    | 229A    | 25.936     | 0.600       | 21.550    | 21.464    | 0.086    | 300.0       | 300      | 10.79         | 50.0         |

| Name   | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|--------|-----------|-----------|------------|--------------|--------------|-------------|--------------------|----------------|--------------------|
| 27.000 | 2.801     | 111.4     | 4.4        | 1.200        | 1.464        | 0.024       | 0.0                | 30             | 1.374              |
| 4.000  | 1.414     | 11.1      | 4.3        | 0.400        | 0.073        | 0.024       | 0.0                | 43             | 1.326              |
| 5.000  | 1.414     | 11.1      | 1.7        | 0.400        | 0.071        | 0.009       | 0.0                | 26             | 1.016              |
| 7.000  | 1.260     | 22.3      | 12.8       | 0.350        | 0.458        | 0.071       | 0.0                | 82             | 1.303              |
| 9.000  | 1.479     | 26.1      | 11.2       | 0.350        | 0.486        | 0.062       | 0.0                | 69             | 1.426              |
| 11.000 | 1.223     | 9.6       | 7.7        | 0.400        | 0.935        | 0.043       | 0.0                | 68             | 1.360              |
| 12.000 | 1.223     | 9.6       | 7.9        | 0.400        | 0.932        | 0.044       | 0.0                | 69             | 1.364              |
| 14.000 | 1.691     | 67.2      | 0.0        | 1.200        | 1.461        | 0.000       | 0.0                | 0              | 0.000              |
| 13.000 | 1.004     | 7.9       | 4.7        | 0.400        | 0.532        | 0.026       | 0.0                | 56             | 1.050              |
| 25.000 | 1.426     | 25.2      | 8.7        | 0.350        | 0.838        | 0.048       | 0.0                | 61             | 1.296              |
| 22.000 | 1.426     | 25.2      | 9.2        | 0.350        | 0.415        | 0.051       | 0.0                | 63             | 1.319              |
| 23.000 | 1.083     | 8.5       | 6.9        | 0.400        | 0.201        | 0.038       | 0.0                | 68             | 1.205              |
| 33.000 | 1.414     | 11.1      | 0.0        | 0.400        | 0.295        | 0.000       | 0.0                | 0              | 0.000              |
| 34.000 | 1.414     | 11.1      | 0.0        | 0.400        | 0.234        | 0.000       | 0.0                | 0              | 0.000              |
| 16.000 | 1.426     | 25.2      | 9.2        | 0.350        | 0.478        | 0.051       | 0.0                | 63             | 1.319              |
| 17.000 | 1.092     | 8.6       | 7.6        | 0.400        | 0.761        | 0.042       | 0.0                | 74             | 1.234              |
| 18.000 | 1.426     | 25.2      | 18.6       | 0.350        | 0.512        | 0.103       | 0.0                | 96             | 1.556              |
| 19.000 | 1.426     | 25.2      | 12.2       | 0.350        | 0.442        | 0.068       | 0.0                | 74             | 1.414              |
| 27.001 | 1.878     | 74.7      | 4.4        | 1.464        | 1.200        | 0.024       | 0.0                | 36             | 1.030              |
| 26.001 | 2.050     | 81.5      | 54.7       | 1.200        | 1.230        | 0.303       | 0.0                | 135            | 2.192              |
| 26.003 | 1.108     | 78.3      | 71.3       | 1.200        | 1.513        | 0.395       | 0.0                | 226            | 1.250              |
| 26.002 | 1.920     | 76.3      | 65.5       | 1.230        | 1.200        | 0.362       | 0.0                | 161            | 2.150              |
| 20.000 | 3.401     | 240.4     | 0.0        | 2.945        | 2.325        | 0.000       | 0.0                | 0              | 0.000              |
| 1.020  | 0.902     | 63.8      | 401.4      | 3.673        | 4.336        | 2.221       | 0.0                | 300            | 0.914              |

### Links

| Name   | US Node | DS Node | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|--------|---------|---------|------------|-------------|-----------|-----------|----------|-------------|----------|---------------|--------------|
| 32.000 | PP215   | 243B    | 41.261     | 0.600       | 26.000    | 25.175    | 0.825    | 50.0        | 150      | 4.48          | 50.0         |
| 1.021  | 229A    | 229     | 21.935     | 0.600       | 21.464    | 21.391    | 0.073    | 300.0       | 300      | 11.20         | 50.0         |
| 1.023  | 230     | 232     | 17.957     | 0.600       | 21.000    | 20.940    | 0.060    | 300.0       | 300      | 11.62         | 50.0         |
| 1.024  | 232     | 233     | 80.412     | 0.600       | 20.940    | 19.935    | 1.005    | 80.0        | 300      | 12.39         | 48.8         |
| 1.025  | 233     | 260     | 25.584     | 0.600       | 19.935    | 19.615    | 0.320    | 80.0        | 300      | 12.63         | 48.3         |
| 1.026  | 260     | J1      | 24.237     | 0.600       | 19.615    | 18.700    | 0.915    | 26.5        | 300      | 12.76         | 48.0         |

| Name   | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|--------|-----------|-----------|------------|--------------|--------------|-------------|--------------------|----------------|--------------------|
| 32.000 | 1.426     | 25.2      | 13.9       | 0.350        | 0.887        | 0.077       | 0.0                | 79             | 1.459              |
| 1.021  | 0.902     | 63.8      | 401.4      | 4.336        | 4.905        | 2.221       | 0.0                | 300            | 0.914              |
| 1.023  | 0.902     | 63.8      | 479.4      | 2.700        | 2.760        | 2.653       | 0.0                | 300            | 0.914              |
| 1.024  | 1.759     | 124.3     | 467.6      | 2.760        | 1.265        | 2.653       | 0.0                | 300            | 1.782              |
| 1.025  | 1.759     | 124.3     | 462.8      | 1.265        | 1.585        | 2.653       | 0.0                | 300            | 1.782              |
| 1.026  | 3.066     | 216.8     | 460.3      | 1.585        | 1.000        | 2.653       | 0.0                | 300            | 3.106              |

### Pipeline Schedule

| Link   | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) | DS CL (m) | DS IL (m) | DS Depth (m) |
|--------|------------|-------------|----------|-----------|-----------|-----------|--------------|-----------|-----------|--------------|
| 21.003 | 32.310     | 100.0       | 225      | Circular  | 29.851    | 28.393    | 1.233        | 29.600    | 28.070    | 1.305        |
| 1.012  | 26.104     | 200.0       | 225      | Circular  | 28.800    | 25.609    | 2.966        | 28.235    | 25.478    | 2.532        |
| 1.014  | 26.336     | 47.9        | 300      | Circular  | 26.562    | 25.062    | 1.200        | 26.012    | 24.512    | 1.200        |
| 1.015  | 11.520     | 36.8        | 375      | Circular  | 26.012    | 24.437    | 1.200        | 26.035    | 24.124    | 1.536        |
| 1.017  | 47.296     | 50.0        | 450      | Circular  | 25.377    | 22.827    | 2.100        | 24.936    | 21.881    | 2.605        |
| 1.018  | 35.481     | 215.0       | 450      | Circular  | 24.936    | 21.990    | 2.496        | 24.600    | 21.825    | 2.325        |
| 24.000 | 42.216     | 35.6        | 225      | Circular  | 30.950    | 29.525    | 1.200        | 30.520    | 28.340    | 1.955        |
| 24.001 | 10.731     | 44.9        | 225      | Circular  | 30.520    | 29.039    | 1.256        | 29.300    | 28.800    | 0.275        |
| 21.004 | 13.615     | 59.7        | 225      | Circular  | 29.600    | 27.978    | 1.397        | 29.300    | 27.750    | 1.325        |
| 21.007 | 50.181     | 40.0        | 225      | Circular  | 29.722    | 27.661    | 1.836        | 28.066    | 26.406    | 1.435        |
| 21.008 | 20.481     | 30.0        | 225      | Circular  | 28.066    | 26.406    | 1.435        | 27.153    | 25.723    | 1.205        |
| 30.000 | 80.270     | 75.0        | 225      | Circular  | 26.830    | 25.405    | 1.200        | 26.212    | 24.335    | 1.652        |
| 15.000 | 21.814     | 200.0       | 225      | Circular  | 28.517    | 27.092    | 1.200        | 28.800    | 26.983    | 1.592        |

| Link   | US Node | Dia (mm) | Node Type | MH Type   | DS Node | Dia (mm) | Node Type | MH Type   |
|--------|---------|----------|-----------|-----------|---------|----------|-----------|-----------|
| 21.003 | 250     | 1200     | Manhole   | Adoptable | 224     | 1200     | Manhole   | Adoptable |
| 1.012  | 235     | 1200     | Manhole   | Adoptable | 236     | 1200     | Manhole   | Adoptable |
| 1.014  | 237     | 1200     | Manhole   | Adoptable | 238     | 1350     | Manhole   | Adoptable |
| 1.015  | 238     | 1350     | Manhole   | Adoptable | 239     | 1350     | Manhole   | Adoptable |
| 1.017  | 240     | 1350     | Manhole   | Adoptable | 241     | 1350     | Manhole   | Adoptable |
| 1.018  | 241     | 1350     | Manhole   | Adoptable | DB06    |          | Junction  |           |
| 24.000 | 251     | 1200     | Manhole   | Adoptable | 220     | 1200     | Manhole   | Adoptable |
| 24.001 | 220     | 1200     | Manhole   | Adoptable | DB04    |          | Junction  |           |
| 21.004 | 224     | 1200     | Manhole   | Adoptable | DB05    |          | Junction  |           |
| 21.007 | 227     | 1200     | Manhole   | Adoptable | 231     | 1200     | Manhole   | Adoptable |
| 21.008 | 231     | 1200     | Manhole   | Adoptable | 248     | 1200     | Manhole   | Adoptable |
| 30.000 | 242     | 1200     | Manhole   | Adoptable | 243B    | 1200     | Manhole   | Adoptable |
| 15.000 | 228     | 1200     | Manhole   | Adoptable | 235     | 1200     | Manhole   | Adoptable |

### Pipeline Schedule

| Link   | Length<br>(m) | Slope<br>(1:X) | Dia<br>(mm) | Link<br>Type | US CL<br>(m) | US IL<br>(m) | US Depth<br>(m) | DS CL<br>(m) | DS IL<br>(m) | DS Depth<br>(m) |
|--------|---------------|----------------|-------------|--------------|--------------|--------------|-----------------|--------------|--------------|-----------------|
| 1.019  | 16.263        | 59.1           | 450         | Circular     | 24.600       | 21.825       | 2.325           | 25.523       | 21.550       | 3.523           |
| 26.004 | 17.682        | 30.0           | 300         | Circular     | 26.212       | 24.260       | 1.652           | 27.430       | 23.671       | 3.459           |
| 1.000  | 56.772        | 40.0           | 225         | Circular     | 32.185       | 30.760       | 1.200           | 30.730       | 29.341       | 1.164           |
| 1.002  | 11.562        | 30.0           | 225         | Circular     | 29.900       | 28.519       | 1.156           | 29.650       | 28.134       | 1.291           |
| 1.001  | 32.896        | 40.0           | 225         | Circular     | 30.730       | 29.341       | 1.164           | 29.900       | 28.519       | 1.156           |
| 1.003  | 31.951        | 23.6           | 225         | Circular     | 29.650       | 28.134       | 1.291           | 28.985       | 26.783       | 1.977           |
| 8.000  | 36.593        | 200.0          | 225         | Circular     | 28.790       | 26.915       | 1.650           | 28.858       | 26.732       | 1.901           |
| 6.000  | 10.827        | 22.0           | 225         | Circular     | 28.700       | 27.275       | 1.200           | 28.985       | 26.783       | 1.977           |
| 1.004  | 11.446        | 21.9           | 225         | Circular     | 28.985       | 26.783       | 1.977           | 28.500       | 26.260       | 2.015           |
| 1.006  | 6.915         | 200.0          | 225         | Circular     | 28.900       | 26.235       | 2.440           | 28.858       | 26.200       | 2.433           |
| 10.000 | 56.302        | 36.3           | 225         | Circular     | 31.670       | 30.245       | 1.200           | 30.246       | 28.696       | 1.325           |
| 1.007  | 25.824        | 200.0          | 225         | Circular     | 28.858       | 26.200       | 2.433           | 29.460       | 26.071       | 3.164           |
| 26.000 | 76.686        | 48.4           | 225         | Circular     | 28.985       | 27.560       | 1.200           | 27.400       | 25.975       | 1.200           |
| 21.001 | 40.074        | 49.4           | 225         | Circular     | 31.100       | 29.402       | 1.473           | 30.184       | 28.591       | 1.368           |
| 1.022  | 14.599        | 37.3           | 300         | Circular     | 26.596       | 21.391       | 4.905           | 24.000       | 21.000       | 2.700           |
| 1.008  | 48.784        | 300.0          | 300         | Circular     | 29.460       | 25.996       | 3.164           | 28.920       | 25.833       | 2.787           |
| 31.000 | 41.423        | 26.9           | 100         | Circular     | 26.500       | 26.000       | 0.400           | 26.212       | 24.460       | 1.652           |
| 21.002 | 9.894         | 50.0           | 225         | Circular     | 30.184       | 28.591       | 1.368           | 29.851       | 28.393       | 1.233           |
| 29.000 | 44.026        | 25.0           | 100         | Circular     | 29.000       | 28.500       | 0.400           | 27.400       | 26.739       | 0.561           |
| 10.001 | 27.466        | 35.0           | 225         | Circular     | 30.246       | 28.696       | 1.325           | 29.460       | 27.911       | 1.324           |
| 1.009  | 11.599        | 87.2           | 300         | Circular     | 28.920       | 25.833       | 2.787           | 28.600       | 25.700       | 2.600           |
| 1.013  | 84.038        | 246.4          | 300         | Circular     | 28.235       | 25.403       | 2.532           | 26.562       | 25.062       | 1.200           |
| 2.000  | 12.494        | 65.4           | 150         | Circular     | 31.000       | 30.500       | 0.350           | 30.730       | 30.309       | 0.271           |
| 21.000 | 23.660        | 50.0           | 225         | Circular     | 31.400       | 29.875       | 1.300           | 31.100       | 29.402       | 1.473           |
| 21.005 | 9.435         | 200.0          | 225         | Circular     | 29.300       | 27.750       | 1.325           | 29.850       | 27.703       | 1.922           |

| Link   | US<br>Node      | Dia<br>(mm) | Node<br>Type | MH<br>Type | DS<br>Node      | Dia<br>(mm) | Node<br>Type | MH<br>Type |
|--------|-----------------|-------------|--------------|------------|-----------------|-------------|--------------|------------|
| 1.019  | DB06            |             | Junction     |            | HB06            | 2700        | Manhole      | Adoptable  |
| 26.004 | 243B            | 1200        | Manhole      | Adoptable  | 246             | 1200        | Manhole      | Adoptable  |
| 1.000  | 201             | 1200        | Manhole      | Adoptable  | 202             | 1200        | Manhole      | Adoptable  |
| 1.002  | 203             | 1200        | Manhole      | Adoptable  | 204             | 1200        | Manhole      | Adoptable  |
| 1.001  | 202             | 1200        | Manhole      | Adoptable  | 203             | 1200        | Manhole      | Adoptable  |
| 1.003  | 204             | 1200        | Manhole      | Adoptable  | 205             | 1200        | Manhole      | Adoptable  |
| 8.000  | 207             | 1200        | Manhole      | Adoptable  | 209             | 1200        | Manhole      | Adoptable  |
| 6.000  | 206             | 1200        | Manhole      | Adoptable  | 205             | 1200        | Manhole      | Adoptable  |
| 1.004  | 205             | 1200        | Manhole      | Adoptable  | DB02            |             | Junction     |            |
| 1.006  | Hydrobrake DB02 | 1500        | Manhole      | Adoptable  | 209             | 1200        | Manhole      | Adoptable  |
| 10.000 | 211             | 1200        | Manhole      | Adoptable  | 212             | 1200        | Manhole      | Adoptable  |
| 1.007  | 209             | 1200        | Manhole      | Adoptable  | 210             | 1200        | Manhole      | Adoptable  |
| 26.000 | 245             | 1200        | Manhole      | Adoptable  | 246A            | 1200        | Manhole      | Adoptable  |
| 21.001 | 219             | 1200        | Manhole      | Adoptable  | 222             | 1200        | Manhole      | Adoptable  |
| 1.022  | 229             | 1200        | Manhole      | Adoptable  | 230             | 1200        | Manhole      | Adoptable  |
| 1.008  | 210             | 1200        | Manhole      | Adoptable  | 213             | 1200        | Manhole      | Adoptable  |
| 31.000 | PP216           |             | Junction     |            | 243B            | 1200        | Manhole      | Adoptable  |
| 21.002 | 222             | 1200        | Manhole      | Adoptable  | 250             | 1200        | Manhole      | Adoptable  |
| 29.000 | PP213           |             | Junction     |            | 246A            | 1200        | Manhole      | Adoptable  |
| 10.001 | 212             | 1200        | Manhole      | Adoptable  | 210             | 1200        | Manhole      | Adoptable  |
| 1.009  | 213             | 1200        | Manhole      | Adoptable  | DB03            |             | Junction     |            |
| 1.013  | 236             | 1200        | Manhole      | Adoptable  | 237             | 1200        | Manhole      | Adoptable  |
| 2.000  | PP201           |             | Junction     |            | 202             | 1200        | Manhole      | Adoptable  |
| 21.000 | 218             | 1200        | Manhole      | Adoptable  | 219             | 1200        | Manhole      | Adoptable  |
| 21.005 | DB05            |             | Junction     |            | Hydrobrake DB05 | 1200        | Manhole      | Adoptable  |

### Pipeline Schedule

| Link   | Length<br>(m) | Slope<br>(1:X) | Dia<br>(mm) | Link<br>Type | US CL<br>(m) | US IL<br>(m) | US Depth<br>(m) | DS CL<br>(m) | DS IL<br>(m) | DS Depth<br>(m) |
|--------|---------------|----------------|-------------|--------------|--------------|--------------|-----------------|--------------|--------------|-----------------|
| 24.002 | 21.002        | 20.0           | 225         | Circular     | 29.300       | 28.800       | 0.275           | 29.300       | 27.750       | 1.325           |
| 1.010  | 4.000         | 200.0          | 225         | Circular     | 28.600       | 25.700       | 2.675           | 28.800       | 25.680       | 2.895           |
| 1.011  | 14.102        | 200.0          | 225         | Circular     | 28.800       | 25.680       | 2.895           | 28.800       | 25.609       | 2.966           |
| 3.000  | 11.109        | 64.2           | 150         | Circular     | 31.000       | 30.500       | 0.350           | 30.730       | 30.327       | 0.253           |
| 1.005  | 5.000         | 200.0          | 225         | Circular     | 28.500       | 26.260       | 2.015           | 28.900       | 26.235       | 2.440           |
| 21.006 | 8.400         | 200.0          | 225         | Circular     | 29.850       | 27.703       | 1.922           | 29.722       | 27.661       | 1.836           |
| 1.016  | 48.878        | 40.0           | 375         | Circular     | 26.035       | 24.124       | 1.536           | 25.377       | 22.902       | 2.100           |
| 28.000 | 46.025        | 25.0           | 150         | Circular     | 29.000       | 28.500       | 0.350           | 27.400       | 26.659       | 0.591           |
|        |               |                |             |              |              |              |                 |              |              |                 |
| 21.009 | 33.866        | 40.0           | 225         | Circular     | 27.153       | 25.723       | 1.205           | 26.596       | 24.876       | 1.495           |
| 27.000 | 28.892        | 22.0           | 225         | Circular     | 29.115       | 27.690       | 1.200           | 28.066       | 26.377       | 1.464           |
| 4.000  | 8.205         | 30.0           | 100         | Circular     | 30.500       | 30.000       | 0.400           | 29.900       | 29.727       | 0.073           |
| 5.000  | 8.129         | 30.0           | 100         | Circular     | 30.500       | 30.000       | 0.400           | 29.900       | 29.729       | 0.071           |
| 7.000  | 7.863         | 63.9           | 150         | Circular     | 29.000       | 28.500       | 0.350           | 28.985       | 28.377       | 0.458           |
| 9.000  | 12.924        | 46.5           | 150         | Circular     | 29.000       | 28.500       | 0.350           | 28.858       | 28.222       | 0.486           |
| 11.000 | 19.567        | 40.0           | 100         | Circular     | 30.200       | 29.700       | 0.400           | 30.246       | 29.211       | 0.935           |
| 12.000 | 19.424        | 40.0           | 100         | Circular     | 30.200       | 29.700       | 0.400           | 30.246       | 29.214       | 0.932           |
| 14.000 | 11.435        | 60.0           | 225         | Circular     | 28.850       | 27.425       | 1.200           | 28.920       | 27.234       | 1.461           |
| 13.000 | 12.509        | 59.0           | 100         | Circular     | 29.000       | 28.500       | 0.400           | 28.920       | 28.288       | 0.532           |
| 25.000 | 23.397        | 50.0           | 150         | Circular     | 30.500       | 30.000       | 0.350           | 30.520       | 29.532       | 0.838           |
| 22.000 | 19.044        | 50.0           | 150         | Circular     | 30.500       | 30.000       | 0.350           | 30.184       | 29.619       | 0.415           |
| 23.000 | 10.214        | 50.8           | 100         | Circular     | 30.000       | 29.500       | 0.400           | 29.600       | 29.299       | 0.201           |
| 33.000 | 43.958        | 30.0           | 100         | Circular     | 29.000       | 28.500       | 0.400           | 27.430       | 27.035       | 0.295           |
| 34.000 | 42.132        | 30.0           | 100         | Circular     | 29.000       | 28.500       | 0.400           | 27.430       | 27.096       | 0.234           |
| 16.000 | 55.792        | 50.0           | 150         | Circular     | 27.000       | 26.500       | 0.350           | 26.012       | 25.384       | 0.478           |

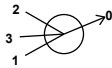
| Link   | US<br>Node      | Dia<br>(mm) | Node<br>Type | MH<br>Type | DS<br>Node      | Dia<br>(mm) | Node<br>Type | MH<br>Type |
|--------|-----------------|-------------|--------------|------------|-----------------|-------------|--------------|------------|
| 24.002 | DB04            |             | Junction     |            | DB05            |             | Junction     |            |
| 1.010  | DB03            |             | Junction     |            | Hydrobrake DB03 | 2100        | Manhole      | Adoptable  |
| 1.011  | Hydrobrake DB03 | 2100        | Manhole      | Adoptable  | 235             | 1200        | Manhole      | Adoptable  |
| 3.000  | PP202           |             | Junction     |            | 202             | 1200        | Manhole      | Adoptable  |
| 1.005  | DB02            |             | Junction     |            | Hydrobrake DB02 | 1500        | Manhole      | Adoptable  |
| 21.006 | Hydrobrake DB05 | 1200        | Manhole      | Adoptable  | 227             | 1200        | Manhole      | Adoptable  |
| 1.016  | 239             | 1350        | Manhole      | Adoptable  | 240             | 1350        | Manhole      | Adoptable  |
| 28.000 | PP214           |             | Junction     |            | 246A            | 1200        | Manhole      | Adoptable  |
|        |                 |             |              |            |                 |             |              |            |
| 21.009 | 248             | 1200        | Manhole      | Adoptable  | 229             | 1200        | Manhole      | Adoptable  |
| 27.000 | 249A            | 1200        | Manhole      | Adoptable  | 234             | 1200        | Manhole      | Adoptable  |
| 4.000  | PP204           |             | Junction     |            | 203             | 1200        | Manhole      | Adoptable  |
| 5.000  | PP203           |             | Junction     |            | 203             | 1200        | Manhole      | Adoptable  |
| 7.000  | PP205           |             | Junction     |            | 205             | 1200        | Manhole      | Adoptable  |
| 9.000  | PP206           |             | Junction     |            | 209             | 1200        | Manhole      | Adoptable  |
| 11.000 | PP207           |             | Junction     |            | 212             | 1200        | Manhole      | Adoptable  |
| 12.000 | PP208           |             | Junction     |            | 212             | 1200        | Manhole      | Adoptable  |
| 14.000 | 252             | 1200        | Manhole      | Adoptable  | 213             | 1200        | Manhole      | Adoptable  |
| 13.000 | PP209           |             | Junction     |            | 213             | 1200        | Manhole      | Adoptable  |
| 25.000 | PP210           |             | Junction     |            | 220             | 1200        | Manhole      | Adoptable  |
| 22.000 | PP211           |             | Junction     |            | 222             | 1200        | Manhole      | Adoptable  |
| 23.000 | PP212           |             | Junction     |            | 224             | 1200        | Manhole      | Adoptable  |
| 33.000 | PP214           |             | Junction     |            | 246             | 1200        | Manhole      | Adoptable  |
| 34.000 | PP213           |             | Junction     |            | 246             | 1200        | Manhole      | Adoptable  |
| 16.000 | PP19            |             | Junction     |            | 238             | 1350        | Manhole      | Adoptable  |

### Pipeline Schedule

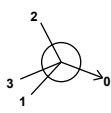
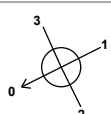
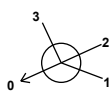
| Link   | Length<br>(m) | Slope<br>(1:X) | Dia<br>(mm) | Link<br>Type | US CL<br>(m) | US IL<br>(m) | US Depth<br>(m) | DS CL<br>(m) | DS IL<br>(m) | DS Depth<br>(m) |
|--------|---------------|----------------|-------------|--------------|--------------|--------------|-----------------|--------------|--------------|-----------------|
| 17.000 | 17.475        | 50.0           | 100         | Circular     | 26.000       | 25.500       | 0.400           | 26.012       | 25.151       | 0.761           |
| 18.000 | 36.276        | 50.0           | 150         | Circular     | 25.500       | 25.000       | 0.350           | 24.936       | 24.274       | 0.512           |
| 19.000 | 32.784        | 50.0           | 150         | Circular     | 25.500       | 25.000       | 0.350           | 24.936       | 24.344       | 0.442           |
| 27.001 | 19.597        | 48.7           | 225         | Circular     | 28.066       | 26.377       | 1.464           | 27.400       | 25.975       | 1.200           |
| 26.001 | 34.151        | 40.9           | 225         | Circular     | 27.400       | 25.975       | 1.200           | 26.596       | 25.141       | 1.230           |
| 26.003 | 21.251        | 200.0          | 300         | Circular     | 26.005       | 24.505       | 1.200           | 26.212       | 24.399       | 1.513           |
| 26.002 | 26.169        | 46.6           | 225         | Circular     | 26.596       | 25.141       | 1.230           | 26.005       | 24.580       | 1.200           |
| 20.000 | 21.384        | 21.6           | 300         | Circular     | 26.212       | 22.967       | 2.945           | 24.600       | 21.975       | 2.325           |
| 1.020  | 25.936        | 300.0          | 300         | Circular     | 25.523       | 21.550       | 3.673           | 26.100       | 21.464       | 4.336           |
| 32.000 | 41.261        | 50.0           | 150         | Circular     | 26.500       | 26.000       | 0.350           | 26.212       | 25.175       | 0.887           |
| 1.021  | 21.935        | 300.0          | 300         | Circular     | 26.100       | 21.464       | 4.336           | 26.596       | 21.391       | 4.905           |
| 1.023  | 17.957        | 300.0          | 300         | Circular     | 24.000       | 21.000       | 2.700           | 24.000       | 20.940       | 2.760           |
| 1.024  | 80.412        | 80.0           | 300         | Circular     | 24.000       | 20.940       | 2.760           | 21.500       | 19.935       | 1.265           |
| 1.025  | 25.584        | 80.0           | 300         | Circular     | 21.500       | 19.935       | 1.265           | 21.500       | 19.615       | 1.585           |
| 1.026  | 24.237        | 26.5           | 300         | Circular     | 21.500       | 19.615       | 1.585           | 20.000       | 18.700       | 1.000           |

| Link   | US<br>Node | Dia<br>(mm) | Node<br>Type | MH<br>Type | DS<br>Node | Dia<br>(mm) | Node<br>Type | MH<br>Type |
|--------|------------|-------------|--------------|------------|------------|-------------|--------------|------------|
| 17.000 | PP20       |             | Junction     |            | 238        | 1350        | Manhole      | Adoptable  |
| 18.000 | PP18       |             | Junction     |            | 241        | 1350        | Manhole      | Adoptable  |
| 19.000 | PP17       |             | Junction     |            | 241        | 1350        | Manhole      | Adoptable  |
| 27.001 | 234        | 1200        | Manhole      | Adoptable  | 246A       | 1200        | Manhole      | Adoptable  |
| 26.001 | 246A       | 1200        | Manhole      | Adoptable  | 247A       | 1200        | Manhole      | Adoptable  |
| 26.003 | 244B       | 1200        | Manhole      | Adoptable  | 243B       | 1200        | Manhole      | Adoptable  |
| 26.002 | 247A       | 1200        | Manhole      | Adoptable  | 244B       | 1200        | Manhole      | Adoptable  |
| 20.000 | 243B       | 1200        | Manhole      | Adoptable  | DB06       |             | Junction     |            |
| 1.020  | HB06       | 2700        | Manhole      | Adoptable  | 229A       | 1200        | Manhole      | Adoptable  |
| 32.000 | PP215      |             | Junction     |            | 243B       | 1200        | Manhole      | Adoptable  |
| 1.021  | 229A       | 1200        | Manhole      | Adoptable  | 229        | 1200        | Manhole      | Adoptable  |
| 1.023  | 230        | 1200        | Manhole      | Adoptable  | 232        | 1200        | Manhole      | Adoptable  |
| 1.024  | 232        | 1200        | Manhole      | Adoptable  | 233        | 1200        | Manhole      | Adoptable  |
| 1.025  | 233        | 1200        | Manhole      | Adoptable  | 260        | 1200        | Manhole      | Adoptable  |
| 1.026  | 260        | 1200        | Manhole      | Adoptable  | J1         |             | Junction     |            |

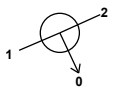
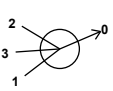
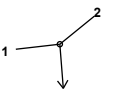
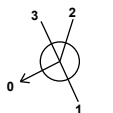
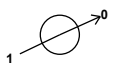
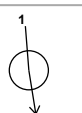
### Manhole Schedule

| Node | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                          | Link   | IL<br>(m) | Dia<br>(mm) |
|------|----------------|-----------------|-----------|--------------|-------------|--------------------------------------------------------------------------------------|--------|-----------|-------------|
| 201  | 724230.182     | 672089.475      | 32.185    | 1.425        | 1200        |  |        |           |             |
|      |                |                 |           |              |             | 0                                                                                    | 1.000  | 30.760    | 225         |
| 250  | 724309.012     | 671955.817      | 29.851    | 1.458        | 1200        |   | 1      | 21.002    | 28.393      |
|      |                |                 |           |              |             | 0                                                                                    | 21.003 | 28.393    | 225         |
| 202  | 724286.847     | 672092.966      | 30.730    | 1.389        | 1200        |  | 1      | 3.000     | 30.327      |
|      |                |                 |           |              |             | 2                                                                                    | 2.000  | 30.309    | 150         |
|      |                |                 |           |              |             | 3                                                                                    | 1.000  | 29.341    | 225         |
|      |                |                 |           |              |             | 0                                                                                    | 1.001  | 29.341    | 225         |

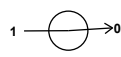
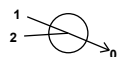
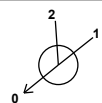
### Manhole Schedule

| Node  | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                          | Link             | IL<br>(m)                        | Dia<br>(mm)                          |                          |
|-------|----------------|-----------------|-----------|--------------|-------------|--------------------------------------------------------------------------------------|------------------|----------------------------------|--------------------------------------|--------------------------|
| 251   | 724266.339     | 671953.632      | 30.950    | 1.425        | 1200        |     | 0                | 24.000                           | 29.525                               | 225                      |
| 203   | 724317.224     | 672105.592      | 29.900    | 1.381        | 1200        |    | 1<br>2<br>3<br>0 | 5.000<br>4.000<br>1.001<br>1.002 | 29.729<br>29.727<br>28.519<br>28.519 | 100<br>100<br>225<br>225 |
| PP201 | 724276.030     | 672099.218      | 31.000    | 0.500        |             |    | 0                | 2.000                            | 30.500                               | 150                      |
| 204   | 724328.033     | 672101.488      | 29.650    | 1.516        | 1200        |     | 1<br>0           | 1.002<br>1.003                   | 28.134<br>28.134                     | 225<br>225               |
| PP202 | 724277.125     | 672087.591      | 31.000    | 0.500        |             |    | 0                | 3.000                            | 30.500                               | 150                      |
| 205   | 724341.112     | 672072.337      | 28.985    | 2.202        | 1200        |  | 1<br>2<br>3<br>0 | 7.000<br>6.000<br>1.003<br>1.004 | 28.377<br>26.783<br>26.783<br>26.783 | 150<br>225<br>225<br>225 |
| PP205 | 724348.135     | 672075.873      | 29.000    | 0.500        |             |   | 0                | 7.000                            | 28.500                               | 150                      |
| 207   | 724371.060     | 672061.604      | 28.790    | 1.875        | 1200        |   | 0                | 8.000                            | 26.915                               | 225                      |
| PP203 | 724311.708     | 672099.621      | 30.500    | 0.500        |             |  | 0                | 5.000                            | 30.000                               | 100                      |
| 206   | 724345.929     | 672062.641      | 28.700    | 1.425        | 1200        |   | 0                | 6.000                            | 27.275                               | 225                      |
| PP204 | 724313.440     | 672112.872      | 30.500    | 0.500        |             |  | 0                | 4.000                            | 30.000                               | 100                      |
| 209   | 724337.784     | 672046.381      | 28.858    | 2.658        | 1200        |  | 1<br>2<br>3<br>0 | 9.000<br>8.000<br>1.006<br>1.007 | 28.222<br>26.732<br>26.200<br>26.200 | 150<br>225<br>225<br>225 |
| PP206 | 724349.876     | 672041.820      | 29.000    | 0.500        |             |   | 0                | 9.000                            | 28.500                               | 150                      |

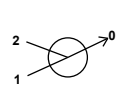
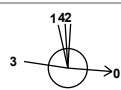
### Manhole Schedule

| Node            | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                           | Link             | IL<br>(m)                            | Dia<br>(mm)                          |                          |
|-----------------|----------------|-----------------|-----------|--------------|-------------|---------------------------------------------------------------------------------------|------------------|--------------------------------------|--------------------------------------|--------------------------|
| 210             | 724314.248     | 672035.755      | 29.460    | 3.464        | 1200        |     | 1<br>2<br><br>0  | 10.001<br>1.007<br><br>1.008         | 27.911<br>26.071<br><br>25.996       | 225<br>225<br><br>300    |
| PP207           | 724272.220     | 672034.983      | 30.200    | 0.500        |             |    | 0                | 11.000                               | 29.700                               | 100                      |
| 211             | 724232.841     | 672021.002      | 31.670    | 1.425        | 1200        |    | 0                | 10.000                               | 30.245                               | 225                      |
| PP208           | 724273.585     | 672013.118      | 30.200    | 0.500        |             |    | 0                | 12.000                               | 29.700                               | 100                      |
| 212             | 724289.006     | 672024.929      | 30.246    | 1.550        | 1200        |     | 1<br>2<br>3<br>0 | 12.000<br>11.000<br>10.000<br>10.001 | 29.214<br>29.211<br>28.696<br>28.696 | 100<br>100<br>225<br>225 |
| DB05            | 724300.633     | 671914.996      | 29.300    | 1.550        |             |   | 1<br>2<br><br>0  | 24.002<br>21.004<br><br>21.005       | 27.750<br>27.750<br><br>27.750       | 225<br>225<br><br>225    |
| 213             | 724334.979     | 671991.595      | 28.920    | 3.087        | 1200        |   | 1<br>2<br>3<br>0 | 14.000<br>13.000<br>1.008<br>1.009   | 27.234<br>28.288<br>25.833<br>25.833 | 225<br>100<br>300<br>300 |
| 236             | 724365.837     | 671982.785      | 28.235    | 2.832        | 1200        |   | 1<br><br><br>0   | 1.012<br><br><br>1.013               | 25.478<br><br><br>25.403             | 225<br><br><br>300       |
| 252             | 724339.743     | 671981.200      | 28.850    | 1.425        | 1200        |  | 0<br><br><br>0   | 14.000<br><br><br>21.005             | 27.425<br><br><br>27.703             | 225<br><br><br>225       |
| Hydrobrake DB05 | 724301.370     | 671905.590      | 29.850    | 2.147        | 1200        |  | 1<br><br><br>0   | 21.005<br><br><br>21.006             | 27.703<br><br><br>27.703             | 225<br><br><br>225       |
| PP209           | 724338.727     | 672003.529      | 29.000    | 0.500        |             |  | 0                | 13.000                               | 28.500                               | 100                      |
| PP210           | 724258.652     | 671932.444      | 30.500    | 0.500        |             |  | 0                | 25.000                               | 30.000                               | 150                      |
| PP211           | 724282.193     | 671966.685      | 30.500    | 0.500        |             |  | 0                | 22.000                               | 30.000                               | 150                      |

### Manhole Schedule

| Node  | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                          | Link       | IL<br>(m)        | Dia<br>(mm)      |            |
|-------|----------------|-----------------|-----------|--------------|-------------|--------------------------------------------------------------------------------------|------------|------------------|------------------|------------|
| PP212 | 724319.204     | 671929.926      | 30.000    | 0.500        |             |     | 0          | 23.000           | 29.500           | 100        |
| 218   | 724236.227     | 671956.973      | 31.400    | 1.525        | 1200        |    | 0          | 21.000           | 29.875           | 225        |
| PP213 | 724362.630     | 671943.148      | 29.000    | 0.500        |             |     | 0-1<br>0-2 | 29.000<br>34.000 | 28.500<br>28.500 | 100<br>100 |
| 219   | 724259.887     | 671957.111      | 31.100    | 1.698        | 1200        |    | 1          | 21.000           | 29.402           | 225        |
|       |                |                 |           |              |             |                                                                                      | 0          | 21.001           | 29.402           | 225        |
| PP214 | 724375.142     | 671946.110      | 29.000    | 0.500        |             |    | 0-1<br>0-2 | 28.000<br>33.000 | 28.500<br>28.500 | 150<br>100 |
| 222   | 724299.882     | 671959.629      | 30.184    | 1.593        | 1200        |  | 1<br>2     | 22.000<br>21.001 | 29.619<br>28.591 | 150<br>225 |
|       |                |                 |           |              |             |                                                                                      | 0          | 21.002           | 28.591           | 225        |
| PP215 | 724420.260     | 671957.755      | 26.500    | 0.500        |             |   | 0          | 32.000           | 26.000           | 150        |
| PP216 | 724430.396     | 671958.762      | 26.500    | 0.500        |             |   | 0          | 31.000           | 26.000           | 100        |
| 224   | 724311.200     | 671923.581      | 29.600    | 1.622        | 1200        |  | 1<br>2     | 23.000<br>21.003 | 29.299<br>28.070 | 100<br>225 |
|       |                |                 |           |              |             |                                                                                      | 0          | 21.004           | 27.978           | 225        |
| 227   | 724302.697     | 671897.295      | 29.722    | 2.061        | 1200        |  | 1          | 21.006           | 27.661           | 225        |
|       |                |                 |           |              |             |                                                                                      | 0          | 21.007           | 27.661           | 225        |
| PP17  | 724477.386     | 671961.786      | 25.500    | 0.500        |             |   | 0          | 19.000           | 25.000           | 150        |
| DB02  | 724330.872     | 672067.223      | 28.500    | 2.240        |             |  | 1          | 1.004            | 26.260           | 225        |
|       |                |                 |           |              |             |                                                                                      | 0          | 1.005            | 26.260           | 225        |
| DB03  | 724324.651     | 671986.316      | 28.600    | 2.900        |             |  | 1          | 1.009            | 25.700           | 300        |
|       |                |                 |           |              |             |                                                                                      | 0          | 1.010            | 25.700           | 225        |

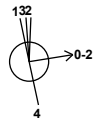
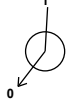
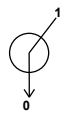
### Manhole Schedule

| Node            | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                           | Link | IL<br>(m) | Dia<br>(mm) |     |
|-----------------|----------------|-----------------|-----------|--------------|-------------|---------------------------------------------------------------------------------------|------|-----------|-------------|-----|
| DB04            | 724279.767     | 671912.613      | 29.300    | 0.500        |             |     | 1    | 24.001    | 28.800      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 0    | 24.002    | 28.800      | 225 |
| Hydrobrake DB03 | 724329.084     | 671976.474      | 28.800    | 3.120        | 2100        |    | 1    | 1.010     | 25.680      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 0    | 1.011     | 25.680      | 225 |
| 235             | 724342.288     | 671971.522      | 28.800    | 3.191        | 1200        |     | 1    | 15.000    | 26.983      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 2    | 1.011     | 25.609      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 0    | 1.012     | 25.609      | 225 |
| PP18            | 724492.269     | 671965.074      | 25.500    | 0.500        |             |    | 0    | 18.000    | 25.000      | 150 |
| Hydrobrake DB02 | 724334.847     | 672052.641      | 28.900    | 2.665        | 1500        |   | 1    | 1.005     | 26.235      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 0    | 1.006     | 26.235      | 225 |
| PP19            | 724412.983     | 672012.418      | 27.000    | 0.500        |             |  | 0    | 16.000    | 26.500      | 150 |
| 220             | 724269.093     | 671911.506      | 30.520    | 2.180        | 1200        |  | 1    | 25.000    | 29.532      | 150 |
|                 |                |                 |           |              |             |                                                                                       | 2    | 24.000    | 28.340      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 0    | 24.001    | 29.039      | 225 |
| PP20            | 724449.201     | 672029.233      | 26.000    | 0.500        |             |  | 0    | 17.000    | 25.500      | 100 |
| 229A            | 724428.371     | 671898.144      | 26.100    | 4.636        | 1200        |   | 1    | 1.020     | 21.464      | 300 |
|                 |                |                 |           |              |             |                                                                                       | 0    | 1.021     | 21.464      | 300 |
| 247A            | 724406.262     | 671897.510      | 26.596    | 1.455        | 1200        |   | 1    | 26.001    | 25.141      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 0    | 26.002    | 25.141      | 225 |
| 228             | 724322.428     | 671962.498      | 28.517    | 1.425        | 1200        |  | 0    | 15.000    | 27.092      | 225 |
| 246             |                |                 | 27.430    | 3.759        | 1200        |  | 1    | 34.000    | 27.096      | 100 |
|                 |                |                 |           |              |             |                                                                                       | 2    | 33.000    | 27.035      | 100 |
|                 |                |                 |           |              |             |                                                                                       | 3    | 26.004    | 23.671      | 300 |
| 246A            | 724372.215     | 671900.178      | 27.400    | 1.425        | 1200        |   | 1    | 29.000    | 26.739      | 100 |
|                 |                |                 |           |              |             |                                                                                       | 2    | 28.000    | 26.659      | 150 |
|                 |                |                 |           |              |             |                                                                                       | 3    | 27.001    | 25.975      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 4    | 26.000    | 25.975      | 225 |
|                 |                |                 |           |              |             |                                                                                       | 0    | 26.001    | 25.975      | 225 |

### Manhole Schedule

| Node | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                                                 | Link   | IL<br>(m) | Dia<br>(mm) |
|------|----------------|-----------------|-----------|--------------|-------------|-------------------------------------------------------------------------------------------------------------|--------|-----------|-------------|
| 242  | 724423.040     | 671997.441      | 26.830    | 1.425        | 1200        | <div></div> <div>0</div>   | 30.000 | 25.405    | 225         |
| 245  | 724367.579     | 671976.724      | 28.985    | 1.425        | 1200        | <div></div> <div>0</div>   | 26.000 | 27.560    | 225         |
| 244B | 724431.972     | 671902.392      | 26.005    | 1.500        | 1200        | <div></div> <div>1</div>   | 26.002 | 24.580    | 225         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 26.003 | 24.505    | 300         |
| 249A | 724324.001     | 671901.248      | 29.115    | 1.425        | 1200        | <div></div> <div>0</div>   | 27.000 | 27.690    | 225         |
| 237  | 724442.449     | 672017.325      | 26.562    | 1.500        | 1200        | <div></div> <div>1</div>   | 1.013  | 25.062    | 300         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 1.014  | 25.062    | 300         |
| 234  | 724352.835     | 671903.084      | 28.066    | 1.689        | 1200        | <div></div> <div>1</div> | 27.000 | 26.377    | 225         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 27.001 | 26.377    | 225         |
| 238  | 724466.616     | 672027.790      | 26.012    | 1.575        | 1350        | <div></div> <div>1</div> | 17.000 | 25.151    | 100         |
|      |                |                 |           |              |             | <div>2</div>                                                                                                | 16.000 | 25.384    | 150         |
|      |                |                 |           |              |             | <div>3</div>                                                                                                | 1.014  | 24.512    | 300         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 1.015  | 24.437    | 375         |
| 239  | 724477.942     | 672025.684      | 26.035    | 1.911        | 1350        | <div></div> <div>1</div> | 1.015  | 24.124    | 375         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 1.016  | 24.124    | 375         |
| 240  | 724481.306     | 671976.922      | 25.377    | 2.550        | 1350        | <div></div> <div>1</div> | 1.016  | 22.902    | 375         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 1.017  | 22.827    | 450         |
| 241  | 724484.175     | 671929.713      | 24.936    | 3.055        | 1350        | <div></div> <div>1</div> | 19.000 | 24.344    | 150         |
|      |                |                 |           |              |             | <div>2</div>                                                                                                | 18.000 | 24.274    | 150         |
|      |                |                 |           |              |             | <div>3</div>                                                                                                | 1.017  | 21.881    | 450         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 1.018  | 21.990    | 450         |
| DB06 | 724449.846     | 671920.745      | 24.600    | 2.775        |             | <div></div> <div>1</div> | 20.000 | 21.975    | 300         |
|      |                |                 |           |              |             | <div>2</div>                                                                                                | 1.018  | 21.825    | 450         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 1.019  | 21.825    | 450         |
| 229  | 724406.770     | 671894.328      | 26.596    | 5.205        | 1200        | <div></div> <div>1</div> | 21.009 | 24.876    | 225         |
|      |                |                 |           |              |             | <div>2</div>                                                                                                | 1.021  | 21.391    | 300         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 1.022  | 21.391    | 300         |
| 230  | 724407.386     | 671879.742      | 24.000    | 3.000        | 1200        | <div></div> <div>1</div> | 1.022  | 21.000    | 300         |
|      |                |                 |           |              |             | <div>0</div>                                                                                                | 1.023  | 21.000    | 300         |

### Manhole Schedule

| Node | Easting (m) | Northing (m) | CL (m) | Depth (m) | Dia (mm) | Connections                                                                              | Link   | IL (m) | Dia (mm) |
|------|-------------|--------------|--------|-----------|----------|------------------------------------------------------------------------------------------|--------|--------|----------|
| 248  | 724372.994  | 671896.797   | 27.153 | 1.430     | 1200     | 1<br>  | 21.008 | 25.723 | 225      |
|      |             |              |        |           |          | 0                                                                                        | 21.009 | 25.723 | 225      |
| 231  | 724352.795  | 671900.183   | 28.066 | 1.660     | 1200     | 1<br>  | 21.007 | 26.406 | 225      |
|      |             |              |        |           |          | 0                                                                                        | 21.008 | 26.406 | 225      |
| HB06 | 724453.417  | 671904.879   | 25.523 | 3.973     | 2700     | 1<br>  | 1.019  | 21.550 | 450      |
|      |             |              |        |           |          | 0                                                                                        | 1.020  | 21.550 | 300      |
| 243B | 724428.730  | 671917.373   | 26.212 | 3.245     | 1200     | 1<br>  | 32.000 | 25.175 | 150      |
|      |             |              |        |           |          | 2                                                                                        | 31.000 | 24.460 | 100      |
|      |             |              |        |           |          | 3                                                                                        | 30.000 | 24.335 | 225      |
|      |             |              |        |           |          | 4                                                                                        | 26.003 | 24.399 | 300      |
|      |             |              |        |           |          | 0-1                                                                                      | 26.004 | 24.260 | 300      |
|      |             |              |        |           |          | 0-2                                                                                      | 20.000 | 22.967 | 300      |
| 232  | 724389.494  | 671878.219   | 24.000 | 3.060     | 1200     | 1<br> | 1.023  | 20.940 | 300      |
|      |             |              |        |           |          | 0                                                                                        | 1.024  | 20.940 | 300      |
| 233  | 724384.954  | 671797.935   | 21.500 | 1.565     | 1200     | 1<br> | 1.024  | 19.935 | 300      |
|      |             |              |        |           |          | 0                                                                                        | 1.025  | 19.935 | 300      |
| J1   | 724369.434  | 671753.439   | 20.000 | 1.300     |          | 1<br> | 1.026  | 18.700 | 300      |
|      |             |              |        |           |          |                                                                                          |        |        |          |
| 260  | 724369.330  | 671777.676   | 21.500 | 1.885     | 1200     | 1<br> | 1.025  | 19.615 | 300      |
|      |             |              |        |           |          | 0                                                                                        | 1.026  | 19.615 | 300      |

### Node Hydrobrake DB02 Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Replaces Downstream Link | x      | Sump Available          | ✓                              |
| Invert Level (m)         | 26.235 | Product Number          | CTL-SHE-0111-7600-2215-7600    |
| Design Depth (m)         | 2.215  | Min Outlet Diameter (m) | 0.150                          |
| Design Flow (l/s)        | 7.6    | Min Node Diameter (mm)  | 1200                           |

### Node Hydrobrake DB03 Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Downstream Link          | 1.011  | Sump Available          | ✓                              |
| Replaces Downstream Link | x      | Product Number          | CTL-SHE-0157-1610-2620-1610    |
| Invert Level (m)         | 25.680 | Min Outlet Diameter (m) | 0.225                          |
| Design Depth (m)         | 2.620  | Min Node Diameter (mm)  | 1800                           |
| Design Flow (l/s)        | 16.1   |                         |                                |

### Node Hydrobrake DB05 Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Replaces Downstream Link | x      | Sump Available          | ✓                              |
| Invert Level (m)         | 27.703 | Product Number          | CTL-SHE-0110-6300-1551-6300    |
| Design Depth (m)         | 1.551  | Min Outlet Diameter (m) | 0.150                          |
| Design Flow (l/s)        | 6.3    | Min Node Diameter (mm)  | 1200                           |

### Node HB06 Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Replaces Downstream Link | x      | Sump Available          | ✓                              |
| Invert Level (m)         | 21.550 | Product Number          | CTL-SHE-0231-3730-3035-3730    |
| Design Depth (m)         | 3.035  | Min Outlet Diameter (m) | 0.300                          |
| Design Flow (l/s)        | 37.3   | Min Node Diameter (mm)  | 2700                           |

### Node 246 Online Weir Control

|                          |   |                  |        |                       |       |
|--------------------------|---|------------------|--------|-----------------------|-------|
| Flap Valve               | x | Invert Level (m) | 23.671 | Discharge Coefficient | 0.590 |
| Replaces Downstream Link | x | Width (m)        | 1.200  |                       |       |

### Node DB02 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 27.900 |
| 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     | 17.0      | 0.0           | 0.600     | 86.0      | 0.0           | 0.601     | 0.0       | 0.0           |

### Node DB02 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 26.260 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.68 | 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     | 245.0     | 0.0           | 1.674     | 324.0     | 0.0           | 1.675     | 0.0       | 0.0           |

### Node DB03 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 28.000 |
| 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     | 13.0      | 0.0           | 0.600     | 92.0      | 0.0           | 0.601     | 0.0       | 0.0           |

### Node DB03 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 25.700 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.76 | 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     | 169.0     | 0.0           | 1.689     | 249.0     | 0.0           | 1.690     | 0.0       | 0.0           |

### Node DB04 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 28.800 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 1.00 | Time to half empty (mins) |        |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 206.2                     | 0.0                           | 0.500        | 374.3                     | 0.0                           | 0.501        | 0.0                       | 0.0                           |

### Node DB05 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 27.750 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 1.00 | Time to half empty (mins) |        |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 1.1                       | 0.0                           | 1.251        | 123.0                     | 0.0                           | 1.551        | 0.0                       | 0.0                           |
| 1.250        | 1.1                       | 0.0                           | 1.550        | 188.0                     | 0.0                           |              |                           |                               |

### Node DB06 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 23.950 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 1.00 | Time to half empty (mins) |        |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 116.0                     | 0.0                           | 0.650        | 285.0                     | 0.0                           | 0.651        | 0.0                       | 0.0                           |

### Node DB06 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 21.825 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.75 | Time to half empty (mins) |        |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 390.4                     | 0.0                           | 2.059        | 583.5                     | 0.0                           | 2.060        | 0.0                       | 0.0                           |

### Node PP201 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 30.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 6      |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 212.5                     | 0.0                           | 0.250        | 212.5                     | 0.0                           | 0.251        | 0.0                       | 0.0                           |

### Node PP202 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 30.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 1      |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 212.5                     | 0.0                           | 0.250        | 212.5                     | 0.0                           | 0.251        | 0.0                       | 0.0                           |

### Node PP203 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 30.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 0      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 125.0                  | 0.0                        | 0.250     | 125.0                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP204 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 30.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 0      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 62.5                   | 0.0                        | 0.250     | 62.5                   | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP205 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 28.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.50 | Time to half empty (mins) | 6      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 175.0                  | 0.0                        | 0.250     | 175.0                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP206 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 28.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 6      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 150.0                  | 0.0                        | 0.250     | 150.0                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP207 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 29.700 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 6      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 150.0                  | 0.0                        | 0.250     | 150.0                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP208 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 29.700 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 6      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 150.0                  | 0.0                        | 0.250     | 150.0                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP209 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 28.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 3      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 75.0                   | 0.0                        | 0.250     | 75.0                   | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP210 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 30.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 0      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 150.0                  | 0.0                        | 0.250     | 150.0                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP211 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 30.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 2      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 150.0                  | 0.0                        | 0.250     | 150.0                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP212 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 29.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 3      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 162.5                  | 0.0                        | 0.250     | 162.5                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP213 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 28.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 0      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 200.0                  | 0.0                        | 0.250     | 200.0                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP214 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 28.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 0      |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 262.5                  | 0.0                        | 0.250     | 262.5                  | 0.0                        | 0.251     | 0.0                    | 0.0                        |

### Node PP215 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 26.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 2      |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 312.5                     | 0.0                           | 0.250        | 312.5                     | 0.0                           | 0.251        | 0.0                       | 0.0                           |

### Node PP216 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 26.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 5      |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 237.5                     | 0.0                           | 0.250        | 237.5                     | 0.0                           | 0.251        | 0.0                       | 0.0                           |

### Node PP17 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 25.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 0      |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 287.5                     | 0.0                           | 0.250        | 287.5                     | 0.0                           | 0.251        | 0.0                       | 0.0                           |

### Node PP18 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 25.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 8      |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 275.0                     | 0.0                           | 0.250        | 275.0                     | 0.0                           | 0.251        | 0.0                       | 0.0                           |

### Node PP19 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 26.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 0      |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 250.0                     | 0.0                           | 0.250        | 250.0                     | 0.0                           | 0.251        | 0.0                       | 0.0                           |

### Node PP20 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 25.500 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.40 | Time to half empty (mins) | 7      |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 150.0                     | 0.0                           | 0.250        | 150.0                     | 0.0                           | 0.251        | 0.0                       | 0.0                           |

**Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.73%**

| Node Event        | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute summer  | 201     | 10          | 30.816    | 0.056     | 11.5         | 0.0822        | 0.0000     | OK         |
| 30 minute summer  | 250     | 20          | 29.498    | 1.105     | 41.5         | 1.3692        | 0.0000     | SURCHARGED |
| 15 minute summer  | 202     | 12          | 29.797    | 0.456     | 83.7         | 1.2653        | 0.0000     | SURCHARGED |
| 15 minute summer  | 251     | 1           | 29.525    | 0.000     | 0.0          | 0.0000        | 0.0000     | OK         |
| 15 minute summer  | 203     | 12          | 29.177    | 0.658     | 90.9         | 1.0290        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP201   | 20          | 30.598    | 0.098     | 29.4         | 8.6029        | 0.0000     | OK         |
| 15 minute summer  | 204     | 12          | 28.736    | 0.602     | 105.5        | 1.0129        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP202   | 20          | 30.576    | 0.076     | 21.3         | 6.6121        | 0.0000     | OK         |
| 30 minute summer  | 205     | 20          | 27.470    | 0.687     | 130.5        | 1.0901        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP205   | 20          | 28.602    | 0.102     | 31.2         | 9.2378        | 0.0000     | OK         |
| 30 minute summer  | 207     | 19          | 28.106    | 1.191     | 22.8         | 1.4159        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP203   | 21          | 30.028    | 0.028     | 4.1          | 1.4020        | 0.0000     | OK         |
| 30 minute summer  | 206     | 20          | 27.471    | 0.196     | 3.6          | 0.2327        | 0.0000     | OK         |
| 15 minute summer  | PP204   | 11          | 30.070    | 0.070     | 11.8         | 1.8145        | 0.0000     | OK         |
| 30 minute summer  | 209     | 19          | 28.077    | 1.877     | 69.8         | 3.8939        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP206   | 19          | 28.599    | 0.099     | 27.4         | 6.1717        | 0.0000     | OK         |
| 30 minute summer  | 210     | 19          | 27.804    | 1.808     | 160.5        | 2.9839        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP207   | 20          | 29.786    | 0.086     | 18.9         | 5.3118        | 0.0000     | OK         |
| 15 minute summer  | 211     | 10          | 30.269    | 0.024     | 2.1          | 0.0284        | 0.0000     | OK         |
| 30 minute summer  | PP208   | 20          | 29.788    | 0.088     | 19.3         | 5.4197        | 0.0000     | OK         |
| 15 minute summer  | 212     | 11          | 28.997    | 0.301     | 96.3         | 0.9693        | 0.0000     | SURCHARGED |
| 180 minute winter | DB05    | 172         | 29.106    | 1.356     | 22.9         | 15.6220       | 0.0000     | FLOOD RISK |
| 360 minute summer | 213     | 320         | 27.132    | 1.299     | 61.4         | 1.9864        | 0.0000     | SURCHARGED |
| 15 minute summer  | 236     | 11          | 25.613    | 0.210     | 57.3         | 0.2993        | 0.0000     | OK         |
| 15 minute summer  | 252     | 1           | 27.425    | 0.000     | 0.0          | 0.0000        | 0.0000     | OK         |

| Link Event<br>(Upstream Depth) | US Node | Link   | DS Node         | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|---------|--------|-----------------|---------------|----------------|----------|---------------|--------------------|
| 15 minute summer               | 201     | 1.000  | 202             | 11.5          | 0.553          | 0.139    | 1.3378        |                    |
| 30 minute summer               | 250     | 21.003 | 224             | 42.0          | 1.056          | 0.808    | 1.2850        |                    |
| 15 minute summer               | 202     | 1.001  | 203             | 70.0          | 1.977          | 0.849    | 1.3083        |                    |
| 15 minute summer               | 251     | 24.000 | 220             | 0.0           | 0.000          | 0.000    | 0.8395        |                    |
| 15 minute summer               | 203     | 1.002  | 204             | 85.0          | 2.285          | 0.892    | 0.4598        |                    |
| 30 minute summer               | PP201   | 2.000  | 202             | 15.8          | 1.328          | 0.719    | 0.1487        |                    |
| 15 minute summer               | 204     | 1.003  | 205             | 98.9          | 2.507          | 0.920    | 1.2707        |                    |
| 30 minute summer               | PP202   | 3.000  | 202             | 10.7          | 1.225          | 0.482    | 0.0973        |                    |
| 30 minute summer               | 205     | 1.004  | DB02            | 126.3         | 3.176          | 1.131    | 0.4552        |                    |
| 30 minute summer               | PP205   | 7.000  | 205             | 16.5          | 1.336          | 0.741    | 0.0970        |                    |
| 30 minute summer               | 207     | 8.000  | 209             | -20.4         | -0.514         | -0.558   | 1.4553        |                    |
| 30 minute summer               | PP203   | 5.000  | 203             | 1.8           | 1.031          | 0.163    | 0.0143        |                    |
| 30 minute summer               | 206     | 6.000  | 205             | 2.3           | 0.082          | 0.020    | 0.4143        |                    |
| 15 minute summer               | PP204   | 4.000  | 203             | 8.6           | 1.519          | 0.778    | 0.0467        |                    |
| 30 minute summer               | 209     | 1.007  | 210             | 57.1          | 1.437          | 1.561    | 1.0270        |                    |
| 30 minute summer               | PP206   | 9.000  | 209             | 18.9          | 1.578          | 0.722    | 0.1548        |                    |
| 30 minute summer               | 210     | 1.008  | 213             | 159.4         | 2.263          | 2.498    | 3.4353        |                    |
| 30 minute summer               | PP207   | 11.000 | 212             | 9.8           | 1.365          | 1.021    | 0.1448        |                    |
| 15 minute summer               | 211     | 10.000 | 212             | 2.0           | 0.097          | 0.024    | 1.1826        |                    |
| 30 minute summer               | PP208   | 12.000 | 212             | 9.9           | 1.369          | 1.032    | 0.1449        |                    |
| 15 minute summer               | 212     | 10.001 | 210             | 84.6          | 2.387          | 0.960    | 1.0005        |                    |
| 180 minute winter              | DB05    | 21.005 | Hydrobrake DB05 | 7.5           | 0.356          | 0.206    | 0.3752        |                    |
| 360 minute summer              | 213     | 1.009  | DB03            | 60.9          | 1.341          | 0.512    | 0.8168        |                    |
| 15 minute summer               | 236     | 1.013  | 237             | 56.8          | 1.212          | 0.807    | 4.0588        |                    |
| 15 minute summer               | 252     | 14.000 | 213             | 0.0           | 0.000          | 0.000    | 0.0000        |                    |

**Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.73%**

| Node Event        | US Node         | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|-----------------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 180 minute winter | Hydrobrake DB05 | 172         | 29.104    | 1.401     | 7.5          | 1.5845        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP209           | 20          | 28.582    | 0.082     | 11.5         | 2.5367        | 0.0000     | OK         |
| 30 minute summer  | PP210           | 20          | 30.081    | 0.081     | 21.2         | 5.0423        | 0.0000     | OK         |
| 30 minute summer  | PP211           | 19          | 30.086    | 0.086     | 22.5         | 5.3159        | 0.0000     | OK         |
| 30 minute summer  | PP212           | 21          | 29.579    | 0.079     | 16.8         | 5.2443        | 0.0000     | OK         |
| 15 minute summer  | 218             | 10          | 29.925    | 0.050     | 7.9          | 0.0663        | 0.0000     | OK         |
| 30 minute summer  | PP213           | 20          | 28.551    | 0.051     | 17.8         | 4.1283        | 0.0000     | OK         |
| 30 minute summer  | 219             | 20          | 29.635    | 0.233     | 27.4         | 0.3917        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP214           | 19          | 28.576    | 0.076     | 39.4         | 8.2202        | 0.0000     | OK         |
| 30 minute summer  | 222             | 20          | 29.583    | 0.992     | 46.0         | 1.3992        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP215           | 21          | 26.085    | 0.085     | 33.8         | 10.9216       | 0.0000     | OK         |
| 30 minute summer  | PP216           | 21          | 26.083    | 0.083     | 26.0         | 8.0323        | 0.0000     | OK         |
| 30 minute summer  | 224             | 19          | 29.251    | 1.273     | 61.6         | 2.0491        | 0.0000     | SURCHARGED |
| 15 minute summer  | 227             | 10          | 27.773    | 0.112     | 38.9         | 0.1997        | 0.0000     | OK         |
| 30 minute summer  | PP17            | 21          | 25.081    | 0.081     | 29.8         | 9.5025        | 0.0000     | OK         |
| 240 minute summer | DB02            | 240         | 27.354    | 1.094     | 66.1         | 202.0826      | 0.0000     | SURCHARGED |
| 360 minute summer | DB03            | 320         | 27.130    | 1.430     | 65.0         | 220.9455      | 0.0000     | SURCHARGED |
| 180 minute winter | DB04            | 172         | 29.106    | 0.306     | 30.8         | 79.2413       | 0.0000     | FLOOD RISK |
| 360 minute summer | Hydrobrake DB03 | 320         | 27.127    | 1.447     | 16.3         | 5.0923        | 0.0000     | SURCHARGED |
| 30 minute summer  | 235             | 18          | 25.816    | 0.207     | 38.8         | 0.3124        | 0.0000     | OK         |
| 30 minute summer  | PP18            | 20          | 25.115    | 0.115     | 45.3         | 13.1258       | 0.0000     | OK         |
| 240 minute summer | Hydrobrake DB02 | 240         | 27.353    | 1.118     | 6.5          | 1.9752        | 0.0000     | SURCHARGED |

| Link Event<br>(Upstream Depth) | US Node         | Link   | DS Node         | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|-----------------|--------|-----------------|---------------|----------------|----------|---------------|--------------------|
| 180 minute winter              | Hydrobrake DB05 | 21.006 | 227             | 6.3           | 0.849          | 0.172    | 0.0744        |                    |
| 30 minute summer               | PP209           | 13.000 | 213             | 7.6           | 1.123          | 0.963    | 0.0884        |                    |
| 30 minute summer               | PP210           | 25.000 | 220             | 14.0          | 1.454          | 0.557    | 0.2258        |                    |
| 30 minute summer               | PP211           | 22.000 | 222             | 15.1          | 1.475          | 0.599    | 0.1950        |                    |
| 30 minute summer               | PP212           | 23.000 | 224             | 7.8           | 1.203          | 0.916    | 0.0661        |                    |
| 15 minute summer               | 218             | 21.000 | 219             | 7.9           | 0.681          | 0.107    | 0.4624        |                    |
| 30 minute summer               | PP213           | 29.000 | 246A            | 6.1           | 1.547          | 0.503    | 0.1742        |                    |
| 30 minute summer               | PP213           | 34.000 | 246             | 5.6           | 1.411          | 0.503    | 0.1667        |                    |
| 30 minute summer               | 219             | 21.001 | 222             | 25.1          | 1.179          | 0.338    | 1.5938        |                    |
| 30 minute summer               | PP214           | 28.000 | 246A            | 17.8          | 2.012          | 0.498    | 0.4070        |                    |
| 30 minute summer               | PP214           | 33.000 | 246             | 10.0          | 1.591          | 0.904    | 0.2775        |                    |
| 30 minute summer               | 222             | 21.002 | 250             | 39.5          | 1.323          | 0.536    | 0.3935        |                    |
| 30 minute summer               | PP215           | 32.000 | 243B            | 15.3          | 1.490          | 0.607    | 0.4232        |                    |
| 30 minute summer               | PP216           | 31.000 | 243B            | 12.0          | 1.682          | 1.024    | 0.3050        |                    |
| 30 minute summer               | 224             | 21.004 | DB05            | 61.1          | 1.536          | 0.906    | 0.5415        |                    |
| 15 minute summer               | 227             | 21.007 | 231             | 38.9          | 2.069          | 0.472    | 0.9444        |                    |
| 30 minute summer               | PP17            | 19.000 | 241             | 13.9          | 1.457          | 0.553    | 0.3139        |                    |
| 240 minute summer              | DB02            | 1.005  | Hydrobrake DB02 | 6.5           | 0.274          | 0.177    | 0.1989        |                    |
| 360 minute summer              | DB03            | 1.010  | Hydrobrake DB03 | 15.4          | 0.388          | 0.422    | 0.1591        |                    |
| 180 minute winter              | DB04            | 24.002 | DB05            | -16.6         | -0.444         | -0.142   | 0.8353        |                    |
| 360 minute summer              | Hydrobrake DB03 | 1.011  | 235             | 15.2          | 0.831          | 0.416    | 0.2978        |                    |
| 30 minute summer               | 235             | 1.012  | 236             | 38.4          | 1.097          | 1.048    | 0.9043        |                    |
| 30 minute summer               | PP18            | 18.000 | 241             | 23.0          | 1.606          | 0.911    | 0.5190        |                    |
| 240 minute summer              | Hydrobrake DB02 | 1.006  | 209             | 6.6           | 0.432          | 0.180    | 0.2750        |                    |

**Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.73%**

| Node Event       | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 30 minute summer | PP19    | 21          | 26.568    | 0.068     | 22.5         | 6.9810        | 0.0000     | OK         |
| 15 minute summer | 220     | 10          | 29.160    | 0.820     | 36.7         | 1.3341        | 0.0000     | OK         |
| 30 minute summer | PP20    | 21          | 25.589    | 0.089     | 18.6         | 5.5028        | 0.0000     | OK         |
| 30 minute summer | 229A    | 19          | 21.630    | 0.166     | 37.3         | 0.1881        | 0.0000     | OK         |
| 15 minute summer | 247A    | 11          | 25.909    | 0.768     | 94.8         | 1.5008        | 0.0000     | SURCHARGED |
| 15 minute summer | 228     | 1           | 27.092    | 0.000     | 0.0          | 0.0000        | 0.0000     | OK         |
| 15 minute summer | 246     | 10          | 23.778    | 0.107     | 78.0         | 0.1967        | 0.0000     | OK         |
| 15 minute summer | 246A    | 12          | 26.680    | 0.705     | 100.8        | 2.0238        | 0.0000     | SURCHARGED |
| 15 minute summer | 242     | 10          | 25.520    | 0.115     | 31.7         | 0.2338        | 0.0000     | OK         |
| 15 minute summer | 245     | 10          | 27.621    | 0.061     | 12.2         | 0.0899        | 0.0000     | OK         |
| 15 minute summer | 244B    | 11          | 24.903    | 0.398     | 105.9        | 0.6213        | 0.0000     | SURCHARGED |
| 15 minute summer | 249A    | 10          | 27.740    | 0.050     | 12.1         | 0.0734        | 0.0000     | OK         |
| 15 minute summer | 237     | 11          | 25.241    | 0.179     | 97.5         | 0.4125        | 0.0000     | OK         |
| 15 minute summer | 234     | 12          | 26.723    | 0.346     | 12.1         | 0.3916        | 0.0000     | SURCHARGED |
| 15 minute summer | 238     | 10          | 24.660    | 0.223     | 163.4        | 0.6549        | 0.0000     | OK         |

|                   |      |     |        |       |       |          |        |            |
|-------------------|------|-----|--------|-------|-------|----------|--------|------------|
| 15 minute summer  | 239  | 10  | 24.347 | 0.223 | 196.5 | 0.4802   | 0.0000 | OK         |
| 240 minute winter | 240  | 228 | 23.310 | 0.483 | 58.2  | 0.8181   | 0.0000 | SURCHARGED |
| 240 minute winter | 241  | 232 | 23.308 | 1.427 | 88.9  | 3.8776   | 0.0000 | SURCHARGED |
| 240 minute winter | DB06 | 232 | 23.306 | 1.481 | 150.1 | 511.7575 | 0.0000 | SURCHARGED |
| 15 minute summer  | 229  | 11  | 21.533 | 0.142 | 72.1  | 0.1609   | 0.0000 | OK         |

| Link Event (Upstream Depth) | US Node | Link   | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-----------------------------|---------|--------|---------|---------------|----------------|----------|---------------|--------------------|
| 30 minute summer            | PP19    | 16.000 | 238     | 10.6          | 1.367          | 0.422    | 0.4344        |                    |
| 15 minute summer            | 220     | 24.001 | DB04    | 36.4          | 3.221          | 0.468    | 0.1975        |                    |
| 30 minute summer            | PP20    | 17.000 | 238     | 8.9           | 1.221          | 1.033    | 0.1303        |                    |
| 30 minute summer            | 229A    | 1.021  | 229     | 37.4          | 1.269          | 0.586    | 0.7864        |                    |
| 15 minute summer            | 247A    | 26.002 | 244B    | 92.5          | 2.325          | 1.211    | 1.0408        |                    |
| 15 minute summer            | 228     | 15.000 | 235     | 0.0           | 0.000          | 0.000    | 0.0000        |                    |
| 15 minute summer            | 246     | Weir   |         | 77.8          |                |          |               | 36.0               |
| 15 minute summer            | 246A    | 26.001 | 247A    | 74.8          | 1.881          | 0.918    | 1.3582        |                    |
| 15 minute summer            | 242     | 30.000 | 243B    | 30.5          | 1.513          | 0.508    | 1.6209        |                    |
| 15 minute summer            | 245     | 26.000 | 246A    | 12.1          | 0.491          | 0.162    | 1.8570        |                    |
| 15 minute summer            | 244B    | 26.003 | 243B    | 106.4         | 1.524          | 1.358    | 1.4195        |                    |
| 15 minute summer            | 249A    | 27.000 | 234     | 12.1          | 1.612          | 0.109    | 0.6591        |                    |
| 15 minute summer            | 237     | 1.014  | 238     | 95.5          | 2.289          | 0.593    | 1.0990        |                    |
| 15 minute summer            | 234     | 27.001 | 246A    | 18.7          | 0.578          | 0.251    | 0.7794        |                    |
| 15 minute summer            | 238     | 1.015  | 239     | 162.2         | 2.387          | 0.490    | 0.7861        |                    |
| 15 minute summer            | 239     | 1.016  | 240     | 193.6         | 2.961          | 0.610    | 3.1961        |                    |
| 240 minute winter           | 240     | 1.017  | 241     | 58.2          | 0.707          | 0.127    | 7.4937        |                    |
| 240 minute winter           | 241     | 1.018  | DB06    | 86.3          | 1.095          | 0.393    | 5.6217        |                    |
| 240 minute winter           | DB06    | 1.019  | HB06    | 81.6          | 0.811          | 0.194    | 2.5768        |                    |
| 15 minute summer            | 229     | 1.022  | 230     | 72.2          | 1.523          | 0.396    | 0.6819        |                    |

**Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.73%**

| Node Event                  | US Node | Peak (mins) | Level (m) | Depth (m)     | Inflow (l/s)   | Node Vol (m³) | Flood (m³)    | Status             |
|-----------------------------|---------|-------------|-----------|---------------|----------------|---------------|---------------|--------------------|
| 15 minute summer            | 230     | 11          | 21.240    | 0.240         | 72.2           | 0.2720        | 0.0000        | OK                 |
| 15 minute summer            | 248     | 10          | 25.835    | 0.112         | 38.8           | 0.1266        | 0.0000        | OK                 |
| 15 minute summer            | 231     | 10          | 26.510    | 0.104         | 38.9           | 0.1173        | 0.0000        | OK                 |
| 240 minute winter           | HB06    | 232         | 23.304    | 1.754         | 83.3           | 10.4377       | 0.0000        | SURCHARGED         |
| 240 minute winter           | 243B    | 228         | 23.308    | 0.341         | 56.5           | 0.6546        | 0.0000        | OK                 |
| 15 minute summer            | 232     | 11          | 21.104    | 0.164         | 71.8           | 0.1857        | 0.0000        | OK                 |
| 15 minute summer            | 233     | 12          | 20.114    | 0.179         | 71.4           | 0.2023        | 0.0000        | OK                 |
| 15 minute summer            | J1      | 12          | 18.818    | 0.118         | 71.8           | 0.0000        | 0.0000        | OK                 |
| 15 minute summer            | 260     | 12          | 19.737    | 0.122         | 71.8           | 0.1379        | 0.0000        | OK                 |
| Link Event (Upstream Depth) | US Node | Link        | DS Node   | Outflow (l/s) | Velocity (m/s) | Flow/Cap      | Link Vol (m³) | Discharge Vol (m³) |
| 15 minute summer            | 230     | 1.023       | 232       | 71.8          | 1.420          | 1.125         | 0.8976        |                    |
| 15 minute summer            | 248     | 21.009      | 229       | 38.3          | 2.002          | 0.464         | 0.6487        |                    |
| 15 minute summer            | 231     | 21.008      | 248       | 38.8          | 2.066          | 0.407         | 0.3848        |                    |
| 240 minute winter           | HB06    | 1.020       | 229A      | 37.3          | 0.924          | 0.585         | 1.0497        |                    |
| 240 minute winter           | 243B    | 26.004      | 246       | 0.0           | 0.000          | 0.000         | 0.0447        |                    |
| 240 minute winter           | 243B    | 20.000      | DB06      | 56.5          | 2.225          | 0.235         | 1.5058        |                    |
| 15 minute summer            | 232     | 1.024       | 233       | 71.4          | 1.733          | 0.574         | 3.3261        |                    |
| 15 minute summer            | 233     | 1.025       | 260       | 71.8          | 2.033          | 0.578         | 0.9041        |                    |
| 15 minute summer            | 260     | 1.026       | J1        | 71.8          | 2.734          | 0.331         | 0.6367        | 565.7              |

**Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.54%**

| Node Event        | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute summer  | 201     | 10          | 30.825    | 0.065     | 15.0         | 0.0941        | 0.0000     | OK         |
| 30 minute summer  | 250     | 19          | 29.798    | 1.405     | 52.7         | 1.7414        | 0.0000     | FLOOD RISK |
| 30 minute summer  | 202     | 19          | 30.593    | 1.252     | 105.5        | 3.4759        | 0.0000     | FLOOD RISK |
| 15 minute summer  | 251     | 1           | 29.525    | 0.000     | 0.0          | 0.0000        | 0.0000     | OK         |
| 30 minute summer  | 203     | 20          | 29.900    | 1.381     | 96.2         | 2.1594        | 0.0000     | FLOOD RISK |
| 30 minute summer  | PP201   | 21          | 30.634    | 0.134     | 38.3         | 11.7868       | 0.0000     | OK         |
| 30 minute summer  | 204     | 20          | 29.397    | 1.263     | 110.3        | 2.1248        | 0.0000     | FLOOD RISK |
| 30 minute summer  | PP202   | 21          | 30.602    | 0.102     | 27.8         | 8.9052        | 0.0000     | OK         |
| 360 minute winter | 205     | 352         | 27.848    | 1.065     | 38.5         | 1.6905        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP205   | 20          | 28.628    | 0.128     | 40.7         | 11.5925       | 0.0000     | OK         |
| 15 minute summer  | 207     | 11          | 28.762    | 1.847     | 33.8         | 2.1958        | 0.0000     | FLOOD RISK |
| 30 minute summer  | PP203   | 20          | 30.034    | 0.034     | 5.3          | 1.6944        | 0.0000     | OK         |
| 360 minute winter | 206     | 352         | 27.848    | 0.573     | 0.4          | 0.6799        | 0.0000     | SURCHARGED |
| 15 minute summer  | PP204   | 12          | 30.089    | 0.089     | 15.4         | 2.3089        | 0.0000     | OK         |
| 15 minute summer  | 209     | 11          | 28.740    | 2.540     | 101.5        | 5.2704        | 0.0000     | FLOOD RISK |
| 30 minute summer  | PP206   | 21          | 28.682    | 0.182     | 35.9         | 11.3974       | 0.0000     | SURCHARGED |
| 15 minute summer  | 210     | 11          | 28.459    | 2.463     | 196.3        | 4.0639        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP207   | 21          | 29.820    | 0.120     | 24.6         | 7.4096        | 0.0000     | SURCHARGED |
| 15 minute summer  | 211     | 10          | 30.272    | 0.027     | 2.7          | 0.0322        | 0.0000     | OK         |
| 30 minute summer  | PP208   | 21          | 29.823    | 0.123     | 25.2         | 7.6067        | 0.0000     | SURCHARGED |
| 15 minute summer  | 212     | 11          | 29.522    | 0.826     | 126.4        | 2.6590        | 0.0000     | SURCHARGED |
| 240 minute winter | DB05    | 228         | 29.193    | 1.443     | 24.2         | 29.2779       | 0.0000     | FLOOD RISK |
| 360 minute winter | 213     | 264         | 27.798    | 1.965     | 52.4         | 3.0038        | 0.0000     | SURCHARGED |
| 15 minute summer  | 236     | 11          | 25.660    | 0.257     | 72.0         | 0.3666        | 0.0000     | OK         |
| 360 minute winter | 252     | 264         | 27.798    | 0.373     | 1.0          | 0.4214        | 0.0000     | SURCHARGED |

| Link Event<br>(Upstream Depth) | US Node | Link   | DS Node         | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|---------|--------|-----------------|---------------|----------------|----------|---------------|--------------------|
| 15 minute summer               | 201     | 1.000  | 202             | 15.0          | 0.564          | 0.182    | 1.3961        |                    |
| 30 minute summer               | 250     | 21.003 | 224             | 53.0          | 1.332          | 1.019    | 1.2850        |                    |
| 30 minute summer               | 202     | 1.001  | 203             | 71.9          | 1.972          | 0.872    | 1.3083        |                    |
| 15 minute summer               | 251     | 24.000 | 220             | 0.0           | 0.000          | 0.000    | 0.8395        |                    |
| 30 minute summer               | 203     | 1.002  | 204             | 91.5          | 2.333          | 0.960    | 0.4598        |                    |
| 30 minute summer               | PP201   | 2.000  | 202             | 21.0          | 1.386          | 0.955    | 0.2140        |                    |
| 30 minute summer               | 204     | 1.003  | 205             | 105.7         | 2.657          | 0.984    | 1.2707        |                    |
| 30 minute summer               | PP202   | 3.000  | 202             | 15.9          | 1.320          | 0.717    | 0.1690        |                    |
| 360 minute winter              | 205     | 1.004  | DB02            | 37.7          | 1.863          | 0.338    | 0.4552        |                    |
| 30 minute summer               | PP205   | 7.000  | 205             | 21.4          | 1.384          | 0.960    | 0.1213        |                    |
| 15 minute summer               | 207     | 8.000  | 209             | -30.3         | -0.761         | -0.827   | 1.4553        |                    |
| 30 minute summer               | PP203   | 5.000  | 203             | 2.7           | 1.124          | 0.243    | 0.0412        |                    |
| 360 minute winter              | 206     | 6.000  | 205             | 0.3           | 0.065          | 0.003    | 0.4306        |                    |
| 15 minute summer               | PP204   | 4.000  | 203             | 11.0          | 1.560          | 0.989    | 0.0623        |                    |
| 15 minute summer               | 209     | 1.007  | 210             | 65.2          | 1.640          | 1.781    | 1.0270        |                    |
| 30 minute summer               | PP206   | 9.000  | 209             | 26.6          | 1.645          | 1.016    | 0.2275        |                    |
| 15 minute summer               | 210     | 1.008  | 213             | 189.8         | 2.696          | 2.976    | 3.4353        |                    |
| 30 minute summer               | PP207   | 11.000 | 212             | 10.0          | 1.373          | 1.043    | 0.1531        |                    |
| 15 minute summer               | 211     | 10.000 | 212             | 2.7           | 0.104          | 0.031    | 1.1953        |                    |
| 30 minute summer               | PP208   | 12.000 | 212             | 10.1          | 1.367          | 1.048    | 0.1520        |                    |
| 15 minute summer               | 212     | 10.001 | 210             | 98.0          | 2.476          | 1.112    | 1.0924        |                    |
| 240 minute winter              | DB05    | 21.005 | Hydrobrake DB05 | 7.1           | 0.352          | 0.193    | 0.3752        |                    |
| 360 minute winter              | 213     | 1.009  | DB03            | 52.0          | 1.354          | 0.437    | 0.8168        |                    |
| 15 minute summer               | 236     | 1.013  | 237             | 70.3          | 1.238          | 0.998    | 4.9388        |                    |
| 360 minute winter              | 252     | 14.000 | 213             | -1.0          | -0.026         | -0.016   | 0.4548        |                    |

**Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.54%**

| Node Event        | US Node         | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|-----------------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 240 minute winter | Hydrobrake DB05 | 228         | 29.192    | 1.489     | 7.1          | 1.6838        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP209           | 20          | 28.610    | 0.110     | 15.0         | 3.4045        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP210           | 19          | 30.099    | 0.099     | 27.6         | 6.1472        | 0.0000     | OK         |
| 30 minute summer  | PP211           | 20          | 30.109    | 0.109     | 29.4         | 6.7603        | 0.0000     | OK         |
| 30 minute summer  | PP212           | 21          | 29.605    | 0.105     | 21.9         | 6.9742        | 0.0000     | SURCHARGED |
| 30 minute summer  | 218             | 20          | 30.039    | 0.164     | 9.1          | 0.2191        | 0.0000     | OK         |
| 30 minute summer  | PP213           | 19          | 28.561    | 0.061     | 23.2         | 5.0016        | 0.0000     | OK         |
| 30 minute summer  | 219             | 19          | 30.045    | 0.643     | 35.7         | 1.0783        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP214           | 19          | 28.593    | 0.093     | 51.4         | 10.0537       | 0.0000     | OK         |
| 30 minute summer  | 222             | 20          | 29.934    | 1.343     | 53.7         | 1.8953        | 0.0000     | FLOOD RISK |
| 30 minute summer  | PP215           | 21          | 26.106    | 0.106     | 44.1         | 13.5406       | 0.0000     | OK         |
| 30 minute summer  | PP216           | 22          | 26.111    | 0.111     | 33.9         | 10.8520       | 0.0000     | SURCHARGED |
| 30 minute summer  | 224             | 19          | 29.414    | 1.436     | 79.1         | 2.3124        | 0.0000     | FLOOD RISK |
| 15 minute summer  | 227             | 10          | 27.790    | 0.129     | 49.0         | 0.2302        | 0.0000     | OK         |
| 30 minute summer  | PP17            | 20          | 25.100    | 0.100     | 38.9         | 11.7648       | 0.0000     | OK         |
| 360 minute winter | DB02            | 352         | 27.847    | 1.587     | 43.2         | 305.7441      | 0.0000     | SURCHARGED |
| 360 minute winter | DB03            | 264         | 27.796    | 2.096     | 55.4         | 268.9684      | 0.0000     | SURCHARGED |
| 240 minute winter | DB04            | 232         | 29.194    | 0.394     | 28.9         | 107.8242      | 0.0000     | FLOOD RISK |
| 360 minute winter | Hydrobrake DB03 | 264         | 27.791    | 2.111     | 16.5         | 7.4312        | 0.0000     | SURCHARGED |
| 30 minute summer  | 235             | 18          | 25.899    | 0.290     | 46.8         | 0.4378        | 0.0000     | SURCHARGED |
| 30 minute summer  | PP18            | 21          | 25.149    | 0.149     | 59.1         | 17.0267       | 0.0000     | OK         |
| 360 minute winter | Hydrobrake DB02 | 352         | 27.846    | 1.611     | 6.5          | 2.8467        | 0.0000     | SURCHARGED |

| Link Event<br>(Upstream Depth) | US Node         | Link   | DS Node         | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|-----------------|--------|-----------------|---------------|----------------|----------|---------------|--------------------|
| 240 minute winter              | Hydrobrake DB05 | 21.006 | 227             | 6.3           | 0.856          | 0.172    | 0.0758        |                    |
| 30 minute summer               | PP209           | 13.000 | 213             | 8.2           | 1.123          | 1.038    | 0.0952        |                    |
| 30 minute summer               | PP210           | 25.000 | 220             | 18.8          | 1.550          | 0.747    | 0.2847        |                    |
| 30 minute summer               | PP211           | 22.000 | 222             | 19.1          | 1.497          | 0.757    | 0.2981        |                    |
| 30 minute summer               | PP212           | 23.000 | 224             | 8.8           | 1.206          | 1.029    | 0.0799        |                    |
| 30 minute summer               | 218             | 21.000 | 219             | 9.0           | 0.658          | 0.122    | 0.8364        |                    |
| 30 minute summer               | PP213           | 29.000 | 246A            | 8.4           | 1.552          | 0.690    | 0.2829        |                    |
| 30 minute summer               | PP213           | 34.000 | 246             | 7.6           | 1.513          | 0.681    | 0.2106        |                    |
| 30 minute summer               | 219             | 21.001 | 222             | 24.8          | 1.107          | 0.335    | 1.5938        |                    |
| 30 minute summer               | PP214           | 28.000 | 246A            | 25.1          | 2.034          | 0.701    | 0.6677        |                    |
| 30 minute summer               | PP214           | 33.000 | 246             | 11.8          | 1.590          | 1.064    | 0.3365        |                    |
| 30 minute summer               | 222             | 21.002 | 250             | 49.9          | 1.254          | 0.677    | 0.3935        |                    |
| 30 minute summer               | PP215           | 32.000 | 243B            | 20.9          | 1.587          | 0.828    | 0.5424        |                    |
| 30 minute summer               | PP216           | 31.000 | 243B            | 12.5          | 1.675          | 1.063    | 0.3241        |                    |
| 30 minute summer               | 224             | 21.004 | DB05            | 77.3          | 1.944          | 1.147    | 0.5415        |                    |
| 15 minute summer               | 227             | 21.007 | 231             | 49.1          | 2.175          | 0.595    | 1.1321        |                    |
| 30 minute summer               | PP17            | 19.000 | 241             | 19.2          | 1.562          | 0.763    | 0.4037        |                    |
| 360 minute winter              | DB02            | 1.005  | Hydrobrake DB02 | 6.5           | 0.226          | 0.178    | 0.1989        |                    |
| 360 minute winter              | DB03            | 1.010  | Hydrobrake DB03 | 16.2          | 0.407          | 0.443    | 0.1591        |                    |
| 240 minute winter              | DB04            | 24.002 | DB05            | -15.5         | -0.407         | -0.133   | 0.8353        |                    |
| 360 minute winter              | Hydrobrake DB03 | 1.011  | 235             | 15.2          | 0.815          | 0.416    | 0.2893        |                    |
| 30 minute summer               | 235             | 1.012  | 236             | 46.8          | 1.197          | 1.277    | 0.9647        |                    |
| 30 minute summer               | PP18            | 18.000 | 241             | 26.6          | 1.604          | 1.055    | 0.6289        |                    |
| 360 minute winter              | Hydrobrake DB02 | 1.006  | 209             | 6.9           | 0.463          | 0.189    | 0.2750        |                    |

**Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.54%**

| Node Event        | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 30 minute summer  | PP19    | 20          | 26.584    | 0.084     | 29.4         | 8.5695        | 0.0000     | OK         |
| 240 minute winter | 220     | 228         | 29.194    | 0.854     | 11.1         | 1.3893        | 0.0000     | OK         |
| 30 minute summer  | PP20    | 21          | 25.622    | 0.122     | 24.3         | 7.5033        | 0.0000     | SURCHARGED |
| 30 minute summer  | 229A    | 19          | 21.637    | 0.173     | 37.3         | 0.1953        | 0.0000     | OK         |
| 15 minute summer  | 247A    | 11          | 26.292    | 1.151     | 107.4        | 2.2494        | 0.0000     | SURCHARGED |
| 15 minute summer  | 228     | 1           | 27.092    | 0.000     | 0.0          | 0.0000        | 0.0000     | OK         |
| 15 minute summer  | 246     | 10          | 23.799    | 0.128     | 102.3        | 0.2357        | 0.0000     | OK         |
| 15 minute summer  | 246A    | 12          | 27.307    | 1.332     | 133.2        | 3.8250        | 0.0000     | FLOOD RISK |
| 15 minute summer  | 242     | 10          | 25.542    | 0.137     | 41.3         | 0.2771        | 0.0000     | OK         |
| 15 minute summer  | 245     | 10          | 27.630    | 0.070     | 15.9         | 0.1030        | 0.0000     | OK         |
| 15 minute summer  | 244B    | 11          | 24.995    | 0.490     | 122.3        | 0.7647        | 0.0000     | SURCHARGED |
| 15 minute summer  | 249A    | 10          | 27.747    | 0.057     | 15.7         | 0.0837        | 0.0000     | OK         |
| 15 minute summer  | 237     | 10          | 25.276    | 0.214     | 124.3        | 0.4926        | 0.0000     | OK         |
| 15 minute summer  | 234     | 12          | 27.342    | 0.965     | 15.7         | 1.0916        | 0.0000     | SURCHARGED |
| 15 minute summer  | 238     | 10          | 24.711    | 0.274     | 214.3        | 0.8058        | 0.0000     | OK         |

|                   |      |     |        |       |       |          |        |            |
|-------------------|------|-----|--------|-------|-------|----------|--------|------------|
| 15 minute summer  | 239  | 10  | 24.396 | 0.272 | 256.4 | 0.5843   | 0.0000 | OK         |
| 360 minute winter | 240  | 352 | 23.859 | 1.032 | 55.7  | 1.7466   | 0.0000 | SURCHARGED |
| 360 minute winter | 241  | 352 | 23.857 | 1.976 | 85.1  | 5.3682   | 0.0000 | SURCHARGED |
| 360 minute winter | DB06 | 352 | 23.855 | 2.030 | 143.3 | 740.4933 | 0.0000 | SURCHARGED |
| 15 minute summer  | 229  | 11  | 21.550 | 0.159 | 82.9  | 0.1794   | 0.0000 | OK         |

| Link Event<br>(Upstream Depth) | US Node | Link   | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|---------|--------|---------|---------------|----------------|----------|---------------|--------------------|
| 30 minute summer               | PP19    | 16.000 | 238     | 15.0          | 1.486          | 0.594    | 0.5621        |                    |
| 240 minute winter              | 220     | 24.001 | DB04    | 11.1          | 1.266          | 0.142    | 0.3698        |                    |
| 30 minute summer               | PP20    | 17.000 | 238     | 8.9           | 1.219          | 1.042    | 0.1341        |                    |
| 30 minute summer               | 229A    | 1.021  | 229     | 38.0          | 1.269          | 0.596    | 0.8529        |                    |
| 15 minute summer               | 247A    | 26.002 | 244B    | 105.9         | 2.662          | 1.387    | 1.0408        |                    |
| 15 minute summer               | 228     | 15.000 | 235     | 0.0           | 0.000          | 0.000    | 0.0000        |                    |
| 15 minute summer               | 246     | Weir   |         | 102.0         |                |          |               | 46.4               |
| 15 minute summer               | 246A    | 26.001 | 247A    | 86.4          | 2.174          | 1.061    | 1.3582        |                    |
| 15 minute summer               | 242     | 30.000 | 243B    | 40.0          | 1.610          | 0.665    | 1.9937        |                    |
| 15 minute summer               | 245     | 26.000 | 246A    | 15.8          | 0.528          | 0.211    | 1.9269        |                    |
| 15 minute summer               | 244B    | 26.003 | 243B    | 122.2         | 1.737          | 1.560    | 1.4498        |                    |
| 15 minute summer               | 249A    | 27.000 | 234     | 15.7          | 1.694          | 0.141    | 0.6881        |                    |
| 15 minute summer               | 237     | 1.014  | 238     | 120.7         | 2.395          | 0.750    | 1.3608        |                    |
| 15 minute summer               | 234     | 27.001 | 246A    | 23.3          | 0.666          | 0.312    | 0.7794        |                    |
| 15 minute summer               | 238     | 1.015  | 239     | 211.7         | 2.543          | 0.640    | 0.9891        |                    |
| 15 minute summer               | 239     | 1.016  | 240     | 252.2         | 3.079          | 0.795    | 4.3479        |                    |
| 360 minute winter              | 240     | 1.017  | 241     | 55.7          | 0.634          | 0.122    | 7.4937        |                    |
| 360 minute winter              | 241     | 1.018  | DB06    | 82.8          | 1.045          | 0.377    | 5.6217        |                    |
| 360 minute winter              | DB06    | 1.019  | HB06    | 43.0          | 0.526          | 0.102    | 2.5768        |                    |
| 15 minute summer               | 229     | 1.022  | 230     | 83.3          | 1.548          | 0.457    | 0.7653        |                    |

**Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.54%**

| Node Event                  | US Node | Peak (mins) | Level (m) | Depth (m)     | Inflow (l/s)   | Node Vol (m³) | Flood (m³)    | Status             |
|-----------------------------|---------|-------------|-----------|---------------|----------------|---------------|---------------|--------------------|
| 15 minute summer            | 230     | 11          | 21.271    | 0.271         | 83.3           | 0.3070        | 0.0000        | OK                 |
| 15 minute summer            | 248     | 10          | 25.853    | 0.130         | 49.2           | 0.1472        | 0.0000        | OK                 |
| 15 minute summer            | 231     | 10          | 26.526    | 0.120         | 49.1           | 0.1357        | 0.0000        | OK                 |
| 360 minute winter           | HB06    | 352         | 23.853    | 2.303         | 43.8           | 13.7045       | 0.0000        | SURCHARGED         |
| 360 minute winter           | 243B    | 352         | 23.856    | 0.889         | 53.7           | 1.7082        | 0.0000        | OK                 |
| 15 minute summer            | 232     | 11          | 21.121    | 0.181         | 83.3           | 0.2047        | 0.0000        | OK                 |
| 15 minute summer            | 233     | 12          | 20.132    | 0.197         | 82.8           | 0.2225        | 0.0000        | OK                 |
| 15 minute summer            | J1      | 12          | 18.828    | 0.128         | 83.1           | 0.0000        | 0.0000        | OK                 |
| 15 minute summer            | 260     | 12          | 19.747    | 0.132         | 83.0           | 0.1498        | 0.0000        | OK                 |
| Link Event (Upstream Depth) | US Node | Link        | DS Node   | Outflow (l/s) | Velocity (m/s) | Flow/Cap      | Link Vol (m³) | Discharge Vol (m³) |
| 15 minute summer            | 230     | 1.023       | 232       | 83.3          | 1.461          | 1.306         | 1.0008        |                    |
| 15 minute summer            | 248     | 21.009      | 229       | 48.6          | 2.112          | 0.589         | 0.7799        |                    |
| 15 minute summer            | 231     | 21.008      | 248       | 49.2          | 2.171          | 0.516         | 0.4639        |                    |
| 360 minute winter           | HB06    | 1.020       | 229A      | 37.3          | 0.928          | 0.585         | 1.0490        |                    |
| 360 minute winter           | 243B    | 26.004      | 246       | 0.0           | 0.000          | 0.000         | 0.0426        |                    |
| 360 minute winter           | 243B    | 20.000      | DB06      | 53.7          | 2.003          | 0.223         | 1.5058        |                    |
| 15 minute summer            | 232     | 1.024       | 233       | 82.8          | 1.789          | 0.666         | 3.7221        |                    |
| 15 minute summer            | 233     | 1.025       | 260       | 83.0          | 2.097          | 0.668         | 1.0100        |                    |
| 15 minute summer            | 260     | 1.026       | J1        | 83.1          | 2.838          | 0.383         | 0.7095        | 636.7              |

**Water Quality (TSS)**

| Node  | Treatment  | Effectiveness | SuDS Component | Mitigation TSS | Cumulative TSS |
|-------|------------|---------------|----------------|----------------|----------------|
| PP201 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP202 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP204 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP203 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP205 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| DB02  | Depth/Area | 1.0           | Pond           | 0.700          |                |
|       | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP206 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP207 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP208 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP209 | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| DB03  | Depth/Area | 1.0           | Pond           | 0.700          |                |
|       | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP19  | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP20  | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP18  | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |
| PP17  | Depth/Area | 1.0           | Pond           | 0.700          | 0.000          |

### Water Quality (TSS)

| Node  | Treatment  | Effectiveness | SuDS Component | Mitigation<br>TSS | Cumulative<br>TSS |
|-------|------------|---------------|----------------|-------------------|-------------------|
| PP211 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| PP212 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| PP210 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| DB04  | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| DB05  | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| PP214 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| PP213 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| PP216 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| PP215 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| 246   |            |               |                |                   | 0.000             |
| PP214 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| PP213 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| 232   |            |               |                |                   | 0.000             |
| 229A  |            |               |                |                   | 0.000             |
| 233   |            |               |                |                   | 0.000             |
| 260   |            |               |                |                   | 0.000             |
| J1    |            |               |                |                   | 0.000             |
| DB06  | Depth/Area | 1.0           | Pond           | 0.700             |                   |
|       | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| 229   |            |               |                |                   | 0.000             |
| 230   |            |               |                |                   | 0.000             |
| HB06  |            |               |                |                   | 0.000             |

### Water Quality (Metals)

| Node  | Treatment  | Effectiveness | SuDS Component | Mitigation<br>Metals | Cumulative<br>Metals |
|-------|------------|---------------|----------------|----------------------|----------------------|
| PP201 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP202 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP204 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP203 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP205 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| DB02  | Depth/Area | 1.0           | Pond           | 0.700                |                      |
|       | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP206 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP207 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP208 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP209 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| DB03  | Depth/Area | 1.0           | Pond           | 0.700                |                      |
|       | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP19  | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP20  | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP18  | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP17  | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP211 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP212 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP210 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| DB04  | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| DB05  | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP214 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP213 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP216 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |
| PP215 | Depth/Area | 1.0           | Pond           | 0.700                | 0.000                |

### Water Quality (Metals)

| Node  | Treatment  | Effectiveness | SuDS Component | Mitigation Metals | Cumulative Metals |
|-------|------------|---------------|----------------|-------------------|-------------------|
| 246   |            |               |                |                   | 0.000             |
| PP214 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| PP213 | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| 232   |            |               |                |                   | 0.000             |
| 229A  |            |               |                |                   | 0.000             |
| 233   |            |               |                |                   | 0.000             |
| 260   |            |               |                |                   | 0.000             |
| J1    |            |               |                |                   | 0.000             |
| DB06  | Depth/Area | 1.0           | Pond           | 0.700             |                   |
|       | Depth/Area | 1.0           | Pond           | 0.700             | 0.000             |
| 229   |            |               |                |                   | 0.000             |
| 230   |            |               |                |                   | 0.000             |
| HB06  |            |               |                |                   | 0.000             |

### Water Quality (Hydrocarbons)

| Node  | Treatment  | Effectiveness | SuDS Component | Mitigation Hydrocarbons | Cumulative Hydrocarbons |
|-------|------------|---------------|----------------|-------------------------|-------------------------|
| PP201 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP202 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP204 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP203 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP205 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| DB02  | Depth/Area | 1.0           | Pond           | 0.500                   |                         |
|       | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP206 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP207 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP208 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP209 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| DB03  | Depth/Area | 1.0           | Pond           | 0.500                   |                         |
|       | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP19  | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP20  | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP18  | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP17  | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP211 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP212 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP210 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| DB04  | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| DB05  | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP214 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP213 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP216 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP215 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| 246   |            |               |                |                         | 0.000                   |
| PP214 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| PP213 | Depth/Area | 1.0           | Pond           | 0.500                   | 0.000                   |
| 232   |            |               |                |                         | 0.000                   |
| 229A  |            |               |                |                         | 0.000                   |
| 233   |            |               |                |                         | 0.000                   |
| 260   |            |               |                |                         | 0.000                   |
| J1    |            |               |                |                         | 0.000                   |
| DB06  | Depth/Area | 1.0           | Pond           | 0.500                   |                         |

**Water Quality (Hydrocarbons)**

| <b>Node</b> | <b>Treatment</b> | <b>Effectiveness</b> | <b>SuDS Component</b> | <b>Mitigation<br/>Hydrocarbons</b> | <b>Cumulative<br/>Hydrocarbons</b> |
|-------------|------------------|----------------------|-----------------------|------------------------------------|------------------------------------|
|             | Depth/Area       | 1.0                  | Pond                  | 0.500                              | 0.000                              |
| 229         |                  |                      |                       |                                    | 0.000                              |
| 230         |                  |                      |                       |                                    | 0.000                              |
| HB06        |                  |                      |                       |                                    | 0.000                              |

## **E. Quality Audit Report – RYCO Engineering**



**QUALITY AUDIT REPORT**

**CLIENT: WATERMAN MOYLAN**

**PROJECT TITLE: MIXED USE DEVELOPMENT AT TINAHASK  
UPPER, MONEY BIG 7 MONE LITTLE, ARKLOW, CO.  
WICKLOW**

**REV 0**

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Tel: 087 9064389

## 1.0 Introduction & Description of the Scheme

This report is a Quality Audit of the Mixed-Use Development at Tinahask Upper, Money Big 7 Mone Little, Arklow, Co. Wicklow.



Figure 6.1 Site Location

## 2.0 Quality Audit Team

The Quality Audit Team members were as follows:

| Position    | Name                                  | TII Auditor Number |
|-------------|---------------------------------------|--------------------|
| Team Leader | John Ryan<br>BEng CEng MSc BE FConsEI | JR*101             |
| Team Member | Michael Condon<br>BEng CEng MIEI      | MC877434           |

## 3.0 Quality Audit Information

The audit comprised an examination of the drawings supplied by Waterman Moylan Consulting Engineers, and a daylight site visit undertaken on 15<sup>th</sup> May 2026 where the area was driven and walked in all directions. During the visits there was no rain, and the surface was dry. The was no rain and the surface was wet. It was raining and the surface was wet. Traffic was moderate, pedestrian numbers were low and no cyclists were observed. Traffic numbers were low and no pedestrians or cyclists were observed.

## 4.0 Information provided to the Audit Team

The following documents were provided to the audit team as part of the audit.

| Document Number           | Document Title                                     | Revision |
|---------------------------|----------------------------------------------------|----------|
| 26004-OMP-01-00-DR-A-1001 | Proposed Amendment Application – Overall Site Plan | S2       |
| ARK-WAT-ZZ-XX-DR-P-0100   | Proposed Levels and Roads General Arrangement      | -        |
| ARK-WAT-ZZ-XX-DR-P-0101   | Proposed Levels and Roads Layout - Sheet 1         | -        |
| ARK-WAT-ZZ-XX-DR-P-0102   | Proposed Levels and Roads Layout - Sheet 2         | -        |
| ARK-WAT-ZZ-XX-DR-P-0103   | Proposed Levels and Roads Layout - Sheet 3         | -        |
| ARK-WAT-ZZ-XX-DR-P-0104   | Proposed General Access Arrangement                | -        |
| ARK-WAT-ZZ-XX-DR-P-0116   | Proposed Swept Path - Refuse Vehicle- Sheet 1 of 3 | -        |
| ARK-WAT-ZZ-XX-DR-P-0117   | Proposed Swept Path - Refuse Vehicle- Sheet 2 of 3 | -        |
| ARK-WAT-ZZ-XX-DR-P-0118   | Proposed Swept Path - Refuse Vehicle- Sheet 3 of 3 | -        |
| ARK-WAT-ZZ-XX-DR-P-0131   | Proposed Road Markings & Signage - Sheet 1 of 3    | -        |
| ARK-WAT-ZZ-XX-DR-P-0132   | Proposed Road Markings & Signage - Sheet 2 of 3    | -        |
| ARK-WAT-ZZ-XX-DR-P-0133   | Proposed Road Markings & Signage - Sheet 3 of 3    | -        |
| ARK-WAT-ZZ-XX-DR-P-0140   | Proposed Sightlines - Sheet 1 of 3                 | -        |
| ARK-WAT-ZZ-XX-DR-P-0141   | Proposed Sightlines - Sheet 2 of 3                 | -        |
| ARK-WAT-ZZ-XX-DR-P-0142   | Proposed Sightlines - Sheet 3 of 3                 | -        |
|                           |                                                    |          |

## 5.0 Previous Road Safety Audits

Details of previous Road Safety Audits have not been provided to the Audit Team as part of this audit process.

## 6.0 Collision History

The Road Safety Authority's collision mapping shows any reported collisions in the vicinity of the site during the period 2016 to 2024. No collisions were recorded at this location.

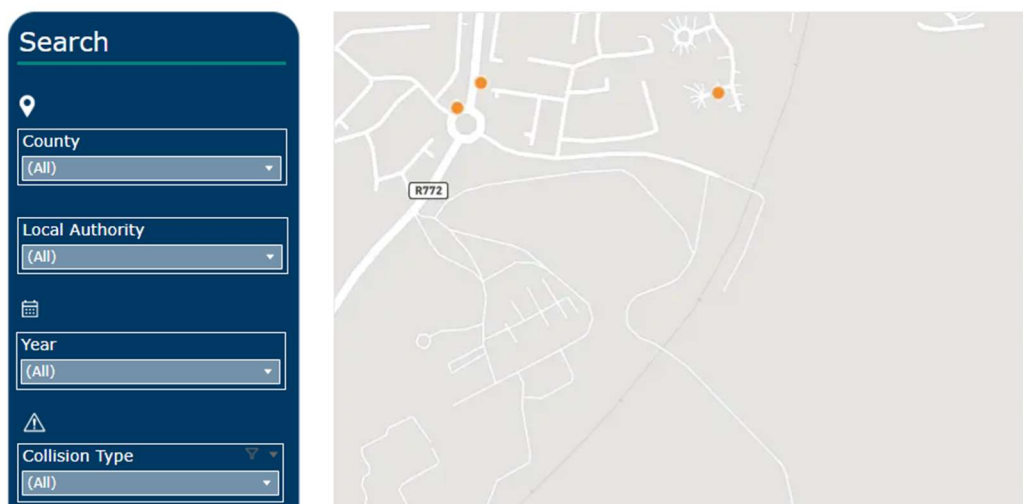


Figure 6.2 RSA Collision Data

## 7.0 Terms of Reference

The audit has been carried out following the guidance issued in TII documents GE-STY-01024 Road Safety Audit and GE-STY-1027 Road Safety Audit Guidance, DMURS and DMURS Advice Note 4.

The Quality Audit consists of the following audit sections:

- Walking, Cycling and Access Audit – focusing on accessibility requirements of vulnerable road users (and in particular, those with visual or mobility impairments), and on the movement and place function of pedestrians and cyclists.
- Road Safety Audit – focussing on issues relating directly to road safety.

## 8.0 Issues relevant to more than one audit type

The following issues have been identified in the Road Safety Audit and are also relevant to other elements of the Quality Audit. For clarity and brevity, these issues are addressed within the Road Safety Audit only and are not repeated in the other audit sections unless additional commentary is considered to be of value.

| Problem Reference | Road Safety Audit | Access Audit | Walking Audit | Cycling Audit | DMURS Audit |
|-------------------|-------------------|--------------|---------------|---------------|-------------|
| 11.1              | ✓                 | ✓            | ✓             |               | ✓           |
| 11.2              | ✓                 | ✓            | ✓             | ✓             | ✓           |
| 11.3              | ✓                 | ✓            | ✓             | ✓             | ✓           |
| 11.4              | ✓                 | ✓            |               | ✓             | ✓           |
| 11.5              | ✓                 | ✓            | ✓             |               | ✓           |
| 11.6              | ✓                 |              |               | ✓             | ✓           |
| 11.7              | ✓                 |              |               | ✓             | ✓           |
| 11.8              | ✓                 | ✓            |               | ✓             | ✓           |
| 11.9              | ✓                 | ✓            |               |               | ✓           |
| 11.10             | ✓                 |              |               |               | ✓           |
| 11.11             | ✓                 | ✓            | ✓             |               | ✓           |
|                   |                   |              |               |               |             |

## 9.0 Walking, Cycling and Access Audit

### Best Practice Guidance

This Quality Audit has been carried out in accordance with general best practice guidance set out within the following documents:

- The Disability Act 2005
- Building Regulations 2022, Technical Guidance Document M – Access for People with Disabilities (Department of the Environment, Heritage and Local Government)
- Buildings for Everyone Access and use for all citizens (National Disability Authority)
- Access Auditing of the Built Environment Guidelines (National Disability Authority)
- Traffic Management Guidelines (Irish Government Publications 2003)
- Guidance for the use of Tactile Paving Surfaces: UK Department for Transport
- Design Manual for Urban Roads and Streets (Department of Transport)
- Cycle Design Manual (National Transport authority)

### **Objectives of the Walking, Cycling and Access Audit**

The objectives of this Walking, Cycling and Access Audit are as follows:

- To ensure a high level of accessibility to the development site for all vulnerable road users and, for visually and mobility impaired users.
- To ensure the current and future access needs within the scheme are recognised and developed.
- To ensure that advantage is afforded to walkers and cyclists at every opportunity.

### **General Accessibility Recommendations**

Following delivery of the Walking, Cycling and Accessibility Audit, the design team should consider all issues related herein for inclusion into the final design. It is less costly to make the changes now, pre-construction, than later after the scheme has been commissioned.

The client should consider setting up a dedicated access team for the project, responsible for the long-term management of universal access throughout the development.

This process should be facilitated by an Access Plan, which is a strategy for improving accessibility developed from the Audit and can ensure that access is an on-going concern and help identify opportunities for change.

The Access Plan should incorporate planned maintenance programmes, a schedule of works that has been devised to take into account the priority information in the Audit, processes to allow regular updating of the Audit information and links to maintenance and management procedures.

It should also set out procedures to ensure that when opportunities for access improvement arise, they are recognised.

### **Specific Walking, Cycling and Accessibility Recommendations**

A summary of the design features, together with recommended actions to be taken during the relevant stage of the design or operation of the scheme have been detailed in the following Table.

| ID                                                                         | Location              | Feature                                 | Action                                                                                                                                                                 | When         |
|----------------------------------------------------------------------------|-----------------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Recommendations to Encourage Walking</b>                                |                       |                                         |                                                                                                                                                                        |              |
| <b>W1</b>                                                                  | Throughout scheme     | Pedestrian Provision / Universal Access | Items raised in the road safety audit should be incorporated into the design to provide a comfortable, attractive and consistent environment for pedestrians.          | Design Stage |
| <b>Recommendations to Encourage Cycling</b>                                |                       |                                         |                                                                                                                                                                        |              |
| <b>C1</b>                                                                  | Throughout scheme     | Cycle route                             | Items raised in the road safety audit should be incorporated into the design to provide a comfortable, attractive and consistent environment for cyclists.             | Design Stage |
| <b>C2</b>                                                                  | Scheme extents        | Cycle route                             | Sufficient clearance to trees from cycle tracks should be provided for cyclists.                                                                                       | Design Stage |
| <b>C3</b>                                                                  | Scheme extents        | Cycle route                             | Routes for cyclists through junctions should be clear and unobstructed.                                                                                                | Design stage |
| <b>Recommendations to Provide for Universal Access &amp; Accessibility</b> |                       |                                         |                                                                                                                                                                        |              |
| <b>A1</b>                                                                  | EV parking bays       | Universal Access & Accessibility        | It should be ensured that a percentage of EV parking bays are available and designed to cater for mobility impaired users.                                             | Design Stage |
| <b>A2</b>                                                                  | Disabled parking bays | Universal Access & Accessibility        | Drop kerbs or similar should be provided to ensure mobility impaired users can access the footpath from the disabled parking bays.                                     | Design Stage |
| <b>Recommendations on Materials</b>                                        |                       |                                         |                                                                                                                                                                        |              |
| <b>M1</b>                                                                  | Scheme extents        | Cyclist provision                       | Ensure cycle friendly paving and gullies are selected.                                                                                                                 | Design Stage |
| <b>M2</b>                                                                  | Scheme extents        | All road users                          | Materials and colour of materials should be selected to ensure sufficient contrast between cycle tracks, shared surfaces, pedestrian only and vehicle interface areas. | Design Stage |

## 10.0 DMURS Street Audit

### Best Practice Guidance

This Street Audit has been carried out in accordance with general best practice guidance set out within the following documents:

- Design Manual for Urban Roads and Streets (DMURS)
- DMURS Advice Note 4
- DMURS Street Design Audit Template

### Objectives of the DMURS Street Audit

The objective of this DMURS Street Audit is as follows:

- To ensure a high level of connectivity to and through the development site for all users.

- To ensure a safe and comfortable environment is created for pedestrians and cyclists.
- To ensure that appropriate layout and materials are chosen to create a self-regulating streetscape with an appropriate level of visual quality for the proposed development.

Items in orange require action.

| Connectivity                                                                                                                |                                 |                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Key Issues                                                                                                                  | Key DMURS Reference             | Auditor Comment                                                                                                                                                                                                     |
| Strategic routes/major desire lines been identified and are clearly incorporated into the design.                           | 3.1 – Integrated Street Network | This project adheres to DMURS guidance on integrated street networks.                                                                                                                                               |
|                                                                                                                             | 3.2.1 – Movement Function       | This project caters for cyclists and pedestrians to move through the area. Refer to the road safety audit and cycle, walking and accessibility recommendations for commentary on improvements to movement function. |
|                                                                                                                             | 3.3.1 – Street layouts          | Appropriate to the location.                                                                                                                                                                                        |
|                                                                                                                             | 3.3.4 - Wayfinding              | Further signage to assist cyclists to navigate their way through junctions is recommended.                                                                                                                          |
| Multiple points of access are provided to the site/place, in particular for sustainable modes.                              | 3.3.1 – Street Layouts          | Multiple points of access are provided for sustainable transport modes.                                                                                                                                             |
|                                                                                                                             | 3.3.3 – Retrofitting            | The cycle tie in at the Southern Port Access should be reviewed to ensure that it adequately caters for the current proposed uses.                                                                                  |
| Accessibility throughout the site is maximised for pedestrians and cyclists, ensuring route choice.                         | 3.3.1 – Street Layouts          | Refer to the Road Safety Audit for commentary on cyclists exiting and entering areas from the cycle track which in some areas is impeded by trees and car parking spaces.                                           |
|                                                                                                                             | 3.3.2 – Block Sizes             | Appropriate to the location.                                                                                                                                                                                        |
|                                                                                                                             | 3.4.1 – Vehicle Permeability    | An appropriate level of vehicle permeability has been proposed.                                                                                                                                                     |
| Through movements by private vehicles on local streets are discouraged by an appropriate level of traffic calming measures. | 3.2.1 – Movement Function       | Refer to the Road Safety Audit for commentary on the needed for additional traffic calming measures on the spine roads.                                                                                             |
|                                                                                                                             | 3.2.2 – Place Context           | As above.                                                                                                                                                                                                           |
|                                                                                                                             | 3.4.1 – Vehicle Permeability    | An appropriate level of vehicle permeability has been proposed for this project.                                                                                                                                    |
|                                                                                                                             |                                 |                                                                                                                                                                                                                     |

| Self-Regulating Street Environment                                                                                               |                                             |                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Key Issues                                                                                                                       | Key DMURS Reference                         | Auditor Comment                                                                                                                                                                                         |
| A suitable range of design speeds have been applied with regard to context and function.                                         | 3.2.1 – Movement Function.                  | Additional traffic calming measures are recommended on spine roads to slow traffic speeds.                                                                                                              |
|                                                                                                                                  | 3.2.3 – Place Context                       | Additional traffic calming measures are recommended on spine roads to slow traffic speeds.                                                                                                              |
|                                                                                                                                  | 4.1.1 – A Balanced Approach to Speed        | Additional traffic calming measures are recommended on spine roads to slow traffic speeds.                                                                                                              |
| The street environment will facilitate the creation of a traffic calmed environment via the use of 'softer' or passive measures. | 4.2.1 – Building Height and Street Width    | Appropriately selected street widths for this setting.                                                                                                                                                  |
|                                                                                                                                  | 4.2.2 – Street Trees                        | Street trees are existing and proposed throughout the site to calm traffic and provide a softer environment. Refer to road safety audit for cycle audit for commentary on trees within the development. |
|                                                                                                                                  | 4.2.3 – Active Street Edges                 | It would not be appropriate to create active street edges within this development.                                                                                                                      |
|                                                                                                                                  | 4.2.4 – Signage and Line Marking            | Further detail at detail design stage on proposed signage should be provided.                                                                                                                           |
|                                                                                                                                  | 4.2.7 – Planting                            | An appropriate level and type of planting has been proposed.                                                                                                                                            |
|                                                                                                                                  | 4.4.2 – Carriageway Surfaces                | Limited detail has been provided on pavement selection however it appears to be asphalt, paving and concrete. Care should be taken to avoid paving in heavily trafficked areas.                         |
|                                                                                                                                  | 4.4.9 - On-Street Parking                   | Appropriate to this location.                                                                                                                                                                           |
|                                                                                                                                  | Advice Note 1 – Transitions and Gateways    | Not applicable                                                                                                                                                                                          |
| A suitable range of design standards/measures have been applied that are consistent with the applied design speeds.              | 4.4.1 - Carriageway Widths                  | Appropriate to this location.                                                                                                                                                                           |
|                                                                                                                                  | 4.4.4 – Forward Visibility                  | Appropriate to this location.                                                                                                                                                                           |
|                                                                                                                                  | 4.4.5 – Visibility Splays                   | See commentary in the Road Safety Audit on visibility at crossings and junctions.                                                                                                                       |
|                                                                                                                                  | 4.4.6 – Alignment and curvature             | Appropriate to this location.                                                                                                                                                                           |
|                                                                                                                                  | 4.4.7 – Horizontal and Vertical Deflections | Appropriate to this location.                                                                                                                                                                           |
|                                                                                                                                  | Advice Note 1 – Transitions and Gateways    | The raised pedestrian crossing on entry to the scheme will act as an effective gateway.                                                                                                                 |

| Pedestrian and Cycling Environment                                                                    |                                             |                                                                                                             |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Key Issues                                                                                            | Key DMURS Reference.                        | Auditor Comment                                                                                             |
| The built environment contributes to the creation of a safe and comfortable pedestrian environment.   | 4.2.1 – Building Height and Street Width    | Appropriate to location.                                                                                    |
|                                                                                                       | 4.2.3 – Active Street Edges                 | Not applicable as it would not be appropriate to have active street edges in this location.                 |
|                                                                                                       | 4.2.5 – Street Furniture                    | Appropriate to location.                                                                                    |
|                                                                                                       | 4.4.9 - On-Street parking                   | Refer to Road Safety Audit for commentary on parking.                                                       |
| Junctions been designed to ensure the needs of pedestrians and cyclists are prioritised.              | 4.3.2 - Pedestrian Crossings                | Appropriate to location.                                                                                    |
|                                                                                                       | 4.3.3 – Corner Radii                        | Appropriate corner radii have been used.                                                                    |
|                                                                                                       | 4.4.3 - Junction Design                     | The route for cyclists through junctions is unclear. Refer to the road safety audit for further commentary. |
|                                                                                                       | 4.4.7 - Horizontal and Vertical Deflections | Appropriate to location.                                                                                    |
| Footpaths are continuous and wide enough to cater for the anticipated number of pedestrian movements. | 3.2.1 – Movement Function.                  | Appropriately designed.                                                                                     |
|                                                                                                       | 3.2.3 – Place Context.                      | Appropriately designed.                                                                                     |
|                                                                                                       | 4.2.5 – Street Furniture                    | Appropriate to location.                                                                                    |
|                                                                                                       | 4.3.1 – Footways, Verges and Strips         | Appropriately designed.                                                                                     |
|                                                                                                       | 4.3.2 - Pedestrian Crossings                | Appropriate to location.                                                                                    |
|                                                                                                       |                                             |                                                                                                             |

## 11.0 Road Safety Audit – Stage 1

The following road safety problems were identified by the audit team when studying the provided information and on the subsequent site visit.

### 11.1 Problem: Visibility of pedestrians on crossings

**Location:** Throughout scheme

Proposed pedestrian crossing located adjacent to parking bays may obscure drivers' visibility of pedestrians on the crossings, particularly if high sided vans are parking in the spaces, leading to collisions between pedestrians and vehicles.

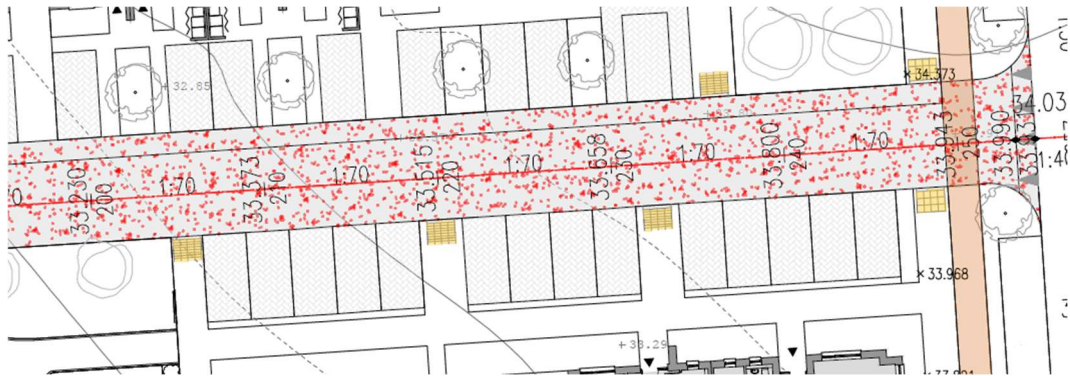


Figure 6.3 Visibility at pedestrian crossings

#### Recommendation

Parking bays should be set back from pedestrian crossings to ensure adequate intervisibility is provided.

### 11.2 Problem: No pedestrian crossing on pedestrian desire line

**Location: Northern junction**

No pedestrian crossing has been provided on the pedestrian desire line illustration below which may lead to slips and trips and collisions between pedestrians and vehicles.

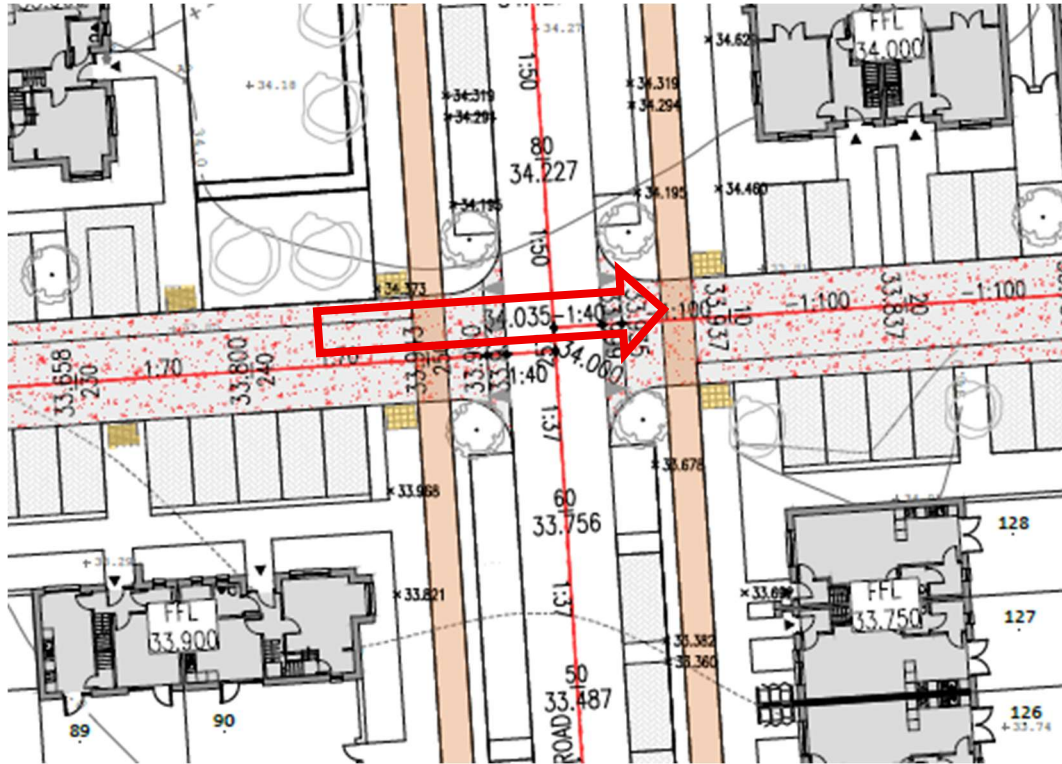


Figure 6.4 Pedestrian desire line

## Recommendation

A pedestrian crossing should be provided to fulfil the pedestrian desire line in this area.

### 11.3 Problem: No pedestrian crossing on desire line

**Location: Internal junction**

No pedestrian crossing has been provided on the pedestrian desire line illustration below which may lead to slips and trips and collisions between pedestrians and vehicles.

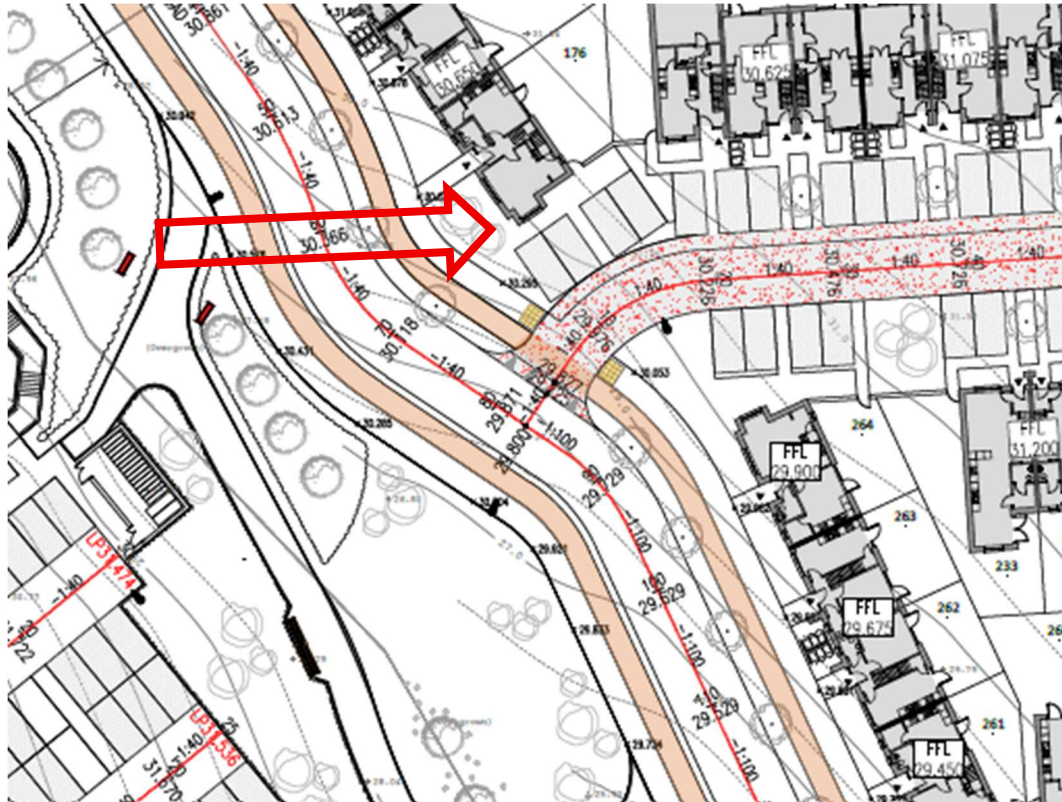


Figure 6.5 Pedestrian desire line

#### Recommendation

A pedestrian crossing should be provided to fulfil the pedestrian desire line in this area.

#### 11.4 Problem: Trees and parking spaces conflicting with cycle movements

##### Location: Internal junctions

Both trees and parking bays conflict with the proposed cycle routes through a number of junctions throughout the scheme. There is a risk of conflict with vehicles and unsafe surfaces for cyclists to cross.

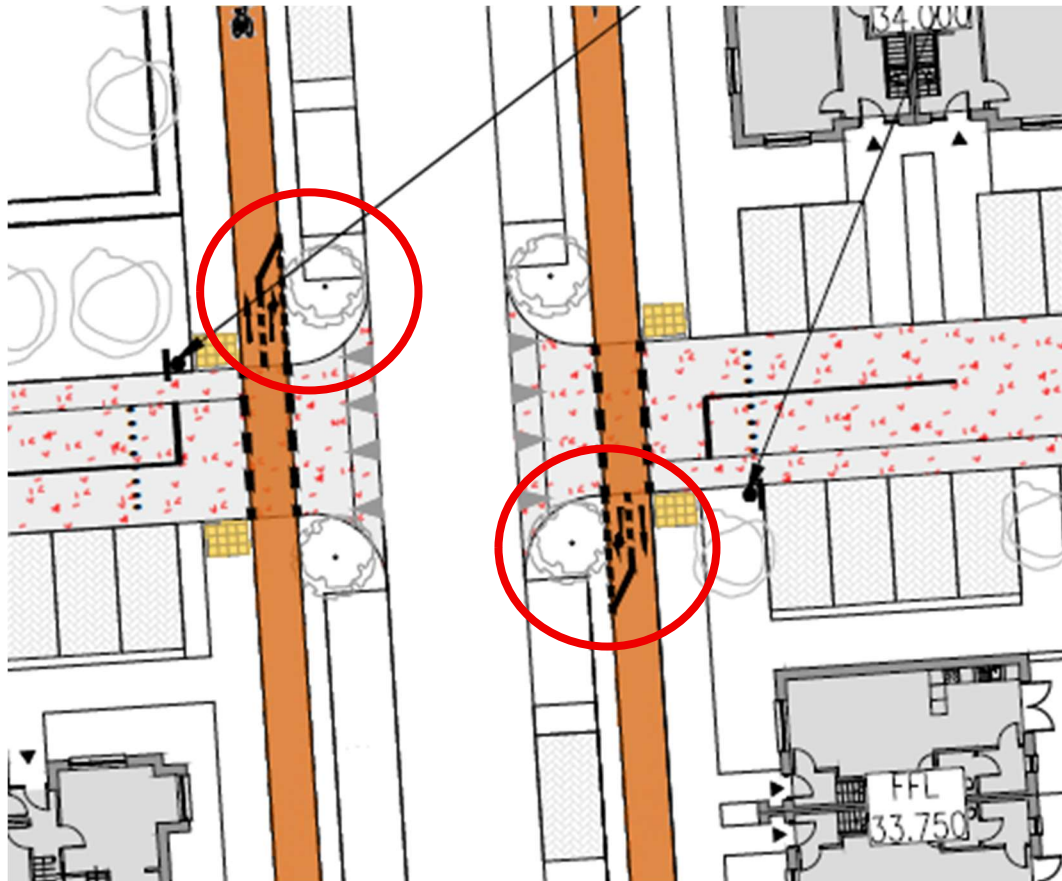


Figure 6.6 Cycle connectivity

##### Recommendation

The design should be updated so that cycle routes are free of obstructions.

### 11.5 Problem: Visibility at crossing obscured by trees

#### Location: Crossings within the development

Trees have been proposed adjacent to pedestrian crossings within the development. As the trees mature, they may obstruct visibility between pedestrians and approaching drivers, increasing the risk of vehicle-pedestrian collisions.

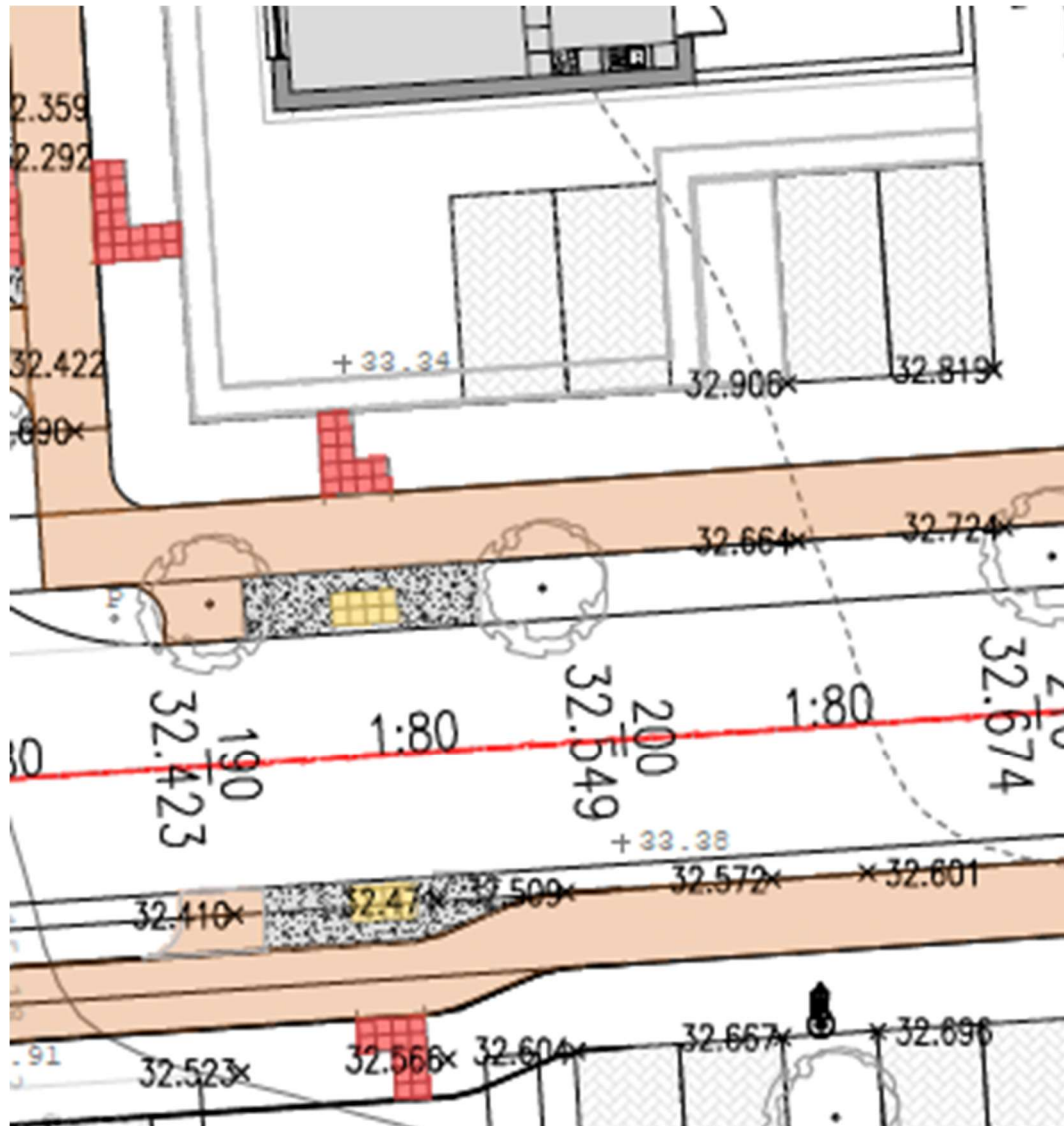


Figure 6.7 Visibility at pedestrian crossings

#### Recommendation

Trees of an appropriate girth and canopy height should be selected and maintained to ensure adequate visibility between pedestrians and approaching vehicles at pedestrian crossings.

### 11.6 Problem: Lack of access for cyclists

#### Location: Southern Port Access

It is unclear whether cyclists travelling straight through on the Southern Port Access Road can access the proposed shared surface on the left-hand side of the road. Where cyclists are required to transfer from the carriageway to the shared surface, no clear means of access has been provided, which may result in cyclists attempting to mount the kerb. This creates a risk of cyclists losing control and falling.

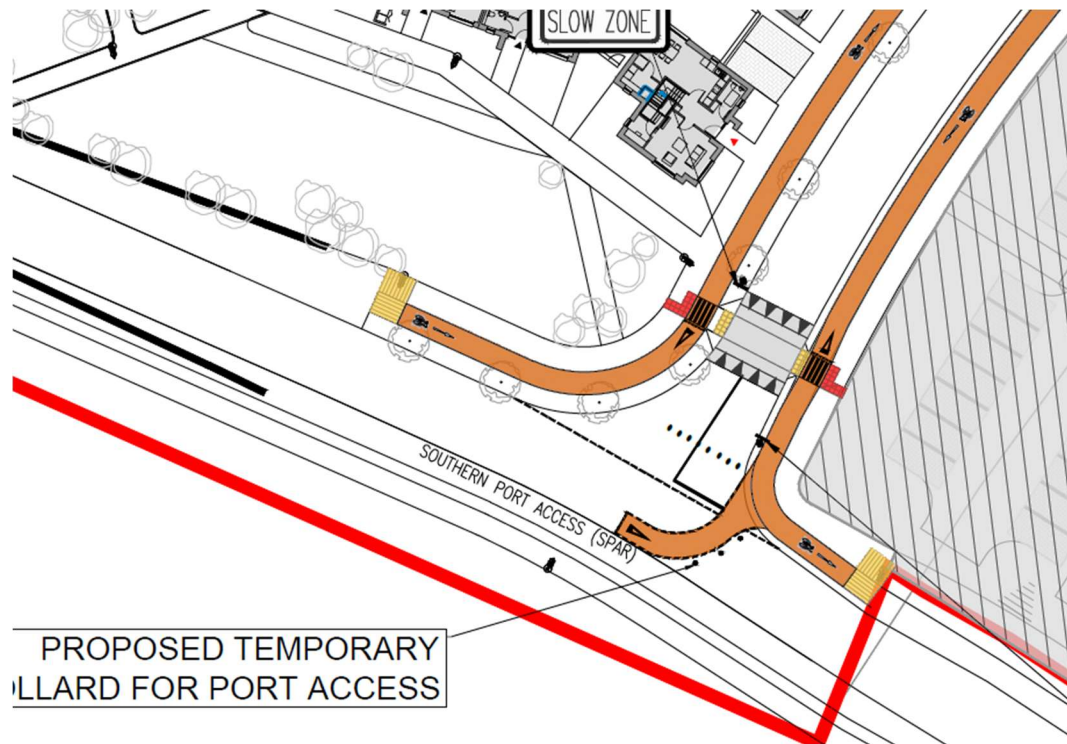


Figure 6.8 Cycle connectivity

#### Recommendation

A suitable and clearly defined cycle connection should be provided between the carriageway and shared surface, including an appropriate dropped kerb or flush transition. This will avoid cyclists having to mount the kerb and reduce the risk of loss of control and falls.

### 11.7 Problem: Visibility of cyclists merging

#### Location: Southern Port Access / Main Entrance

Cyclists exiting the scheme will continue towards the yield point, while vehicles are intended to stop at the stop line. However, as the Southern Port Access is currently closed to vehicular traffic by bollards, drivers may be less likely to stop at the designated stop line and may instead continue around the bend. This could result in vehicles and cyclists merging at the same location, with cyclists travelling along the vehicle's left side.

The resulting arrangement may give rise to restricted intervisibility between cyclists and drivers, particularly where either road user does not yield or stop at the designated location. This could increase the potential for conflicts or collisions between cyclists and vehicles, as well as conflicts with pedestrians in the vicinity.

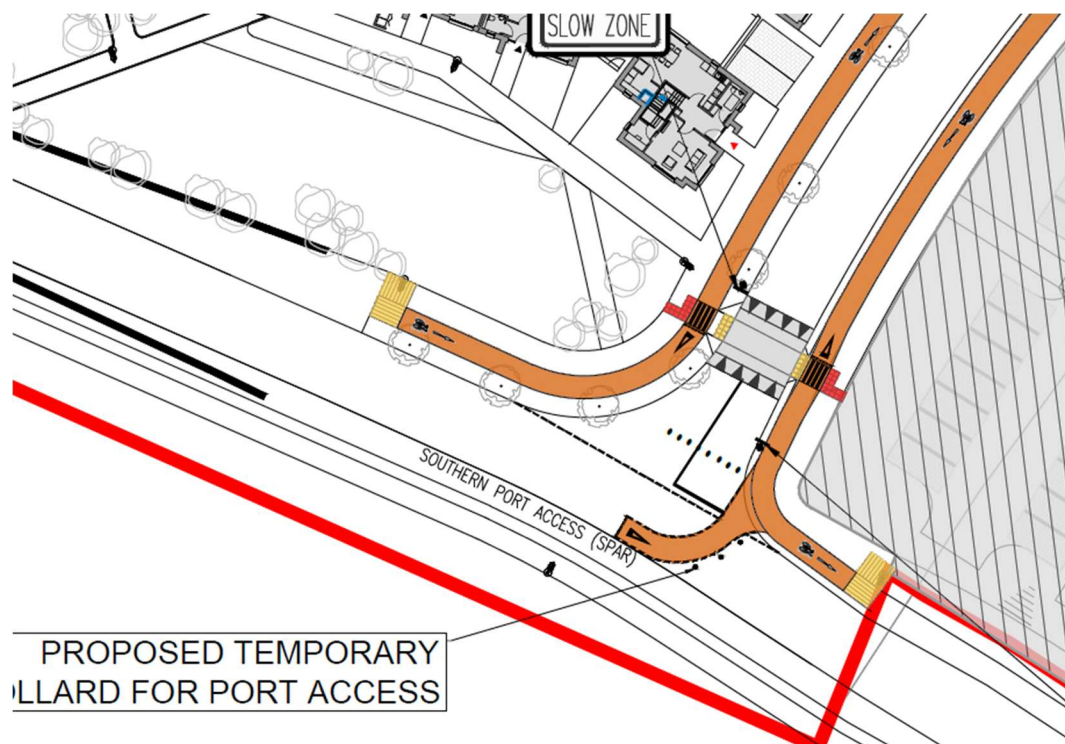


Figure 6.9 Cycle connectivity

#### Recommendation

The cycle arrangement at the junction should be reviewed to provide greater separation and protection for cyclists from vehicles, while ensuring that both cyclists and drivers have adequate intervisibility when merging.

### 11.8 Problem: Trees within visibility splay

#### Location: Visibility splays of junctions

A number of trees have been proposed within the visibility splays of junctions. As these trees mature, they may obstruct visibility for drivers approaching or exiting the junctions, increasing the risk of conflicts and collisions with vehicles travelling along the mainline.

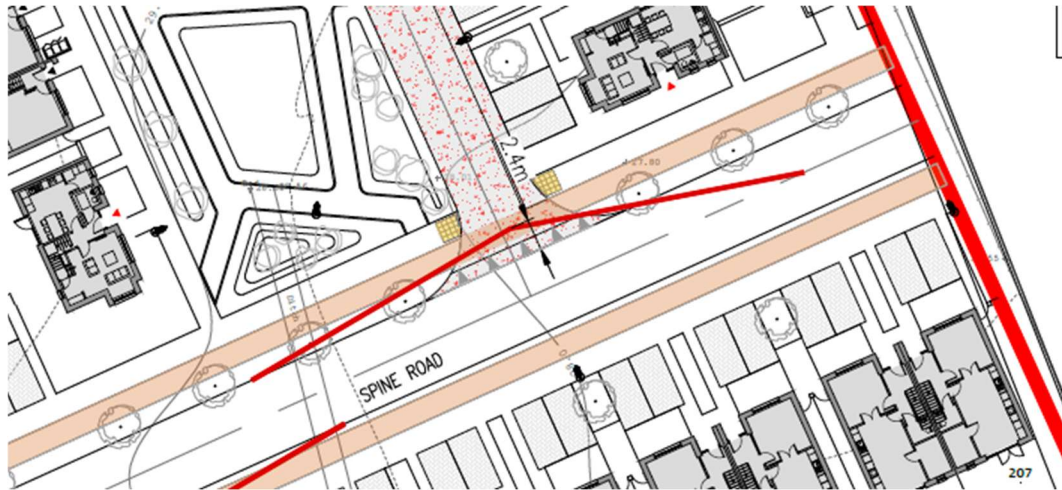


Figure 6.10 Junction visibility

#### Recommendation

Trees of appropriate canopy height and girth should be selected and maintained to ensure that adequate visibility is maintained within the junction visibility splays.

### 11.9 Problem: Trees and car parking

**Location:** Throughout scheme

Trees have been proposed directly within and immediately behind parking bays throughout the development. This creates a risk of vehicles colliding with the trees, potentially resulting in material damage to vehicles and damage to the trees.

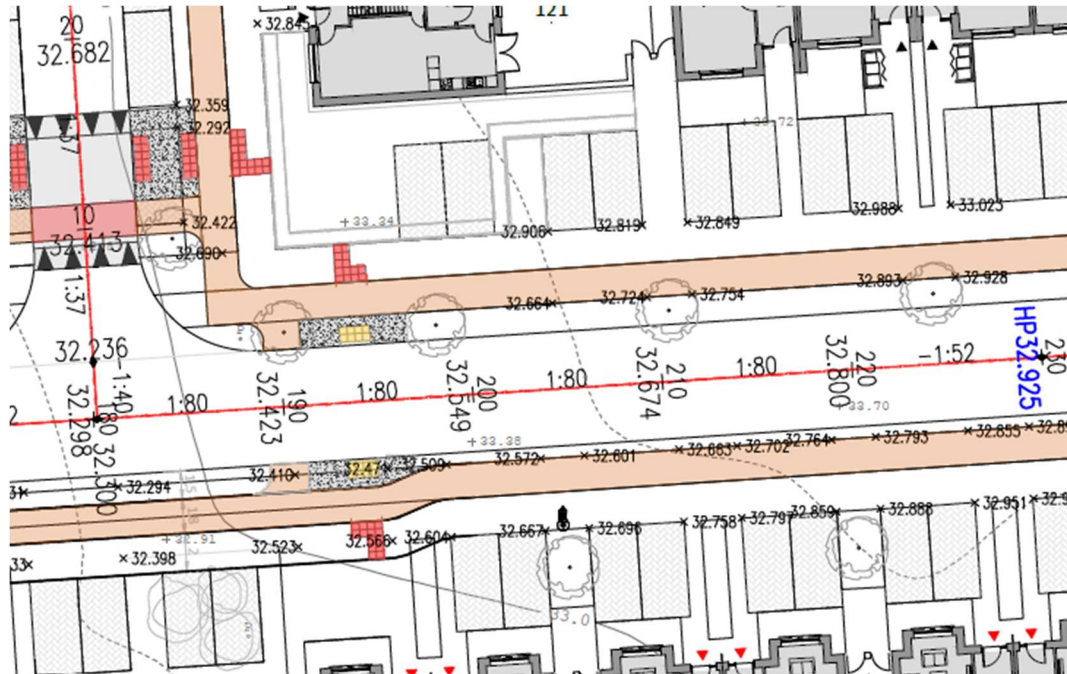


Figure 6.11 parking conflict

## Recommendation

Suitable separation should be provided between trees and parking bays. The location of trees should also be reviewed to ensure that they do not encroach into the reversing manoeuvre of vehicles exiting the parking bays.

### 11.10 Problem: Long straight sections encouraging higher speeds

#### Location: Spine roads

Long, straight sections of road with limited traffic-calming measures have been proposed within the scheme. The road layout may encourage higher vehicle speeds, increasing the risk of collisions, particularly given the high number of vulnerable road users within the development.

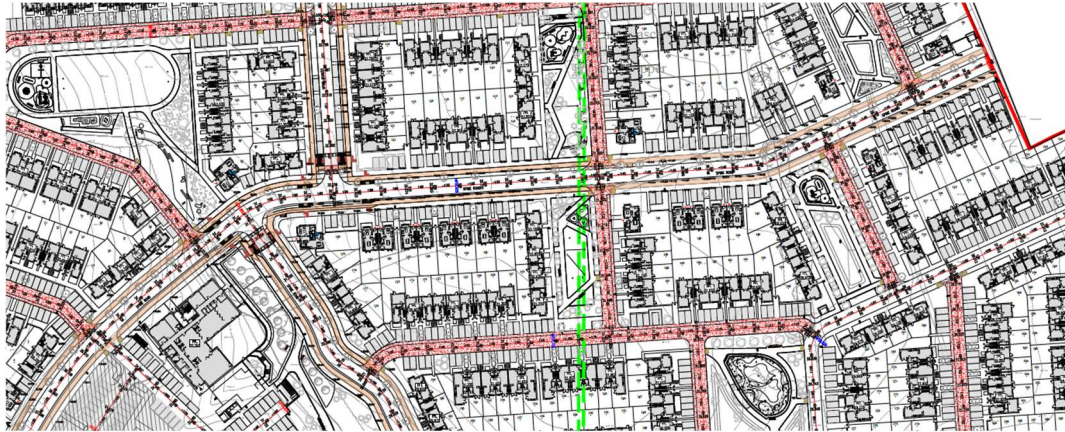


Figure 6.12 Spine road speed



Figure 6.13 Spine road speed

#### Recommendation

Appropriate traffic-calming measures should be introduced along the longer straight sections of road to discourage excessive vehicle speeds and ensure that traffic speeds are appropriate for the development and the presence of vulnerable road users.

### 11.11 Problem: Lack of tactile pairing

#### Location: Pedestrian crossings

At a number of pedestrian crossings within the scheme, tactile paving has only been provided on one side of the road. This may cause confusion for visually impaired pedestrians and may result in pedestrians crossing at inappropriate or unintended locations, increasing the risk of collisions with vehicles and slips and trips.

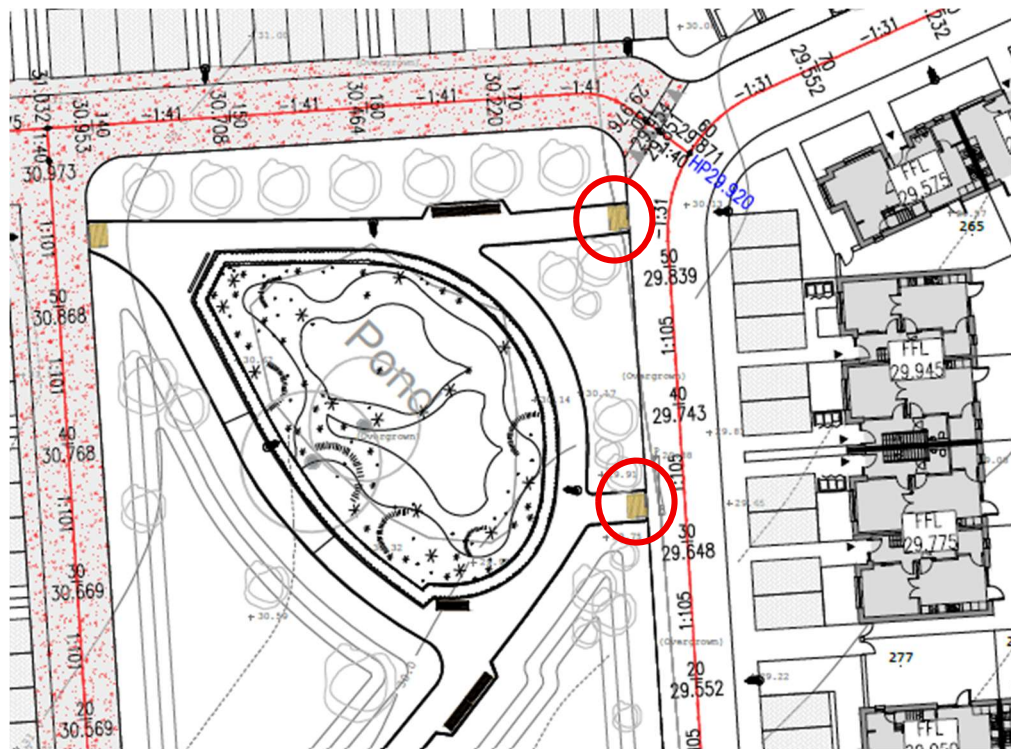


Figure 6.14 Tactile Paving Arrangement

#### Recommendation

Tactile paving should be provided in pairs when it is indicating a pedestrian crossing point.

## 12.0 Audit Team Statement

We certify that we have examined the drawings and documents listed in section 4.0 and visited the site during the day of 15<sup>th</sup> May 2026. We further certify that we are independent from the design team for this scheme. This examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified to improve the road safety aspects of the proposed scheme.

### Road Safety Audit Team Leader

|               |                                                                                   |
|---------------|-----------------------------------------------------------------------------------|
| Name          | John Ryan                                                                         |
| Signed        |  |
| Qualification | MSc BEng CEng FconsEI                                                             |
| Position      | Audit Team Leader                                                                 |
| Date:         | 15/05/2026                                                                        |

### Road Safety Audit Team Member

|               |                        |
|---------------|------------------------|
| Name          | Michael Condon         |
| Qualification | Cert of Competence RSA |
| Position      | Audit Team Member      |
| Date:         | 15/05/2026             |

## Road Safety Audit Feedback Form

| Road Safety Audit Feedback Form                          |  |                          |
|----------------------------------------------------------|--|--------------------------|
| Scheme: <b>Tinahask Arklow Mixed Use Development RSA</b> |  |                          |
| Audit Stage: 1                                           |  | Date of Audit 15/05/2026 |

| To be Completed by Designer |                           |                                       |                                                                                                                                                                            | To be Completed by Audit Team Leader                          |
|-----------------------------|---------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Item                        | Problem accepted (yes/no) | Recommended measure accepted (yes/no) | Describe alternative measure(s) Give reasons for not accepting recommended measure. Only complete if recommended measure is not accepted.                                  | Alternative measures or reasons accepted by auditors (yes/no) |
| 11.1                        | Yes                       | Yes                                   | Noted, tactile arrangement amended at Homezones. WM Drawings ARK-WAT-ZZ-XX-DR-P-0101 – 0104 & 0131-0133 updated.                                                           |                                                               |
| 11.2                        | Yes                       | Yes                                   | Noted, pedestrian crossing point added between Homezones. WM Drawings ARK-WAT-ZZ-XX-DR-P-0101 – 0104 & 0131-0133 updated.                                                  |                                                               |
| 11.3                        | Yes                       | Yes                                   | Noted, pedestrian crossing point added. WM Drawings ARK-WAT-ZZ-XX-DR-P-0101 – 0104 & 0131-0133 updated.                                                                    |                                                               |
| 11.4                        | Yes                       | Yes                                   | Noted, cycle crossing point amended. WM Drawings ARK-WAT-ZZ-XX-DR-P-0101 – 0104 & 0131-0133 updated.                                                                       |                                                               |
| 11.5                        | Yes                       | Yes                                   | Noted.                                                                                                                                                                     |                                                               |
| 11.6                        | Yes                       | Yes                                   | Noted, WM Drawing ARK-WAT-ZZ-XX-DR-P-0104 updated.                                                                                                                         |                                                               |
| 11.7                        | Yes                       | Yes                                   | Noted, cycle arrangement at SPAR amended to reduce the risk of conflict between vehicles and on road cyclists at the junction. WM Drawing ARK-WAT-ZZ-XX-DR-P-0104 updated. |                                                               |
| 11.8                        | Yes                       | Yes                                   | Noted.                                                                                                                                                                     |                                                               |
| 11.9                        | Yes                       | Yes                                   | Noted, trees to be set back from pedestrian crossing points to reduce risk of obscuring sightlines.                                                                        |                                                               |
| 11.10                       | Yes                       | Yes                                   | Noted, raised tables added as traffic calming measure. WM Drawings ARK-                                                                                                    |                                                               |

|       |     |     |                                                                                                    |  |
|-------|-----|-----|----------------------------------------------------------------------------------------------------|--|
|       |     |     | WAT-ZZ-XX-DR-P-0101 – 0104 & 0131-0133 updated.                                                    |  |
| 11.11 | Yes | Yes | Noted, tactile arrangement amended WM Drawings ARK-WAT-ZZ-XX-DR-P-0101 – 0104 & 0131-0133 updated. |  |
|       |     |     |                                                                                                    |  |

Signed

*Noel Mahon*

Designer

Date 30/09/26

Signed

*Johny*Audit  
Team  
Leader

Date 01/10/2026

Signed

*Hal Parker*

Employer

Date 1/10/2026

## 1.0 Observations

No response is required to observations however they should be considered by both the client and the designer.

### 1.1 Observations: Information audited

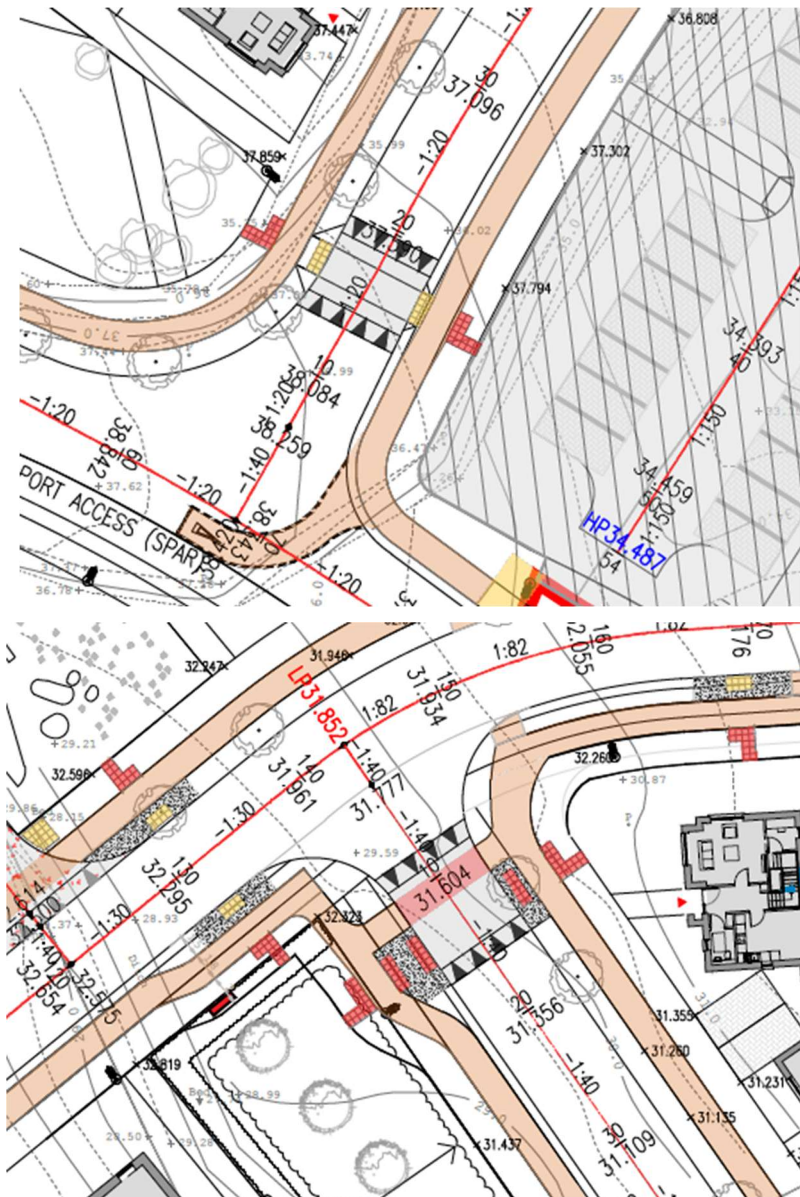
**Location:** Throughout scheme

Limited information is currently available in relation to drainage and kerbing within the scheme. These should be further developed at detailed design stage.

## 1.2 Observations: Tactile paving orientation

**Location:** Throughout scheme

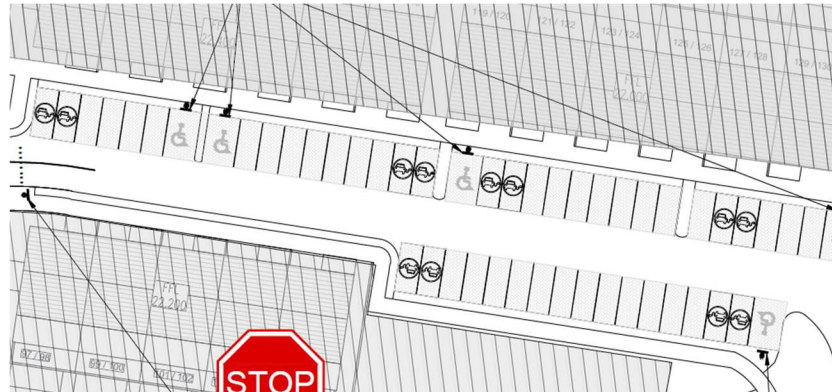
The orientation of the red tactile paving throughout the scheme should be reviewed. Tactile paving that is not orientated in the usual manner may cause confusion for visually impaired pedestrians and could result in users misinterpreting the intended direction of travel or crossing point. The island size between the cycle lane and pedestrian crossing also appears narrow risking collisions between pedestrians and cyclists.



### 1.3 Observations: EV parking bay sizes

**Location:** Throughout scheme

EV parking bays have been detailed to the same dimensions as standard parking bays. The available width may be insufficient to allow convenient access and egress from vehicles, particularly where charging cables are required. This may increase the risk of material damage to vehicles and create difficulties for mobility-impaired users accessing or using the EV charging facilities.



## **F. Soakaway Tests Section – Site Investigations Ltd**

#### **6.4. Soakaway Tests**

The soakaway tests failed the specification as the water level did not fall sufficiently enough to complete the test. The BRE Digest stipulates that the pit should half empty within 24hrs, and extrapolation indicates this condition would not be satisfied. The tests were terminated at the end of the first (of a possible three) fill/empty cycle since further testing would give even slower fall rates due to increased soil saturation.

#### **6.5. Pavement Design**

The CBR results in Appendix 5 recorded values ranging from 6.1% to 15.9%.

Compaction of the capping and subbase should be in line with TII Series 600 Earthworks Design. Once the exact formation levels are finalised then additional in-situ testing could be completed to assist with the detailed pavement design.

#### **6.6. Contamination**

Environmental testing was carried out on three samples from the investigation and the results are shown in Appendix 7. For material to be removed from site, Suite I testing was carried out to determine if the material is hazardous or non-hazardous and then the leachate results were compared with the published waste acceptance limits of BS EN 12457-2 to determine whether the material on the site could be accepted as 'inert material' by an Irish landfill.

The Waste Classification Report in Appendix 8, created using HazWasteOnline™ software, shows that the material tested can be classified as non-hazardous material with waste code 17-05-04.

Following this analysis of the solid test results, the leachate WAC analysis results were analysed in accordance with 2003/33/EC inert criteria and this shows that the soils would be able to be treated as Inert Waste.

Finally, a soil recovery facility screening has been completed and this is provided in Appendix 9. The soils pass the majority of the Domain except for the TP024 sample that recorded slightly elevated copper values. The soils may still be accepted by the individual facilities and therefore the results should be provided to the chosen landfill prior to any removal of soil from the site.

Three samples were tested for analysis but it cannot be discounted that any localised contamination may have been missed. Any MADE GROUND excavated on site should be stockpiled separately to natural soils to avoid any potential cross contamination of the soils. Additional testing of these soils may be requested by the individual landfill before acceptance and a testing regime designed by an environmental engineer would be recommended to satisfy the landfill.

# UK and Ireland Office Locations

